All About

Mathematics

Help Kit : 6 to 8

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1 Knowing Our Numbers

Exercise 1.1

1. (a) Ninety-five lakh three hundred twenty-two.
   ⇒ 95,00,322
   (b) Forty crore one thousands thirty.
   ⇒ 40,00,01,030
   (c) Two billion three hundred sixty-five thousand seven hundred twenty-eight.
   ⇒ 2,000,365,728
   (d) Two hundred twenty-five million seven hundred sixteen thousand four hundred two.
   ⇒ 225,716,402

2. (a) 6,87,54,329
   Six crore eighty-seven lakh fifty-four thousand three hundred twenty-nine.
   (b) 7,39,87,021
   Seven crore thirty-nine lakh eighty-seven thousand twenty-one.
   (c) 9,37,54,081
   Nine crore thirty-seven lakh fifty-four thousand eighty-one.
   (d) 2,60,00,786 Two crore sixty lakh seven hundred eighty-six.

3. (a) 98,765,434
   Ninety-eight million seven hundred sixty-five thousand four hundred thirty four.
   (b) 76,382,949
   Seventy-six million three hundred eighty-two thousand nine hundred forty-nine.
   (c) 45,654,670
   Forty-five crore six hundred fifty-four thousand six hundred seventy.
   (d) 14,367,856,792
   Forty billion three hundred sixty-seven million eight hundred fifty-six thousand seven hundred ninety-two.

4. (a) 253491 ⇒ 400 (b) 120607 ⇒ 20,000
   (c) 546124 ⇒ 20 (d) 294336 ⇒ 300

5. (a) 2,43,45,892
   = 2,00,00,000 + 40,00,000 + 3,00,000 + 40,000 + 5,000 + 800 + 90 + 2
   (b) 6,78,92,831 = 40,00,000 + 5,00,000 + 70,000 + 3,000 + 900 + 10
   (c) 45,73,910 = 40,00,000 + 5,00,000 + 70,000 + 3,000 + 900 + 10
   (d) 2,34,56,410
   = 2,00,00,000 + 30,00,000 + 4,00,000 + 50,000 + 6,000 + 400 + 10

6. Place value of first seven in the number 2,85,73,89,507 = 70,00,000
   Place value of second seven in the number 2,85,73,89,507 = 7

Difference $\Rightarrow 70,00,000 - 7$

$\Rightarrow$ 69,99,993

7. How many seven-digit numbers are there in all?

99,99,999 – 9,99,999

$\Rightarrow$ 90,00,000

So, 90,00,000 seven digit numbers are there in all.

8. Find the difference between the place value and face value of 8 in 67,85,90,213.

Place value of 8 in 67,85,90,213 $\Rightarrow$ 80,00,000

Face value of 8 in 67,85,90,213 $\Rightarrow$ 8

Difference $\Rightarrow 80,00,000 - 8$

$\Rightarrow$ 79,99,992

9. Which is smaller : 5,67,34,523 or 5,67,35,587?

Compare of 5,67,34,523 and 5,67,35,587

The crores, lakhs and ten thousand digit are same.

Then, compare with thousands digit

$\because \quad 4 < 5$

$\therefore \quad 5,67,34,523 < 5,67,35,587$?

10. (a) 1 thousand = 100 tens

(b) 1 lakh = 10 ten thousand

(c) 1 million = 10 hundred thousand

(d) 1 crore = 10 ten lakh

(e) 1 crore = 10 million

(f) 1 million = 10 lakh

Exercise 1.2

1. (a) The successor of 9999 is 10,000.

(b) The predecessor of 250305 is 250304.

(c) The greatest number among 25286, 25245, 25270 and 25210 is 25286.

(d) $2 \times 10000 + 3 \times 1000 + 3 \times 1 = 23,001$.

(e) The face value of 3 in 53201 is 3.

(f) The place value of 7 is 67891 is 7,000.

2. (a) The successor of 7386 = $7386 + 1 = 7387$.

(b) The successor of 20,000 = $20,000 + 1 = 20,001$.

(c) The successor of 8,99,999 = $8,99,999 + 1 = 9,00,000$.

(d) The successor of 4,001 = $4,001 + 1 = 4002$.

(e) The successor of 20,100 = $20,100 + 1 = 20,101$.

(f) The successor of 9,88,888 = $9,88,888 + 1 = 9,88,889$.

3. (a) The predecessor of 9731 = $9731 - 1 = 9730$.

(b) The predecessor of 25,360 = $25,360 - 1 = 25,359$.

(c) The predecessor of 90,000 = $90,000 - 1 = 89,999$.

(d) The predecessor of 2013 = $2013 - 1 = 2012$.

(e) The predecessor of 36,025 = $36,025 - 1 = 36,024$.

(f) The predecessor of 77,700 = 77,700 − 1 = 77,699.

4. (a) 391 < 931 < 4434 < 8100

(b) 501 < 2305 < 60931 < 122360

5. (a) 533400 > 222222 > 23451 > 2000

(b) 13,00,00,000 > 2,33,55,400 > 18,88,888 > 9,88,808

6. (a) 89,280 = 80,000 + 9,000 + 200 + 80.

(b) 3,09,120 = 3,00,000 + 0 + 9,000 + 100 + 20.

(c) 6,23,41,123

= 6,00,00,000 + 20,00,000 + 3,00,000 + 40,000 + 1,000 + 100 + 20 + 3.

7. (a) 200000 + 30000 + 6000 + 200 + 20 + 1 $\Rightarrow$ 2,36,221.

(b) 400000 + 40 + 4 = 4,00,044

8. (a) 78201

Place value of 8 = 8,000

of 2 = 20

Face value of 8 = 8

(b) 230729

Place value

Face value of 2 = 2

9. (a) 7, 2, 1, 5, 3, 9

Greatest six-digit number = 9,75,231.

and smallest six-digit number = 1,32,579.

(b) 2, 1, 0, 5, 7, 8

Greatest six-digit number = 8,75,210

and, smallest six-digit number = 1,02,578.

10. (a) 1, 3, 7, 2, 5

Greatest six-digit number = 7,75,321.

and smallest six-digit number = 1,12,357.

(b) 2, 0, 9, 8, 1

Greatest six-digit number = 9,98,210.

and smallest six-digit number = 1,00,289.

11. Greatest six-digit number = 9,99,999

and, smallest five digit number = 10,000

Difference = 9,99,999 − 10,000 = 9,89,999

Exercise 1.3

1. (a) 67 + 40

Let's round off to the nearest tens.

67 is rounded off to 70.

40 is rounded off to 40.

Therefore, estimated sum = 70 + 40 = 110.

(b) 78 + 43

Let's round off to the nearest tens.

78 is rounded off to 80.

43 is rounded off to 40.

Therefore, estimated sum = 80 + 40 = 120.

(c) 881 + 728

Let's round off to the nearest tens.

881 is rounded off to 880.

728 is rounded off to 730.

Therefore, estimated sum = $880 + 730 = 1610$.

(d) $567 + 432$

Let's round off to the nearest tens.

567 is rounded off to 570.

432 is rounded off to 430.

Therefore, estimated sum = $570 + 430 = 1{,}000$.

2. (a) $367 + 564$

Let's round off to the nearest hundreds.

367 is rounded off to 400.

564 is rounded off to 600.

Therefore, estimated sum = $400 + 600 = 1{,}000$.

(b) $872 + 569$

Let's round off to the nearest hundreds.

872 is rounded off to 900.

569 is rounded off to 600.

Therefore, estimated sum = $900 + 600 = 1500$.

(c) $852 + 769$

Let's round off to the nearest hundreds.

852 is rounded off to 900.

769 is rounded off to 800.

Therefore, estimated sum = $900 + 800 = 1700$.

(d) $5{,}139 + 7{,}653$

Let's round off to the nearest hundreds.

5139 is rounded off to 5,100.

7,653 is rounded off to 7,700.

Therefore, estimated sum = $5{,}100 + 7{,}700 = 12{,}800$.

3. (a) $56{,}784 + 76{,}834$

Let's round off to the nearest thousands.

56,784 is rounded off to 57,000.

76,834 is rounded off to 77,000.

Therefore, estimated sum = $57{,}000 + 77{,}000 = 1{,}34{,}000$.

(b) $43{,}829 + 34{,}784$

Let's round off to the nearest thousands.

43,829 is rounded off to 44,000.

34,784 is rounded off to 35,000.

Therefore, estimated sum = $44{,}000 + 35{,}000 = 79{,}000$.

(c) $24{,}568 + 54{,}118$

Let's round off to the nearest thousands.

24,568 is rounded off to 25,000.

54,118 is rounded off to 54,000.

Therefore, estimated sum = $25,000 + 54,000 = 79,000$.

(d) $21,384 + 45,379$

Let's round off to the nearest thousands.

21,384 is rounded off to 21,000.

45,379 is rounded off to 45,000.

Therefore, estimated sum = $21,000 + 45,000 = 66,000$.

4. (a) 67 – 43

Let's round off to the nearest tens.

67 is rounded off to 70.

43 is rounded off to 40.

Therefore, estimated difference = $70 - 40 = 30$.

(b) 689 – 432

Let's round off to the nearest tens.

689 is rounded off to 690.

432 is rounded off to 430.

Therefore, estimated difference = $690 - 430 = 260$.

(c) 564 – 321

Let's round off to the nearest tens.

564 is rounded off to 560.

321 is rounded off to 320.

Therefore, estimated difference = $560 - 320 = 240$.

(d) 856 – 672

Let's round off to the nearest tens.

856 is rounded off to 860.

672 is rounded off to 670.

Therefore, estimated difference = $860 - 670 = 190$.

5. (a) 674 – 432

Let's round off to the nearest hundreds.

674 is rounded off to 700.

432 is rounded off to 400.

Therefore, estimated difference = $700 - 400 = 300$.

(b) 689 – 532

Let's round off to the nearest hundreds.

689 is rounded off to 700.

532 is rounded off to 500.

Therefore, estimated difference = $700 - 500 = 200$.

(c) 764 – 321

Let's round off to the nearest hundreds.

764 is rounded off to 800.

321 is rounded off to 300.

Therefore, estimated difference = $800 - 300 = 500$.

(d) 956 – 572

Let's round off to the nearest hundreds.
956 is rounded off to 1,000.
572 is rounded off to 600.
Therefore, estimated difference $= 1000 - 600 = 400$

6. (a) 7,674 – 3,432
Let's round off to the nearest thousands.
7,674 is rounded off to 8,000.
3,432 is rounded off to 3,000.
Therefore, estimated difference $= 8{,}000 - 3{,}000 = 5{,}000.$

(b) 3,689 – 2,532
Let's round off to the nearest thousands.
3,689 is rounded off to 4,000.
2,532 is rounded off to 3,000.
Therefore, estimated difference $= 4{,}000 - 3{,}000 = 1{,}000$

(c) 6,764 – 5,321
Let's round off to the nearest thousands.
6,764 is rounded off to 7,000.
5,321 is rounded off to 5,000.
Therefore, estimated difference $= 7{,}000 - 5{,}000 = 2{,}000.$

(d) 8,956 – 7,572
Let's round off to the nearest thousands.
8,956 is rounded off to 9,000.
7,572 is rounded off to 8,000.
Therefore, estimated difference $= 9{,}000 - 8{,}000 = 1{,}000.$

7. (a) 58×45
Let's round off to the nearest tens.
58 is rounded off to 60.
45 is rounded off to 50.
Therefore, estimated product $= 60 \times 50 = 3{,}000.$

(b) 67×33
Let's round off to the nearest tens.
67 is rounded off to 70.
33 is rounded off to 30.
Therefore, estimated product $= 70 \times 30 = 2{,}100.$

(c) 78×32
Let's round off to the nearest tens.
78 is rounded off to 80.
32 is rounded off to 30.
Therefore, estimated product $= 80 \times 30 = 2{,}400.$

(d) 23×98
Let's round off to the nearest tens.
23 is rounded off to 20.

98 is rounded off to 100.
Therefore, estimated product $= 20 \times 100 = 2{,}000$.

8. (a) 581×456
Let's round off to the nearest hundred.
581 is rounded off to 600.
456 is rounded off to 500.
Therefore, estimated product $= 600 \times 500 = 3{,}00{,}000$.

(b) 167×233
Let's round off to the nearest hundred.
167 is rounded off to 200.
233 is rounded off to 200.
Therefore, estimated product $= 200 \times 200 = 40{,}000$.

(c) 478×132
Let's round off to the nearest hundred.
478 is rounded off to 500.
132 is rounded off to 100.
Therefore, estimated product $= 500 \times 100 = 50{,}000$.

(d) 223×198
Let's round off to the nearest hundred.
223 is rounded off to 200.
198 is rounded off to 200.
Therefore, estimated product $= 200 \times 200 = 40{,}000$.

9. (a) 345×46
Rounding off each number to the greatest place.
345 rounded off to the nearest thousands is 300.
46 rounded off to the nearest hundreds is 50.
Therefore, estimated product $= 300 \times 50 = 15{,}000$.

(b) $3{,}427 \times 456$
Rounding off each number to the greatest place.
3,427 rounded off to the nearest thousands is 3,000.
456 rounded off to the nearest hundreds is 500.
Therefore, estimated product $= 3000 \times 500 = 15{,}00{,}000$.

(c) $2{,}192 \times 479$
Rounding off each number to the greatest place.
Rounded off to the nearest thousands is
Rounded off to the nearest hundreds is
Therefore, estimated product

(d) $9{,}876 \times 32$
Rounding off each number to the greatest place.
9,876 rounded off to the nearest thousands is 10,00.
32 rounded off to the nearest hundreds is 30.
Therefore, estimated product $= 10{,}000 \times 30 = 3{,}00{,}000$.

10. (a) $567 \div 24$

Rounding off each number to the greatest place.

567 rounded off to the nearest hundreds is 600.

24 rounded off to the nearest tens is 20.

Therefore, estimated quotient $= 600 \div 20 = 30.$

(b) $861 \div 29$

Rounding off each number to the greatest place.

861 rounded off to the nearest hundreds is 900.

29 rounded off to the nearest tens is 30.

Therefore, estimated quotient $= 900 \div 30 = 30.$

(c) $347 \div 13$

Rounding off each number to the greatest place.

347 rounded off to the nearest hundreds is 300.

13 rounded off to the nearest tens is 10.

Therefore, estimated quotient $= 300 \div 10 = 30.$

(d) $691 \div 18$

Rounding off each number to the greatest place.

691 rounded off to the nearest hundreds is 700.

18 rounded off to the nearest tens is 20.

Therefore, estimated quotient $= 700 \div 20 = 35.$

Exercise 1.4

1. (a) LVI $\boxed{>}$ XL (b) LVII $\boxed{<}$ C

(c) XLIV $\boxed{<}$ LXIV (d) XCIX $\boxed{>}$ LXXXIX

(e) CD $\boxed{<}$ CM (f) DXCVI $\boxed{>}$ DLVI

2. (a) $7 \times (11 + 9) = 7 \times 20 = 140.$

(b) $42 + (73 - 23) = 42 + (50) = 92.$

(c) $248 - (300 - 152) = 248 - (148) = 100.$

(d) $(27 + 23)(68 - 58) = (50)(10) = 50 \times 10 = 500.$

(e) $287 \times 90 = 287 \times (100 - 10) = 287 \times 100 - 287 \times 10$

$= 28700 - 2870 = 25{,}830.$

(f) $105 \times 95 = (100 + 5) \times (100 - 5)$

$= (100)^2 - (5)^2$

$= 10{,}000 - 25 = 9{,}975.$

3. (a) $22 = 20 + 2 = \text{XXII}$ (b) $28 = 20 + 8 = \text{XXVIII}$

(c) $32 = 30 + 2 = \text{XXXII}$

(d) $45 = 40 + 5 = (50 - 10) + 5 = \text{XLV}$

(e) $47 = 40 + 7 = (50 - 10) + 7 = \text{XLVII}$

(f) $55 = 50 + 5 = \text{LV}$

(g) $64 = 60 + 4 = (50 + 10) + 4 = \text{LXIV}$

(h) $81 = 80 + 1 = (50 + 30) + 1 = \text{LXXXI}$

(i) $93 = 90 + 3 = (100 - 10) + 3 = \text{XCIII}$

(j) $97 = 90 + 7 = (100 - 10) + 7 = \text{XCVII}$

(k) $327 = 300 + 20 + 7 = CCCXXVII$
(l) $548 = 500 + 40 + 8 = DXLVIII$
(m) $991 = 900 + 90 + 1 = (1000 - 100) + (100 - 10) + 1 = CMXCI$
(n) $1{,}207 = 1000 + 200 + 7 = MCCVII$
(o) $3{,}919 = 3000 + 900 + 10 + 9 = MMMCMXIX$

4. (a) $XVII = 10 + 5 + 2 = 17$ (b) $XXIV = 20 + 4 = 24$
(c) $XLV = (50 - 10) + 5 = 45$ (d) $LI = 50 + 1 = 51$
(e) $XCII = (100 - 10) + 2 = 92$ (f) $XCV = (100 - 10) + 5 = 95$
(g) $CLXXXVII = (100 + 50 + 30 + 7) = 187$
(h) $CCCLXXXIII = (300 + 50 + 30 + 3) = 383$
(i) $CDXLIX = (500 - 100) + (50 - 10) + (10 - 1) = 449$
(j) $MCDLV = 1000 + (500 - 100) + 50 + 5 = 1455$
(k) $MDCCXXV = 1000 + 700 + 20 + 5 = 1{,}725$
(l) $MMMDXXI = 3000 + 500 + 20 + 1 = 3{,}521$

5. (a) $XL + XXI = 40 + 21 = 61 = LXI$
(b) $XCIII + XVIII = 93 + 18 = 111 = CXI$
(c) $XCII - LXV = 92 - 65 = 27 = XXVII$

6. $LIX + XXXVI + IX + III$
Here, $LIX = 50 + 9 = 59$
$IX = 9$
$XXXVI = 30 + 6 = 36$
$III = 3$
Hence, $LIX + XXXVI + I \times + III = 59 + 36 + 9 + 3 = 107.$
$= 100 + 7 = CVII.$

Multiple Choice Questions

Tick (3) the correct option :

1. (b), 2. (b), 3. (d), 4. (b), 5. (c), 6. (d), 7. (d), 8. (c), 9. (a), 10. (d), 11. (d), 12. (c)

Higher Order Thinking Skills

Greatest four digit number using 2 different digits $\Rightarrow$ 9,998.
The place value of ones digit is always equal to its face value.
Smallest number rounding off 5,400 is 5000.
Greatest number rounding off 5,400 is 6000.
So, difference $= 6{,}000 - 5{,}000 = 1{,}000$.
Digits = 0, 2, 5 and 7.
Smallest number formed by given digits = 7520.
Greatest number formed by given digits = 2057.
So, difference $= 7{,}520 - 2{,}057 = 5{,}463$.

Exercise 2.1

1. (a) Successor of 10799 $= 10799+1 = 10800$

And Successor of 10800 $= 10800+1 = 10801$

So, the two successor of 10799 is 10800, 10801.

(b) Successor of 20999 $= 20999+1 = 21000$

and Successor of 21000 $= 21000+1 = 21001$

So, the two successor of 20999 is 21000, 21001.

2. (a) Predecessor of 20010 $= 20010-1 = 20009$

Predecessor of 20009 $= 20009-1 = 20008$

and Predecessor of 20008 $= 20008-1 = 20007$

So, the three predecessors of 20010 is 20009, 20008 and 20007.

(b) Predecessor of 9999 $= 9999-1 = 9998$

Predecessor of 9998 $= 9998-1 = 9997$

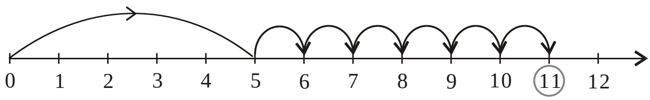
And predecessor of 9997 $= 9997-1 = 9996$

So, the three predecessors of 9999 is 9998, 9997 and 9996.

3. The natural numbers are 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71.

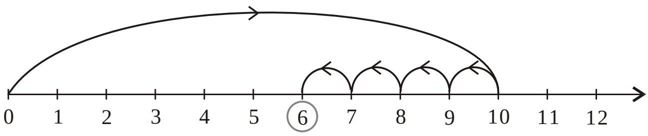
So, the number of natural number is 12.

4. (a) $5+6$



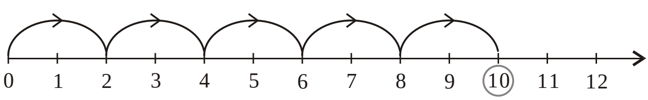
$5+6=11$

(b) $10-4$



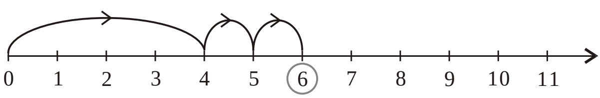
$10-4=6$

(c) 2×5



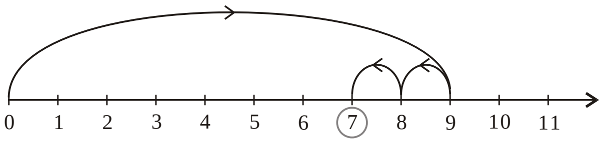
$2\times 5=10$

(d) $4+2$



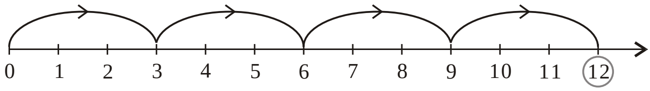
$4+2=6$

(e) $9-2$



$9-2=7$

(f) 3×4



$3\times 4=12$

5. (a) False (b) True (c) True (d) False
(e) False (f) False (g) True

Exercise 2.2

1. (a)
$$\begin{array}{r} 3\ \boxed{0}\ 5\ 3 \\ -\ \boxed{1}\ 2\ \boxed{1}\ 1 \\ \hline 1\ 8\ 4\ \boxed{2} \end{array}$$

(b)
$$\begin{array}{r} \boxed{4}003\boxed{7}\quad \boxed{} \\ -143\boxed{7}2 \\ \hline 25665\ \boxed{} \end{array}$$

2. (a) Multiplicative identity. (b) Additive identity.
(c) Commutative property for subtraction.
(d) Associative property for multiplication.
(e) Distributive property of multiplication.

3. (a) $75\times 71+29\times 75$
$=75\times(71+29)$
$=75\times 100=7500$

(b) $135\times 105=(100+35)\times(100+5)$
$=10000+500+3500+175=14175$

(c) $393\times 435-35\times 393=393(435-35)$
$=393\times 400=157200$

(d) $25\times 94=25\times(100-6)$
$=2500-150=2350$

(e) $350\times 25+35\times 10\times 21$
$=35\times 10\times 25+35\times 10\times 21$
$=35\times 10\times(25+21)$
$=350\times 46=16100$

(f) $250\times 8+25\times 10\times 9$
$=250\times 8+250\times 9$
$=250(8+9)$
$=250\times 17=4250$

(g) $546\times 999+546$
$=546\times(999+1)$
$=546\times 1000=546000$

(h) $3845 \times 5 \times 782 + 769 \times 25 \times 218$

$= 3845 \times 5 \times 782 + (769 \times 5) \times 5 \times 218$

$= 3845 \times 5 \times 782 + 3845 \times 5 \times 218 = 3845 \times 5 \times (782 + 218)$

Distributive property of multiplication over addition.

$= 3845 \times 5 \times 1000 = 19225000$

4. (a) True (b) True (c) False (d) True (e) False

5. $a \div 11$ (given)

quotient = 5, remainder = 1

We know that,

Dividend = Divisor × Quotient + Remainder

$a = 11 \times 5 + 1$

$a = 55 + 1$

$a = 56$

6. The greatest 4-digit number = 9999

$\therefore$ 70) 9999 (142

$$\begin{array}{r} -70 \\ \hline 299 \\ -280 \\ \hline 199 \\ -140 \\ \hline 59 \text{ R} \end{array}$$

$\because$ $59 < 70$

$\therefore$ the greater 4-digit number = $70 \times 142 = 9940$

Exercise 2.3

1. (a) $40 + [80 + \{(20 - 3) \times 7\}]$

$= 40 + [80 + \{17 \times 7\}]$

$= 40 + [80 + 119] = 40 + 199 = 239$

(b) $240 \div [8 + \{24 \times (10 - 7)\}]$

$= 240 \div [8 + \{24 \times 3\}]$

$= 240 \div [8 + 72] = 240 \div 80 = 3$

(c) $\{(112 + 3) - (5 \times 10 - 17) + 6\} \div 4$

$= \{115 - (50 - 17) + 6\} \div 4$

$= \{115 - 33 + 6\} \div 4 = \{82 + 6\} \div 4 = 88 \div 4 = 22$

(d) 25 of $[70 - \{9 \times 7 + (14 - 3 \text{ of } 4)\}]$

$= 25 \times [70 - \{63 + (14 - 3 \times 4)\}]$

$= 25 \times [70 - \{63 + (14 - 12)\}]$

$= 25 \times [70 - \{63 + 2\}]$

$= 25 \times [70 - 65] = 25 \times 5 = 125$

(e) $(12 \times 3) \div 4 \times 5 - 7 + 3 \times (9 - 5)$

$= 36 \div 4 \times 5 - 7 + 3 \times 4$

$= 9 \times 5 - 7 + 12$
$= 45 - 7 + 12 = 38 + 12 = 50$

2. (a) $25 - [20 - \{10 - (7 - 5 + 3)\}]$
$= 25 - [20 - \{10 - (10 - 5)\}]$
$= 25 - [20 - \{10 - 5\}]$
$= 25 - [20 - 5] = 25 - 15 = 10$

(b) $6 + [12 - \{8 + 3 - (9 \text{ of } 6 - 13 \times 4 + 1)\}]$
$= 6 + [12 - \{8 + 3 - (9 \times 6 - 13 \times 4 + 1)\}]$
$= 6 + [12 - \{11 - (54 - 52 + 1)\}]$
$= 6 + [12 - \{11 - 3\}]$
$= 6 + [12 - 8] = 6 + 4 = 10$

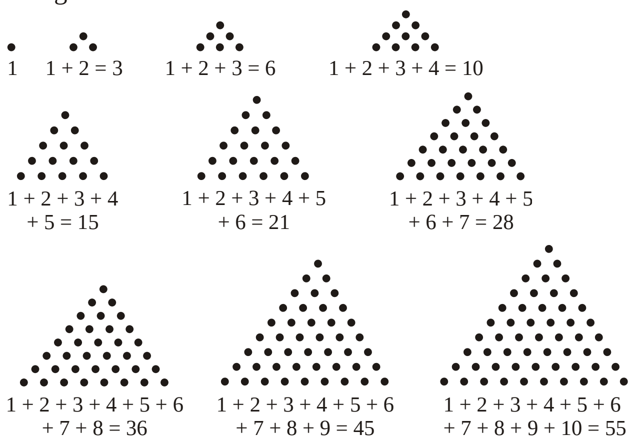
(c) $20 - \{6 + 4 - (4 \times 2 - \overline{3 + 5})\}$
$= 20 - [10 - (8 - 8)]$
$= 20 - [10 - 0] = 20 - 10 = 10$

(d) $37 + 26 \div 2 + 2 \text{ of } 25 - 60 \div 2$
$= 37 + 13 + 2 \times 25 - 30$
$= 50 + 50 - 30 = 100 - 30 = 70$

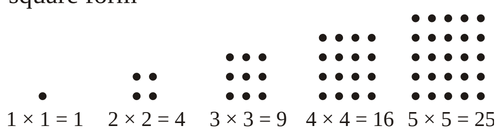
(e) $30 \div (2 \text{ of } 4 + 11 - 4) + 7$
$= 30 \div (2 \times 4 + 11 - 4) + 7$
$= 30 \div (8 + 11 - 4) + 7$
$= 30 \div (19 - 4) + 7 = 30 \div 15 + 7 = 2 + 7 = 9$

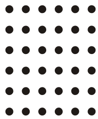
Exercise 2.4

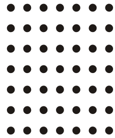
1. (a) triangular numbers

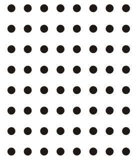


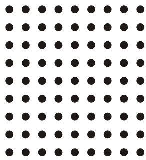
(b) square form

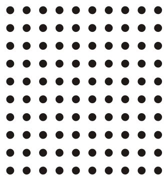



6 × 6 = 36


7 × 7 = 49


8 × 8 = 64


9×9=81

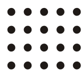

10×10=100

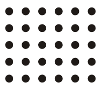
(c) rectangular form

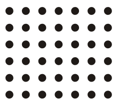
2×1=2

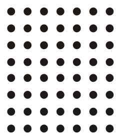

3×2=6

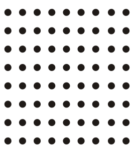

4×3=12

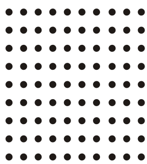

5×4=20

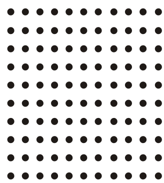

6×5=30


7×6=42


14×4=56


9×8=72


10×9=90


11×10=1 10

2. (a)

$$1 \times 8 + 1 = 9$$
$$12 \times 8 + 2 = 98$$
$$123 \times 8 + 3 = 987$$
$$1234 \times 8 + 4 = 9876$$
$$12345 \times 8 + 5 = 98765$$
$$123456 \times 8 + 6 = 987654$$

(b) 1, 2, 4, 7, 11, 16, <u>22</u>, <u>29</u>, <u>37</u>, <u>46</u>.

(c)

$$1 \times 11 = 11$$
$$11 \times 11 = 121$$
$$111 \times 11 = 1221$$
$$1111 \times 11 = 12221$$
$$11111 \times 11 = 122221$$
$$111111 \times 11 = 1222221$$

3. We know that,

No. of dots $= 2n + 2$

When, $n = 4$ (where, n No. of Quadrilateral)

$\therefore$ No. of dots $= 2 \times 4 + 2 = 8 + 2 = 10$

When, $n = 6$

$\therefore$ No. of dots $= 2 \times 6 + 2 = 12 + 2 = 14$

When, $n = 9$

$\therefore$ No. of dots $= 2 \times 9 + 2 = 18 + 2 = 20$

When, $n = 11$

$\therefore$ No. of dots $= 2 \times 11 + 2 = 24$

No. of Quadrilaterals	1	2	3	4	6	9	11
No. of Dots	4	6	8	10	14	20	24

4. (a) According to the table, formula $= 5n$

When, $n = 5$

$\therefore$ $= 5 \times 5 = 25$

When, $n = 7$

$\therefore$ $= 5 \times 7 = 35$

When $n = 9$

$\therefore$ $= 5 \times 9 = 45$

So, the complete table

1	2	3	4	5	7	9
5	10	15	20	25	35	45

(b) According to the table

formula $= n \div 3$

When, $n = 18$

$\therefore$ $= 18 \div 3 = 6$

When, $n = 21$

$\therefore$ $= 21 \div 3 = 7$

When, $n \div 3 = 9$

$\therefore$ $n = 9 \times 3$

$n = 27$

So, the complete table

6	9	12	15	18	21	27
2	3	4	5	6	7	9

Multiple Choice Questions

1. (a), 2. (b), 3. (b), 4. (c), 5. (b), 6. (b), 7. (c), 8. (c), 9. (a)

Exercise 3.1

1. (a) True (b) False (c) False (d) True
(e) False (f) False (g) False (h) True

2. (a) 23 is prime number because it has no factors except 1 and itself.
(b) 25 is composite number because it have more than two factors.
(c) 31 is prime number.
(d) 51 is composite number.
(e) 101 is prime number.

3. (a) 36
$1\times36=36$ So, 1 and 36 are factor of 36.
$2\times18=36$ 2 and 18 are factor of 36.
$3\times12=36$ 3 and 12 are factor of 36.
$4\times9=36$ 4 and 9 are factor of 36.
$6\times6=36,$ 6 and 6 are factor of 36.
Hence, 1, 2, 3, 4, 6, 9, 12, 18 and 36 are all factors of 36.

(b) 24
$1\times24=24,$ So, 1 and 24 are factor of 24.
$2\times12=24,$ So, 2 and 12 are factor of 24.
$3\times8=24,$ So, 3 and 8 are factor of 24.
$4\times6=24,$ So, 4 and 6 are factor of 24.
Hence, 1, 2, 3, 4, 6, 8, 12 and 24 are all factors of 24.

(c) 18
$1\times18=18,$ So, 1 and 18 are factor of 18.
$2\times9=18,$ So, 2 and 9 are factor of 18.
$3\times6=18,$ So, 3 and 6 are factor of 18.
Hence, 1, 2, 3, 6, 9 and 18 are all factors of 18.

(d) 28
$1\times28=28,$ So, 1 and 28 are factor of 28.
$2\times14=28,$ So, 2 and 14 are factor of 28.
$4\times7=28,$ So, 4 and 7 are factor of 28.
Hence, 1, 2, 4, 7, 14 and 28 are all factors of 28.

4. (a) 19
$19\times1=19,$ $19\times2=38,$ $19\times3=57,$
$19\times4=76$ $19\times5=95$
$\therefore$ The first five multiples of 19 are 19, 38, 57, 76 and 95.

(b) 21
$21\times1=21,$ $21\times2=42,$ $21\times3=63,$
$21\times4=84,$ $21\times5=105$

$\therefore$ The first five multiples of 21 are 21, 42, 63, 84 and 105.

(c) 25

$25\times1=25,$ $25\times2=50,$ $25\times3=75,$

$25\times4=100,$ $25\times5=125$

$\therefore$ The first five multiples of 25 are 25, 50, 75, 100 and 125.

(d) 17

$17\times1=17$ $17\times2=34$ $17\times3=51$

$17\times4=68$ $17\times5=85$

$\therefore$ The first five multiples of 17 are 17, 34, 51, 68 and 85.

5. 11

$11\times1=11,$ $11\times2=22,$ $11\times3=33,$

$11\times4=44,$ $11\times5=55,$ $11\times6=66,$

$11\times7=77,$ $11\times8=88$ $11\times9=99$

$\therefore$ The first nine multiples of 11 are 11, 22, 33, 44, 55, 66, 77, 88 and 99.

6. First 10 prime numbers are 2, 3, 5, 7, 11, 13 17, 19, 23, 29.

7. The smallest prime number is 2. It is a even number.

8. Two consecutive odd prime number are called twin primes.

for example, (3, 5); (5, 7); (11, 13); (17, 19); (29, 31); (41, 43) etc. are all twin prime numbers.

9.

even numbers	odd numbers
(b) 38	(a) 35
(c) 52	(d) 59
(h) 576	(e) 79
	(f) 145
	(g) 333

10. Two numbers are known as co-primes if they have not a common factor other than 1.

for example, (2, 3); (3, 4); (4, 5); (5, 6); and (6, 7) are pairs of co-prime.

11. (a) 31

$\Rightarrow$ $5+7+19=31$ $\therefore$ three odd prime numbers are 5, 7 and 19.

(b) 35

$\Rightarrow$ $5+7+23=35$ $\therefore$ three odd prime numbers are 5, 7 and 23.

(c) 49

$\Rightarrow$ $3+5+41=49$ $\therefore$ three odd prime numbers are 3, 5 and 41.

(d) 63

$\Rightarrow$ $3+7+53=63$ $\therefore$ three odd prime numbers are 3, 7 and 53.

12. (a) 36

$\Rightarrow$ $17+19=36$ $\therefore$ (17, 19) are twin primes.

(b) 60

$\Rightarrow$ $29+31=60$ $\therefore$ 29, 31 are twin primes.

(c) 84

$\Rightarrow$ $41+43=84$ $\therefore$ 41, 43 are twin primes.

(d) 120

$\Rightarrow$ $59+61=120$ $\therefore$ 59, 61 are twin primes.

13. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89 and 97 are prime numbers.

There are 25 prime numbers between 1 and 100.

14. 12, 24, 36, 48, 60 are multiples of both 3 and 4.

15. Yes, the smallest odd composite number is 9.

Exercise 3.2

1. (a) True (b) False (c) False (d) True (e) False

2. (a) Given number = 377316, test the divisibility by 2.

$\because$ The last digit is 6.

Which is divisible by 2. So, 377316 is divisible by 2.

(b) Given number = 537897

$\because$ The last digit is 7.

Which is not divisible by 2. So, 537897 is not divisible by 2.

(c) Given number = 789400

$\because$ The last digit is 0.

which is divisible by 2. So, 789400 is divisible by 2.

3. (a) Given number = 94650

$\because$ The last digit is 0. So, 94650 is divisible by 5.

(b) Given number = 235090

$\because$ The last digit is 0. So, 235090 is divisible by 5.

(c) Given number = 53378

$\because$ The last digit is 8.

which is not divisible by 5. So, 53378 is not divisible by 5.

4. (a) Given number = 26570

The number 26570 has 0 in the unit's place.

There fore, the number 26570 is divisible by 10.

(b) Given number = 207000

The number 207000 has 0 in the units place.

There fore, the number 207000 is divisible by 10.

(c) Given number = 93640

The number 93640 has 0 in the unit's place.

There fore, the number 93640 is divisible by 10.

5. (a) Given number = 254784

Test the divisiblity by 3.

Sum of the digit of 254784 = $2+5+4+7+8+4=30$,

which is divisible by 3. ($\because 30\div 3=10$)

So, 254784 is divisible by 3.

(b) Given number = 100083.

Test the divisiblity by 3.

Sum of the digits of 100083 $= 1 + 0 + 0 + 0 + 8 + 3 = 12$,
which is divisible by 3. ($\because 12 \div 3 = 4$)
So, 100083 is divisible by 3.

(c) Given number = 20802
Test the divisibility by 3
Sum of the digits of 20802 $= 2 + 0 + 8 + 0 + 2 = 12$
which is divisible by 3 ($\because 12 \div 3 = 4$)
So, 20802 is divisible by 3.

6. (a) We have the number $54 * 106$.
Sum of the given digits in the number
$$= 5 + 4 + 1 + 0 + 6 = 16$$
The number next to 16 which is divisible by 3 is 18.
So, the $*$ is to be replaced by $(18 - 16) = 2$
The smallest digit which replace $*$ is 2.
The new number which will be divisible by 3 is 542106.

(b) We have the number $237 * 48$
Sum of the given digits in the number
$$= 2 + 3 + 7 + 4 + 8 = 24$$
The number is 24, which is divisible by 3.
So, the $*$ is to be replaced by 0.
The smallest digit which replace $*$ is 0.
The new number which will be divisible by 3 is 237048.

7. (a) We have the number $53 * 88$
Sum of the given digits in the number $= 5 + 3 + 8 + 8 = 24$
The number next to 24 which is divisible by 9 is 27.
So, the $*$ is to be replaced by $(27 - 24) = 3$.
The smallest digit which replace $*$ is 3.
The new number which will be divisible by 9 is 53388.

(b) We have the number $667 * 48$.
Sum of the given digits in the number
$$= 6 + 6 + 7 + 4 + 8 = 31$$
The number next to 31 which is divisible by 9 is 36.
So, the $*$ is to be replaced by $(36 - 31) = 5$.
The smallest digit which replace $*$ is 5.
The new number which will be divisible by 9 is 667548.

8. (a) We have the number $90208 * 14$.
Sum of the digits at odd places $= 9 + 2 + 8 + 1 = 20$
Sum of the digits at even places $= 0 + 0 + * + 4 = * + 4$
Difference of the two sums = either 0 or multiple of 11.
$$\begin{aligned} 20 - (* + 4) &= \text{multiple of 11.} \\ 20 - * - 4 &= 11 \\ 16 - * &= 11 \end{aligned}$$

$$* = 16 - 11$$
$$* = 5$$

So, the $*$ is to be replaced by 5. The smallest digit which replace $*$ is 5.

The new number which will be divisible by 11 is 90208514.

(b) We have the number $8*3423$.

Sum of the digits at odd places $= 8 + 3 + 2 = 13$

Sum of the digits at even places $= * + 4 + 3 = * + 7$

Difference of the two sums $= 0$ or multiple of 11.

$$13 - (* + 7) = 0$$
$$13 - * - 7 = 0$$
$$* = 13 - 7$$
$$* = 6$$

So, the $*$ is to be replaced by 6. The smallest digit which replace $*$ is 6.

The new number which will be divisible by 11 is 863423.

9. (a) We have number 96525.

Test the divisibility by 9

Sum of the digits of $96525 = 9 + 6 + 5 + 2 + 5 = 27$,

Which is divisible by 9.

So, 96525 is divisible by 9.

(b) We have number 297351.

Test the divisibility by 9.

Sum of the digits of $297351 = 2 + 9 + 7 + 3 + 5 + 1 = 27$,

Which is divisible by 9.

So, 297351 is divisible by 9.

(c) We have number 835686.

Test the divisibility by 9.

Sum of the digits of $835686 = 8 + 3 + 5 + 6 + 8 + 6 = 36$,

which is divisible by 9.

So, 835686 is divisible by 9.

10. (a) We have number 55770.

The last digit of the number is 0, so it is divisible by 2.

Sum of the digits of $55770 = 5 + 5 + 7 + 7 + 0 = 24$,

which is divisible by 3.

So, it is also divisible by 3.

Since, 55770 is divisible by both 2 and 3.

So, 55770 is divisible by 6.

(b) We have the number 42174.

Test the divisibility by 6.

The last digit of the number is 4, so it is divisible by 2.

Sum of the digits of $42174 = 4 + 2 + 1 + 7 + 4 = 18$,

which is divisible by 3.

So, it is also divisible by 3.

Since, 42174 is divisible by both 2 and 3.
So, 42174 is divisible by 6.

(c) We have the number 33675. Test the divisibility by 6.
The last digit of the number is 5, so it is not divisible by 2.
So, 33675 is not divisible by 6.

11. (a) Given number = 6216. Test the divisibility by 4.
The number formed by its last two digits is 16,
which is divisible by 4.
Therefore, 6216 is divisible by 4.

(b) Given number = 3214 Test the divisibility by 4.
The number formed by its last two digits is 14,
which is not divisible by 4.
There fore, 3214 is not divisible by 4.

(c) Given number = 63720
Test the divisibility by its last two digits is 20,
which is divisible by 4.
Therefore, 63720 is divisible by 4.

12. (a) Given number = 39864.
Test the divisibility by 8.
In 39864, the number formed by the hundreds ten's and unit's digit is 864, which is divisible by 8.
So, 39864 is divisible by 8.

(b) Given number = 123808.
Test the divisibility by 8.
In 123808, the number formed by the hundreds, ten's and unit's digits is 808, which is divisible by 8.
So, 123808 is divisible by 8.

(c) Given number = 63791
Test the divisibility by 8.
In 63791, the number formed by the hundreds, ten's and unit's digits is 791, which is not divisible by 8.
So, 63791 is not divisible by 8.

13. (a) Given number = 446321.
Test the divisibility by 11.
In 446321, sum of the digits odd places $= 4+6+2 = 12.$
Sum of the digits at even places $= 4+3+1 = 8.$
Difference of the two sums $= 12-8 = 4$, which is not multiple of 11.
So, 446321 is not divisible by 11.

(b) Given number = 57834.
Test the divisibility by 11. In 57834, sum of the digits at odd places $= 5+8+4 = 17.$
Sum of the digits at even places $= 7+3 = 10.$

Difference of the two sums $= 17 - 10 = 7$, which is not multiple of 11.
So, 57834 is not divisible by 11.

(c) Given number $= 901351$.
Test the divisibility by 11. In 901351, sum of the digits at odd places $= 9 + 1 + 5 = 15$.
Sum of the digits at even places $= 0 + 3 + 1 = 4$
Difference of the two sums $= 15 - 4 = 11$, which is multiple of 11.
So, 901351 is divisible by 11.

(d) Given number $= 68353$.
Test the divisibility by 11. In 68353, sum of the digits at odd places $= 6 + 3 + 3 = 12$.
Sum of the digits at even places $= 8 + 5 = 13$
Difference of the two sums $= 13 - 12 = 1$, which is not multiple of 11.
So, 68353 is not divisible by 11.

(e) Given number $= 95325$
Test the divisibility by 11. In 95325, sum of the digits at odd places $= 9 + 3 + 5 = 17$.
Sum of the digits at even places $= 5 + 2 = 7$
Difference of the two sums $= 17 - 7 = 10$, which is not multiple of 11.
So, 95325 is not divisible by 11.

(f) Given number $= 45694$
Test the divisibility by 11. In 45694 sum of the digits at odd places $= 4 + 6 + 4 = 14$
Sum of the digits at even places $= 5 + 9 = 14$.
Difference of the sums $= 14 - 14 = 0$, which is divisible by 11.
So, 45694 is divisible by 11.

14. (a) Given number $= 167$
Test the divisibility of 167 by each one of the prime numbers 2, 3, 5, 7, 11, 13.
We find that 167 is not divisible by any of them.
So, 167 is a prime number.

(b) Given number $= 179$
Test the divisibility of 179 by each one of the prime numbers 2, 3, 5, 7, 11, 13.
We find that 179 is not divisible by any of them.
So, 179 is a prime number.

(c) Given number $= 267$.
Test the divisibility of 267 by each one of the prime numbers 2, 3, 5, 7, 11, 13, 17 and 19.
We find that 267 is divisible by 3.
So, 267 is not a prime number.

(d) Given number $= 353$.

Test the divisibility of 353 by each one of the prime numbers 2, 3, 5, 7, 11, 13, 17 and 19.

We find that 353 is not divisible by any of these prime numbers.

So, 353 is a prime number.

Exercise 3.3

1. (a) 4335

By the prime number

3	4335
5	1445
17	289
17	17
	1

Hence, $4335 = 3 \times 5 \times 17 \times 17$

(b) 9282

By the prime number

2	9282
3	4641
7	1547
13	221
17	17
	1

Hence, $9282 = 2 \times 3 \times 7 \times 13 \times 17$

(c) 2907

By the prime number

3	2907
3	969
17	323
19	19
	1

Hence, $2907 = 3 \times 3 \times 17 \times 19$

2. Take first four prime numbers are 2, 3, 5 and 7.

So, the smallest number $= 2 \times 3 \times 5 \times 7 = 6 \times 35 = 210$

3. The smallest number of 4-digit $= 1000$

2	1000
2	500
2	250
5	125
5	25
5	5
	1

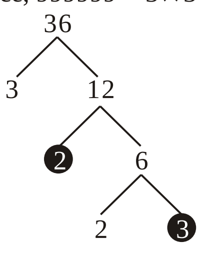
Hence, $1000 = 2\times2\times2\times5\times5\times5 = 2^3 \times 5^3$

4. The greatest number of 6-digit = 999999

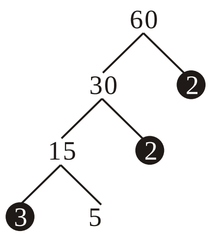
3	999999
3	333333
3	111111
7	37037
11	5291
13	481
37	37
	1

Hence, $999999 = 3\times3\times3\times7\times11\times13\times37$

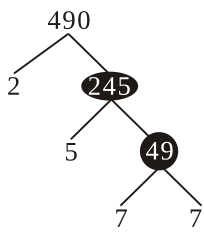
5. (a)



(b)



(c)



Exercise 3.4

1. (a) 36, 84

Prime factors of 36,

$\therefore$ $36 = 2\times2\times3\times3$

2	36
2	18
3	9
3	3
	1

And, prime factors of 84

$\therefore$ $84 = 2 \times 2 \times 3 \times 7$

Product of common prime factors

$= 2 \times 2 \times 3 = 12$

Hence, HCF of 36 and 84 is 12.

2	84
2	42
3	21
7	7
	1

(b) 14, 42, 84

Prime factors of 14,

$\therefore$ $14 = 2 \times 7$

2	14
7	7
	1

Prime factors of 42

$\therefore$ $42 = 2 \times 3 \times 7$

2	42
3	21
7	7
	1

And

Prime factors of 84

$\therefore$ $84 = 2 \times 2 \times 3 \times 7$

Product of common prime factors $= 2 \times 7 = 14$

Hence, H.C.F. of 14, 42 and 84 is 14.

2	84
2	42
3	21
7	7
	1

(c) 140, 252, 630

Prime factors of 140

$\therefore$ $140 = 2 \times 2 \times 5 \times 7$

2	140
2	70
5	35
7	7
	1

Prime factors of 252

$\therefore$ $252 = 2 \times 2 \times 3 \times 3 \times 7$

2	252
2	126
3	63
3	21
7	7
	1

Prime factors of 630

$\therefore$ $630 = 2 \times 3 \times 3 \times 5 \times 7$

Product of common prime factors $= 2 \times 7 = 14$

Hence, H.C.F. of 140, 252 and 630 is 14.

2	630
3	315
3	105
5	35
7	7
	1

2. (a) 504, 980

By long division method.

$$\begin{array}{r} 504\,\overline{)\,980\,}(\,1 \\ -504 \\ \hline 476\,)\,504\,(\,1 \\ -476 \\ \hline 28\,)\,476\,(\,17 \\ -28 \\ \hline 196 \\ -196 \\ \hline \times \\ \hline \end{array}$$

Hence, the H.C.F. of 504 and 980 is 28.

(b) 155, 341, 1302

By long division method

$$\begin{array}{r} 155\,\overline{)\,341\,}(\,2 \\ -310 \\ \hline 31\,)\,155\,(\,5 \\ -155 \\ \hline 0 \\ \hline \end{array}$$

So, the H.C.F. of 155 and 341 is 31.

and the H.C.F. of 31 and 1302 is.

$$\begin{array}{r} 31\,\overline{)\,1302\,}(\,42 \\ -124 \\ \hline 62 \\ -62 \\ \hline 0 \end{array}$$

The final H.C.F. of 155, 341 and 1302 is 31.

(c) 1197, 5320, 4389

By long division method

$$\begin{array}{r} 1197\,\overline{)\,5320\,}(\,4 \\ -4788 \\ \hline 532\,)\,1197\,(\,2 \\ -1064 \\ \hline 133\,)\,532\,(\,4 \\ -532 \\ \hline 0 \end{array}$$

So, the H.C.F. 1197 and 5320 is 133.

and the HCF of 133 and 4389 is :

$$
\begin{array}{r}
133\overline{)4389}(33 \\
\underline{-399} \\
399 \\
\underline{-399} \\
0
\end{array}
$$

The final H.C.F. of 1197, 5320 and 4389 is 133.

3. (a) 847, 1014

By prime factorization method

$847 = 1 \times 7 \times 11 \times 11$

7	847
11	121
11	11
	1

And $1014 = 1 \times 2 \times 3 \times 13 \times 13$

The C.F. is $= 1$

Hence, they are co-prime.

2	1014
3	507
13	169
13	13
	1

(b) 343, 432

By prime factorization method.

$343 = 1 \times 7 \times 7 \times 7$

7	343
7	49
7	7
	1

$432 = 1 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

So, C.F. $= 1$

Hence, they are co-prime.

2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

(c) 59, 97

By prime factorization method

$59 = 1 \times 59$

$97 = 1 \times 97$

So, C.F. $= 1$

Hence, they are co-prime.

59	59
	1

97	97
	1

4. (a) $\dfrac{1794}{2346}$

In order to reduce a given fraction to the lowest terms, we divide its numerator and denominator by their H.C.F.

Now, we find the H.C.F. of 1794 and 2346.

Hence, the H.C.F. of 1794 and 2346 is 138.

$$
\begin{array}{l}
1794\,)\,2346\,(\,1 \\
\quad -1794 \\
\quad\quad 552\,)\,1794\,(\,3 \\
\quad\quad\quad -1656 \\
\quad\quad\quad 138\,)\,552\,(\,4 \\
\quad\quad\quad\quad -552 \\
\quad\quad\quad\quad\quad \times
\end{array}
$$

Now, dividing the numerator and the denominator by 138

$$\frac{1794}{2346} = \frac{1794 \div 138}{2346 \div 138} = \frac{13}{17}$$

Hence, lowest term is $\dfrac{13}{17}$.

(b) $\dfrac{296}{480}$

We find the H.C.F. of 296 and 480.

$$
\begin{array}{l}
296\,)\,480\,(\,1 \\
\quad -296 \\
\quad 184\,)\,296\,(\,1 \\
\quad\quad -184 \\
\quad\quad 112\,)\,184\,(\,1 \\
\quad\quad\quad -112 \\
\quad\quad\quad 72\,)\,112\,(\,1 \\
\quad\quad\quad\quad -72 \\
\quad\quad\quad\quad 40\,)\,72\,(\,1 \\
\quad\quad\quad\quad\quad -40 \\
\quad\quad\quad\quad\quad 32\,)\,40\,(\,1 \\
\quad\quad\quad\quad\quad\quad -32 \\
\quad\quad\quad\quad\quad\quad 8\,)\,32\,(\,4 \\
\quad\quad\quad\quad\quad\quad\quad -32 \\
\quad\quad\quad\quad\quad\quad\quad 0 \times
\end{array}
$$

Hence, the H.C.F. of 296 and 480 is 8.

Now, dividing the numerator and the denominator by 8.

$\frac{296}{480} = \frac{296 \div 8}{480 \div 8} = \frac{37}{60}$ Hence, lowest term is $\frac{37}{60}$.

(c) $\frac{161}{207}$

we find the H.C.F. of 161 and 207.

$$\begin{array}{l} 161)\overline{207}(1 \\ \quad -161 \\ \quad \overline{\quad 46)161(3} \\ \qquad -138 \\ \qquad \overline{\quad 23)46(2} \\ \qquad\quad -46 \\ \qquad\quad \overline{\quad\times} \end{array}$$

Now, dividing the numerator and denominator by 23.

$$\frac{161}{207} = \frac{161 \div 23}{207 \div 23} = \frac{7}{9}$$

5. Clearly, we must find the greatest number which divides $(1277-3)$ and $(1368-3)$ exactly.

$$\begin{array}{l} 1274)\overline{1365}(1 \\ \quad -1274 \\ \quad \overline{\quad 91)1274(14} \\ \qquad -1274 \\ \qquad \overline{\quad\times} \end{array}$$

So, the required number
$=$ H.C.F. of 1274 and 1365. $= 91$
Hence, the required number is 91.

6. Clearly, we must find the greatest number which divides $(445-4)$, $(572-5)$ and $(699-6)$ exactly.

$$\begin{array}{l} 441)\overline{567}(1 \\ \quad -441 \\ \quad \overline{\quad 126)441(3} \\ \qquad -378 \\ \qquad \overline{\quad 63)126(2} \\ \qquad\quad -126 \\ \qquad\quad \overline{\quad\times} \end{array}$$

And the H.C.F. of 63 and 693 is

$$63)\overline{693}(11$$

– 63

63

63

×

So, the required number = H.C.F. of 441, 567 and 693. = 63
Hence, the required number is 63.

7. Clearly, we must find the greatest number which divides (398 – 7), (436 – 11) and (452 – 10) exactly.

391) 425 (1
– 391
34) 391 (11
– 34
51
34
17) 34 (2
34
×

And the H.C.F. of 17 and 442 is

17) 442 (26
– 34
102
– 102
×

So, the required number = H.C.F. of 391, 425 and 442.
Hence, the required number is 17.

8. Length of the tape = 7 m or = 700 cm
Length of the other tap = 3 m 85 cm = 385 cm
And length of the one more tape = 12 m 95 m = 1295 cm
Longest length of each tape will be the H.C.F. of 700 cm, 385 cm and 1295 cm.

385) 700 (1
– 385
315) 385 (1
315
70) 315 (4
280
35) 70 (2
– 70
×

And the H.C.F. of 35 cm and 1295 cm is :

$$\begin{array}{r} 35\overline{)1295}(37 \\ -105 \\ \hline 245 \\ -245 \\ \hline 0\times \end{array}$$

H.C.F. of 700 cm, 385 cm and 1295 cm is 35 cm.
So, the longest tape is 35 cm.
Hence, the require measure of tape is 35 cm.

9. The capacity of two tankes 700 L and 750 L respectively.
The maximum capacity of container
= H.C.F. of the capacity of both the tankers
= H.C.F. of 700 L and 750 L

$\therefore$ H.C.F. of 700 L and 750 L = 50 L

$$\begin{array}{r} 700\overline{)750}(1 \\ 700 \\ \hline 50\overline{)700}(14 \\ -50 \\ \hline 200 \\ -200 \\ \hline 0\times \end{array}$$

Hence, maximum capacity of the required container = 50 L.

10. We first find the H.C.F. of 490 kg, 588 kg and 882 kg.

$$\begin{array}{r} 490\overline{)588}(1 \\ -490 \\ \hline 98\overline{)490}(5 \\ -490 \\ \hline 0 \end{array}$$

$\therefore$ H.C.F. of 490 and 588 is 98 kg.
Now, we find the H.C.F. of 98 kg and 882 kg.

$$\begin{array}{r} 98\overline{)882}(9 \\ -882 \\ \hline 0 \end{array}$$

$\therefore$ H.C.F. of 490, 588 and 822 is 98 kg.

$\therefore$ Hence, the maximum capacity of wheat in a bag is 98 kg.

11. Length of the courtyard = 18 m 72 cm = 1872 cm.
Breadth of the courtyard = 13 m 20 cm = 1320 cm.
Largest size of each tile will be the H.C.F. of 1872 cm and 1320 cm.
H.C.F. of 1872 cm and 1320 cm is 24 cm.

So, the largest size of the square tiles is 24 cm.

$$
\begin{array}{l}
1320\,\overline{)\,1872\,}(\,1 \\
\quad\;\; -1320 \\
\quad\;\; \overline{\quad 552\,)\,1320\,(\,2} \\
\qquad\quad -1104 \\
\qquad\quad \overline{\quad 216\,)\,552\,(\,2} \\
\qquad\qquad\quad -432 \\
\qquad\qquad\quad \overline{\quad 120\,)\,216\,(\,1} \\
\qquad\qquad\qquad\quad -120 \\
\qquad\qquad\qquad\quad \overline{\quad 96\,)\,120\,(\,1} \\
\qquad\qquad\qquad\qquad\quad -96 \\
\qquad\qquad\qquad\qquad\quad \overline{\quad 24\,)\,96\,(\,4} \\
\qquad\qquad\qquad\qquad\qquad\quad -96 \\
\qquad\qquad\qquad\qquad\qquad\quad \overline{\quad 0 \quad}
\end{array}
$$

Least number of square of such tiles.

$$= \frac{\text{Area of rectangular courtyard}}{\text{Area of a tile}}$$

$$= \frac{1872 \times 1320}{24 \times 24} = 78 \times 55 = 4290 \text{ tiles}$$

Hence, least number of tiles required is 4290.

12. Length of the longest room = 8 m 25 cm = 825 cm

Breadth of the longest room = 6 m 75 cm = 675 cm

Height of the longest room = 4 m 50 cm = 450 cm

The length of the longest tape = H.C.F. of 825 cm, 675 cm and 450 cm.

We first find the H.C.F. of 825 cm and 675 cm.

$$
\begin{array}{l}
675\,\overline{)\,825\,}(\,1 \\
\quad\;\; -675 \\
\quad\;\; \overline{\quad 150\,)\,675\,(\,4} \\
\qquad\quad -600 \\
\qquad\quad \overline{\quad 75\,)\,150\,(\,2} \\
\qquad\qquad\quad -150 \\
\qquad\qquad\quad \overline{\quad 0 \quad}
\end{array}
$$

Now, find the H.C.F. of 75 cm and 450.

$$
\begin{array}{l}
75\,\overline{)\,450\,}(\,6 \\
\quad\;\; 450 \\
\quad\;\; \overline{\quad 0 \quad}
\end{array}
$$

$\therefore$ the H.C.F. of 825 cm, 675 cm and 450 cm is 75 cm.
Hence, length of the longest tape is 75 cm.

Exercise 3.5

1. (a) 12, 48

We have,

2	12
2	6
3	3
	1

2	48
2	24
2	12
2	6
3	3
	1

$\therefore$ $12 = 2 \times 2 \times 3 = 2^2 \times 3$

$48 = 2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3$

L.C.M. of 12 and 48 $= 2 \times 2 \times 2 \times 2 \times 3$

$= 2^4 \times 3 = 16 \times 3 = 48$

Hence, L.C.M. of 12 and 48 is 48.

(b) 9, 45

We have

3	9
3	3
	1

3	45
3	15
5	5
	1

$\therefore$ $9 = 3 \times 3 = 3^2$ and $45 = 3 \times 3 \times 5 = 3^2 \times 5$

L.C.M. of 9 and 45 $= 3^2 \times 5 = 9 \times 5 = 45$

Hence, L.C.M. of 9 and 45 is 45.

(e) 24, 36

We have

2	24
2	12
2	6
3	3
	1

2	36
2	18
3	9
3	3
	1

$\therefore$ $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$

$36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$

L.C.M. of 24 and 36 $= 2 \times 2 \times 2 \times 3 \times 3 = 72$

Hence, L.C.M. of 24 and 36 is 72.

(d) 40, 48, 45

We have

2	40
2	20
2	10
5	5
	1

2	48
2	24
2	12
2	6
3	3
	1

3	45
3	15
5	5
	1

$\therefore$ $40 = 2\times 2\times 2\times 5 = 2^3 \times 5$

$48 = 2\times 2\times 2\times 2\times 3 = 2^4 \times 3$

$45 = 3\times 3\times 5 = 3^2 \times 5$

L.C.M. of 40, 48 and 45 $= 2\times 2\times 2\times 2\times 3\times 3\times 5 = 720$

Hence, L.C.M. of 40, 48 and 45 is 720.

(e) 16, 28, 40

We have

2	16
2	8
2	4
2	2
	1

2	28
2	14
7	7
	1

2	40
2	20
2	10
5	5
	1

$\therefore$ $16 = 2\times 2\times 2\times 2 = 2^4$

$28 = 2\times 2\times 7 = 2^2 \times 7$

$40 = 2\times 2\times 2\times 5 = 2^3 \times 5$

L.C.M. of 16, 28 and 40 $= 2\times 2\times 2\times 2\times 5\times 7$

$= 16\times 35 = 560$

(f) 64, 72, 96

We have

2	64
2	32
2	16
2	8
2	4
2	2
	1

2	72
2	36
2	18
3	9
3	3
	1

2	96
2	48
2	24
2	12
2	6
3	3
	1

$\therefore \quad 64 = 2\times2\times2\times2\times2\times2 = 2^6$

$72 = 2\times2\times2\times3\times3 = 2^3 \times 3^2$

$96 = 2\times2\times2\times2\times2\times3 = 2^5 \times 3$

L.C.M. of 64, 72 and 96

$= 2\times2\times2\times2\times2\times2\times3\times3 = 576$

2. (a)

3	117, 221
3	39, 221
13	13, 221
17	1, 17
	1, 1

L.C.M. of 117 and 221 $= 3\times3\times13\times17$

$= 1989$

Hence, L.C.M. of the given numbers is 1989.

(b)

2	234, 572
2	117, 286
3	117, 143
3	39, 143
13	13, 143
11	1, 11
	1, 1

L.C.M. of 234, 572 $= 2\times2\times3\times3\times13\times11 = 5148$

Hence, L.C.M. of the given numbers is 5148.

(c)

2	27, 90
3	27, 45
3	9, 15
3	3, 5
5	1, 5
	1, 1

L.C.M. of 27 and 90 $= 2\times3\times3\times3\times5 = 270$

Hence, L.C.M. of the given numbers is 270.

(d)

2	8, 12, 16, 30
2	4, 6, 8, 15
2	2, 3, 4, 15
2	1, 3, 2, 15
3	1, 3, 1, 15
5	1, 1, 1, 5
	1, 1, 1, 1

L.C.M. of 8, 12, 16 and 30 = $2 \times 2 \times 2 \times 2 \times 3 \times 5 = 240$
Hence, L.C.M. of the given numbers is 240.

(e)

2	144, 180, 384
2	72, 90, 192
2	36, 45, 96
2	18, 45, 48
2	9, 45, 24
2	9, 45, 12
2	9, 45, 6
3	9, 45, 3
3	3, 15, 1
5	1, 5, 1
	1, 1, 1

L.C.M. of 144, 180 and 384

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

$= 5760$

3. (a) We first find the H.C.F. of 576, 720 and after then L.C.M.

576) 720 (1
– 576
144) 576 (4
– 576
×

The H.C.F. of 576 and 720 is 144.

2	576, 720
2	288, 360
2	144, 180
2	72, 90
2	36, 45
2	18, 45
3	9, 45
3	3, 5
5	1, 15
	1, 1

The L.C.M. of 576 and 720

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 2880$

Hence, the H.C.F. and L.C.M. of the given numbers are 144, 2880 respectively.

(b) We first find the H.C.F. of 1152, 1664 and after then L.C.M.

$$\begin{array}{l} 1152\,)\,1664\,(\,1 \\ \quad -1152 \\ \hline \quad 512\,)\,1152\,(\,2 \\ \qquad -1024 \\ \hline \qquad 128\,)\,512\,(\,4 \\ \qquad\quad -512 \\ \hline \qquad\quad 0\times \end{array}$$

The H.C.F. of 1152 and 1664 is 128.

2	1152, 1664
2	576, 832
2	288, 416
2	144, 208
2	72, 104
2	36, 26
3	18, 26
3	9, 13
3	3, 13
13	1, 13
	1, 1

Hence, the H.C.F. and L.C.M. of the given numbers are 128, 14976 respectively.

(c) We first find the H.C.F. of 234, 572 and after then L.C.M.

$$\begin{array}{l} 234\,)\,572\,(\,2 \\ \quad -468 \\ \hline \quad 104\,)\,234\,(\,2 \\ \qquad -208 \\ \hline \qquad 26\,)\,104\,(\,4 \\ \qquad\quad -104 \\ \hline \qquad\qquad 0\times \end{array}$$

The H.C.F. of 234 and 572 is 26.

2	234, 572
2	117, 286
3	117, 143
3	39, 143
11	13, 143
13	13, 13
	1, 1

The L.C.M. of 234 and 572 $= 2\times2\times3\times3\times11\times13 = 5148$

Hence, the H.C.F. and L.C.M. of given numbers are 26, 5148 respectively.

4. We know that, H.C.F. is one of the factors of L.C.M.

So, 16 should be a factor of 380.

But 16 is not a factor of 380.

So, there can not exist two numbers such that they have 16 as their H.C.F. and 230 as their L.C.M.

5. The given,

$$\begin{aligned} \text{H.C.F.} &= 16 \\ \text{The product of two numbers} &= 3072 \\ \text{L.C.M.} &= ? \end{aligned}$$

We know that,

$$\begin{aligned} \text{H.C.F.} \times \text{L.C.M.} &= \text{product of two numbers} \\ 16 \times \text{L.C.M.} &= 3072 \\ \text{L.C.M.} &= \frac{3072}{16} \\ &= 192 \end{aligned}$$

Hence, L.C.M. $= 192$

6. The given,

$$\begin{aligned} \text{H.C.F.} &= ? \\ \text{the product of two numbers} &= 128 \\ \text{L.C.M.} &= 32 \\ \text{H.C.F.} \times \text{L.C.M.} &= \text{product of two numbers} \\ \text{H.C.F.} \times 32 &= 128 \\ \text{H.C.F.} &= \frac{128}{32} = 4 \end{aligned}$$

Hence, H.C.F. $= 4$

7. The given

$$\begin{aligned} \text{H.C.F.} &= 145, \\ \text{L.C.M.} &= 2175 \\ \text{One of the number} &= 725 \\ \text{The other number} &= ? \\ \text{H.C.F.} \times \text{L.C.M.} &= \text{One number} \times \text{Other number} \\ 145 \times 2175 &= 725 \times \text{Other number} \\ \text{Other number} &= \frac{145 \times 2175}{725} \\ &= 145 \times 3 = 435 \end{aligned}$$

Hence, the other number is 435.

8. We first find the L.C.M. of 5, 10, 15, 20 and 25.

2	5, 10, 15, 20, 25
2	5, 5, 15, 10, 25
3	5, 5, 15, 5, 25
5	5, 5, 5, 5, 25
5	1, 1, 1, 1, 5
	1, 1, 1, 1, 1

$\therefore$ L.C.M. $= 2 \times 2 \times 3 \times 5 \times 5 = 300$

Now, greatest numbers of 5–digits = 99999

$$\begin{array}{r} 300\overline{)99999}(333 \\ -900 \\ \hline 999 \\ -900 \\ \hline 999 \\ -900 \\ \hline 99 \end{array}$$

We find that when 99999 is divided by 300, the remainder is 99.

So, the greatest number of five digit exactly divisible by 5, 10, 15, 20 and 25

$$= 99999 - 99$$
$$= 99900$$

Hence, the required number is 99900.

9. We first find the L.C.M. of 4, 12, 20 and 24.

2	4, 12, 20, 24
2	2, 6, 10, 12
2	1, 3, 5, 6
3	1, 3, 5, 3
5	1, 1, 5, 1
	1, 1, 1, 1

$\therefore$ L.C.M. of 4, 12, 20 and 24 $= 2 \times 2 \times 2 \times 3 \times 5 = 120$

The least number of five digit number $= 10000$

$\therefore$ the smallest number of five digits exactly divisible by given numbers

$\because$

$$
\begin{array}{r}
120\overline{)10000}(\ 83 \\
-\ 960 \\
\hline
400 \\
-\ 360 \\
\hline
40
\end{array}
$$

$$= 10000 + (120 + 3) - 40$$
$$= 9960 + 123$$
$$= 10083$$

Hence, the least number of five digit is 10083.

10. We first find the L.C.M. of 16, 24, 40.

2	16, 24, 40
2	8, 12, 20
2	4, 6, 10
2	2, 3, 5
3	1, 3, 5
5	1, 1, 5
	1, 1, 1

$\therefore$ L.C.M. of 16, 24 and 40 $= 2\times2\times2\times2\times3\times5 = 240$

Here, 240 is the least number which when divided by 16, 24, 40 and leaves a remainder 80 in each case.

Hence, the required smallest number $= 240 + 8$

$= 248$

11. We first find the L.C.M. of 2, 3, 4, 5, 6 and 7.

2	2, 3, 4, 5, 6, 7
2	1, 3, 2, 5, 3, 7
3	1, 3, 1, 5, 3, 7
5	1, 1, 1, 5, 1, 7
7	1, 1, 1, 1, 1, 7
	1, 1, 1, 1, 1, 1

$\therefore$ L.C.M. of 2, 3, 4, 5, 6 and 7 $= 2\times2\times3\times5\times7 = 420$

$\because$

$$\begin{array}{r} 420\overline{)10000}(23 \\ -840 \\ \hline 1600 \\ -1260 \\ \hline 340 \end{array}$$

$\therefore$ the number 10000 exactly divisible by given numbers

$= 10000 - 340 = 9660$

And other number $= 9660 + 420 = 10080$

Hence, the two numbers are 9660, 10080.

12. The minimum distance = L.C.M. of 80 cm, 85 cm and 90 cm.

2	80, 85, 90
2	40, 85, 45
2	20, 85, 45
2	10, 85, 45
3	5, 85, 45
3	5, 85, 15
5	5, 85, 5
17	1, 17, 1
	1, 1, 1

$\therefore$ L.C.M. of 80 cm, 85 cm and 90 $= 2\times2\times2\times2\times3\times3\times5\times17$

$= 12240$ cm.

Hence, the required minimum distance is 12240 cm or 122.40 m.

13. The bell ring together = L.C.M. of 6, 8 and 20 min.

2	6, 8, 20
2	3, 4, 10
2	3, 2, 5
3	3, 1, 5
5	1, 1, 5
	1, 1, 1

$\therefore$ L.C.M. of 6, 8 and 20 = $2 \times 2 \times 2 \times 3 \times 5 = 120$ min or 2 hr.
Hence, the bell will ring together again 10 am.

14. The clocks chime together = L.C.M. of 15 min 20 min and 30 min

2	15, 20, 30
2	15, 10, 15
5	15, 5, 15
3	3, 1, 3
	1, 1, 1

$\therefore$ L.C.M. of 15, 20 and 30 = $2 \times 2 \times 3 \times 5 = 60$ min
Hence, the clock will chime together again = 9 am.

Multiple Choice Questions

Tick (3) the correct option :

1. (a), 2. (a), 3. (b), 4. (c), 5. (a), 6. (c), 7. (a), 8. (a)

4 Integers

Exercise 4.1

1. (a) Earning of ` 5000 = + ` 5000
(b) Decrease in rainfall by 10 mm = – 10 mm
(c) 45 km North = + 45 km
(d) Going 1 km towards the West = – 1 km
(e) 4°C below the freezing point = – 4°C
(f) Going 300 m below the ground level into a mine = – 300 m
(g) An aeroplane flying at a height of 1800 m above the sea level = + 1800 m.
(h) A submarine moving at a depth of 500 m below the sea level = – 500 m.

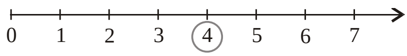
2. (a) – 234, the opposite is + 234 (b) 2085, the opposite is – 2085
(c) – 4096, the opposite is + 4096

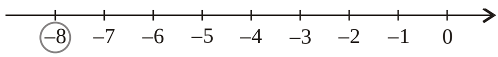
3. (a) The integer lying between 0 and 8 = 1, 2, 3, 4, 5, 6, 7.
(b) The integers lying between 0 and – 8 = – 1, – 2, – 3, – 4, – 5, – 6, – 7.

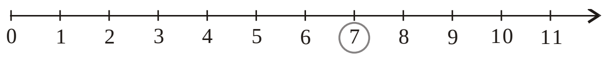
(c) the integers lying between – 4 and 4 = – 3, – 2, – 1, 0, 1, 2, 3.
(d) The integers lying between – 10 and – 19
= –11, – 12, – 13, – 14, – 15, – 16, – 17, – 18.
(e) The integers lying between – 111 and – 115 = – 112, – 113, – 114

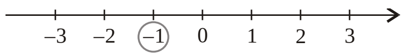
4. (a) Greater than – 22 = – 21, – 20, – 19, – 18, – 17.
(b) Greater than – 96 = – 95, – 94, – 93, – 92, – 91.
(c) Less than – 32 = – 33, – 34, – 35, – 36, – 37.
(d) Less than – 70 = – 71, – 72, – 73, – 74, – 75.

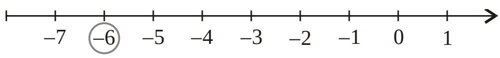
5. The greatest negative integer is – 1and greatest positive integer is not definite.

6. (a)


(b)


(c)


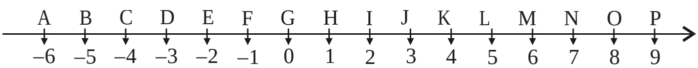
(d)


(e)


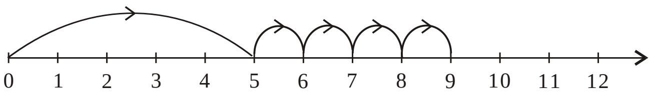
7. (a) Ascending order = – 10, – 9, – 7, – 5, 0, 3, 5.
(b) Ascending order = – 84, – 48, – 45, – 33, – 30

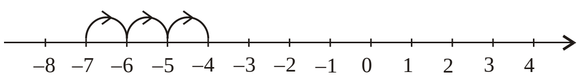
8. (a) Descending order = 9, 4, 0, – 4, – 6, – 9
(b) Descending order = – 1, – 7, – 15, – 18, – 20

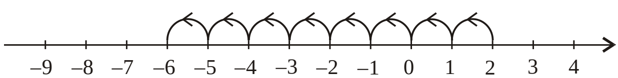
9. (a) 3°C is warmer. (b) – 6°C is cooler. (c) – 8°C is lower.

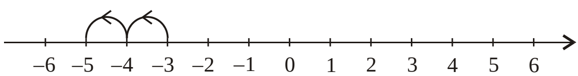
10.


11. (a) – 8, – 6, – 4, $\underline{-2}$, $\underline{0}$, $\underline{2}$. (b) – 40, – 35, – 30, $\underline{-25}$, $\underline{-20}$, $\underline{-15}$
(c) – 21, – 18, – 15, $\underline{-12}$, $\underline{-9}$, $\underline{-6}$ (d) 16, 13, 10, $\underline{7}$, $\underline{4}$, $\underline{1}$
(e) – 66, – 60, – 54, $\underline{-48}$, $\underline{-42}$, $\underline{-36}$ (f) – 84, – 72, – 60, $\underline{-48}$, $\underline{-36}$, $\underline{-24}$
(g) – 48, – 44, – 40, $\underline{-36}$, $\underline{-32}$, $\underline{-28}$

12. (a)


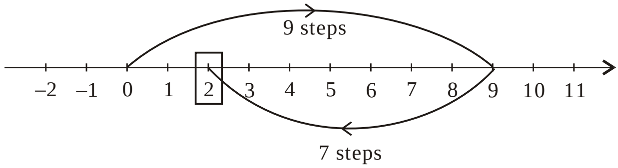
(b)


(c)


(d)


Exercise 4.2

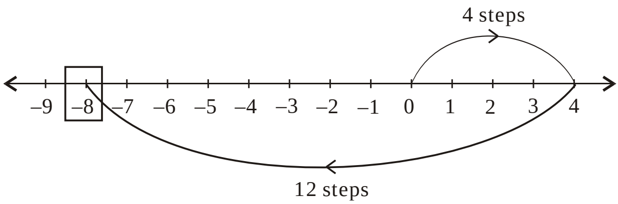
1. (a)



As shown in the above figure, you start from 0 and first move 9 steps to the right reaching 9. Then you move 7 steps to the left of 8 and reach 2.

Thus, $9+(-7)=2$

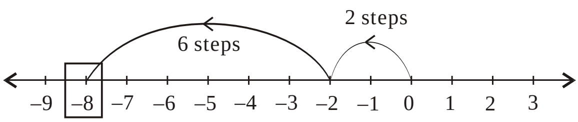
(b)



As shown in the above figure, you start from 0 and first move 4 steps to the right reaching 4. Then you move 12 steps to the left of 4 and reach -8.

Thus, $4+(-12)=-8$

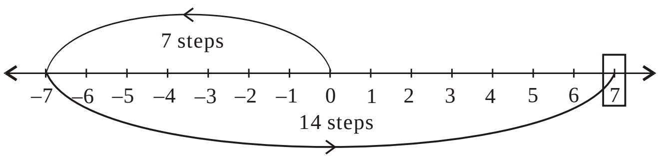
(c)



As shown in the above figure, you start from 0 and first move 2 steps to the left reaching -2. Then you move 6 steps again to the left starting from -2. You reach at -8.

Thus, $(-2)+(-6)=-8$.

(d)

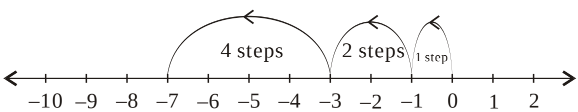


As shown in the above figure, you start from 0 and first move 7 steps to the left reaching -7.

Then you move 14 steps to the right starting from -2. You reach at 7.

Thus, $(-7)+14=7$

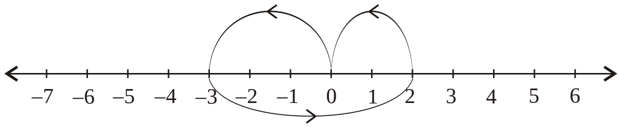
(e)



As shown in the above figure, you start from 0 and first move 1 step to the left reaching – 1. Then you move 2 steps again to the left starting from – 1. You reach at – 3. And again you move 4 steps to the left starting from – 3. You reach at – 7.

Thus, $(-1)+(-2)+(-4)=-7$

(f)



As shown in the above figure, you start from 0 and first move 3 steps to the left reaching – 3. Then you move 5 steps again to the right starting from – 3. You reach at 2 and again you move 2 steps to the left starting from 2. You reach at 0.

Thus, $(-3)+5+(-2)=0$

2. (a) $(-13)+18$
$=-13+18=5$

(b) $(-45)+24$
$=-45+24=-21$

(c) $(-256)+150$
$=-256+150=-106$

(d) $(-315)+(-100)$
$=-315-100=-415$

(e) $(-500)+(-680)$
$=-500-680=-1180$

(f) $(-20)+8$
$=-20+8=-12$

(g) $(-463)+(254)$
$=-463+254=-209$

(h) $(-1060)+900$
$=-1060+900=-160$

3. (a) $168+(-345)$
$=168-345=-177$

(b) $(-831)+(831)$
$=-831+831=0$

(c) $(-40)+(-190)+320$
$=-40-190+320$
$=-230+320=90$

(d) $(-512)+69+171$
$=-512+240$
$=-272$

4. We rearrange the terms so that positive integers and negative integers are grouped together.

(a) We have
$54+(-3)+(-66)+17$
$=54+17+(-3)+(-66)$
$=71-3-66$
$=71-69=2$

(b) We have
$(-8)+(-9)+7+18$
$=7+18+(-8)+(-9)$
$=25-8-9$
$=25-17=8$

(c) We have
$30+(-43)+(-63)+55=30+55+(-43)+(-63)$
$=85-43-63$
$=85-106=-21$

5. (a) True (b) False (c) False (d) False (e) False

6. The temperature of Srinagar $=4+(-7)=4-7=-3°C$.

Exercise 4.3

1. (a) $8-3=5$ (b) $36-21=15$ (c) $83-90=-7$

(d) $-10-(-18)$ $= -10+18 = 8$ (e) $-25-15$ $= -40$ (f) $-46-(-50)$ $= -46+50 = 4$

2. (a) $-15-(-16)$ $= -15+16$ $= 1$ (b) $-286-(-451)$ $= -286+451$ $= 165$ (c) $-2154-(5123)$ $= -2154-5123$ $= -7277$

(d) $-562-(-1040)$ $= -562+1040$ $= 478$ (e) $52-(-52)$ $= 52+52$ $= 104$ (f) $0-(-725)$ $= 0+725$ $= 725$

3. (a) $-10-5-(-35)$ $= -10-5+35$ $= -15+35 = 20$ (b) $-15+34-14-6$ $= -15-14-6+34$ $= -35+34 = -1$

(c) $-8+(-9)+(-80)$ $= -8-9-80 = -97$ (d) $100-(-100)-(-100)$ $= 100+100+100 = 300$

(e) $-26+(-13)+(-52) = -26-13-52 = -91$

(f) $-13+(-17)-(-22)-(-40) = -13-17+22+40 = 62-30 = 32$

4. (a) $34-\mathbf{24} = 10$ (b) $-\mathbf{27}+8 = -19$ (c) $-7+\mathbf{7} = 0$

(d) $841+\mathbf{(-329)} = 512$ (e) $-4+\mathbf{(-8)} = -12$

5. (a) $-2+(-4) < (-3)-(-2)$ (b $-6-5 = (-6)+(-5)$

(c) $45-(-8) < 57+(-1)$ (d) $-83-(-10) = -93+20$

(e) $50-(-40) > -60-30$ (f) $163-(-117) > -163-117$

(g) $-631+853 > -1000-115$ (h) $-78+86 < 97-10$

6. The temperature on afternoon in Ladakh = $+2°C$

The temperature dropped at night in Ladakh = $-5°C$

So, the temperature of Ladakh at night = $2°C+(-5°C) = 2°C-5°C = -3°C$

7. Submarine 700 m below the sea level = -700 m

Submarine 250 m ascends = $+250$ m

New position of submarine = -700 m $+ 250$ m $= -450$ m.

So, submarine 450 m below sea level.

8. Reeta's scores in four successive rounds = $35, -5, -10, 20$.

Thus, the total score $= 35+(-5)+(-10)+20$

$= 35-5-10+20$

$= (35+20)-(5+10) = 55-15 = 40$

9. The temperature on Friday = $-4°C$

The temperature dropped on Saturday = $-3°C$

So, the temperature at Manali on Saturday

$= -4°C+(-3°C)$

$= -4°C-3°C = -7°C$

And on Sunday, the temperature rise = $+5°C$

So, the temperature on Sunday = $-7°C+5°C = -2°C$

Hence, the temperature of Manali on Saturday and on Sunday $-7°C, -2°C$ respectively.

10. (a) The temperature was $-5°C$ and drops by $2°C$. The place has become more colder than before.

(b) Temperature was $8°C$ and drops by $3°C$.
The place has became colder than before.

(c) The temperature was $-3°C$ and increase by $4°C$.
The place has become warmer than before.

(d) The temperature was $3°C$ and increases by $5°C$.
The place has become more warmer than before.

(e) The temperature was $-6°C$ and drops by $7°C$. The place has become more colder than before.

Multiplce Choice Questions

Tick (3) the correct option :

1. (b) 2. (b), 3. (b), 4. (c), 5. (c), 6. (b), 7. (a), 8. (c), 9. (a), 10. (c)

5 Algebra

Exercise 5.1

1. (a), (b) both are algebraic expression.

2. In the algebraic expression $25ab$, 25 is numerical factor and ab are literal factors.

3. We have algebraic expression

(a) x, b (b) $2a, 3b, -c$

(c) $5abc^2, -2ab, 7a^2c$ (d) $2ab, 4ac^2, -6z$

4.

	like terms		**unlike terms**
(a)	$3a, 8a, -6a$	(b)	$6b, -4x, 9m$
(e)	$-9z, 15z, 8z$	(c)	$5n, -6p, -6y$
(f)	$-4r, 6r, -9r$	(d)	$-16x, -8y, -3a$

5.

Monomials	**Binomials**	**Trinomials**
$3x$	$m+n$	$x+y+z$
$-xyz$	$ab+2c$	$2t+3q+x$

6.

Powered Number	Base	Power/Index
m^4	m	4
x^3	x	3
$(xy)^2$	xy	2
y^{14}	y	14

7. (a) $a \times a \times b \times b = a^2 \times b^2 = (ab)^2$

(b) $a \times a \times a \times a \times a = a^5$ (c) $x \times x \times x \times x = x^4$

(d) $pq \times pq \times pq = (pq)^3$ (e) $mn \times mn \times mn \times mn = (mn)^4$

8. (a) $a^4 = a \times a \times a \times a$ (b) $p^5 = p \times p \times p \times p \times p$

(c) $(pq)^3 = pq \times pq \times pq$ (d) $(ab)^4 = ab \times ab \times ab \times ab$

(e) $y^3 = y \times y \times y$

9. (a) $x^7, x^4, x^{13}, x^{11}, x^2$ Ascending order $= x^2, x^4, x^7, x^{11}, x^{13}$

(b) $5x^2, 2x, 4x^4, 3x^3, 7x^5$ Ascending order $= 2x, 5x^2, 3x^3, 4x^4, 7x^5$

10. (a) $\mathrm{D} = \mathrm{S} \times \mathrm{T}$ (b) S.I. $= \dfrac{P \times R \times T}{100}$

(c) $\mathrm{A} = l \times b$ (d) $\mathrm{A} = \dfrac{1}{2} b \times h$

11. (a) $a+5$ (b) $q+p$ (c) $x-9$ (d) $y-x$

(e) $50b$ (f) $18 \div a$ (g) $6a+3b$ (h) $y-3$

(i) $10-5x$ (j) $6a+xy$ (k) $3x-ab$

Exercise 5.2

1. If price of diesel $= d$

And price of petrol $= p$

So, according to the question, $d = \dfrac{p}{2}$

2. (a)and (b) are not equations.

3. (a) Let a number be x. Then, according to questions, $x+7=21$

(b) Let a number by x Then, according to questions, $3x+1=10$

(c) Let a number be x $7x-10=32$

4. (a) $x \div 4 = 7$ (b) $x+y=25$ (c) $\dfrac{x+y}{2} = 8$ (d) $x^2 = 12+x$

5. (a) $3x+8=17$ (b) $\dfrac{1}{5}x - \dfrac{1}{10}x = 3$

6. The breadth of rectangular hall $= b$

According to questions

the length of a rectangular hall $= (3b-4)$ m

7. The total distance covered by Rakhi $= (4x+2y+9)$ km

8. The height of rectangular box $= h$ cm

The length of rectangular box $= 5h$ cm

The breadth of rectangular box $= (5h-10)$ cm

9. The total number of copies $= y^2 + 2x + 5$

Exercise 5.3

1. The given equation is $5x+10=30$. Since R.H.S. of this equation is 30, therefore, we put several values of x to find L.H.S. till for a particular values of x it become equal to 30.

x	L.H.S.	R.H.S.
1	$5\times1+10=15$	30
2	$5\times2+10=20$	30
3	$5\times3+10=25$	30
4	$5\times4+10=30$	30

Thus, $x = 4$ is the solution of the given equations.

2. The given equation is $3x-1=11$. Since R.H.S. of this equation is 11, therefore, we put several values of x to find L.H.S. till for a particular value of x, it becomes equal to 11.

x	L.H.S.	R.H.S.
1	$3\times1-1=2$	11
2	$3\times2-1=5$	11
3	$3\times3-1=8$	11
4	$3\times4-1=11$	11

Thus, $x = 4$ is the solution of the given equation.

3. (a) $x+5=12$

Adding -5 to both the sides, we get

$x+5-5=12-5, \qquad x=7$

$\therefore$ $x=7$ is the required solution.

(b) $y-2=10$

Adding $+2$ to both the sides, we get

$$y-2+2=10+2$$
$$y=12$$

$\therefore$ $y=12$ is the required solution.

(c) $7p=210$

To find the value of x, eliminate its numerical coefficient of 7 by multiplying both the sides of the equation by $\frac{1}{7}$.

$$7\times p\times\frac{1}{7}=210\times\frac{1}{7}$$
$$p\times1=30\times1$$
$$p=30$$

Hence, $p=30$ is the solution of the equation $7x=210$.

(d) $5q=50$

To find the value of x, eliminate its numerical coefficient of 5 by multiply both the sides of the equation by $\frac{1}{5}$.

So, $$5 \times q \times \frac{1}{5} = 50 \times \frac{1}{5}$$

or $$q \times 1 = 10 \times 1$$

or $$q = 10$$

Hence, $q = 10$ is the solution of the equation $5q = 50$.

(e) $x + 8 = 11$

Adding -8 (the additive inverse of $+8$) to both the sides, we get

$$x + 8 - 8 = 12 - 8$$

$$x = 4$$

∴ $x = 4$ is the required solution.

(f) $2x - 10 = -12$

Adding $+10$ to both the side,

we get, $2x - 10 + 10 = -12 + 10$

$$2x = -2$$

Now, to find the value of x, eliminate its numerical coefficient of 2 by multiplying both the sides of the equation by $\frac{1}{2}$.

So, $$2 \times x \times \frac{1}{2} = -2 \times \frac{1}{2}$$

$$x \times 1 = -1 \times 1$$

$$x = -1$$

Hence, $x = -1$ is the solution of the equation.

(g) $9x = 36$

To find the value of x, eliminate its numerical coefficient of 9 by multiplying both the sides of the equation by $\frac{1}{9}$.

$$9 \times x \times \frac{1}{9} = 36 \times \frac{1}{9}$$

$$x \times 1 = 4 \times 1$$

or $$x = 4$$

Hence, $x = 4$ is the solution of the equation.

(h) $12x = -108$

To find the value of x, eliminate its numerical coefficient of 12 by multiplying both the sides of the equation by $\frac{1}{12}$.

So, $$12 \times x \times \frac{1}{12} = -108 \times \frac{1}{12}$$

$$x \times 1 = -9 \times 1$$

or $$x = -9$$

Hence, $x = -9$ is the solution of the equation.

4. (a) $x + 8 = 12$

Adding -8 to both the sides, we get

$x+8-8=12-8,$ $x=4$

$\therefore$ $x=4$ is the required solution.

Check : Put $x=4$ in the given equation.

L.H.S. $=4+8=12$

R.H.S. $=12$

i.e., L.H.S. = R.H.S.

(b) $15-x=3$

Adding -15 to both the sides,

we get $15-x-15=3-15$

$$-x=-12$$

Cancel the negative sign of the both side

$$x=12$$

Check : Put $x=12$ in the given equation.

L.H.S. $=15-12=3$

R.H.S. $=3$

i.e., L.H.S. = R.H.S.

(c) $4y=-12$

To find the value of y, eliminate its numerical coefficient of 4 by multiplying both the sides of the equation by $\frac{1}{4}$.

So, $4\times y\times\frac{1}{4}=-12\times\frac{1}{4}$

$$y\times 1=-3\times 1$$

$$y=-3$$

Hence, $y=-3$ is the solution of the equation $4y=-12$.

Check : Put $y=-3$ in the given equation.

L.H.S. $=4\times(-3)=-12$

R.H.S. $=-12$

i.e., L.H.S. = R.H.S.

(d) $x-8=16$

Adding $+8$ to both sides, we get

$$x-8+8=16+8$$

$$x=24$$

$\therefore$ $x=24$ is the required solution.

Check : Put $x=24$ in the given equation

L.H.S. $=24-8=16$

R.H.S. $=16$

i.e., L.H.S. = R.H.S.

5. (a) $19x-13=11x+35$

$19x-11x=35+13$

$8x=48$

$$x = \frac{48}{8}$$

$$x = 6$$

Hence, $x = 6$ is the solution of the equation.

Check : $19 \times 6 - 13 = 11 \times 6 + 35$

$$114 - 13 = 66 + 35$$

$$101 = 101$$

L.H.S. = R.H.S.

(b) $2(x-2) - 3(x-3) = 5(x-5)$

$$2x - 4 - 3x + 9 = 5x - 25$$

$$2x - 3x - 5x = 4 - 9 - 25$$

$$2x - 8x = 4 - 34$$

$$-6x = -30$$

Cancel the negative sign both side, we get

$$6x = 30$$

$$x = \frac{30}{6}$$

$$x = 5$$

Hence, $x = 5$ is the solution of the equation.

Check : Put $x = 5$ in the given equation

L.H.S. = $2(5-2) - 3(5-3) = 2 \times 3 - 3 \times 2 = 6 - 6 = 0$

R.H.S. = $5(5-5) = 5 \times 0 = 0$

i.e., L.H.S. = R.H.S.

6. Solve : $\frac{y}{4} - \frac{1}{2} = \frac{y}{3} + 1$

$$\frac{y-2}{4} = \frac{y+3}{3}$$

$$3(y-2) = 4(y+3)$$

$$3y - 6 = 4y + 12$$

$$4y - 3y = -6 - 12$$

$$y = -18$$

Hence, $y = -18$ is the solution of the equation.

Exercise 5.4

1. Let the number be x.

So, According to the questions $6x - 10 = 32$

$$6x = 32 + 10$$

$$6x = 42$$

$$x = \frac{42}{6}$$

$$x = 7$$

Hence, the number is 7.

2. Let the number be *x*.

So,
$$x \div 8 = 4$$
$$x \times \frac{1}{8} = 4$$
$$x = 4 \times 8 = 32$$

Hence, the number is 32.

3. Let the number be *x*.

So,
$$\frac{1}{3}x + 9 = 19$$
$$\frac{1}{3}x = 19 - 9$$
$$\frac{1}{3}x = 10$$
$$x = 3 \times 10$$
$$x = 30$$

Hence, the number is 30.

4. According to questions
$$\frac{1}{4}x - 4 = 8$$
$$\frac{1}{4}x = 4 + 8$$
$$\frac{1}{4}x = 12$$
$$x = 12 \times 4$$
$$x = 48$$

Hence, the number is 48.

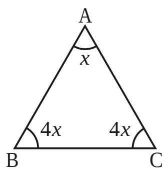
5. Let the number be *x*.

So,
$$2x + 3x = 90$$
$$5x = 90$$
$$x = \frac{90}{5} \quad \Rightarrow \quad x = 18$$

Hence, the number is 18.

6. $\because$ Sum of three angles $= 180°$.

$\therefore$
$$\angle A + \angle B + \angle C = 180°$$
$$x + 4x + 4x = 180°$$
$$9x = 180°$$
$$x = 20°$$



$\therefore \quad \angle A = x = 20°, \angle B = 4x = 4 \times 20° = 80° = \angle C$

Multiplce Choice Questions

Tick (3) the correct Questions :

1. (c), 2. (b), 3. (b), 4. (d), 5. (b), 6. (a), 7. (a), 8. (a), 9. (a), 10. (a)

6 Ratio, Proportion and Unitary Mehtod

Exercise 6.1

1. (a) The ratio in a village out of 3 people 2 are illiterate $= 2:3$

(b) The ratio dilute acid solution and water $= 5:9$

(c) The ratio income and expenditure of a man $= 9000:7500 = 6:5$

(d) In a school, number of boys : total strength of a section of class VI $= 30 : 45 = 2 : 3$

(e) The ratio of speed of two trains $= 75 : 60 = 5 : 4$

(f) The ratio of length and breadth of a room $= b : 3b = 1 : 3$

(g) The ratio of a mixture of milk and water $= 30 : 5 = 6 : 1$

2. (a) (i) The required ratio $= 100:25 = \frac{100}{25}$

To reduce this ratio in the simplest form, we divide two terms by their common factor 25.

$$\frac{100 \div 25}{25 \div 25} = \frac{4}{1} = 4:1$$

(ii) The required ratio $= 60:80 = \frac{60}{80}$

To reduce this ratio in the simplest form, we divide two terms by their common factor 20.

$$\frac{60 \div 20}{80 \div 20} = \frac{3}{4} = 3:4$$

(iii) The required ratio $= 40:75 = \frac{40}{75}$

The reduce this ratio in the simplest form, we divide the two terms by their common factor 5.

$$\frac{40 \div 5}{75 \div 5} = \frac{8}{15} = 8:15 \qquad (\because 1 \text{ m} = 100 \text{ cm})$$

(iv) The required ratio $= 5 \times 100:75 = \frac{500}{75}$

The reduce this ratio in the simplest form, we divide the two terms by their common factor 25.

$$\frac{500 \div 25}{75 \div 25} = \frac{20}{3} = 20:3.$$

(v) The required ratio $= 72:8 \times 100$

The reduce this ratio in the simplest from, we divide the two terms by their common factor 8.

$$\frac{72 \div 8}{800 \div 8} = \frac{9}{100} = 9:100$$

(vi) The required ratio $= 8\times1000:560 = 8000:560$

$\therefore \quad \dfrac{8000\div80}{560\div80} = \dfrac{100}{7} = 100:7$

(vii) The required ratio $= 3\times1000:900 = \dfrac{3000}{900}$

$\therefore \quad = \dfrac{3000\div300}{900\div300} = \dfrac{10}{3} = 10:3$

(viii) The required ratio $= 15:90 = \dfrac{15}{90}$

$\therefore \quad \dfrac{15\div15}{90\div15} = \dfrac{1}{6} = 1:6$

(ix) The required ratio $= 3\times60:5\times60+20$

$= 180:300+20$

$= 180:320$

$\therefore \quad \dfrac{180\div20}{320\div20} = \dfrac{9}{16} = 9:16$

(x) The required ratio $= 4\times60:30 = 240:30 = \dfrac{240}{30}$

$\therefore \quad \dfrac{240\div30}{30\div30} = \dfrac{8}{1} = 8:1$

(b) (i) $\dfrac{5}{8} \neq \dfrac{11}{15}$

$15\times5 \neq 8\times11$

$75 \neq 88$

$75 < 88$

$\therefore \quad \dfrac{5}{8} < \dfrac{11}{5}$

(ii) $\dfrac{12}{25} \neq \dfrac{25}{48}$

$12\times48 = 25\times25$

$576 \neq 625$

$576 < 625$

$\therefore \quad \dfrac{12}{25} < \dfrac{25}{48}$

3. (a) $\dfrac{3}{5} = \dfrac{9}{15} = \dfrac{12}{20} = \dfrac{15}{25} = \dfrac{24}{40}$ (b) $\dfrac{2}{7} = \dfrac{4}{14} = \dfrac{6}{21} = \dfrac{20}{70} = \dfrac{28}{98}$

4. The ratio of their marks $= 375:360 = \dfrac{375\div15}{360\div15} = \dfrac{25}{24} = 25:24.$

5. Performance is better :

$\Rightarrow \quad \dfrac{560}{600} = \dfrac{450}{500}$

$\Rightarrow \quad 56\times50 = 45\times50$

$\Rightarrow \quad 2800 = 2250$

So, $\quad 2800 > 2250$

Thus, Anita's scored is better.

6. Kumble is more successfully.

Because

$$\Rightarrow \quad \frac{3}{5} = \frac{2}{4}$$

$$\Rightarrow \quad 3 \times 4 = 5 \times 2$$

$$\Rightarrow \quad 12 > 10$$

Thus, Kumble is better boler.

7. (a) The ratio of 2 to 5 is equal to (i), (iv) and (v).
So, (ii), (iii) are not equal to the given ratio.

(b) the ratio of 7 m and 5 dm is equal to (i) and (ii).
So, (iii), (iv) and (v) are not equal to the given ratio.

8. The monthly income of a man = ` 9600
His monthly expenditure = ` 7200
Saving in a month = ` (9600 – 7200) = ` 2400

(a) The ratio of income : expenditure = ` 9600 : ` 7200
$= 8 : 6 = 4 : 3$

(b) The ratio of saving : income = ` 2400 : ` 9600
$= 1 : 4$

9. The total weight of alloy $= \frac{15}{2} + \frac{3}{4} = \frac{30+3}{4} = \frac{33}{4}$

(a) The ratio of copper to alloy $= 7\frac{1}{2} : \frac{33}{4}$

$$= \frac{15}{2} : \frac{33}{4} = \frac{15 \times 4}{33 \times 2}$$

$$= \frac{5 \times 2}{11 \times 1} = \frac{10}{11} = 10 : 11$$

(b) The ratio of copper to tin $= 7\frac{1}{2} : \frac{3}{4}$

$$= \frac{15}{2} : \frac{3}{4}$$

$$= \frac{15 \times 4}{2 \times 3} = \frac{5 \times 2}{1} = \frac{10}{1} = 10 : 1$$

(c) The ratio of tin the alloy $= \frac{3}{4} : \frac{33}{4}$

$$= \frac{3 \times 4}{33 \times 4} = \frac{3}{33}$$

$$= 1 : 11$$

10. Naresh's income = ` 12500
His saving= ` 2500
His expenditure = ` (12500 – 2500) = ` 10000

(a) The ratio of saving to expenses = ` 2500 : ` 10000 $= \frac{2500}{10000} = 1 : 4$

(b) The ratio of savings to earning $= 2500 : 12500 = \dfrac{2500}{12500} = \dfrac{1}{5} = 1 : 5$

(c) The ratio of earning to expenditure $= 12500 : 10000$

$$= \frac{12500}{10000} = \frac{5}{4} = 5 : 4$$

11. Let the length of square of A be L

Then, According to the question the length of square of $B = \dfrac{L}{2}$

(a) The ratio of the sides of B to $A = \dfrac{L}{2} : L = \dfrac{1}{2} / 1 = \dfrac{1}{2} = 1 : 2$

(b) The ratio of the area of B to $A = \dfrac{L}{2} \times \dfrac{L}{2} : L \times L = \dfrac{1}{4} : 1 = 1 : 4$

(c) The ratio of the perimeter of A to $B = 4 \times L : 4 \times \dfrac{L}{2} = 1 : \dfrac{1}{2} = 2 : 1$

12. A man travels on a cycle

The speed of a cycle $= \dfrac{20\,\text{km}}{3/2\,\text{h}} = \dfrac{40}{3}$ km/h

And a man travels on a car

The speed of a car $= \dfrac{120\,\text{km}}{2\,\text{h}} = 60$ km/h

The ratio of their speeds $= \dfrac{40}{3} : 60$

$$= 40 : 60 \times 3$$
$$= 40 : 180$$
$$= 4 : 18$$

or $\qquad = 2 : 9$

13. The total amount $=$ ₹ 900

Sangita gets the money $=$ ₹ $\dfrac{900}{12+15} \times 12$

$$= ₹\ \frac{900 \times 12}{27}$$

$$= ₹\ \frac{900 \times 4}{9} = ₹\ 100 \times 4 = ₹\ 400$$

Rachita gets to money $=$ ₹ $(900 - 400) =$ ₹ 500

14. The total amount $=$ ₹ 1560

Suman gets the money $=$ ₹ $\dfrac{1560}{3+4+5} \times 3$

$$= ₹\ \frac{1560}{12} \times 3$$

$$= ₹\ \frac{1560}{4} = ₹\ 390$$

Krishna gets the money = ` $\dfrac{1560}{3+4+5}\times 4$

= ` $\dfrac{1560}{12}\times 4$

= ` $130\times 4 =$ ` 520

And Abir gets the money = ` $(1560-390-520)$ = ` 650

15. If Kiran gets = ` 5

And Kanu gets = ` 7

$\therefore$ The ratio between Kiran and Kanu = 5 : 7

therefore, Kiran gets the money = ` $\dfrac{2880}{5+7}\times 5$

= ` $\dfrac{2880}{12}\times 5$

= ` 240×5

= ` 1200

And Kanu gets the money = ` $(2880-1200)=$ ` 1680

16. The ratio between copper and tin = 5 : 2

If the total weight of copper = 31.5 gm

The weight of tin = ?

$$\text{The weight of tin} = \frac{\text{The weight of copper}}{\text{The ratio of copper and tin}}$$

$$= \frac{31.5}{5/2} = \frac{31.5}{5}\times 2$$

$$= 6.3\times 2 = 12.6 \text{ gm}$$

17. The rate of 1 orange = ` $100\div 20 =$ ` 5

And the rate of 1 apple = ` $100\div 12$

Therefore,

The ratio of oranges to apples = ` 5 : ` $\dfrac{100}{12}$

= 60 : 100

= 3 : 5

18. The ratio of expenditure to savings = 7 : 2

The monthly income = ` 13500

My savings = ?

$$\text{My savings} = \frac{\text{The monthly income}}{\text{The sum of given ratio}}\times \text{Second ratio}$$

= ` $\dfrac{13500}{7+2}\times 2$

= ` 1500×2

= ` 3000

19. The lesson time of the school $= 5\,\text{hours}$

$$= 5 \times 60\,\text{min} = 300\,\text{min}$$

The recess time of the school $= 15\,\text{min} + 30\,\text{min}$

$$= 45\,\text{min}$$

So, the ratio of the recess time to lesson time $= 45 : 300 = 3 : 20$

20. 

$$AC = 4.5 \text{ cm}$$

$$AB : BC = 7 : 8$$

The length of $AB = \dfrac{AC}{\text{the sum of ratio}} \times \text{First ratio}$

$$= \left(\frac{4.5}{7+8} \times 7\right) \text{cm}$$

$$= \left(\frac{4.5}{15} \times 7\right) \text{cm}$$

$$= (0.3 \times 7)\,\text{cm}$$

$$= 2.1 \text{ cm}$$

the length of $BC = (4.5 - 2.1)$ cm

$$= 2.4 \text{ cm}$$

Exercise 6.2

1. (a) $3 : 5 = 15 : 25$

or $\dfrac{3}{5} = \dfrac{15}{25}$

$\dfrac{3}{5} = \dfrac{3}{5}$ which is proportion

So, $3 : 5 = 15 : 25$ are true.

(b) $4 : 15 = 16 : 30$

$\dfrac{4}{15} = \dfrac{16}{30}$

$\dfrac{4}{15} \neq \dfrac{8}{15}$ which is not proportion

So, $4 : 15 = 16 : 30$ are false.

(c) $7 : 16 = 28 : 32$

or $\dfrac{7}{16} = \dfrac{28}{32}$

$\dfrac{7}{16} \neq \dfrac{7}{8}$ which is not proportion.

So, $7 : 16 = 28 : 32$ are false.

(d) $5 : 24 = 30 : 144$

or $\dfrac{5}{24} = \dfrac{30}{144}$

or $\dfrac{5}{24} = \dfrac{5}{24}$ which is proportion.

So, $5 : 24 = 30 : 144$ are true.

(e) $15 : 45 = 75 : 125$

or $\dfrac{15}{45} = \dfrac{75}{125}$

or $\frac{1}{3} \neq \frac{3}{5}$ which is not proportion.

So, $15:45 = 75:125$ are false.

2. (a) 15 cm : 1 m

$$= \frac{15\,\text{cm}}{1 \times 100\,\text{cm}} = \frac{15}{100} \quad (\because 1\,\text{m} = 100\,\text{cm})$$

$$= \frac{3}{20}$$

And $\quad 75\text{ g} : 500\text{ g} = \frac{75\text{g}}{500\text{g}}$

$$= \frac{3}{20}$$

So, it is a proportion.

(b) $5\text{ kg} : 3\text{ kg } 500\text{ g} = \frac{5\text{ kg}}{3\text{ kg } 500\text{ g}}$

$$= \frac{5 \times 1000\,\text{g}}{(3 \times 1000 + 500)\text{g}} \; (\because 1\,\text{kg} = 1000\,\text{g})$$

$$= \frac{5000}{3500} = \frac{10}{7}$$

And ` 150 : ` 100 $= \frac{\text{` }150}{\text{` }100} = \frac{3}{2}$

So, It is not a proportion.

(c) $6\text{ km} : 2\text{ km } 400\text{ m} = \frac{6\text{ km}}{2\text{ km } 400\text{ m}}$

$$= \frac{6 \times 1000\text{ m}}{(2 \times 1000 + 400)\text{ m}} \; (\because 1\text{ km} = 1000\text{ m})$$

$$= \frac{6000}{2400} = \frac{5}{2}$$

And 12 hours : 4 hours 48 min

$$= \frac{12 \times 60\,\text{min}}{(4 \times 60 + 48)\,\text{min}} = \frac{720}{240 + 48} = \frac{720}{288} = \frac{5}{2} \; (\because 1\text{ h} = 60\,\text{min})$$

So, it is a proportion.

(d) $300\text{ mL} : 2.5\text{ L} = \frac{300\text{ mL}}{2.5 \times 1000\,\text{mL}} \; (\because 1\text{ L} = 1000\,\text{mL})$

$$= \frac{300}{2500} = \frac{3}{25}$$

And ` 12 : ` 96 $= \frac{12}{96} = \frac{1}{8}$

So, it is not a proportion.

(e) $2 \text{ km} : 800 \text{ m} = \dfrac{2 \text{ km}}{800 \text{ m}} = \dfrac{2 \times 1000 \text{ m}}{800 \text{ m}}$

$$= \frac{2000}{800} = \frac{5}{2}$$

and ` 75 : ` 30 $= \dfrac{75}{30} = \dfrac{5}{2}$

So, it is a proportion.

3. (a) Cloth required $= \dfrac{7.5 \times 15}{4} = 1.875 \times 15 = 28.125$ m

(b) A man take a time $= \dfrac{150 \times 2}{5} = 30 \times 2 = 60 \text{ min} = 1 \text{ hour}$

(c) The bag are required $= \dfrac{485 \times 4}{194} = \dfrac{1940}{194} = 10 \text{ bags.}$

(d) The drawing $= \dfrac{25 \times 5}{2} = \dfrac{125}{2} = 62.5$ km

(e) We will get the apples $= \dfrac{12 \times 7}{2}$

$$= 6 \times 7 = 42 \text{ apples}$$

4. Let the missing terms be *x*.

(a) $x : 16 :: 5 : 40$

$$\frac{x}{16} = \frac{5}{40}$$

$$x = \frac{5 \times 16}{40} = \frac{16}{8} = 2$$

Hence, the first number is 2.

(b) $5 : 7 :: x : 49$

$$\frac{5}{7} = \frac{x}{49}$$

$$x = \frac{5 \times 49}{7} = 5 \times 7 = 35$$

Hence, the third number is 35.

(c) $24 : 6 :: 48 : x$

$$\frac{24}{6} = \frac{48}{x}$$

$$x = \frac{48 \times 6}{24}$$

$$x = 2 \times 6 = 12$$

Hence, the fourth number is 12.

(d) $3 : x :: 15 : 75$

$$\frac{3}{x} = \frac{15}{75}$$

$$x = \frac{75 \times 3}{15}$$

$$x = 5 \times 3$$

$$= 15$$

Hence, the second number is 15.

(e) 28 : 4 : : x : 2

$$\frac{28}{4} = \frac{x}{2}$$

$$x = \frac{28 \times 2}{4}$$

$$= 7 \times 2$$

$$x = 14$$

Hence, the third proportion is 14.

5. (a) We have,

Product of the extremes = $a \times 60$

Product of the means = 30×40

a, 30, 40 and 60 will be in proportion if

$$a \times 60 = 30 \times 40$$

or $$a = \frac{30 \times 40}{60}$$

$$= 20$$

$\therefore$ The value of $a = 20$.

(b) We have,

Product of the extremes = $a \times 48$

Product of the means = 24×32

a, 24, 32 and 48 will be in proportion

if $$a \times 48 = 24 \times 32$$

or $$a = \frac{24 \times 32}{48}$$

$$a = 16$$

$\therefore$ The value of $a = 16$.

(c) we have,

Product of the extremes = 10×60

Product of the means = $b \times 24$

10, b 24 and 60 will be in proportion

if $$10 \times 60 = b \times 24$$

$$b = \frac{10 \times 60}{24}$$

$$b = 25$$

$\therefore$ The value of $b = 25$.

(d) We have,

Product of the extremes = 24×144

Product of the means = $b \times 72$

24, b, 72 and 144 will be in proportion.

If $\quad 24 \times 144 = b \times 72$

$$b = \frac{24 \times 144}{72}$$

$$b = 48$$

$\therefore$ The value of $b = 48$..

(e) We have,

Product of the extremes $= 12 \times 36$

Product of the means $= 48 \times c$

12, 48, c and 36 will be in proportion if

$$12 \times 36 = 48 \times c$$

$$c = \frac{12 \times 36}{48}$$

$$c = 9$$

$\therefore$ the value of $c = 9$.

(f) We have,

Product of the extremes $= 57 \times 190$

Product of the means $= 95 \times c$

57, 95, c and 190 will be proportion if

$$57 \times 190 = 95 \times c$$

$$c = \frac{57 \times 190}{95}$$

$$c = 114$$

$\therefore$ The value of $c = 114$.

6. (a) The three more proportion are (36, 18, 24, 12) (36, 24, 18, 12) and (12, 24, 18, 36).

(b) The three more proportion are (80, 40, 48, 24) (80, 48, 40, 24) and (24, 48, 40, 80).

(c) The three more proportion are (240, 80, 120, 40), (240, 120, 8, 40) and (40, 120, 80, 240).

7. Let the third term of a proportion be x.

Therefore,

$$15 : 25 : : x : 50$$

$$\frac{15}{25} = \frac{x}{50}$$

$$x = \frac{50 \times 15}{25}$$

$$x = 2 \times 15$$

$$= 30$$

Hence, the third term is 30.

8. Let the 4th term be x.

$$48 : 96 : : 144 : x$$

$$\frac{48}{96} = \frac{144}{x}$$

$$x = \frac{144 \times 96}{48}$$

$$x = 3 \times 96$$

$$x = 288$$

Hence, the fourth term is 288.

9. If four numbers are in proportion, then $\frac{a}{b} = \frac{c}{d}$

(a) 20 km : 60 km $= 3$ hours : x

$$\frac{20}{60} = \frac{3}{x}$$

$$x = \frac{60 \times 3}{20}$$

$$x = 3 \times 3$$

$$= 9 \text{ hours.}$$

(b) 5 kg : 12 kg $= x :$ ` 48

$$\frac{5}{12} = \frac{x}{\text{`}\ 48}$$

$$x = \text{`}\ \frac{48 \times 5}{12}$$

$$x = \text{`}\ 4 \times 5$$

$$= \text{`}\ 20$$

(c) 24 cm : 5 m $=$ ` $6 : x$

$$\frac{24 \text{ cm}}{5 \times 100 \text{ cm}} = \frac{\text{`}\ 6}{x}$$

$$\frac{24}{500} = \frac{\text{`}\ 6}{x}$$

$$x = \frac{\text{`}\ 6 \times 500}{24}$$

$$x = \text{`}\ 125$$

10. 4, 6, 9 are said to be in proportion if

$$4 : 6 = 6 : 9$$

Now, $4 : 6 = 4 \div 6 = \frac{4}{6} = \frac{2}{3}$

and $6 : 9 = 6 \div 9 = \frac{6}{9} = \frac{2}{3}$

$\therefore$ $4 : 6 = 6 : 9$

i.e., 4, 6, 9 are in proportion.

11. Let the middle term be *x*.

As, 4, *x* and 36 are in proportion.

Therefore, $4 : x = x : 36$

$$\frac{4}{x} = \frac{x}{36}$$

$$x^2 = 4 \times 36$$

$$x = \sqrt{4 \times 36}$$

$$x = 2 \times 6$$

$$x = 12$$

Hence, the required term is 12.

12. Let the third number of proportion be *x*.

(a) (i) $25 : 30 = 30 : x$

$$\frac{25}{30} = \frac{30}{x}$$

$$x = \frac{30 \times 30}{25}$$

$$x = 6 \times 6$$

$$= 36$$

Hence, 25, 30 and 36 are in proportion.

(ii) $x : 24 = 24 : 64$

$$\frac{x}{24} = \frac{24}{64}$$

$$x = \frac{24 \times 24}{64}$$

$$x = 3 \times 3 = 9$$

Hence, 9, 24 and 64 are in proportion.

(iii) $36 : 42 = 42 : x$

$$\frac{36}{42} = \frac{42}{x}$$

$$x = \frac{42 \times 42}{36}$$

$$x = 7 \times 7 = 49$$

Hence, 36, 42 and 49 are in proportion.

(iv) $x : 35 = 35 : 49$

$$\frac{x}{35} = \frac{35}{49}$$

$$x = \frac{35 \times 35}{49}$$

$$x = \frac{5 \times 5}{1}$$

$$x = 25$$

Hence, 25, 35 and 49 are in proportion.

(b)

	a	b	c	d	Product of the extremes	Product of means	Are the numbers Proportional? (Yes/No)
(i)	2	4	5	10	$2\times10=20$	$4\times5=20$	Yes
(ii)	7	72	26	206	$7\times206=1442$	$72\times26=1872$	No
(iii)	15	35	63	147	$15\times147=2205$	$35\times63=2205$	Yes
	a	b	c		Product of the extremes $(a\times c)$	Product of means $(b\times b)$	Are they Proportional? (Yes/No)
(iv)	2	4	8		2×8	4×4	Yes
(v)	35	62	50.4		$35\times50.4=1764$	$62\times62=3844$	No
(vi)	63	126	252		$63\times252=15876$	$126\times126=15876$	Yes

13. Let the cost of 15 books be ` x.

We know that,

Ratio of cost of books and ratio of number of books are proportional.

$$\frac{`\ x}{`\ 205}=\frac{15}{5}$$

$$x=\frac{205\times15}{5}=205\times3=615$$

Hence, the cost of 15 books is ` 615.

14. The ratio of boys and girls = 5 : 2

The number of boys = 725

The number of girls = ?

$$\text{The number of girls}=\frac{\text{The number of boys}}{\text{The given ratio}}$$

$$=\frac{725}{5/2}$$

$$=\frac{725\times2}{5}=145\times2=290$$

15. In 72 min, water lifts $=216\,\text{L}$

In 1 min, water lifts $=(216\div72)\,\text{L}$

So, In 30 min, water will lifts $= \dfrac{216}{72} \times 30\,\text{L}$

$= \dfrac{216 \times 30}{72} = 3 \times 30\,\text{L}$

$= 90\,\text{L}$

Hence, 90 L of water can lift in 30 minutes.

16. In a weak, a man earns = ` 420

In a 1 day, a man earns = ` $\dfrac{420}{7}$

In a 30 days, a man will earns = ` $\dfrac{420}{7} \times 30$

= ` $60 \times 30 =$ ` 1800

17. The ratio of the cost of a ratio and tape-recorder = 3 : 7

The cost of a tape-recorder = ` 3500

The cost of the ratio = ?

The cost of the ratio

$= \dfrac{\text{first ratio} \times \text{the cost of a tape-recorder}}{\text{second ratio}}$

= ` $\dfrac{3 \times 3500}{7} =$ ` $3 \times 500 =$ ` 1500

18. The ratio of circumference and diameter of a circle = 22 : 7

The diameter of a circle = 42 metres

The length of circumference = ?

The length of circumference

$= \dfrac{\text{the diameter of a citrcle}}{\text{second ratio}} \times \text{first ratio}$

$= \dfrac{42 \times 22}{7} = 6 \times 22 = 132\,\text{m}.$

19. (a) B makes $= \dfrac{6}{9} \times 24 = 2 \times 8 = 16$

(b) A makes $= \dfrac{9}{6} \times 14 = 3 \times 7 = 21$

20. (a) The actual length $= 200 \times 6\,\text{cm}$

$= 1200\,\text{cm}$

$= 12\,\text{m}$

And the actual breadth $= 200 \times 5\,\text{cm}$

$= 1000\,\text{cm}$

$= 10\,\text{m}$

(b) The length on the drawing $= \dfrac{5 \times 100\,\text{cm}}{200}$

$$= \frac{500}{200} \text{ cm} = 2.5 \text{ cm}$$

21. In 3 hours, a car travels $= 150\,\text{km}$

$\therefore$ in 1 hours, a car travels $= \frac{150}{3}$ km

$\therefore$ in 7 hours, a care will travels $= \frac{150}{3} \times 7 = 50 \times 7 = 350\,\text{km}.$

Exercise 6.3

1. The cost of 3 kg of tea = ₹ 150

$\therefore$ the cost of 1 kg of tea = ₹ $\frac{150}{3}$

$\therefore$ the cost of 10 kg of tea = ₹ $\frac{150}{3} \times 10 =$ ₹ $50 \times 10 =$ ₹ 500

Hence, the cost of 10 kg of tea is ₹ 500.

2. The cost of 15 meters of cloth = ₹ 2850.

$\therefore$ the cost of 1 meters of cloth = ₹ $\frac{2850}{15}$

$\therefore$ the cost of 11 meters of cloth = ₹ $\frac{2850}{15} \times 11$

= ₹ $190 \times 11 =$ ₹ 2090

Hence, the cost of 11 meters of cloth is ₹ 2090.

3. The cost of 12 tins of biscuits = ₹ 543

$\therefore$ the cost of 1 tin of biscuits = ₹ $\frac{543}{12}$

$\therefore$ the cost of 30 tins of biscuits = ₹ $\frac{543}{12} \times 30$

= ₹ 45.25×30 = ₹ 1357.50

Hence, the cost of 30 tins of biscuit is ₹ 1357.50.

4. The cost of 7 chairs = ₹ 857.50

$\therefore$ the cost of 1 chair = ₹ $\frac{857.50}{7}$

$\therefore$ the cost of 5 chairs = ₹ $\frac{857.50}{7} \times 5$

= ₹ 122.50×5

= ₹ 612.50

Hence, the cost of 5 chairs is ₹ 612.50.

5. The weight of 5 bags of rice = 197.50 kg

$\therefore$ the weight of 1 bag of rice $= \frac{197.50}{5}$ kg

$\therefore$ the weight of 12 bags of rice $= \dfrac{197.50}{5} \times 12\,\text{kg}$

$= 39.50 \times 12 \quad \text{kg}$

$= 474\,\text{kg}$

Hence, the weight of 12 such bags of rice is 474 kg.

6. 14 water-tanks can be filled by a pipe $= 3\frac{1}{2}$ h

$\therefore$ 1 water-tank can be filled by a pipe $= \dfrac{7}{2 \times 14}$ h

$\therefore$ 4 such tanks will fill a pipe $= \dfrac{7}{2 \times 14} \times 4\,\text{h} = \dfrac{28}{28}\,\text{h} = 1\text{h}$

Hence, 1 hour will be taken by the pipe to fill 4 such tanks.

7. A tank fill $= 1\text{h}\ 40\ \text{min} = 60\,\text{min} + 40\,\text{min} = 100\,\text{min}$

$\dfrac{3}{10}$ part of tank fill $= \dfrac{300}{100} \times \dfrac{10}{3}$ min

$= 10\,\text{min}$

8. The cost of $2\frac{1}{2}$ kg of apples = ` 25.40

$\therefore$ the cost of 1 kg of apples = ` $\dfrac{25.40}{5/2}$

$\therefore$ the cost of $1\frac{1}{2}$ kg of apples $= \dfrac{\text{\` } 25.40 \times 2}{5} \times \dfrac{3}{2}$

$= \dfrac{\text{\` } 25.40 \times 3}{5} =$ ` $5.08 \times 3 =$ ` 15.24

Hence, the cost of $1\frac{1}{2}$ kg of apples is ` 15.24.

9. The weight of 6 packets of biscuits $= 2400\,\text{g}$

$\therefore$ the weight of 1 packet of biscuits $= \dfrac{2400}{6}$ g

$\therefore$ the weight of 15 such packets $= \left(\dfrac{2400}{6} \times 15\right)$ g

$= (400 \times 15)\,\text{g} = 6000\,\text{g} = 6\,\text{kg}$

10. In 5 hours, car travels $= 35 \times 5 = 175\,\text{km}$

So, take a time to completed the journey $= \dfrac{175\ \text{km}}{50\ \text{km/h}}$

$= \dfrac{175}{50}$ h

$= \dfrac{175}{50} \times 60\,\text{min}$

$= 35 \times 6\,\text{min} = 210\,\text{min}$

or $= 3$ hours 30 min

11. In 6.4 seconds, boy runs $= 72$ m

$\therefore$ In 1 second, boy runs $= \frac{72}{6.4}$ m/sec

$\therefore$ In 4.8 second, boy runs $= \frac{72}{6.4} \times 4.8$ m

$$= \frac{9 \times 4.8}{0.8} \text{ m}$$

$$= 9 \times 6 \text{ m} = 54 \text{ m}$$

Hence, he run in 4.8 see is 54 m.

12. The weight of 6 tins of mustard oil $= 147$ kg

$\therefore$ the weight of 1 tin of mustard oil $= \frac{147}{6}$ kg

$\therefore$ the weight of 15 tins of mustard oil $= \frac{147}{6} \times 15 \text{ kg} = 367.5$ kg

or $= 3$ quintals 67.5 kg.

13. The monthly consumption of wheat in a hostel for 250 students $= 5500$ kg

$\therefore$ the monthly consumption of wheat in a hostel for 1 student

$$= \frac{5500}{250} \text{ kg}$$

$\therefore$ the monthly consumption of wheat in a hostel for 220 students

$$= \frac{5500}{250} \times 220$$

$$= 220 \times 22$$

$$= 4840 \text{ kg.}$$

14. (a) In $2\frac{1}{2}$ hours, dam water-level rises $= 3$ meters

$\therefore$ In 1 hours, dam water level rise $= \frac{3}{5/2}$ m

$\therefore$ In $1\frac{1}{4}$ min, dam water level rise $= \frac{3}{5} \times \frac{2}{60} \times \frac{5}{4}$ m

$$= \frac{1}{40} \text{ m} = \frac{100}{40} \text{ cm}$$

$$= 2.5 \text{ cm}$$

or $= 2\frac{1}{2}$ cm

Hence, 2.5 cm the water-level rise in $1\frac{1}{4}$ min.

(b) 3 meters rises of water level $= 2\frac{1}{2}$ h

$\therefore$ 1 meters rises of water level $= \frac{5}{2 \times 3}$

$\therefore$ 9 meters rises of water level $= \frac{5}{3 \times 2} \times 9$

$= \frac{5 \times 3}{2}$ hours

$= \frac{15}{2}$ hours

$= 7.5$ hours

or $= 7\frac{1}{2}$ hours

15. 28×10^3 km light travel $= 1$ sec

1 km light travel $= \frac{1}{28 \times 10^3}$ sec

210×10^6 km light travel $= \frac{1}{28 \times 10^3} \times 210 \times 10^6$

$= 75 \times 10^2$ sec

or $= 7500$ sec or 2 hr 5 minute.

16. (a) The cost of 25 packets of sweet = ` 625

$\therefore$ the cost of 1 packet of sweet = ` $\frac{625}{25}$ = ` 25

$\therefore$ the cost of 47 packets of sweet = ` 25×47

= ` 1175

(b) In ` 625, purchase the packets of sweet = 25

In ` 1, purchase the packets of sweet $= \frac{25}{625}$

In ` 725, purchase the packets of sweet $= \frac{25}{625} \times 725$

$= 29$ packets

Hence, 29 packets can be purchased in ` 725.

17. (a) 350 quintals yield of wheat = 5 hectares

$\therefore$ 1 quintals yield of wheat $= \frac{5 \times 10000}{350}$ m^2

$\therefore$ 175 quintals will yield of wheat $= \frac{50000}{350} \times 175$ m^2

$= 142.85 \times 175$ m^2

$= 24999.99$ m^2

or $= 25000$ m^2.

(b) The yield of wheat from 5 hectares $= 350$ quintals

The yield of wheat from 1 $m^2 = \frac{350}{50000}$

The yield of wheat from 500 $m^2 = \frac{350}{50000} \times 500$

$= \frac{35}{10}$

$= 3.5$ quintals.

18. (a) 10 men can do a piece of land of work in $= 14$ days

$\therefore$ 1 man can do the same work in $= 14 \times 15$ days

$\therefore$ 35 men can do the same work in $= \frac{14 \times 15}{35}$ days

$= 2 \times 3$

$= 6$ days.

(b) In 14 days, finished the work $= 15$ men

$\therefore$ In 1 day, finished the work $= 15 \times 14$ men

$\therefore$ In 10 days finished the work $= \frac{15 \times 14}{10}$ men

$= 3 \times 7$ men

$= 21$ men.

19. Clearly, mor the number of men will take less time.

And, less the number of men will take more time.

So, 250 men for provisions $= 40$ days

$\therefore$ 1 man for provisions $= 40 \times 250$ days

$\therefore$ $(250+150)$ men for provisions $= \frac{40 \times 250}{400}$ days

$= 25$ days.

Thus, the provisions will last for 25 days.

20. Clearly, less men, more days

So, 550 men for provisions $= 72$ days

$\therefore$ 1 men for provisions $= 72 \times 550$ days

$\therefore$ $(550-150)$ men for provisions $= \frac{72 \times 550}{400}$ days

$= 11 \times 9$ days

$= 99$ days.

Thus, the provisions will last for 99 days.

Multiplce Choise Questions

Tick (3) the correct option :

1. (d), 2. (a), 3. (b), 4. (d), 5. (c) 6. (b), 7. (a) 8. (c)

7 Fractions

Exercise 7.1

1. (a) $\frac{2}{3}$ (b) $\frac{4}{5}$ (c) $\frac{4}{7}$

(d) $\frac{5}{12}$ (e) $\frac{8}{9}$ (f) $\frac{3}{10}$

2. (a) four-ninths (b) two-sevenths (c) one-thirds

(d) three-fourths (e) seven-eighths (f) nine-sixteenths

3. (a) In the fraction $\frac{5}{11}$, 5 is the numerator and 11 is the denominator.

(b) In the fraction $\frac{1}{7}$, 1 is the numerator and 7 is the denominator.

(c) In the fraction $\frac{6}{13}$, 6 is the numerator and 13 is the denominator.

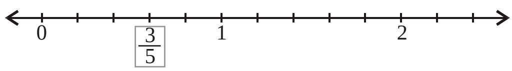
(d) In the fraction $\frac{7}{19}$, 7 is the numerator and 19 is the denominator.

(e) In the fraction $\frac{9}{21}$, 9 is the numerator and 21 is the denominator.

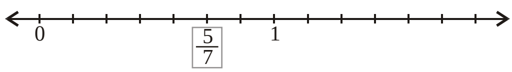
(f) In the fraction $\frac{11}{23}$, 11 is the numerator and 23 is the denominator.

4. (a) $\frac{3}{8}$ (b) $\frac{8}{11}$ (c) $\frac{11}{25}$ (d) $\frac{13}{29}$

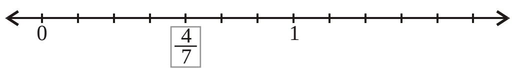
5. (a) $\frac{3}{5}$



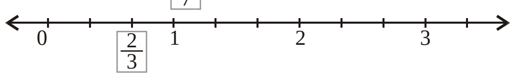
(b) $\frac{5}{7}$



(c) $\frac{4}{7}$



(d) $\frac{2}{3}$



6. (a) The collection $= \frac{3}{5}$

$\therefore$ $\frac{3}{5} \times 20\,\text{balloons} = 3 \times 4\ \text{balloons} = 12\,\text{balloons}.$

(b) The collection $= \frac{3}{5}$

$\frac{3}{5} \times 25\,\text{pens} = 3 \times 5\,\text{pens} = 15\,\text{pens}.$

(c) The collection $= \frac{3}{5}$

$\therefore \quad \frac{3}{5} \times 45 \text{ toffees} = 3 \times 9 \text{ toffees}$

$= 27 \text{ toffees.}$

Exercise 7.2

1. (a) The fraction $= \frac{3}{5}$

$\therefore \quad \frac{3\times 2}{5\times 2} = \frac{6}{10}, \quad \frac{3\times 3}{5\times 3} = \frac{9}{15}$

$\frac{3\times 4}{5\times 4} = \frac{12}{20}, \quad \frac{3\times 5}{5\times 5} = \frac{15}{25}$

So, the four fractions equivalent to $\frac{3}{5}$ are $\frac{6}{10}, \frac{9}{15}, \frac{12}{20}$ and $\frac{15}{25}$.

(b) The fraction $= \frac{4}{7}$

$\therefore \quad \frac{4\times 2}{7\times 2} = \frac{8}{14}, \frac{4\times 3}{7\times 3} = \frac{12}{21}, \frac{4\times 4}{7\times 4} = \frac{16}{28}, \frac{4\times 5}{7\times 5} = \frac{20}{35}$

So, the four fractions equivalent to $\frac{4}{7}$ are $\frac{8}{14}, \frac{12}{21}, \frac{16}{28}$ and $\frac{20}{35}$.

(c) The fraction $= \frac{6}{11}$

$\therefore \quad \frac{6\times 2}{11\times 2} = \frac{12}{22}, \frac{6\times 3}{11\times 3} = \frac{18}{33}, \frac{6\times 4}{11\times 4} = \frac{24}{44}, \frac{6\times 5}{11\times 5} = \frac{30}{55}$

So, the four fractions equivalent to $\frac{6}{11}$ are $\frac{12}{22}, \frac{18}{33}, \frac{24}{44}$ and $\frac{30}{55}$.

(d) The fraction $= \frac{8}{13}$

$\therefore \quad \frac{8\times 2}{13\times 2} = \frac{16}{26}, \frac{8\times 3}{13\times 3} = \frac{24}{39}, \frac{8\times 4}{13\times 4} = \frac{32}{52}, \frac{8\times 5}{13\times 5} = \frac{40}{65}$

So, the four fractions equivalent to $\frac{8}{13}$ are $\frac{16}{26}, \frac{24}{39}, \frac{32}{52}$ and $\frac{40}{65}$.

(e) The fraction $= \frac{7}{9}$

$\therefore \quad \frac{7\times 2}{9\times 2} = \frac{14}{18}, \frac{7\times 3}{9\times 3} = \frac{21}{27}, \frac{7\times 4}{9\times 4} = \frac{28}{36}, \frac{7\times 5}{9\times 5} = \frac{35}{45}$

So, the four fractions equivalent to $\frac{7}{9}$ are $\frac{14}{18}, \frac{21}{27}, \frac{28}{36}$ and $\frac{35}{45}$.

(f) The fraction $= \frac{5}{12}$

$\therefore \quad \frac{5\times2}{12\times2}=\frac{10}{24}, \frac{5\times3}{12\times3}=\frac{15}{36}, \frac{5\times4}{12\times4}=\frac{20}{48}, \frac{5\times5}{12\times5}=\frac{25}{60}$

So, the four fractions equivalent to $\frac{5}{12}$ are $\frac{10}{24}, \frac{15}{36}, \frac{20}{48}$ and $\frac{25}{60}$.

2. (a) We have $\frac{2}{3}$ and $\frac{33}{22}$.

Cross multiplying, we have $\frac{2}{3} \times \frac{33}{22}$

Now, $2\times22=44$ and $3\times33=99$

$\therefore \quad 2\times22\neq3\times33$

So, $\frac{2}{3}$ and $\frac{33}{22}$ are not equivalent fractions.

(b) We have $\frac{1}{3}$ and $\frac{9}{24}$.

Cross multiplying, we have $\frac{1}{3} \times \frac{9}{24}$

Now, $1\times24=24$ and $3\times9=27$

$\therefore \quad 1\times24\neq3\times9$

So, $\frac{1}{3}$ and $\frac{9}{24}$ are not equivalent fraction.

(c) We have $\frac{2}{9}$ and $\frac{14}{63}$

Cross multiplying, we have $\frac{2}{9} \times \frac{14}{63}$

Now, $2\times63=126$ and $9\times14=126$

$\therefore \quad 2\times63=9\times14$

So, $\frac{2}{9}$ and $\frac{14}{63}$ are equivalent fraction.

(d) We have $\frac{4}{7}$ and $\frac{16}{21}$

Cross multiplying, we have $\frac{4}{7} \times \frac{16}{21}$

Now, $4\times21=84$ and $7\times16=112$

$\therefore \quad 4\times21\neq7\times16$

So, $\frac{4}{7}$ and $\frac{16}{21}$ are not equivalent fraction.

(e) We have $\frac{3}{8}$ and $\frac{15}{40}$

Cross multiplying, we have $\frac{3}{8} \times \frac{15}{40}$

$3\times40=120$ and $8\times15=120$

$\therefore \quad 3\times 40 = 8\times 15$

So, $\frac{3}{8}$ and $\frac{15}{40}$ are equivalent fraction.

(f) we have $\frac{5}{6}$ and $\frac{20}{24}$

Cross multiplying, we have $\frac{5}{6} \times \frac{20}{24}$

Now, $5\times 24 = 120$ and $6\times 20 = 120$

$\therefore \quad 5\times 24 = 6\times 20$

So, $\frac{5}{6}$ and $\frac{20}{24}$ are equivalent fraction.

3. Let $\frac{3}{5} = \frac{15}{?}$

Now, we have to find the missing number.

To get 15 in the numerator, we multiply 3 by 5. So, we multiply the denominator and numerator by 5.

$$\therefore \quad \frac{3}{5} = \frac{3\times 5}{5\times 5} = \frac{15}{25}$$

So, $\frac{3}{5}$ and $\frac{15}{25}$ are equivalent fractions.

Let $\frac{5}{7} = \frac{?}{42}$

Now, we have to find the missing number.

To get 42 in the denominator, we multiply 7 by 6. So, we multiply the numerator and denominator by 6.

$$\frac{5}{7}\times\frac{6}{6} = \frac{30}{42}$$

So, $\frac{5}{7}$ and $\frac{30}{42}$ are equivalent fractions.

5. Let $\frac{4}{9} = \frac{36}{?}$

Now, we have to find the missing number.

To get 36 in the numerator we multiply 4 by 9. So, we multiply the numerator and denominator by 9.

$$\therefore \quad \frac{4\times 9}{9\times 9} = \frac{36}{81}$$

So, $\frac{4}{9}$ and $\frac{36}{81}$ are equivalent fractions.

6. Let $\frac{5}{8} = \frac{?}{72}$

Now, we have to find the missing number.

To get 72 in the denominator, we multiply 8 by 9. So, we multiply the numerator and denominator by 9.

$$\therefore \qquad \frac{5\times 9}{8\times 9}=\frac{45}{72}$$

So, $\frac{5}{8}$ and $\frac{45}{72}$ are equivalent fractions.

7. Let $\frac{24}{30}=\frac{4}{?}$

Now, we have to find the missing number.

To get 4 in the numerator, we divide 24 by 6. So, we divide the numerator and denominator by 6.

$$\therefore \qquad \frac{24\div 6}{30\div 6}=\frac{4}{5}$$

So, $\frac{24}{30}$ and $\frac{4}{5}$ are equivalent fractions.

8. Let $\frac{50}{60}=\frac{?}{6}$

Now, we have to find the missing number.

To get 6 in the denominator, we divide 60 by 10. So, we divide the numerator and denominator by 10.

$$\therefore \qquad \frac{50\div 10}{60\div 10}=\frac{5}{6}$$

So, $\frac{50}{60}$ and $\frac{5}{6}$ are equivalent fractions.

9. (a) L.C.M. of denominators 7, 8, 14 and 16 $=112$.

Now, $\frac{2}{7}=\frac{16\times 2}{7\times 16}=\frac{32}{112}, \frac{7}{8}=\frac{7\times 14}{8\times 14}=\frac{98}{112}$

$\frac{5}{14}=\frac{5\times 8}{14\times 8}=\frac{40}{112}, \frac{9}{16}=\frac{9\times 7}{16\times 7}=\frac{63}{112}$

$\therefore \quad \frac{2}{7}, \frac{7}{8}, \frac{5}{14}$ and $\frac{9}{16}=\frac{32}{112}, \frac{98}{112}, \frac{40}{112}$ and $\frac{63}{112}$.

(b) L.C.M. of denominators 5, 6, 7, and 10 = 210

Now, $\frac{4}{5}=\frac{4\times 42}{5\times 42}=\frac{168}{210}, \frac{7}{6}=\frac{7\times 35}{6\times 35}=\frac{245}{210}$

$\frac{6}{7}=\frac{60\times 30}{7\times 30}=\frac{180}{210}, \frac{9}{10}=\frac{9\times 21}{10\times 21}=\frac{189}{210}$

$\therefore \quad \frac{4}{5}, \frac{7}{6}, \frac{6}{7}$ and $\frac{9}{10}=\frac{168}{210}, \frac{245}{210}, \frac{180}{210}$ and $\frac{189}{210}$

(c) L.C.M. of denominators 5, 10, 4 and 7 = 140.

Now, $\frac{1}{5} = \frac{1 \times 28}{5 \times 28} = \frac{28}{140}, \frac{7}{10} = \frac{7 \times 14}{10 \times 14} = \frac{98}{140}$

$\frac{3}{4} = \frac{3 \times 35}{4 \times 35} = \frac{105}{140}, \frac{5}{7} = \frac{5 \times 20}{7 \times 20} = \frac{100}{140}$

$\therefore \quad \frac{1}{5}, \frac{7}{10}, \frac{3}{4}$ and $\frac{5}{7} = \frac{28}{140}, \frac{98}{140}, \frac{105}{140}$ and $\frac{100}{140}$

(d) L.C.M. of denominator 6, 8, 12 and 10 = 120.

Now, $\frac{5}{6} = \frac{5 \times 20}{6 \times 20} = \frac{100}{120}, \frac{7}{8} = \frac{7 \times 15}{8 \times 15} = \frac{105}{120}$

$\frac{11}{12} = \frac{11 \times 10}{12 \times 10} = \frac{110}{120}, \frac{3}{10} = \frac{3 \times 12}{10 \times 12} = \frac{36}{120}$

$\therefore \quad \frac{5}{6}, \frac{7}{8}, \frac{11}{12}$ and $\frac{3}{10} = \frac{100}{120}, \frac{105}{120}, \frac{110}{120}$ and $\frac{36}{120}$.

(e) L.C.M. of denominator 3, 5, 4 and 6 = 60

Now, $\frac{1}{3} = \frac{1 \times 20}{3 \times 20} = \frac{20}{60}, \frac{2}{5} = \frac{2 \times 12}{5 \times 12} = \frac{24}{60}$

$\frac{3}{4} = \frac{3 \times 15}{4 \times 15} = \frac{45}{60}, \frac{1}{60} = \frac{1 \times 10}{6 \times 10} = \frac{10}{60}$

$\therefore \quad \frac{1}{3}, \frac{2}{5}, \frac{3}{4}, \frac{1}{6} = \frac{20}{60}, \frac{24}{60}, \frac{45}{60}$ and $\frac{10}{60}$.

10. (a) $\frac{8}{10}$

H.C.F. of 8 and 10 is 2. So, divide both the numerator and denominator by 2.

So, $\frac{8}{10} = \frac{8 \div 2}{10 \div 2} = \frac{4}{5}$, which is the given fraction in its lowest terms.

(b) $\frac{9}{21}$

H.C.F. of 9 and 21 is 3. So, divide both the numerator and denominator by 3.

So, $\frac{9}{21} = \frac{9 \div 3}{21 \div 3} = \frac{3}{7}$, which is the given fraction in its lowest terms.

(c) $\frac{50}{75}$

H.C.F. of 50 and 75 is 25. So, divide both the numerator and denominator by 25.

So, $\frac{50}{75} = \frac{50 \div 25}{75 \div 25} = \frac{2}{3}$ which is the given fraction in its lowest terms.

(d) $\frac{40}{120}$

H.C.F. of 40 and 120 is 40. So, divide both the numerator and denominator by 40.

So, $\frac{40}{120} = \frac{40 \div 40}{120 \div 40} = \frac{1}{3}$, which is the given fraction in its lowest terms.

(e) $\frac{13}{65}$

H.C.F. of 13 and 65 is 13. So, divide both the numerator and denominator by 13.

So, $\frac{13}{65} = \frac{13 \div 13}{65 \div 13} = \frac{1}{5}$, which is the given fraction in its lowest terms.

(f) $\frac{105}{70}$

H.C.F. of 105 and 70 is 35. So, divide both the numerator and denominator by 35.

So, $\frac{105}{70} = \frac{105 \div 35}{70 \div 35} = \frac{3}{2} = 1\frac{1}{2}$,

which is the given fraction in its lowest terms.

Exercise 7.3

1. (a), (c) and (d) are proper fraction.

2. (c) and (d) are improper fraction.

3. (a) $2\frac{1}{5} = \frac{(2 \times 5)+1}{5} = \frac{10+1}{5} = \frac{11}{5}$ (b) $3\frac{1}{4} = \frac{(3 \times 4)+1}{4} = \frac{12+1}{4} = \frac{13}{4}$

(c) $7\frac{1}{8} = \frac{(7 \times 8)+1}{8} = \frac{56+1}{8} = \frac{57}{8}$ (d) $2\frac{1}{11} = \frac{(2 \times 11)+1}{11} = \frac{22+1}{11} = \frac{23}{11}$

4. (a) $\frac{8}{3}$, on dividing 8 by 3, we get

quotient = 2 and remainder = 2.

$\therefore \quad \frac{8}{3} = 2 + \frac{2}{3} = 2\frac{2}{3}$

(b) $\frac{15}{4}$, on dividing 15 by 4, we get

quotient = 3 and remainder = 3

$\therefore \quad \frac{15}{4} = 3 + \frac{3}{4} = 3\frac{3}{4}$

(c) $\frac{27}{5}$, on dividing 27 by 5, we get

quotient = 5 and remainder = 2

$\therefore \qquad \frac{27}{5} = 5 + \frac{2}{5} = 5\frac{2}{5}.$

(d) $\frac{100}{17}$, on dividing 100 by 17, we get

quotient $= 5$ and remainder $= 15$

$\therefore \qquad \frac{100}{17} = 5 + \frac{15}{17} = 5\frac{15}{17}.$

Exercise 7.4

1. (a) $\frac{3}{5}$ or $\frac{2}{3}$

By cross multiplication, we see that

$\frac{3}{5} \times \frac{2}{5} \qquad \Rightarrow 3 \times 3$ and 5×2

or 9 and 10.

Since, $9 < 10$

So, $\frac{3}{5} < \frac{2}{3}.$

Hence, $\frac{2}{3}$ is greater.

(b) $\frac{11}{12}$ or $\frac{5}{6}$

By cross multiplication, we see that

$$\frac{11}{12} \times \frac{5}{6}$$

$\Rightarrow$ 11×6 and 12×5

or 66 and 60

Since, $66 > 60$

So, $\frac{11}{12} > \frac{5}{6}$

Hence, $\frac{11}{12}$ is greater.

(c) $\frac{5}{9}$ or $\frac{3}{4}$

By cross multiplication

$$\frac{5}{9} \times \frac{3}{4}$$

$\Rightarrow$ 5×4 and 9×3

Since, $20 < 27$

Hence, $\frac{3}{4}$ is greater.

2. (a) $\frac{3}{8}$ or $\frac{4}{5}$

By cross multiplying, we see that $\frac{3}{8} \times \frac{4}{5}$

$\Rightarrow$ 3×5 and 8×4

or $\Rightarrow$ 15 and 32

Since, $15 < 32$

So, $\frac{3}{8} < \frac{4}{5}$

Hence, $\frac{3}{8}$ is smaller.

(b) $\frac{5}{7}$ or $\frac{3}{7}$

By cross multiplying, we see that $\frac{5}{7} \times \frac{3}{7}$

$\Rightarrow$ 5×7 and 7×3

$\Rightarrow$ 35 and 21

Since, $35 > 21$

So, $\frac{5}{7} > \frac{3}{7}$

Hence, $\frac{3}{7}$ is smaller

(c) $\frac{5}{9}$ or $\frac{3}{5}$

By cross multiplying $\frac{5}{9} \times \frac{3}{5}$

$\Rightarrow$ 5×5 and 9×3

$\Rightarrow$ 25 and 27

Since, $25 < 27$

So, $\frac{5}{9} < \frac{3}{5}$

Hence, $\frac{5}{9}$ is smaller.

3. (a) $\frac{3}{4}, \frac{5}{6}$ and $\frac{23}{24}$

L.C.M. of denominators 4, 6 and 24 = 24

the given fractions can be written as

$$\frac{3}{4} = \frac{3 \times 6}{4 \times 6} = \frac{18}{24}, \frac{5}{6} = \frac{5 \times 4}{6 \times 4} = \frac{20}{24}$$

$$\frac{23}{24} = \frac{23 \times 1}{24 \times 1} = \frac{23}{24}$$

$\therefore$ Ascending order is $\frac{18}{24} < \frac{20}{24} < \frac{23}{24}$ or $\frac{3}{4} < \frac{5}{6} < \frac{23}{24}$.

(b) $\frac{2}{3}, \frac{5}{9}, \frac{5}{6}, \frac{3}{8}$

L.C.M. of denominators 3, 9, 6 and 8 = 72

Hence, the given fractions can be written as

$\frac{2}{3} = \frac{2 \times 24}{3 \times 24} = \frac{48}{72}, \frac{5}{9} = \frac{5 \times 8}{9 \times 8} = \frac{40}{72}$

$\frac{5}{6} = \frac{5 \times 12}{6 \times 12} = \frac{60}{72}, \frac{3}{8} = \frac{3 \times 9}{8 \times 9} = \frac{27}{72}$

$\therefore$ Ascending order is $\frac{27}{72} < \frac{40}{72} < \frac{48}{72} < \frac{60}{72}$

or, $\frac{3}{8} < \frac{5}{9} < \frac{2}{3} < \frac{5}{6}$.

(c) $\frac{5}{6}, \frac{2}{7}, \frac{8}{9}, \frac{1}{3}$

L.C.M. of denominators 6, 7, 9 and 3 = 126

Hence, the given fractions can be written as

$\frac{5}{6} = \frac{5 \times 21}{6 \times 21} = \frac{105}{126}, \frac{2}{7} = \frac{2 \times 18}{7 \times 18} = \frac{36}{126}$

$\frac{8}{9} = \frac{8 \times 14}{9 \times 14} = \frac{112}{126}, \frac{1}{3} = \frac{1 \times 42}{3 \times 42} = \frac{42}{126}$

$\therefore$ Ascending order is $\frac{36}{126} < \frac{42}{126} < \frac{105}{126} < \frac{112}{126}$

or $\frac{2}{7} < \frac{1}{3} < \frac{5}{6} < \frac{8}{9}$.

4. (a) $\frac{5}{7}, \frac{3}{8}, \frac{9}{11}$

L.C.M. of denominators 7, 8 and 11 = 616

Hence, the given fraction can be written as $\frac{5}{7} = \frac{5 \times 88}{7 \times 88} = \frac{440}{616}$,

$\frac{3}{8} = \frac{3 \times 77}{8 \times 77} = \frac{231}{616}$

$\frac{9}{11} = \frac{9 \times 56}{11 \times 56} = \frac{504}{616}$

$\therefore$ Descending order is $\frac{504}{616} > \frac{440}{616} > \frac{231}{616}$

or $\frac{9}{11} > \frac{5}{7} > \frac{3}{8}$.

(b) $\frac{4}{5}, \frac{7}{15}, \frac{11}{20}, \frac{3}{4}$

L.C.M. of denominators 5, 15, 20 and 4 = 60

Hence, the given fractions can be written as

$\frac{4}{5} = \frac{4\times12}{5\times12} = \frac{48}{60}, \frac{7}{15} = \frac{7\times4}{15\times4} = \frac{28}{60}$

$\frac{11}{20} = \frac{11\times3}{20\times3} = \frac{33}{60}; \frac{3}{4} = \frac{3\times15}{4\times15} = \frac{45}{60}$

$\therefore$ Descending order is $\frac{48}{60} > \frac{45}{60} > \frac{33}{60} > \frac{28}{60}$

or $\frac{4}{5} > \frac{3}{4} > \frac{11}{20} > \frac{7}{15}$.

$$\begin{array}{r} 16.25 \\ -\ 9.28 \\ \hline 6.97 \\ \hline \end{array}$$

$$\begin{array}{r} ` \ 701.50 \\ 35.25 \\ \hline ` \ 736.75 \\ \hline \end{array}$$

(c) $\frac{5}{16}, \frac{13}{24}, \frac{7}{8}$

L.C.M. of denominators 16, 24 and 8 = 48

Hence, the given fractions can be written as $\frac{5}{16} = \frac{5\times3}{16\times3} = \frac{15}{48}$,

$\frac{13}{24} = \frac{13\times2}{24\times2} = \frac{26}{48}$

$$\frac{7}{8} = \frac{7\times6}{8\times6} = \frac{42}{48}$$

$\therefore$ Descending order is $\frac{42}{48} > \frac{26}{48} > \frac{15}{48}$ or $\frac{7}{8} > \frac{13}{24} > \frac{5}{16}$.

Exercise 7.5

1. (a) $\frac{5}{8} + \frac{2}{8}$

$= \frac{5+2}{8} = \frac{7}{8}$

(b) $\frac{4}{7} + \frac{1}{7}$

$= \frac{4+1}{7} = \frac{5}{7}$

(c) $\frac{2}{5} + \frac{3}{15} + \frac{7}{10}$

$= \frac{6\times2+2\times3+3\times7}{30}$

$= \frac{12+6+21}{30} = \frac{39}{30}$

or $1\frac{3}{10}$

(d) $\frac{4}{9} + \frac{1}{4} + \frac{5}{6}$

$= \frac{4\times4+9+6\times5}{36}$

$= \frac{16+9+30}{36} = \frac{55}{36}$

$= 1\frac{19}{36}$

(e) $1\frac{7}{8} + 1\frac{1}{2} + 1\frac{3}{4}$

$= \frac{15}{8} + \frac{3}{2} + \frac{7}{4}$

(f) $3\frac{1}{2} + 4\frac{2}{3} + 7\frac{5}{6}$

$= \frac{7}{2} + \frac{14}{3} + \frac{47}{6}$

$= \dfrac{15 + 4 \times 3 + 2 \times 7}{8}$

$= \dfrac{15 + 12 + 14}{8}$

$= \dfrac{41}{8} = 5\dfrac{1}{8}$

(g) $3\dfrac{3}{4} + 2\dfrac{1}{6} + 1\dfrac{5}{8}$

$= \dfrac{15}{4} + \dfrac{13}{6} + \dfrac{13}{8}$

$= \dfrac{15 \times 6 + 13 \times 4 + 13 \times 3}{24}$

$= \dfrac{90 + 52 + 39}{24}$

$= \dfrac{181}{24} = 7\dfrac{13}{24}$

$= \dfrac{7 \times 3 + 14 \times 2 + 47}{6}$

$= \dfrac{21 + 28 + 47}{6}$

$= \dfrac{96}{6} = 16$

(h) $\dfrac{8}{9} + \dfrac{11}{18} + \dfrac{13}{27} + \dfrac{5}{6}$

$= \dfrac{8 \times 6 + 11 \times 3 + 13 \times 2 + 5 \times 9}{54}$

$= \dfrac{48 + 33 + 26 + 45}{54}$

$= \dfrac{152}{54} = \dfrac{76}{27}$

$= 2\dfrac{22}{27}$

2. She purchase the cloth all $= \left(5\dfrac{1}{2} + 3\dfrac{2}{3}\right)$ m

$= \left(\dfrac{11}{2} + \dfrac{11}{3}\right) \text{m} = \left(\dfrac{11 \times 3 + 11 \times 2}{6}\right) \text{m}$

$= \dfrac{33 + 22}{6} = \dfrac{55}{6} \text{ m} = 9\dfrac{1}{6} \text{ m.}$

3. She pay to the shopkeeper = ` $\left(7\dfrac{3}{4} + 9\dfrac{2}{5}\right)$

= ` $\left(\dfrac{31}{4} + \dfrac{47}{5}\right)$

= ` $\left(\dfrac{31 \times 5 + 47 \times 4}{20}\right)$

= ` $\left(\dfrac{155 + 188}{20}\right)$

= ` $\dfrac{343}{20}$ = ` $17\dfrac{3}{20}$.

4. The total weight of the boys $= \left(15\dfrac{1}{2} + 16\dfrac{3}{4} + 17\dfrac{1}{5}\right)$ kg

$= \left(\dfrac{31}{2} + \dfrac{67}{4} + \dfrac{86}{5}\right) \text{kg}$

$= \left(\dfrac{31 \times 10 + 67 \times 5 + 86 \times 4}{20}\right) \text{kg}$

$= \left(\dfrac{310 + 335 + 344}{20}\right) \text{kg}$

$$= \frac{989}{20} \text{ kg} = 49\frac{9}{20} \text{ kg.}$$

5. Total weight of these three empty boxes

$$= \left(17\frac{3}{4} + 5\frac{1}{2} + 9\frac{1}{5}\right) \text{kg}$$

$$= \left(\frac{71}{4} + \frac{11}{2} + \frac{46}{5}\right) \text{kg}$$

$$= \left(\frac{71 \times 5 + 11 \times 10 + 46 \times 4}{20}\right) \text{kg}$$

$$= \left(\frac{355 + 110 + 184}{20}\right) \text{kg}$$

$$= \frac{649}{20} \text{ kg} = 32\frac{9}{20} \text{ kg.}$$

Exercise 7.6

1. (a) $\frac{3}{8} - \frac{1}{8} = \frac{3-1}{8}$

$= \frac{2}{8} = \frac{1}{4}$

(b) $\frac{7}{9} - \frac{2}{9} = \frac{7-2}{9}$

$= \frac{5}{9}$

(c) $\frac{11}{14} - \frac{9}{14} = \frac{11-9}{14}$

$= \frac{2}{14} = \frac{1}{7}$

(d) $\frac{4}{3} - \frac{5}{6} = \frac{4 \times 2 - 5}{6}$

$= \frac{8-5}{6} = \frac{3}{6} = \frac{1}{2}$

(e) $\frac{11}{12} - \frac{13}{16} = \frac{11 \times 4 - 13 \times 3}{48}$

$= \frac{44 - 39}{48}$

$= \frac{5}{48}$

(f) $\frac{5}{8} - \frac{7}{12} = \frac{5 \times 3 - 7 \times 2}{24}$

$= \frac{15 - 14}{24}$

$= \frac{1}{24}$

(g) $2\frac{3}{4} - 1\frac{5}{6}$

$= \frac{11}{4} - \frac{11}{6}$

$= \frac{11 \times 3 - 11 \times 2}{12}$

$= \frac{33 - 22}{12} = \frac{11}{12}$

(h) $6\frac{2}{3} - 3\frac{3}{4}$

$= \frac{20}{3} - \frac{15}{4}$

$= \frac{20 \times 4 - 15 \times 3}{12}$

$= \frac{80 - 45}{12} = \frac{35}{12} = 2\frac{11}{12}$

(i) $3\frac{5}{8} - 2\frac{5}{12}$

$= \frac{29}{8} - \frac{29}{12}$

(j) $7 - 5\frac{2}{3}$

$= 7 - \frac{17}{3}$

$= \frac{29\times3-29\times2}{24}$

$= \frac{87-58}{24} = \frac{29}{24}$

$= 1\frac{5}{24}$

$= \frac{7\times3-17}{3}$

$= \frac{21-17}{3}$

$= \frac{4}{3} = 1\frac{1}{3}$

2. (a) $\frac{1}{4}+\frac{1}{6}-\frac{1}{12}$

$= \frac{3+2-1}{12}$

$= \frac{5-1}{12}$

$= \frac{4}{12} = \frac{1}{3}$

(b) $3\frac{5}{6}-\frac{1}{6}-1\frac{1}{12}$

$= \frac{23}{6}-\frac{1}{6}-\frac{13}{12}$

$= \frac{23\times2-2-13}{12}$

$= \frac{46-15}{12} = \frac{31}{12} = 2\frac{7}{12}$

(c) $4+\frac{3}{10}-1\frac{8}{15}$

$= \frac{4\times30+3\times3-23\times2}{30}$

$= \frac{120+9-46}{30}$

$= \frac{83}{30} = 2\frac{23}{30}$

(d) $1\frac{3}{4}+2\frac{5}{7}-1\frac{3}{14}$

$= \frac{7}{4}+\frac{19}{7}-\frac{17}{14}$

$= \frac{7\times7+19\times4-17\times2}{28}$

$= \frac{49+76-34}{28} = \frac{125-34}{28}$

$= \frac{91}{28} = 3\frac{7}{28} = 3\frac{1}{4}$

(e) $3\frac{1}{2}+1\frac{2}{3}-2\frac{1}{4}$

$= \frac{7}{2}+\frac{5}{3}-\frac{9}{4}$

$= \frac{7\times6+5\times4-9\times3}{12}$

$= \frac{42+20-27}{12}$

$= \frac{62-27}{12} = \frac{35}{12} = 2\frac{11}{12}$

(f) $7\frac{5}{8}-3\frac{1}{6}-2\frac{3}{4}$

$= \frac{61}{8}-\frac{19}{6}-\frac{11}{4}$

$= \frac{61\times3-19\times4-11\times6}{24}$

$= \frac{183-76-66}{24}$

$= \frac{183-142}{24} = \frac{41}{24} = 1\frac{17}{24}$

(g) $1\frac{2}{3}-\frac{2}{3}-\frac{5}{6}$

$= \frac{5}{3}-\frac{2}{3}-\frac{5}{6}$

$= \frac{5\times2-2\times2-5}{6}$

$= \frac{10-4-5}{6}$

(h) $2\frac{5}{12}+1\frac{19}{60}+2\frac{11}{40}$

$= \frac{29}{12}+\frac{79}{60}+\frac{91}{40}$

$= \frac{29\times10+79+2+91\times3}{120}$

$= \frac{290+158+273}{120}$

$$= \frac{10-9}{6} = \frac{1}{6} \qquad\qquad = \frac{721}{120} = 6\frac{1}{120}$$

3. Let x be added to get 18.

$\therefore$
$$x + 8\frac{2}{3} = 18$$
$$x = 18 - 8\frac{2}{3}$$
$$x = 18 - \frac{26}{3}$$
$$x = \frac{18 \times 3 - 26}{3}$$
$$x = \frac{54-26}{3} = \frac{28}{3}$$
$$x = 9\frac{1}{3}$$

Hence, $9\frac{1}{3}$ is the required number.

4. Let x be added to get $7\frac{1}{5}$.

$\therefore$
$$x + 5\frac{7}{15} = 7\frac{1}{5}$$
$$x + \frac{82}{15} = \frac{36}{5}$$
$$x = \frac{36}{5} - \frac{82}{15}$$
$$x = \frac{36 \times 3 - 82}{15}$$
$$= \frac{108-82}{15} = \frac{26}{15}$$
$$x = 1\frac{11}{15}$$

Hence, the required number is $1\frac{11}{15}$.

5. The give fractions

$\frac{3}{4}$ and $\frac{5}{7}$.

By cross multiplying, we see that $\frac{3}{4} \qquad \frac{5}{7}$

$\Rightarrow$ $\quad 3 \times 7$ and 4×5

or $\Rightarrow$ $\quad$ 21 and 20

Since, 21> 20

So, $\qquad \frac{3}{4} > \frac{5}{7}$

And the difference $= \frac{3}{4} - \frac{5}{7} = \frac{3\times7-5\times4}{28} = \frac{21-20}{28} = \frac{1}{28}$

Hence, $\frac{3}{4}$ is greaer than by $\frac{1}{28}$.

6. The difference $= \left[\left(4\frac{5}{6}+3\frac{1}{9}\right)-\left(2\frac{5}{9}+2\frac{1}{3}\right)\right]$

$$= \left[\left(\frac{29}{6}+\frac{28}{9}\right)-\left(\frac{23}{9}+\frac{7}{3}\right)\right]$$

$$= \left[\left(\frac{29\times3+28\times2}{18}\right)-\left(\frac{23+7\times3}{9}\right)\right]$$

$$= \left[\left(\frac{87+56}{18}\right)-\left(\frac{23+21}{9}\right)\right]$$

$$= \left[\frac{143}{18}-\frac{44}{9}\right] = \left[\frac{143-44\times2}{18}\right] = \left[\frac{143-88}{18}\right]$$

$$= \frac{55}{18} = 3\frac{1}{18}$$

7. A potter earned $= \text{`}\ 47\frac{1}{2} = \text{`}\ \frac{95}{2}$

He spent the money $= \text{`}\ 18\frac{3}{4} = \text{`}\ \frac{75}{4}$

So, the money is left with him $= \text{`}\ \left(\frac{95}{2}-\frac{75}{4}\right)$

$$= \text{`}\ \left(\frac{95\times2-75}{4}\right)$$

$$= \text{`}\ \left(\frac{190-75}{4}\right)$$

$$= \text{`}\ \frac{115}{4} = \text{`}\ 28\frac{3}{4}.$$

8. Mrs. Khanna bought the milk $= 7\frac{1}{2}$ L

Consumed the milk $= 6\frac{3}{4}$ L

So, the milk is left with her $= \left(7\frac{1}{2}-6\frac{3}{4}\right)$ L

$$= \left(\frac{15}{2}-\frac{27}{4}\right) \text{ L}$$

$$= \left(\frac{15 \times 2 - 27}{4}\right) \text{L}$$

$$= \left(\frac{30 - 27}{4}\right) \text{L} = \frac{3}{4} \text{L}$$

Hence, $\frac{3}{4}$ L of milk is left with her.

9. The total length of a rope $= 10\frac{1}{2}\text{ m} = \frac{21}{2}\text{ m}$

Cult off the rope $= 4\frac{5}{8}\text{ m} = \frac{37}{8}\text{ m}$

$\therefore$ the length of the remaining rope $= \left(\frac{21}{2} - \frac{37}{8}\right)\text{ m}$

$$= \left(\frac{21 \times 4 - 37}{8}\right)\text{ m}$$

$$= \left(\frac{84 - 37}{8}\right)\text{ m}$$

$$= \frac{47}{8}\text{ m} = 5\frac{7}{8}\text{ m}$$

Hence, the length of the remaining rope is $5\frac{1}{8}$ m.

10. Saroj bought wheat = ` $12\frac{1}{2}$ = ` $\frac{25}{2}$

Bought of rice = ` $25\frac{3}{4}$ = ` $\frac{103}{4}$

Bought of vegetables = ` $10\frac{1}{4}$ = ` $\frac{41}{4}$

So, he will return to her

= ` $\left(100 - \frac{25}{2} - \frac{103}{4} - \frac{41}{4}\right)$

= ` $\left(\frac{100 \times 4 - 25 \times 2 - 103 - 41}{4}\right)$

= ` $\left(\frac{400 - 50 - 103 - 41}{4}\right)$

= ` $\left(\frac{400 - 194}{4}\right)$ = ` $\frac{206}{4}$ = ` $51\frac{1}{2}$

Multiple Choise Questions

Tick (3) the correct option :

1. (b), 2. (a), 3. (a), 4. (b), 5. (d), 6. (c), 7. (a), 8. (b), 9. (b), 10. (b)

8

Decimals Fractions

Exercise 8.1

1. **Whole number** — **Decimal number**

	Whole number	Decimal number
(a)	0	57
(b)	1	21
(c)	0	651
(d)	21	635
(e)	63	793
(f)	21	935
(g)	16	108
(h)	25	169
(i)	1	738

2. The number of decimal places

(a) 3 (b) 2 (c) 1

(d) 3 (e) 3 (f) 4

3. (a) 7.34 = Seven decimal three four.

(b) 127.45 = One hundred twenty-seven decimal four five.

(c) 5.005 = Five decimal zero zero five.

(d) 27.35 = Twenty-seven decimal three five.

(e) 282.161 = Two hundred eighty-two decimal one six one.

(f) 3512.77 = Three thousand five hundred twelve decimal seven seven.

4. (a) Ninety-nine hundredths = 0.99

(b) Sixty-six thousandths = 0.066

(c) Seventy-five thousand and fifty five hundredths = 75000.55

(d) Five hundred nineteen and three hundred fifty five thousandths = 519.355

5. (a) $\frac{7}{10} = 0.7$ (b) $\frac{11}{10} = 1.1$ (c) $\frac{13}{10} = 1.3$

(d) $\frac{11}{100} = 0.11$ (e) $\frac{135}{100} = 1.35$ (f) $\frac{1765}{1000} = 1.765$

(g) $\frac{175}{100} = 1.75$ (h) $\frac{17689}{1000} = 17.689$ (i) $\frac{51728}{1000} = 51.728$

6. (a) $1.17 = \frac{117}{100}$ (b) $0.9 = \frac{9}{10}$

(c) $17.5 = \frac{175}{10}$ (d) $116.75 = \frac{11675}{100} = \frac{467}{4}$

(e) $5.7832 = \frac{57832}{10000} = \frac{7229}{1250}$ (f) $10.5 = \frac{105}{10} = \frac{21}{2}$

(g) $105.7 = \frac{1057}{10} = 9$

(h) $60.5 = \frac{605}{10} = \frac{121}{2}$

(i) $2.789 = \frac{2789}{1000}$

(j) $6.785 = \frac{6785}{1000} = \frac{1357}{200}$

(k) $0.38512 = \frac{38512}{100000} = \frac{2407}{6250}$

(l) $1.6783 = \frac{16783}{10000}$

(m) $3.77551 = \frac{377551}{100000}$

(n) $15.2835 = \frac{152835}{10000} = \frac{30567}{2000}$

(o) $7.7189 = \frac{77189}{10000}$

Exercise 8.2

1.

	Thousands	Hundreds	Tens	Ones	Decimals	Tenths	Hundredths	Thousandths	Ten Thousandths
a			1	7	.	5	8		
b			6	8	.	0	0	5	
c	1	8	6	5	.	6	3	5	8
d		8	1	5	.	3	3	9	
e		1	5	8	.	2	7		

2. (a) 7 . ① 5, the place value = 0.1
(b) 17.23 ⑤, the place value = 0.005
(c) 1 ⑤ . 331, the place value = 5
(d) 5.5 ⑤ ⑥, the place value = 0.05, 0.006
(e) 23. ④ 1 ⑤, the place value = 0.4, 0.005
(f) ⑥ . ① 9 ⑧, the place value = 6, 0.1, 0.008

3. (a) $6.53 = 6 + \frac{5}{10} + \frac{3}{100}$

(b) $7.175 = 7 + \frac{1}{10} + \frac{7}{100} + \frac{5}{1000}$

(c) $235.238 = 200 + 30 + 5 + \frac{2}{10} + \frac{3}{100} + \frac{8}{1000}$

(d) $96708.086 = 90000 + 6000 + 700 + 8 + \frac{8}{100} + \frac{6}{1000}$

(e) $7659.22 = 7000 + 600 + 50 + 9 + \frac{2}{10} + \frac{2}{100}$

(f) $71.7005 = 70 + 1 + \frac{7}{10} + \frac{5}{10000}$

4. (a) $60+5+0.500+0.070+0.007=65.577$
   (b) $300+60+0.200+0.06+0.005=360.265$
   (c) $5+0.70+0.05=5.75$
   (d) $10+5+0.400+0.050+0.006=15.456$

5. (a) $0.751 = \frac{7}{\boxed{10}} + \frac{5}{\boxed{100}} + \frac{\boxed{1}}{1000}$
   (b) $5.061 = 5 + \frac{\boxed{0}}{10} + \frac{6}{\boxed{100}} + \frac{1}{\boxed{1000}}$
   (c) $16.699 = 10 + 6 + \frac{\boxed{6}}{10} + \frac{9}{\boxed{100}} + \frac{\boxed{9}}{1000}$
   (d) $0.609 = \frac{\boxed{6}}{10} + \frac{0}{\boxed{100}} + \frac{\boxed{9}}{1000}$

Exercise 8.3

1. (a) 7.8, 3.99, 1.682; like decimals = 7.800, 3.990 and 1.682
   (b) 16.7, 18.36, 2.007; like decimals = 16.700, 18.360 and 2.007
   (c) 561.5, 389.6001, 175.0002; like decimals = 561. 5000, 389.6001 and 175.0002
   (d) 0.78, 9.1, 0.0075; like decimals = 0.7800, 9.1000 and 0.0075
   (e) 13.668, 1.2, 6.7389; like decimals = 13.6680, 1.2000 and 6.7389
   (f) 1.95, 6.005, 3.2966 like decimals = 1.9500, 6.0050 and 3.2966.

2. (a) 2.5 Four equivalent decimals of 2.5 are 2.50, 2.500, 2.5000 and 2.50000.
   (b) 0.4 Four equivalent decimals of 0.4 are 0.40, 0.400, 0.4000 and 0.4000.
   (c) 71.5 Four equivalent decimals of 71.5 are 71.50, 71.500, 71.5000 and 71.500000
   (d) 3.89 Four equivalent decimals of 3.89 are 3.890, 3.8900, 3.89000 and 3.890000.
   (e) 12.7 Four equivalent decimals of 12.7 are 12.70, 12.700, 12.7000 and 12.70000.
   (f) 79.85 Four equivalent decimals of 79.85 are 79.850, 79.8500, 79.85000 and 79.850000
   (g) 36.1 Four equivalent decimals of 36.1 are 36.10, 36.100 36.1000 and 36.10000.
   (h) 25.45 Four equivalent decimals of 25.45 are 25.450, 25.4500, 25.45000 and 25.450000.

Exercise 8.4

1. (a) In 1.678 and 1.687, we have
   Compare the whole number parts.
   we have $1=1$
   Now, compare the tenths digit.

At tenths, we have $6 = 6$
At last compare the hundredths digit
At hundredths, we have $7 < 8$.

$\therefore$ 1.678 < 1.687

(b) In 2.40 and 2.4,
First convert the given decimal into like decimals.
we have
2.40 and 2.40
We see that, all the digits come out to be the same.
So, the decimal are equal.
Hence, $2.40 = 24$

(c) In 5.1 and 5.001,
$5 = 5$ whole parts of both the decimals are equal.
Now, compare the tenths digit. At tenths, we have 1 > 0.

$\therefore$ 5.1 > 5.001

(d) In 71.005 and 71.05,
We have
$71 = 71$ (whole parts of both the decimals are equal.)
Now, compare the tenths digit. Which is also equal.
And compare the hundredths digit.
At hundredths, we have 0 < 5.

$\therefore$ 71.005 < 71.05

(e) In 21.6785 and 21.768,
we have,
$21 = 21$ (whole parts of both the decimals are equal.)
Now, compare the tenths digit. At tenths we have, 6 < 7

$\therefore$ 21.6785 < 21.768

(f) In 75.128 and 75.218,
We have $75 = 75$ (whole parts of both the decimals are equal).
Now, compare the tenths digit. At tenths we have, 1 < 2.

$\therefore$ 75.128 < 75.218

(g) In 176.160 and 176.166 (convert into like decimals)
We have $176 = 176$ (whole part of the both the decimals are equal.
Tenths and hundredths digits are also same.
Now, compare the thousandths digit. At thousandths, we have $0 < 6$

$\therefore$ 176.16 < 176.166

(h) In 221.768 and 221.678,
We have
$221 = 221$ (whole part of both the decimals are equal).
Now, compare the tenths digit. At tenths we have $7 > 6$

$\therefore$ 221.768 > 221.678

(i) In 73.915 and 73.951,

We have $73 = 73$ (whole part of both the decimals are equal).
tenths part is also same.
So, we compare hundredths part. At hundredths
we have, $1 < 5$
So, $73.915 < 73.951$.

2. For comparing the given decimals, we must first change the unlike decimals into like decimals,

(a) $2 = 2.00$, $1.75 = 1.75$, $0.7 = 0.70$ and $1.8 = 1.80$
Comparing the whole number parts
$2 > 1 = 1 > 0$
In 1.75 and 1.80 compare the dights at the tenths place, $7 < 8$
So, 1.80 is greater than 1.75
Therefore, $2.00 > 1.80 > 1.75 > 0.70$
Thus, the required descending order is
$$2.00 > 1.80 > 1.75 > 0.70$$

(b) $3.685 = 3.685$, $2.18 = 2.180$, $5.66 = 5.660$ and $3.61 = 3.610$
Compare the whole number parts, $3 = 3$; $2 < 5$
Therefore, 5.660 is the greater number.
Compare the digits at the tenths place, $6 = 6$; it is also same.
Now, compare the digits at the hundredths place, $8 > 1$
Therefore, 3.685 is greater then 3.610.
Therefore, $3.685 > 3.610$
So, the required descending order is $5.660 > 3.685 > 3.610 > 2.180$.

(c) $6.1 = 6.10$, $1.6 = 1.60$, $1.62 = 1.62$ and $2.16 = 2.16$
Compare the whole number parts
$$6 > 2 ; 1 = 1$$
Therefore, 6.10 is the greater number.
In 1.60 and 1.62, the digits at the tenths place is also same part.
Now, compare the digits at the hundredths place, $0 < 2$
Therefore, 1.62 is greater then 1.60.
Therefore, $1.62 > 1.60$.
So, the required descending order is $6.10 > 2.16 > 1.62 > 1.60$

3. For comparing the giving decimals, we must first change the unlike decimals into like decimals.

(a) $71.6 = 71.600$, $70.86 = 70.860$
$28.778 = 28.778$ and $29.03 = 29.030$
Comparing the whole number parts $28 < 29 < 70 < 71$
Therefore, $28.778 < 29.030 < 70.860 < 71.600$
Thus, the required ascending order is
$28.778 < 29.030 < 70.860 < 71.600$

(b) $189.3 = 189.30$, $169.33 = 169.33$
$819.28 = 819.28$ and $918.82 = 918.82$

Comparing the whole number parts

$$169 < 189 < 819 < 918$$

Therefore, 169.33 < 189.30 < 819. 28 < 918.82

Thus, the required ascending order is

$$169.33 < 189.30 < 819.28 < 918.82$$

(c) 718.5 = 718.50, 817.6 = 817.60

187.67 = 187.67 and 781.76 = 781.76

Comparing the whole number parts 187 < 718 < 781 < 817

Therefore, 187.67 < 718.50 < 781.76 < 817.60

Exercise 8.5

1. First convert all the decimals into like decimals.

(a) 3.6 = 3.60, 16.2 = 16.20 and 18.75 = 18.75

So, arrange the like decimals in columns and add.

①①

$$\begin{array}{r} 3.60 \\ 16.20 \\ +\,18.75 \\ \hline 38.55 \\ \hline \end{array}$$

(b) 5.28 = 5.28, 1.23 = 1.23 and 6.1 = 6.10

So, arrange the like decimals in columns and add.

① ①

$$\begin{array}{r} 5.28 \\ 1.23 \\ +\,6.10 \\ \hline 12.61 \\ \hline \end{array}$$

(c) 2.25 = 2.25, 1.7 = 1.70 and 3.23 = 3.23

So, arrange the like decimals in columns and add.

①

$$\begin{array}{r} 2.25 \\ 1.70 \\ +\,3.23 \\ \hline 7.18 \\ \hline \end{array}$$

(d) So, arrange the like decimals in columns and add.

① ①

$$\begin{array}{r} 3.10 \\ 7.28 \\ +\,1.66 \\ \hline 12.04 \\ \hline \end{array}$$

(e) 16.2 = 16.200, 1.62 = 1.620 and 0.162 = 0.162

So, arrange the like decimals in columns and add.

$$\begin{array}{r} 16.200 \\ 1.620 \\ +0.162 \\ \hline 17.982 \\ \hline \end{array}$$

(f) 8 = 8.00, 2.6 = 2.60, 3.2 = 3.20 and 0.32 = 0.32

So, arrange the like decimals in columns and add.

$$\begin{array}{r} 1 \\ 8.00 \\ 2.60 \\ 3.20 \\ +0.32 \\ \hline 14.12 \\ \hline \end{array}$$

(g) 172.5 = 172.50, 2.85 = 2.85 and 112.6 = 112.60

So, arrange the like decimals in columns and add.

$$\begin{array}{r} 1 \\ 172.50 \\ 2.85 \\ +112.60 \\ \hline 287.95 \\ \hline \end{array}$$

(h) 77.5 = 77.50, 3.66 = 3.66 and 1.85 = 1.85

So, arrange the like decimals in columns and add.

$$\begin{array}{r} 2\;\;1 \\ 77.50 \\ 3.66 \\ +1.85 \\ \hline 83.01 \\ \hline \end{array}$$

(i) 667.12 = 667.12, 18.68 = 18.68 and 32.6 = 32.60

So, arrange the like decimals in columns and add.

$$\begin{array}{r} 667.12 \\ 18.68 \\ +32.60 \\ \hline 718.40 \\ \hline \end{array}$$

2. (a)
$$\begin{array}{r} 4\;10 \\ 50.68 \\ -38.16 \\ \hline 12.52 \\ \hline \end{array}$$

(b)
$$\begin{array}{r} 83.72 \\ -10.72 \\ \hline 73.00 \\ \hline \end{array}$$

(c)
$$\begin{array}{r} 9\;10\;\;7\;11 \\ 100.81 \\ -32.77 \\ \hline 68.04 \\ \hline \end{array}$$

(d)
$$\begin{array}{r} 1\;9\;10\;\;6\;15 \\ 200.75 \\ -175.08 \\ \hline 25.67 \\ \hline \end{array}$$

(e)
$$\begin{array}{r} 15 \\ 1\;\;5\;13\;\;6\;16 \\ 263.76 \\ -67.38 \\ \hline 196.38 \\ \hline \end{array}$$

(f)
$$\begin{array}{r} 9\;\;9\;10 \\ 190.00 \\ -116.75 \\ \hline 73.25 \\ \hline \end{array}$$

3. (a)
$$\begin{array}{r} 9\,9\;\;9\,10 \\ 100.00 \\ -\;78.65 \\ \hline 21.35 \\ \hline \end{array}$$

(b)
$$\begin{array}{r} 15 \\ 2\,5\;\;17\,4\,10 \\ 136.750 \\ -\;28.805 \\ \hline 107.945 \\ \hline \end{array}$$

(c)
$$\begin{array}{r} 2\;\;17 \\ 33.75 \\ -\;12.80 \\ \hline 20.95 \\ \hline \end{array}$$

(d)
$$\begin{array}{r} 11\,14\;\;\;\; \\ 1\,4\;\;17 \\ 125.75 \\ -\;68.90 \\ \hline 56.85 \\ \hline \end{array}$$

(e)
$$\begin{array}{r} 13\,13\;\;\;\; \\ 3\,3\;\;16 \\ 144.65 \\ -\;98.80 \\ \hline 45.85 \\ \hline \end{array}$$

(f)
$$\begin{array}{r} 16\,14\;\;\;\; \\ 2\,6\,4\;\;9\,10 \\ 375.00 \\ -\;198.96 \\ \hline 176.04 \\ \hline \end{array}$$

4. First convert all the decimals into like decimals.

And you know that when addition and subtraction are given together, first add the then subtract.

So, rearrange the expression as.

(a) $28.4 - 2.66 + 2.35 = 28.40 - 2.66 + 2.35$

$= 28.40 + 2.35 - 2.66$

$$\begin{array}{r} 1\;\;\;\; \\ 28.40 \\ +\;\;2.35 \\ \hline 30.75 \\ \hline \end{array} \qquad \begin{array}{l} \\ \\ = 30.75 - 2.66 \\ = 28.09 \end{array} \qquad \begin{array}{r} 2\,10\;\;6\,15 \\ 30.75 \\ -\;2.66 \\ \hline 28.09 \\ \hline \end{array}$$

(b) $2.83 - 1.98 + 99.8 - 6.5$

$= 2.83 - 1.98 + 99.80 - 6.50$

$= 2.83 + 99.80 - (1.98 + 6.50)$

$$\begin{array}{r} 1\,1\;\;\;\; \\ 2.83 \\ +\;99.80 \\ \hline 102.63 \\ \hline \end{array} \qquad \begin{array}{r} 1\;\;\;\; \\ 1.98 \\ +\;6.50 \\ \hline 8.48 \\ \hline \end{array} \qquad \begin{array}{l} \\ = 102.63 - 8.48 \\ = 94.15 \\ \\ \end{array} \qquad \begin{array}{r} 9\,12\;\;5\,13 \\ 102.63 \\ -\;8.48 \\ \hline 94.15 \\ \hline \end{array}$$

(c) $75.2 - 8.68 + 1.25 - 2.5$

$= 75.20 - 8.68 + 1.25 - 2.50$

$= 75.20 + 1.25 - (8.68 + 2.50)$

$= 76.45 - 11.18$

$= 65.27$

$$\begin{array}{r} 2\,15\;\;\;\; \\ 156.35 \\ -\;35.28 \\ \hline 121.07 \\ \hline \end{array} \qquad \begin{array}{r} 1\,1\;\;\;\;\;\; \\ 77.60 \\ +\;78.75 \\ \hline 156.35 \\ \hline \end{array}$$

$$\begin{array}{r} \\ 75.20 \\ +\;1.25 \\ \hline 76.45 \\ \hline \end{array} \qquad \begin{array}{r} 1\;\;\;\; \\ 8.68 \\ +\;2.50 \\ \hline 11.18 \\ \hline \end{array} \qquad \begin{array}{r} \\ 76.45 \\ -\;11.18 \\ \hline 65.27 \\ \hline \end{array}$$

(d) $77.6 - 35.28 + 78.75$

$= 77.60 - 35.28 + 78.75$

$= 77.60 + 78.75 - 35.28$

$= 156.35 - 35.28$

$= 121.07$

(e) $29.6 + 15.2 - 6.9$
$= 44.8 - 6.9$
$= 37.9$

$$\begin{array}{r} \scriptstyle 1 \\ 29.6 \\ +15.2 \\ \hline 44.8 \end{array} \qquad \begin{array}{r} \scriptstyle 13 \\ \scriptstyle 3\ 3\ \ 18 \\ 44.8 \\ -6.9 \\ \hline 37.9 \end{array}$$

Exercise 8.6

1. The sum of two number $= 16.25$
One of the number $= 9.28$
The other number $= ?$
Let the other number be x.
So, according to the question
$x + 9.28 = 16.25$
$x = 16.25 - 9.28$
$x = 6.97$
Hence, the other number is 6.97.

2. Ravi had the amount = ` 701.50
So, according to the question
Shyam had the amount $= x + 35.25$
where, x is the amount of Ravi
So, Shyam had = ` (701.50 + 35.25)
= ` 736.75

3. Johny bought $= 4.5$ kg
Titoo bought $= 7.25$ kg
And Albert bought $= 6$ kg
Weight are given in unlike decimals, so first convert them into like decimals.

kg : gm
$$\begin{array}{r} 4.50 \\ 7.25 \\ +\ 6.00 \\ \hline 17.75 \end{array}$$

The total weight of rice = (4.50 + 7.25 + 6.00) kg = 17.75 kg
Hence, 17.75 kg of rice was bought by them together.

4. First change the distance in like decimals
Sudhir walked on Tuesday $= 5.200$ km
on Wednesday $= 7.250$ km
on Thursday $= 3.655$ km

km m
$$\begin{array}{r} \scriptstyle 1 \qquad 1 \\ 5.200 \\ 7.250 \\ +3.655 \\ \hline 16.105 \end{array}$$

So, the total distance walked by him

$= (5.200 + 7.250 + 3.655)$ km

$= 16.105$ km

Hence, 16.105 is walked by him during these three days.

5. Abhinav is carrying a bag of mass = 1.75 kg

His father is carrying another bag of mass = 10.25 kg

So, the total mass of both bags together = (1.75 + 10.25) kg

= 12 kg

Hence, 12 kg is the mass of both bags together.

6. The pocket money of Sanjana = ` 75.15

The pocket money of her brother = ` 67.50

So, the difference of the amount = ` (75.15 – 67.50) = ` 7.65

Hence, Sanjana get ` 7.65 more as pocket money to her brother.

7. Rakhee had = ` 500

She bought a purse = ` 75.50

And also bought some medicines = ` 121.35

So, money returned = ` (500 – 75.50 – 121.35)

= ` (500 – 196.85) = ` 303.15

Thus, ` 303.15 is left with her.

8. The temperature of three consecutive days = 33.5°C, 40.2°C and 38.3°C

(a) The difference between temperature = (38.3 – 33.5)°C = 4.8°C

(b) The sum of temperature = (33.5 + 40.2 + 38.3)°C = 112°C.

9. A car fill the petrol = 23.400 L

The two wheeler fill the petrol = 6.250 L

and An auto-rickshaw fill the petrol = 9.375 L

The total petrol was sold = (23.400 + 6.250 + 9.375) L

= 39.025 L or 39 L 25 mL.

10. Sanchita bought fabric = 6.75 m

used fabric = 3.45 m

So, remained fabric = (6.75 – 345) m = 3.30 m

Thus, 3.30 m is left with her.

Exercise 8.7

1. (a)
$$\begin{array}{r} 3.6 \\ \times 8 \\ \hline 28.8 \end{array}$$

(b)
$$\begin{array}{r} 6.65 \\ \times 1.6 \\ \hline 3990 \\ 665\times \\ \hline 10.640 \end{array}$$

(c)
$$\begin{array}{r} 3.82 \\ \times 2.6 \\ \hline 2292 \\ 764\times \\ \hline 9.932 \end{array}$$

(d)
$$\begin{array}{r} 165.2 \\ \times 1.2 \\ \hline 3304 \\ 1652\times \\ \hline 198.24 \end{array}$$

(e)
$$\begin{array}{r} 2.88 \\ \times 3.2 \\ \hline 576 \\ 864\times \\ \hline 9.216 \end{array}$$

(f)
$$\begin{array}{r} 3.65 \\ \times 2.4 \\ \hline 1460 \\ 730\times \\ \hline 8.760 \end{array}$$

(g)
$$\begin{array}{r} 2.65 \\ \times 3.12 \\ \hline 530 \\ 265\times \\ 795\times\times \\ \hline 8.2680 \\ \hline \end{array}$$

(h)
$$\begin{array}{r} 7.65 \\ \times 7.1 \\ \hline 765 \\ 5355\times \\ \hline 54.315 \\ \hline \end{array}$$

(i)
$$\begin{array}{r} 2.862 \\ \times 0.1 \\ \hline 0.2862 \\ \hline \end{array}$$

2. (a) $7.12 \times 10 =$ **71.2**

(b) $7.68 \times 100 =$ **768.00**

(c) $0.0052 \times 1000 =$ **5.2**

(d) $7.1285 \times 1000 =$ **7128.5**

(e) $2.8362 \times 100 =$ **283.62**

(f) $0.7812 \times 100 =$ **78.12**

3. (a)
$$\begin{array}{r} 4\overline{)16.8}(4.2 \\ -16 \\ \hline 8 \\ -8 \\ \hline 0 \end{array}$$

Thus, $16.8 \div 4 = 4.2$

(b)
$$\begin{array}{r} 3\overline{)200.01}(66.67 \\ -18 \\ \hline 20 \\ -18 \\ \hline 20 \\ -18 \\ \hline 21 \\ 21 \\ \hline \times \end{array}$$

Thus, $200.01 \div 3 = 66.67$

(c)
$$\begin{array}{r} 11\overline{)13.31}(1.21 \\ -11 \\ \hline 23 \\ -22 \\ \hline 11 \\ -11 \\ \hline \times \end{array}$$

Thus, $13.31 \div 11 = 1.21$

(d)
$$\begin{array}{r} 16\overline{)1.76}(0.11 \\ -16 \\ \hline 16 \\ -16 \\ \hline \times \end{array}$$

Thus, $1.76 \div 16 = 0.11$

(e) $17\overline{)173.4}(10.2$

-17

34

-34

$\times$

Thus, $173.4 \div 17 = 10.2$

(f) $15\overline{)500.25}(33.35$

-45

50

-45

52

-45

75

-75

$\times$

Thus, $500.25 \div 15 = 33.35$

4. (a) $7.165 \div 10 = 0.7165$

(b) $785.16 \div 100 = 7.8516$

(c) $3368 \div 1000 = 3.368$

(d) $17852 \div 100 = 178.52$

(e) $28.96 \div 100 = 0.2896$

(f) $7186 \div 1000 = 7.186$

5. (a) $2.24 \div 1.6 = 22.4 \div 16$

$\therefore$ $16\overline{)22.4}(1.4$

-16

64

-64

$\times$

Thus, $2.24 \div 1.6 = 1.4$

(b) $0.408 \div 0.17 = 40.8 \div 17$

$\therefore$ $17\overline{)40.8}(2.4$

-34

68

-68

$\times$

Thus, $0.408 \div 0.17 = 2.4$

(c) $6.25 \div 2.5 = 62.5 \div 25$

$\therefore$ $25\overline{)62.5}(2.5$

-50

125

-125

$\times$

Thus, $6.25 \div 2.5 = 2.5$

(d) $1.331 \div 0.11 = 133.1 \div 11$

$\therefore$ $11\overline{)133.1}(12.1$

-11

23

-22

11

-11

$\times$

Thus, $1.331 \div 0.11 = 12.1$

(e) $0.213 \div 0.3 = 2.13 \div 3$

$\therefore$ $3\overline{)2.13}(0.71$

-21

3

-3

$\times$

Thus, $0.213 \div 0.3 = 0.71$

(f) $77.33 \div 1.1 = 773.3 \div 11$

$\therefore$ $11\overline{)773.3}(70.3$

-77

33

-33

$\times$

Thus, $77.33 \div 1.1 = 70.3$

(g) $0.196 \div 2.8 = 1.96 \div 28$

$\therefore$ $28\overline{)1.96}(0.07$

-196

$\times$

Thus, $0.196 \div 2.8 = 0.07$

(h) $8.005 \div 0.05 = 800.5 \div 5$

$\therefore$ $5\overline{)800.5}(160.1$

-5

30

-30

05

-5

$\times$

Thus, $8.005 \div 0.05 = 160.1$

(i) $76.363 \div 0.7 = 763.63 \div 7$

$\therefore$ $7\overline{)763.63}(109.09$

-7

63

-63

0063

-63

$\times$

Thus, $76.363 \div 0.7 = 109.09$

(j) $1.296 \div 0.108 = 1296 \div 108$

$\therefore$ $108\overline{)1296}(12$

-108

216

-216

$\times$

Thus, $1.296 \div 0.108 = 12$

(k) $81.33 \div 0.03 = 8133 \div 3$

$\therefore$ $3\overline{)8133}(2711$

-6

21

-21

03

-3

03

-3

$\times$

Thus, $81.33 \div 0.03 = 2711$

(l) $4.41 \div 0.04 = 441 \div 4$

$\therefore$ $4\overline{)441}(110.25$

-4

04

-4

10

-8

20

-20

$\times$

Thus, $4.41 \div 0.04 = 110.25$

Exercise 8.8

1. Product of two decimals $= 42.63$

Given decimals $= 20.3$

$\therefore$ The other decimals $= 42.63 \div 20.3$

$\because$ $42.63 \div 20.3 = 426.3 \div 20.3$

$\therefore$ $203\overline{)426.3}(\,2.01$

$$\begin{array}{r} -\,406 \\ \hline 2003 \\ -\,203 \\ \hline \times \end{array}$$

Thus, the other decimals is 2.1.

2. The rate of one metre of cloth = ` 46

But he paid for the cloth = ` 425.50

$\therefore$ the total length of the cloth = ` 425.50 ÷ ` 46 = 9.25 m

Hence, he bought 9.25 m of cloth.

3. The rate of one kilogram of resins = ` 175.75

$\therefore$ the rate of 17 kilogram of resins = ` 17×175.75

= ` 2987.75

4. An amount of one day paid by worker = ` 87.75

$\therefore$ the total amount of 23 days paid by worker = ` 23×87.75

= ` 2018.25.

5. The total length of string = 72.75 m

Length of one piece of string = 14.55 m

So, No. of pieces of string

$$= \frac{\text{Total length of string}}{\text{Length of one piece of string}} = \frac{72.75}{14.55} = 5 \text{ piece.}$$

6. A family consumes wheat per day = 1.750 kg

$\therefore$ A family consumes wheat 365 days = 365×1.750 kg

= 638.75 kg

7. The cloth required for a shirt = 2.5 m

The total length of cloth = 17.5 m

$$\therefore \text{No. of shirts} = \frac{\text{Total length of cloth}}{\text{The cloth required for a shirt}}$$

$$= \frac{17.5}{2.5} = 7 \text{ shirts.}$$

8. The capacity of one bottle = 1.8 L.

The total capacity of the milk = 27 L.

$$\therefore \text{the number of bottles} = \frac{27}{1.8} = 15 \text{ bottles}$$

9. The cost of 75 copies of a book = ` 2043.75

$\therefore$ the cost of a single book = ` $\dfrac{2043.75}{75}$ = ` 27.25.

10. A container can hold of water = 5.7 L

The total capacity of water = 74.1 L

$\therefore$ No. of container $= \frac{74.1}{5.7} = 13$ Containers.

Multiple Choise Questions

Tick (3) the correct option :

1. (b), 2. (c). 3. (c), 4. (b), 5. (d), 6. (b), 7. (a), 8. (a), 9. (c)

9 Basic Geometrical Concepts

Exercise 9.1

1. (a) Point = Tip of the pin, a binds, tip of ice-cream cone

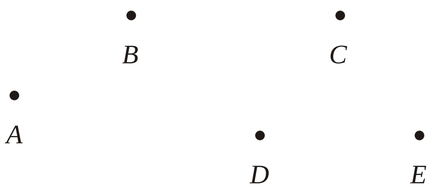
(b) Line segment = Boundaries of a black boards, the edges of a table, greeting card etc.

(c) Ray = sun rays, light emitted by the torch, a projector.

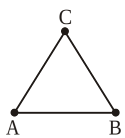
(d) Intersecting lines = adjacent walls of a room, sign of X, both arms of a scissor.

(e) Parallel line = Railway line, opposite sides of a rectangle, opposite sides of a ruler.

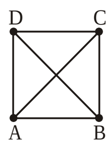
2.



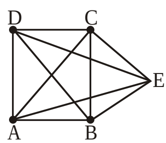
3. (a)



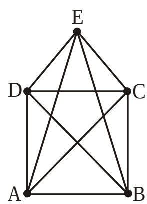
(b)



(c)



(d)



4. **A line :** Any line segment PQ when extended indefinitely in both the directions is called line PQ.

A line segment : A line segment is limited by two end points. It is a point of a straight line between two points A and B.

5. **A ray** $\Rightarrow$ A ray has only one end point.

A line $\Rightarrow$ A line has no end points.

6. (a) $\overrightarrow{AP}$, $\overrightarrow{AQ}$, $\overrightarrow{AC}$ and $\overrightarrow{AD}$.

(b) There are 15 line segment and $\overline{PA}$, $\overline{PB}$, $\overline{PQ}$, $\overline{AB}$, $\overline{AQ}$, $\overline{AD}$, $\overline{AC}, \overline{BQ}, \overline{RD}, \overline{RC}, \overline{RS}, \overline{DC}, \overline{DS}, \overline{CS}, \overline{BC}$

(c) $\overline{PQ} \,||\, \overline{RS}$

(d) $(\overline{AD}, \overline{BC})$, $(\overline{AD}, \overline{AC})$, $(\overline{AC}, \overline{BC})$ are not paralled line.

(e) $\overline{AD}$ and $\overline{AC}$ intersect at A, $\overline{AC}$ and $\overline{BC}$ intersect at C, $\overline{PQ}$ and $\overline{AD}$ intersect at A, $\overline{PQ}$ and $\overline{BC}$ intersect at B and soon.

(f) $\overline{RS}$, $\overline{AC}$, $\overline{BC}$ are containing point C.

(g) $\overline{PQ}$ and $\overline{BC}$ are the line on which point B lies.

(h) $\overline{PQ}, \overline{AC}, \overline{AD}$ are the lines passing through point A.

7. (a) Infinite lines can pass through a point.

(b) Only line can pass through two point.

8. (a) Yes, B is the mid-point of AC.

(b) Yes, C is the mid-point of BD.

9. $\overline{PX} = \dfrac{PQ}{2} = \dfrac{15}{2} = 7.5$ cm.

$\overline{PY} = \dfrac{PR}{2} = \dfrac{18}{2} = 9$ cm.

$\overline{XQ} = PX = 7.5$ cm

and $\overline{YR} = PY = 9$ cm.

10. A line contains infinite points.

11. (a) A, B, C, D, E, F, G and H are the marked points in the figure.

(b) There are 12 line segments and $\overline{AB}, \overline{BC}, \overline{CD}, \overline{DA}, \overline{AE}, \overline{DH}, \overline{BF}, \overline{CG}, \overline{EH}, \overline{HG}, \overline{FG}$ and $\overline{EF}$ are the name.

(c) BF, EF and GF are the line segments meeting at point F.

(d) AB, CB, FB are the line segments meeting at point B.

(e) $AB \,||\, DC$, $AD \,||\, BC$, $EF \,||\, HG$, $EH \,||\, FH$ are the groups of four parallel line segments.

12.

(a) False	(b) True	(c) True	(d) False
(e) False	(f) False	(g) True	(h) False
(i) True	(j) False	(k) True	(l) True

Exercise 9.2

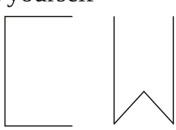
1. (i) Open curves = (c), (e), (f), and (h)

(ii) Closed curves = (a), (b), (d) and (g)

2. (a), (d) and (g) are simple closed curves.

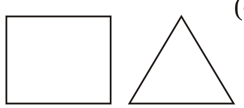
3. Do it yourself

4. (a)



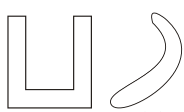
(i) (ii)

(b)



(i) (ii)

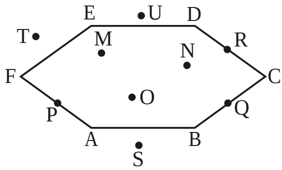
(c)



(i) (ii)

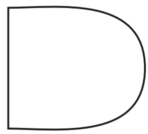
5. (a), (c) and (g) are polygons.

6.

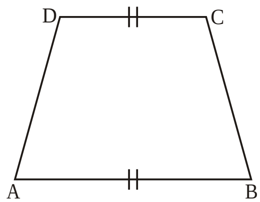


7. (a)

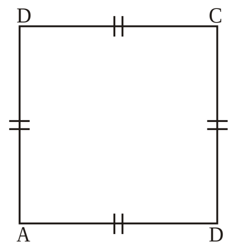
(b)



(c)

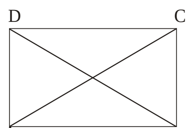


(d)

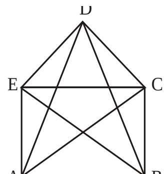


8. (a) Two (b) Closed curve (c) Triangle (d) Quadrilateral

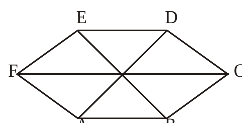
9.



Quadrilateral

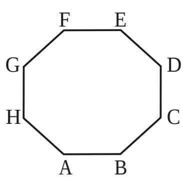


Pentagon

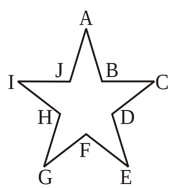


Hexagon

10. (a)



(b)

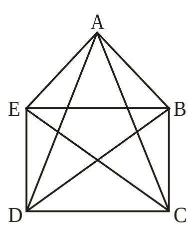


11. (a) A, B, C, D and E are vertices

(b) AB, BC ; BC, CD ; CD, DE ; DE, EA and EA, AB are adjacent sides.

(c) (A, B), (B, C), (C, D) and (D, A) are the pair of adjacent verities.

(d) AC, AD, BE, BD and EC are diagonals of given pentagon.

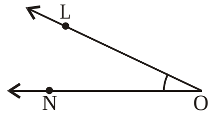


Exercise 9.3

1. Clock hands, scissor and sides of a table are the examples of angles.

2. (i) O is vertex.

(ii) OL and ON are arms of the angle.



3. (a) In a figure, there are 3 angles. And angles are $\angle A, \angle B, \angle C$.

(b) In a figure, there are 4 angles. And angles are and $\angle P, \angle Q, \angle R$ and $\angle S$.

(c) In a figure, there are 12 angles. And angles are $\angle HEG, \angle GEF, \angle HEF, \angle EFH, \angle HFG, \angle EFG, \angle FGE, \angle HGE, \angle FGH, \angle GHF, \angle FHE$ and $\angle GHE$.

4. (a) G, D, E, F and H are interior point of $\angle ABC$.

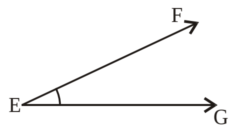
(b) L, M, G, C, I and K are exterior point of $\angle ABF$.

(c) A, B, C, I and J are lie on $\angle ABC$.

(d) C, B, F, I, D and E are lie on $\angle CBF$.

5. $\angle ABC$ and $\angle CBA$ are same angle.

6. Do it yourself



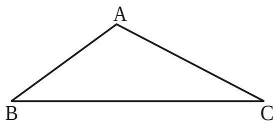
7. Yes, they always form an angle.

8. No.

Exercise 9.4

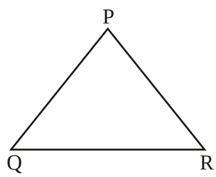
1. (b) and (e) are triangles.

2. (a)



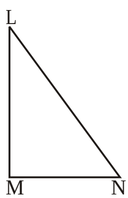
ΔABC

(b)



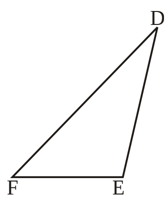
ΔPQR

(c)



ΔLMN

(d)



ΔDEF

3. (a) $\angle A, \angle B, \angle C$ (b) $\angle P, \angle R, \angle Q$

(c) $\angle L, \angle M, \angle N$ (d) $\angle D, \angle F, \angle E$

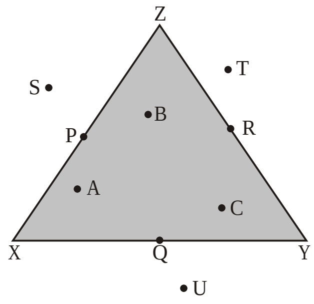
4. (a) There are 3 triangles, ΔABD, ΔADC and ΔABC.

(b) There are5 triangles, ΔPQR, ΔPSU ΔSTU, ΔSQT and ΔUTR.

(c) There are 8 triangles, $\Delta\, EOF$, $\Delta\, FOG$, $\Delta\, GOH$, $\Delta\, HOE$, $\Delta\, HEF$, $\Delta\, HEG$, $\Delta\, GHF$ and $\Delta\, GEF$.

(d) There are 6 triangles, $\Delta\, ABC$, $\Delta\, ABD$, $\Delta\, ABE$, $\Delta\, ACE$, $\Delta\, ACD$ and $\Delta\, ADE$.

5.



6. (a) $\overline{PQ}, \overline{QS}, \overline{SR}, \overline{QR}, \overline{PS}$ and $\overline{PR}$ are six line segments.

(b) $\angle PQS$, $\angle PRQ$, $\angle QPS$, $\angle QPR$, $\angle SPR$, $\angle PSQ$ and $\angle PSR$ are seven angles.

7. $\Delta\, PQR$ and $\Delta\, PRQ$ are same angles.

Exercise 9.5

1. (1) Surface of the door, (2) Top of the table,
(3) Room floor (4) A paper sheet.

2.

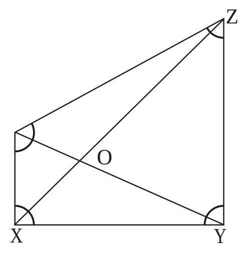
(a) (EF, FG), (FG, GH), (GH, HE) and (HE, EF) are pair of adjacent sides.

(b) (EF, HG), (HE, GF) are pair of opposite sides.

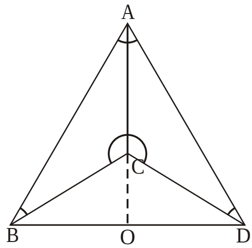
(c) $(\angle E, \angle F)$; $(\angle F, \angle G)$; $(\angle G, \angle H)$ and $(\angle H, \angle E)$ are pair of adjacent angles.

(d) $(\angle E, \angle G)$ and $(\angle F, \angle H)$ are pair of opposite angles.

3. Convex quadrilateral has each angles less than 180°. Also, the point of intersecting of diagonals of a convex quadrilateral lies inside the quadrilateral.



Concave quadrilateral has one of the angles is more than 180° but less than 360°. Also, the point of intersection of diagonals lies outside the quadrilateral.



4. (a) K, L, M are interior point of quadrilateral $ABCD$.

(b) X, Y, W and Z are exterior point of quadrilateral $ABCD$.

(c) A, B, C, D, P, Q, R and S are lie on the quadrilateral $ABCD$.

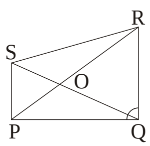
(d) $K, L, M, A, B, C, D, R, Q, P$ and S lie on the quadrilateral region of quadrilateral $ABCD$.

5. (a) and (c) are convex quadrilateral figure .
And (b), (d) are concave quadrilateral figure.

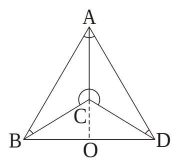
6. The given figure $PQRS$ is not a quadrilateral because it is not bounded four sides or as it not a simple close figure/curve.

7. If a quadrilateral in which the measure of one of the angles is more than 180° but less than 360° is called a concave quadrilateral.

8.



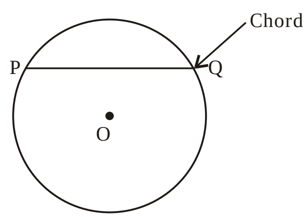
Convex quadrilateral



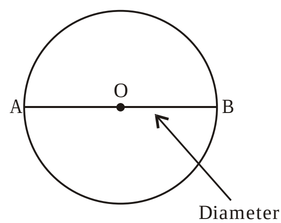
Concave quadrilateral

Exercise 9.6

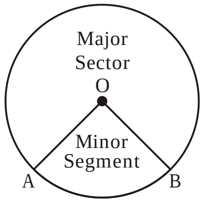
1. (a) Chord : A line segment having its end points on the circle is called a chord of the circle.



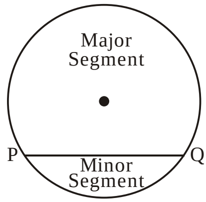
(b) Diameter : The diameter of a circle is line segment having its end points on the circle and passing thorugh its centre.



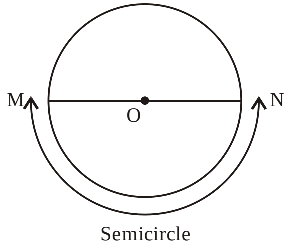
(c) Sector : A region in the interior of a cirlc,e formed by an arc and the two raddii joing the end points of the arc is called a sector of the circle.



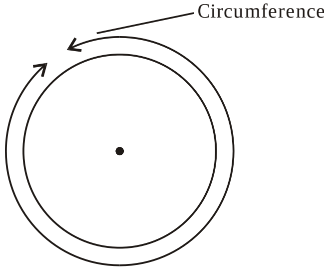
(d) Segment : A chord of a circle divded the circular region into two parts called segments of the circle.



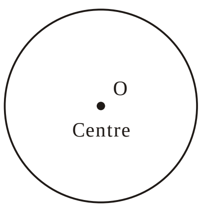
(e) Semicircle : A diameter divides the circle into two equal parts called semicircle.



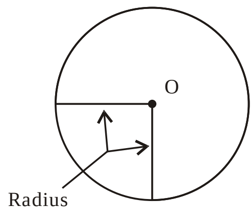
(f) Circumference : The perimeter of a circle is known as its circumference. Or, the length of the boundary of a circle its circumference.



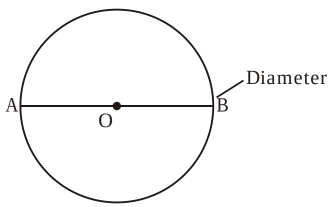
2. (a)



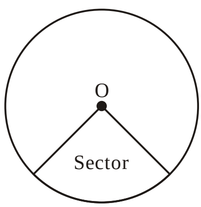
(b)



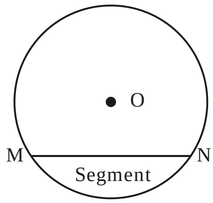
(c)



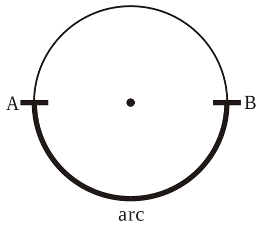
(d)



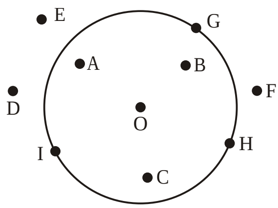
(e)



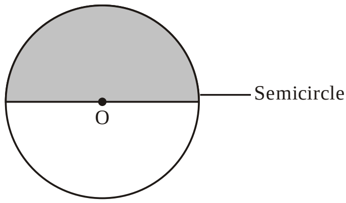
(f)



3.



4.



5. (a) O is the centre of the circle.

(b) OD, OB, OC and OA are four radii of the circle.

(c) AB and DC are two diameters of the circle.

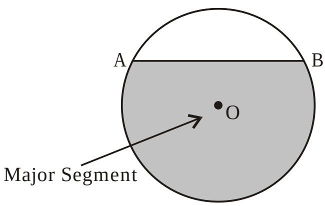
(d) AB, DC, AD and BC are four chord of the circle.

(e) A, B, D, C, F, O, R, Q and P are points in the circular region.

(f) $AOCF$ is the sector of the circle.

(g) $\overparen{AFC}$ is the arc of the circle.

6.



7. (a) Yes, every diameter of a circle is also a chord.

(b) No, every chord of a circle is not a diameter.

(c) Yes, the diameter is a part of the semicircle.

(d) Yes, the centre is a part of the circle.

(e) Yes, the radius is a part of the circle.

8. We know that,

Diameter of a circle = $2 \times$ radius of the circle.

(a) $d = 2r \because r = 4$ cm

$\therefore$ $d = 2 \times 4$ cm $= 8$ cm

(b) $\because r = 5$ cm

$\therefore$ $d = 2 \times 5$ cm $= 10$ cm

(c) $\because r = 7.5$ cm

$\therefore$ $d = 2 \times 7.5$ cm $= 15.0$ cm

(d) $\because r = 14.5$ cm

$\therefore d = 2 \times 14.5$ cm $= 29$ cm

9. (a) $\because d = 6$ cm

$\therefore$ $r = \frac{d}{2} = \frac{6}{2} = 3$ cm

(b) $\because d = 8$ cm

$\therefore$ $r = \frac{d}{2} = \frac{8}{2} = 4$ cm

(c) $\because d = 18$ cm

(d) $\because d = 8.5$ cm

$\therefore \quad r = \frac{d}{2} = \frac{18}{2} = 9\,\text{cm} \quad \therefore \quad r = \frac{d}{2} = \frac{8.5}{2} = 4.25\,\text{cm}$

Multiplce Choice Questions

Tick (3) the correct option :

1. (a), 2. (a), 3. (b), 4. (c), 5. (b), 6. (b), 7. (a), 8. (a), 9. (c), 10. (a)

HOTS

(a) 10 (b) 10

10 3-D Shapes

1. (a) Cone (b) Cuboid (c) Sphere
(d) Cylinder (e) Cube (f) Triangular prism
(g) Triangular pyramid (h) Square pyramid (i) Cube dice

2. (a) Cone → Ice-cream cone, Joker's Cap, Birthday cap, Conical vessel
(b) Cylinder → Circular pipe, New pencil, test tube, Gas Cylinder
(c) Cube → Ice-cube, Sugar cube, wooden Cube, Dice.
(d) Spheric → Football, Tennis ball, Marbles, Cricket-ball.

3.

	A			**B**
(a)	A new pencil	⟶	(iv)	Cylinder
(b)	A football	⟶	(v)	Sphere
(c)	A dice	⟶	(i)	Cube
(d)	A box	⟶	(ii)	Cuboid
(e)	A joker's cap	⟶	(iii)	Cone

4.

S.No.	a	Number of faces	No. of edges	No. of vertex
(a)	Cuboid	6	12	8
(b)	Cube	6	12	8
(c)	Triangular Pyramid	4	6	4
(d)	Square Pyramid	5	8	5
(e)	Triangular Prism	5	9	6
(f)	Cone	2	1	1

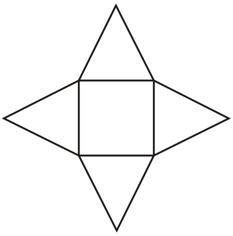
5. (a) A cuboid has **six** faces, **twelve** edges and **eight** vertices.
(b) A cube has **six** face **twelve** edges and **eight** vertices.
(c) The **opposite** face of a cuboid are identical.
(d) An object that occupice space is called a **solid**.
(e) A sphere has a **curved** surface.
(f) A triangular pyramid is also called a **tetrahedron**.
(g) A tennis ball is an example of **sphere**.
(h) A triangular prism has **six** vertices and **nine** edges.

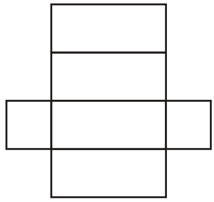
Multiple Choice Questions

Tick (3) the correct option :

1. (c), 2. (c) 3. (a), 4. (c), 5. (d), 6. (b), 7. (c), 8. (b), 9. (a), 10. (a)

HOTS



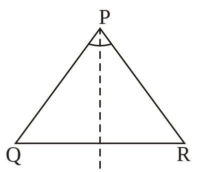


11 Symmetry

Exercise 11

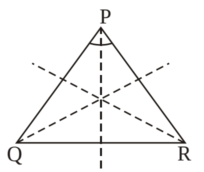
1. (a) False (b) True (c) True
(d) False (e) True (f) False

2. (a)



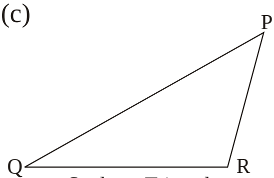
An isosceles triangle

(b)



An equilateral triangle

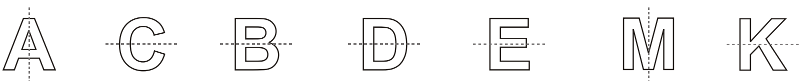
(c)



Scalene Triangle

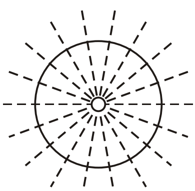
3. No.

4.



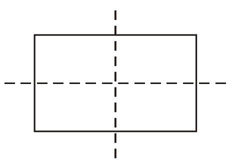
5.

6. (a)



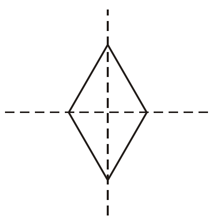
Infinite Nince of Symmetry

(b)



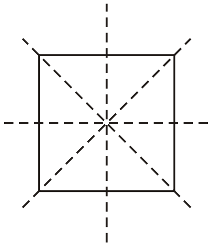
Two Lines of Symmetry

(c)



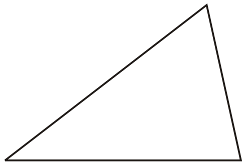
Two lines of Symmetry

(d)



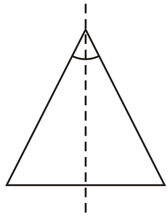
Four Lines Symmetry

(e)



No lines of Symmetry

(f)



One line of Symmetry

7. Foot ball, Kite, Ice-cream, Taj Mahal.

8. $F, G, J, L, N, P, Q, R, S$ and Z have no line of symmetry.

Multiplce Choice Questions

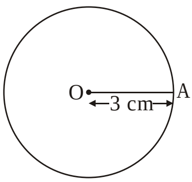
Tick (3) the correct option :

1. (d), 2. (c) 3. (d), 4. (b), 5. (c), 6. (c), 7. (b), 8. (d), 9. (b), 10. (b)

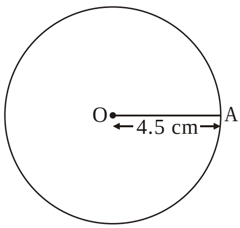
12 Practical Geometry

Exercise 12.1

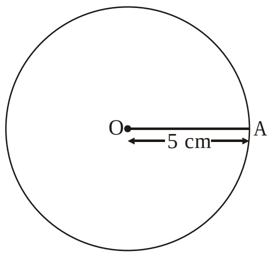
1. (a) $r = 3\,\text{cm}$



(b) $r = 4.5$ cm

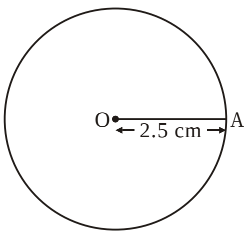


(c) $r = 5\,\text{cm}$



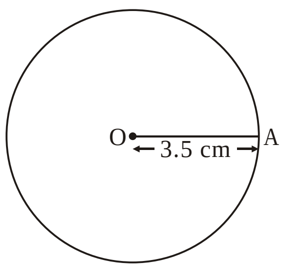
2. (a) $\because \quad d = 5\,\text{cm},$

$$\therefore \quad r = \frac{d}{2} = \frac{5}{2}\,\text{cm} = 2.5\text{ cm}$$



(b) $\because \quad d = 7\,\text{cm},$

$$\therefore \quad r = \frac{d}{2} = \frac{7}{2}\,\text{cm} = 3.5\text{ cm}$$

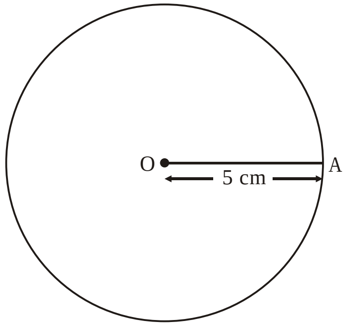


(c) $\because$ $d = 10\,\text{cm}$,

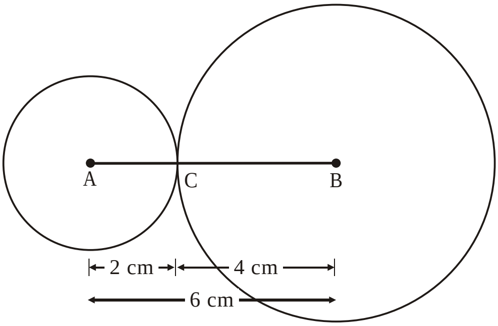
$\therefore$ $r = \dfrac{d}{2}$

$= \dfrac{10}{2}$

$= 5\,\text{cm}$

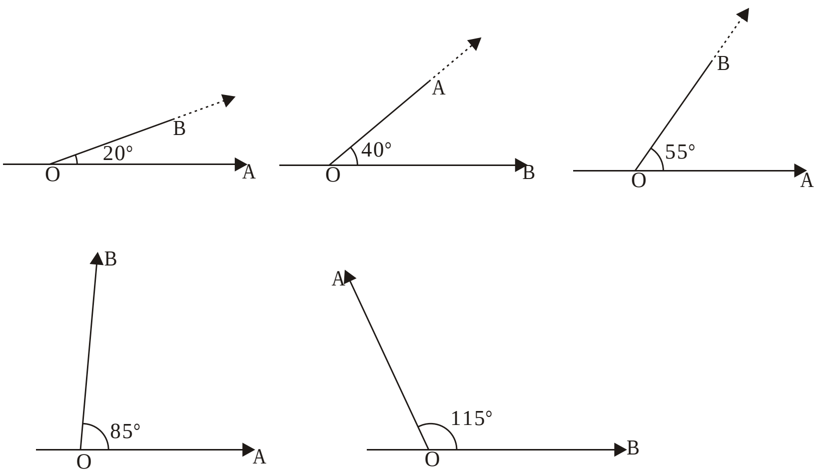


3. Yes, the two circles touch each other.

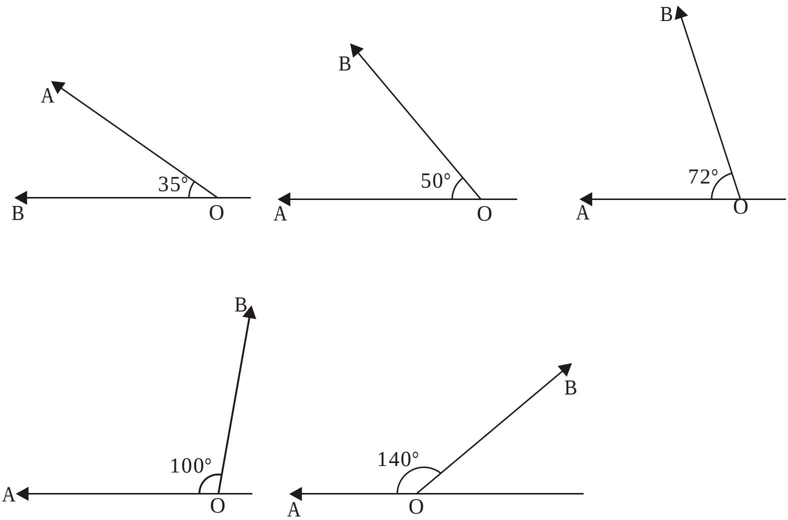


Exercise 12.2

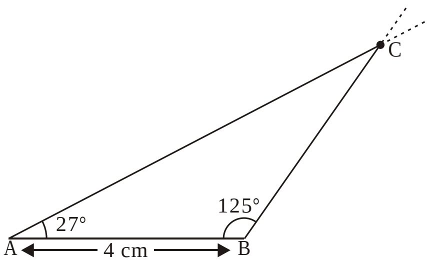
1.



2.

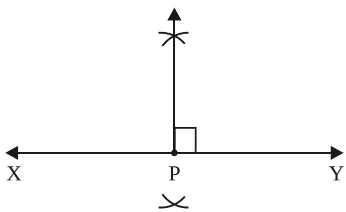


3.

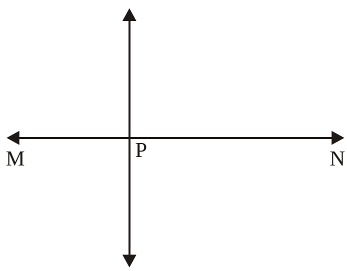


Exercise 12.3

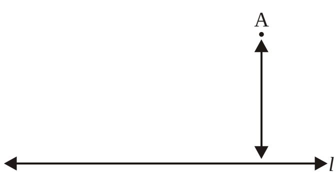
1.



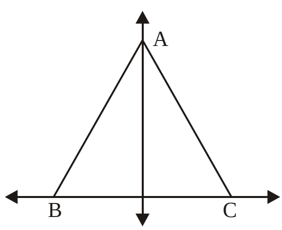
2.



3.

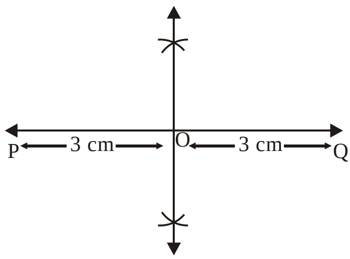


4.

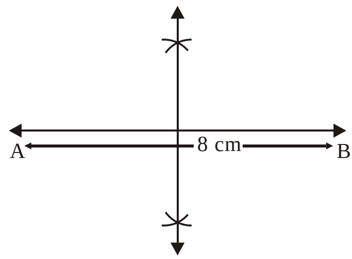


Exercise 12.4

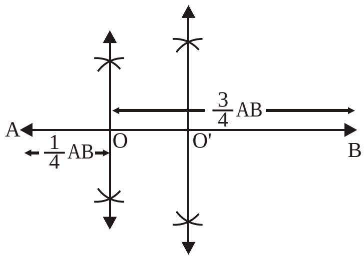
1.



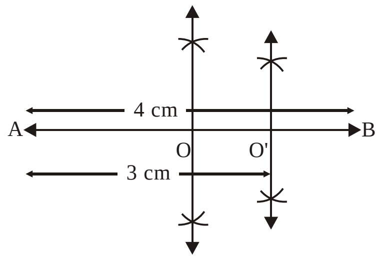
2.



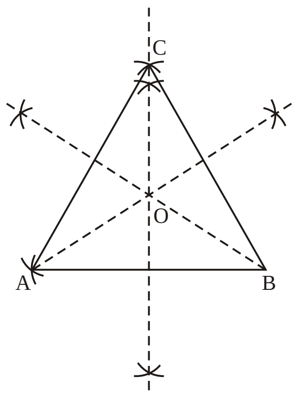
3.



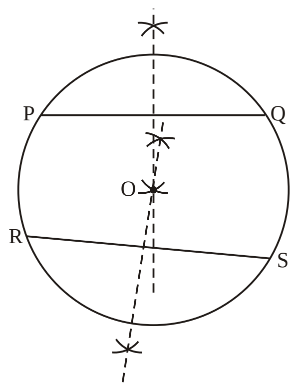
4.



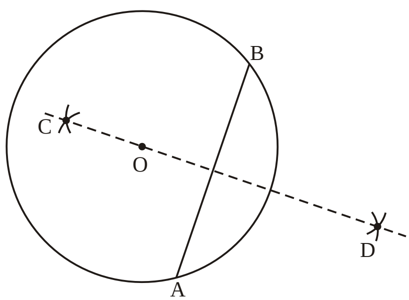
5.



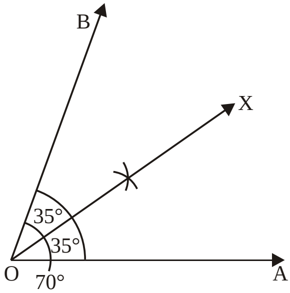
6. Bisectors meet at the centre of the circle.



7. Yes, *CD* passing through *O*, the centre of the circle.

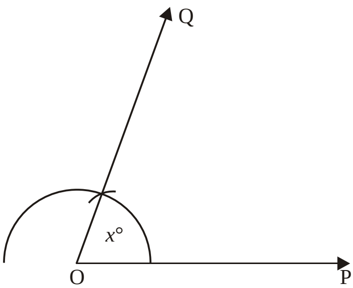


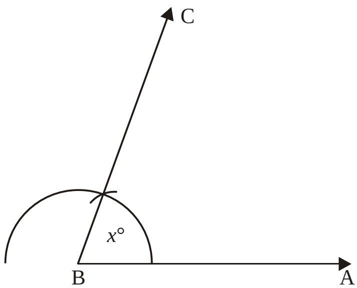
8.



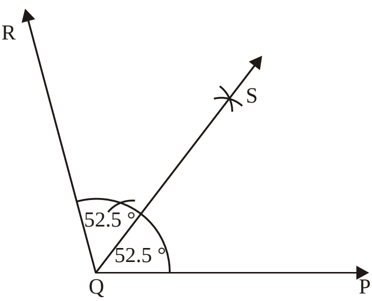
Yes, the two angles $\angle AOX$ and $\angle BOX$ are equal.

9. $\angle ABC$ is equal to $\angle POQ$

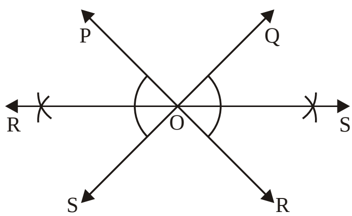




10.

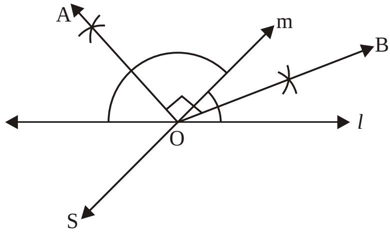


11.



Yes, the two bisecting rays are in the same line.

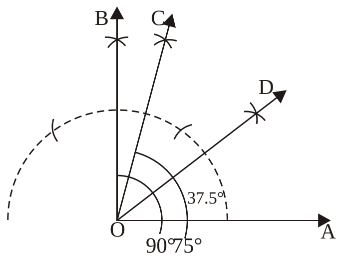
12.



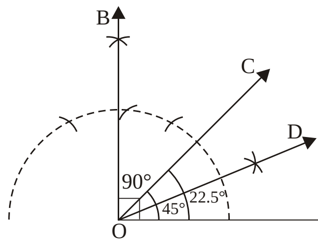
Yes, the two bisecting rays are perpendicular to each other.

Exercise 12.5

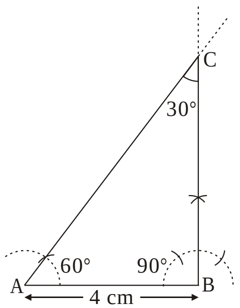
1.



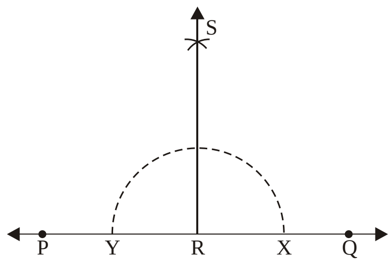
2.



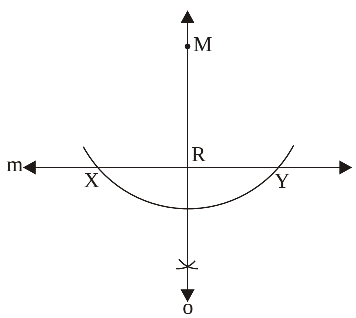
3. Thus, $\angle C = 30^\circ$



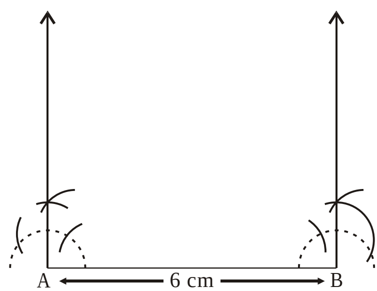
4.



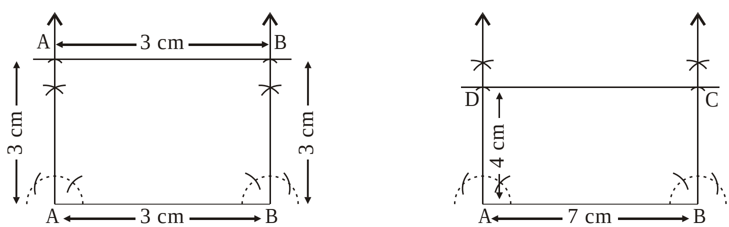
5.



6.



7.



Multiplce Choice Questions

Tick (3) the correct option :

1. (b), 2. (b), 3. (d), 4. (c), 5. (d)

13 Perimeter and Area

Exercise 13.1

1. (a) Perimeter of triangle = The sum of the sides
$= 12\text{ cm} + 12\text{ cm} + 15\text{ cm} = 39\text{ cm}.$

(b) Perimeter of polygon = The sum of *n*th sides
$= 10\text{ cm}+ 10\text{ cm} + 10\text{ cm} + 7\text{ cm} + 7\text{ cm} + 10\text{ cm}$
$+ 10\text{ cm} + 12\text{ cm} = 76\text{ cm}$

(c) Perimeter of regular hexagons $= 6 \times \text{sides} = 6 \times 6\text{ cm} = 36\text{ cm}$

(d) Perimeter of Rhombus $= 4 \times \text{sides}$
$= 4 \times 10\text{ cm}$
$= 40\text{ cm}$

(e) Perimeter of quadrilateral = The sum of four sides
$= 35\text{ cm} + 40\text{ cm} + 25\text{ cm} + 50\text{ cm}$
$= 150\text{ cm}$

(f) Perimeter of polygons
= The sum of different *n*th sides
$= 4\text{ cm} + 1\text{ cm} + 3\text{ cm} + 2\text{ cm} + 3\text{ cm} + 4\text{ cm} + 1\text{ cm}$
$+ 3\text{ cm} + 2\text{ cm} + 3\text{ cm} + 4\text{ cm} + 1\text{ cm} + 3\text{ cm} + 2\text{ cm}$
$+ 3\text{ cm} + 4\text{ cm} + 1\text{ cm} + 3\text{ cm} + 2\text{ cm} + 3\text{ cm} = 52\text{ cm}$

2. The perimeter of triangle $= 75\text{ cm}$
Two of the sides $= 20\text{ cm}, 30\text{ cm}$
Third side = ?
$\because$ Perimeter of triangle = The sum of three sides
$\therefore$ $75\text{ cm} = 20\text{ cm} + 30\text{ cm} +$ Third side
Third side $= (75 - 20 - 30)\text{ cm} = 25\text{ cm}.$

3. The length of rectangular park $= 25\text{ m}$
The breadth of rectangular park $= 10\text{ m}$
Distance covered in 4 round
$= 4 \times$ Perimeter of rectangular park.
$= 4\,(25 \times 2 + 10 \times 2)\text{ m}$
$= 4\,(50 + 20)\text{ m}$
$= 4 \times 70\text{ m}$
$= 280\text{ m}.$

4. The length of photograph $= 45\text{ cm}$
The breadth of photograph $= 32\text{ cm}$
$\therefore$ The length of wooden strip $= 2\,(45\text{ cm} + 32\text{ cm})$
$= 2 \times 77\text{ cm} = 154\text{ cm}$
the cost of 1 cm frame = ` 12
$\therefore$ the cost of 154 cm frame = ` 12 × 154 = ` 1848.

5. The total length of wire $= 600\text{ cm}$
(a) Perimeter of an equilateral triangle $= 3 \times \text{sides}$
$600\text{ cm} = 3 \times \text{side}$

$$\text{side} = \frac{600\text{cm}}{3}$$

$\therefore$ side = 200 cm.

(b) Perimeter of a square = The total length of wire

$4 \times \text{side} = 600\,\text{cm}$

$$\text{side} = \frac{600\text{cm}}{4} = 150\,\text{cm.}$$

$\therefore$ side = 150 cm.

(c) Perimeter of a regular pentagon = The total length of wire

$5 \times \text{side} = 600\,\text{cm}$

$$\text{side} = \frac{600\text{cm}}{5} = 120\,\text{cm}$$

$\therefore$ side = 120 cm.

(d) Perimeter of regular hexagon

= The total length of wire $6 \times$ sides

$6 \times \text{side} = 600\,\text{cm}$

$$\text{side} = \frac{600\text{cm}}{6}$$

side = 100 cm.

(e) Perimeter of regular decagon

= The total length of wire

$10 \times \text{side} = 600\,\text{cm}$

$$\text{side} = \frac{600}{10}\,\text{cm}$$

$\therefore$ side = 60 cm.

6. The length of a square park = 300 m

$\because$ perimeter of a square = $4 \times$ side

$\therefore$ perimeter of a square = $4 \times 300\,\text{m} = 1200\,\text{m}$

Cost of fencing = perimeter $\times$ cost per meter

= ` $15 \times 1200$ = ` 18000.

7. The length of a rectangular park = 300 m

and the breadth of a park = 200 m

$\therefore$ Distance covered in four rounds

= $4 \times$ Distance walked in 1 round

= $4 \times$ perimeter of the rectangular park

= $4[2(300+200)\,\text{m}]$

= $4[2 \times 500]\,\text{m}$

= $4 \times 1000\,\text{m} = 4000\,\text{m}$.

$$\text{No. of rounds} = \frac{\text{Total distance covered by him}}{\text{Perimeter of a rectangular park}}$$

$$= \frac{9\,\text{km}}{2(300+200)\,\text{m}} = \frac{9 \times 1000\,\text{m}}{2 \times 500\,\text{m}}$$

No. of rounds $= \frac{9000}{1000} = 9$ rounds.

8. Total rounds of a rectangular field $= 600\,m$

The length of field $= 35\,m$

and the breadth of field $= 15\,m$

No. of rounds $= \frac{600\,m}{2(35+15)\,m} = \frac{600\,m}{100\,m} = 6$ times

9. The length of a carpet = 6 m 20 cm = 6.20 m

The breadth of a carpet = 4 m 40 cm = 4.40 m

$\therefore$ Perimeter of a carpet $= 2(6.20 + 4.40)$ m

$= 2 \times 10.60$ m

$= 21.20$ m or $= 2120$ cm

Cost of fencing = Perimeter × Cost per meter

= ` 15 × 21.20 = ` 318.

10. The distance run by Dinesh $= 4 \times 90\,m = 360\,m$

The distance run by Naresh $= 2(120+80)\,m = 2 \times 200\,m = 400\,m$

The difference $= 400\,m - 360\,m = 40\,m$

Naresh covers more distance by 40 m.

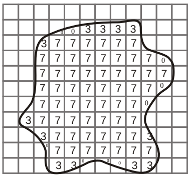
Exercise 13.2

1. (a) The required area of figure

= No. of (7) square

+ No. of (3) square

$+ \frac{1}{2} \times$ No. of (0) squares.



$= 58 + 12 + \frac{1}{2} \times 6$

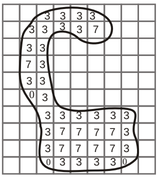
$= (70+3)$ sq. cm $= 73$ sq. cm (app)

(b) The required area of figure

= No. of (7) square

+ No. of (3) square

$+ \frac{1}{2} \times$ No. of (0) square



$= 10 + 27 + \frac{1}{2} \times 2$

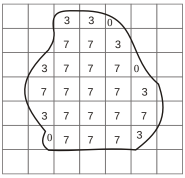
$= (37+1)$ sq. cm $= 38$ sq. cm (app)

(c) The required area of figure

= No. of (7) square

+ No. of (3) square

$+ \frac{1}{2} \times$ No. of (0) square.

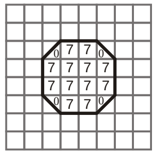


$= 15 + 7 + \frac{1}{2} \times 3$

$= 22 + 1\frac{1}{2}$

$= 23\frac{1}{2}$ sq. cm (app)

2. (a) The area of figure



$=$ No. of (7) square

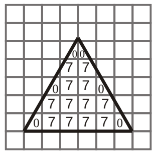
$+$ No. of (3) square

$+ \frac{1}{2} \times$ No. of (0) square.

$= 12 + 0 + \frac{1}{2} \times 4$

$= 12 + 2 = 14$ sq. cm

(b) The area of figure



$=$ No. of (7) square

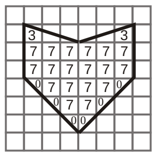
$+$ No. of (3) square

$+ \frac{1}{2} \times$ No. of (0) square

$= 8 + 4 + \frac{1}{2} \times 6 = (8 + 4 + 3)$ sq. cm

$= 15$ sq. cm

(c) The area of figure



$=$ No. of (7) square

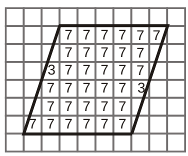
$+$ No. of (3) square

$+ \frac{1}{2} \times$ No. of (0) square.

$= 18 + 2 + \frac{1}{2} \times 8$

$= (18 + 2 + 4)$ sq. cm 24 sq. cm

(d) The area of figure



$=$ No. of (7) square

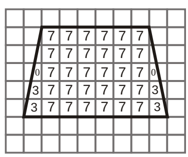
$+$ No. of (3) square

$+ \frac{1}{2} \times$ No. of (0) squares

$= 30 + 4 + \frac{1}{2} \times 2$

$= 34 + 1 = 35$ sq. cm

(e) The area of figure



$=$ No. of (7) square

$+$ No. of (3) square

$+ \frac{1}{2} \times$ No. of (0) square

$= 30 + 4 + \frac{1}{2} \times 2$

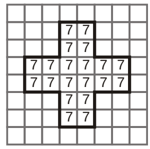
$= (34+1)$ sq. cm $= 35$ sq. cm

(f) The area of figure

$=$ No. of (7) square

$+$ No. of (3) square

$+\frac{1}{2} \times$ No. of (0) square



$= 20 + 0 + \frac{1}{2} \times 0$

$= 20$ sq. cm

Exercise 13.3

1. (a) The given, $l = 16$ cm, $b = 12$ cm

$\because$ the area of rectangle $= l \times b$

$\therefore$ the area of rectangle $= 16 \times 12 = 192\ \text{cm}^2$

(b) The given, $l = 11.2$ m, $b = 9$ m

$\therefore$ the area of rectangle $= l \times b = 11.2 \times 9 = 100.8\ \text{m}^2$

(c) The given, $l = 25$ cm, $b = 16$ cm

The area of rectangle $= l \times b = 25 \times 16 = 400\ \text{cm}^2$

2. $\because$ the area of a square $= (\text{side})^2$

(a) The area of a square $= (4.50)^2 = 20.25\ \text{m}^2$

(b) The given, side $= 25$ cm

$\therefore$ the area of a square $= (\text{side})^2 = (25)^2 = 625\ \text{cm}^2$

(c) The given, side $= 10\frac{1}{2}$ m $= 10.5$ m

$\therefore$ The area of a square $= (\text{side})^2 = (10.5)^2 = 110.25\ \text{m}^2$

3. (a) The given, $l = 20$ cm, $b = 15$ cm

$\therefore$ the area of a rectangle $= l \times b = 20 \times 15 = 300\ \text{cm}^2$

(b) The given, side $= 22$ cm

$\therefore$ the area of a square $= (\text{side})^2 = (22)^2 = 484\ \text{cm}^2$

So, rectangle has smaller area.

4. The length of a room $= 6$ m

$\therefore$ the area of square room $= (\text{length})^2 = (6\ \text{m})^2 = 36\ \text{m}^2$

$\therefore$ the cost of flooring a square room $=$ ` 150×36

$=$ ` 5400.

5. The given, side of a square $= 16$ cm

$\therefore$ the area of a square $= (16)^2 = 256\ \text{cm}^2$

If the area of rectangle is the same of the square.

$\therefore$ the breadth of a rectangle $= \dfrac{\text{The area of square}}{\text{length of rectangle}}$

$= \dfrac{256}{32} = 8$ cm

Hence, the breadth of a rectangle is 8 cm.

6. The length of rectangular plot = 400 m

The breadth of rectangular plot = 200 m

$\therefore$ the area of rectangular plot $= l \times b = 400 \times 200\ \text{m}^2 = 80000\ \text{m}^2$

$\therefore$ the cost of tiling a rectangular plot $=$ ₹ $\frac{12}{100} \times 80000 =$ ₹ $12 \times 800 =$ ₹ 9600.

7. The area of a room $= 300\ \text{m} \times 200\ \text{m} = 60000\ \text{m}^2$

$\because$ side of a square carpet = 180 m

$\therefore$ the area of a square carpet $= 180 \times 180\ \text{m}^2 = 32400\ \text{m}^2$

So, the area of floor which is not carpeted

$= 60000\ \text{m}^2 - 32400\ \text{m}^2 = 27600\ \text{m}^2$

8. The length of a rectangular park = 500 m

The breadth of a rectangular park = 300 m

$\therefore$ the area of a rectangular park $= 500 \times 300 = 150000\ \text{m}^2$

$\because$ side of a square = 50 m

$\therefore$ the area of one flower bed $= (50)^2\ \text{m}^2 = 2500\ \text{m}^2$

$\therefore$ the area of five flower bed $= 5 \times 2500\ \text{m}^2 = 12500\ \text{m}^2$

$\therefore$ the remaining area of the park

= Area of a rectangular park – Area of five flowerbed

$= 150000 - 12500 = 137500\ \text{m}^2$.

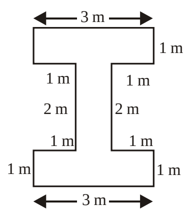
9. The area of a tile $= 20 \times 20\ \text{cm}^2 = 400\ \text{cm}^2$

The area of a square bathroom $= 300 \times 300\ \text{cm}^2 = 90000\ \text{cm}^2$

No. of tile $= \dfrac{\text{The area of a square bathroom}}{\text{The area of a tile}} = \dfrac{90000}{400} = 225$ tiles.

10. (a) The area of figure

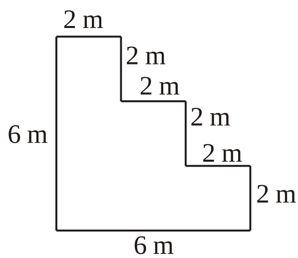
$= 2[3 \times 1] + 2 \times 1 = 6 + 2 = 8\ \text{m}^2$.



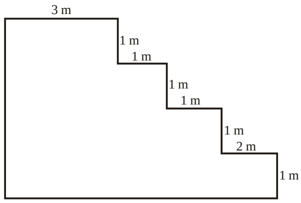
(b) The area of figure

$= [2 \times 2]\ \text{m}^2 + [4 \times 2]\ \text{m}^2 + [6 \times 2]\ \text{m}^2$

$= 4\ \text{m}^2 + 8\ \text{m}^2 + 12\ \text{m}^2 = 24\ \text{m}^2$.



(c) The area of figure



$$= 3 \times 1\text{m}^2 + 4 \times 1\text{m}^2 + 5 \times 1\text{m}^2 + 7 \times 1\text{m}^2$$
$$= 3 + 4 + 5 + 7 = 19\,\text{m}^2$$

Multiplce Choice Questions

Tick (3) the correct option :

1. (c), 2. (b), 3. (a), 4. (b), 5. (b), 6. (c), 7. (a)

14 Data Handling

Exercise 14.1

1. The required frequency distribution table is :

Marks	Tally Marks	Frequency
1	$\vert$	1
2	$\vert\vert\vert$	3
3	$\cancel{\vert\vert\vert\vert}$	5
4	$\cancel{\vert\vert\vert\vert}$ $\vert\vert\vert$	8
5	$\cancel{\vert\vert\vert\vert}$ $\vert$	6
6	$\vert\vert\vert\vert$	4
7	$\vert\vert$	2
8	$\vert$	1
	Total	30

(a) 13 students have scored 5 or more marks.
(b) 23 students have scored 5 or less marks.
(c) 4 marks is received by the maximum number of students.

2. Descending order = 5, 5, 5, 5, 5, 4, 4, 4, 4, 4, 4, 4, 4, 3, 3, 3, 3, 3, 2, 2, 2, 2, 2 , 2, 1, 1, 1, 0, 0, 0.
The maximum number of children in a family is 5.
The minimum number of children in a family is 1.
Number of families with no child is 3.

3. The required frequency distribution table is :

Number	Tally Marks	Frequency
1	$\cancel{\vert\vert\vert\vert}$ $\vert\vert$	7
2	$\cancel{\vert\vert\vert\vert}$ $\vert\vert$	7

<table>
<tr><td>3</td><td>卌 |||</td><td>8</td></tr>
<tr><td>4</td><td>卌</td><td>5</td></tr>
<tr><td>5</td><td>卌 卌</td><td>10</td></tr>
<tr><td>6</td><td>卌 |||</td><td>8</td></tr>
<tr><td></td><td>Total</td><td>45</td></tr>
</table>

(a) 5 number appeared maximum number of times.
(b) 4 number appeared minimum number of times.
(c) 8 times 6 had appeared.

4. The required frequency distribution table is :

<table>
<tr><th>Marks</th><th>Tally Marks</th><th>Frequency</th></tr>
<tr><td>1</td><td>||</td><td>2</td></tr>
<tr><td>2</td><td>|||</td><td>3</td></tr>
<tr><td>3</td><td>|||</td><td>3</td></tr>
<tr><td>4</td><td>卌 ||</td><td>7</td></tr>
<tr><td>5</td><td>卌 |</td><td>6</td></tr>
<tr><td>6</td><td>卌 ||</td><td>7</td></tr>
<tr><td>7</td><td>卌</td><td>5</td></tr>
<tr><td>8</td><td>||||</td><td>4</td></tr>
<tr><td>9</td><td>|||</td><td>3</td></tr>
<tr><td></td><td>Total</td><td>40</td></tr>
</table>

(a) 12 students obtained 7 or more marks.
(b) 8 students obtained less than 4 marks.

5. The required frequency distribution table is :

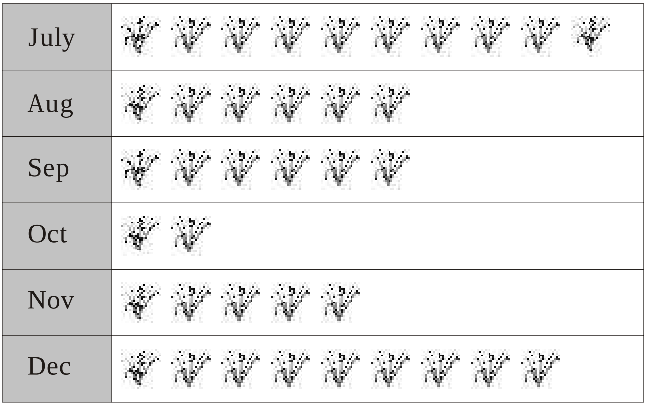
<table>
<tr><th>Expenses (`)</th><th>Tally Marks</th><th>Frequency</th></tr>
<tr><td>62</td><td>||</td><td>2</td></tr>
<tr><td>64</td><td>|||</td><td>3</td></tr>
<tr><td>66</td><td>|||</td><td>3</td></tr>
<tr><td>68</td><td>||</td><td>2</td></tr>
<tr><td>70</td><td>卌 |</td><td>6</td></tr>
<tr><td>72</td><td>||</td><td>2</td></tr>
<tr><td>74</td><td>||</td><td>2</td></tr>
<tr><td>76</td><td>||</td><td>2</td></tr>
<tr><td>78</td><td>|</td><td>1</td></tr>
<tr><td>80</td><td>||</td><td>2</td></tr>
<tr><td></td><td>Total</td><td>25</td></tr>
</table>

(a) ` 70 was spent by maximum number of students.
(b) ` 78 was spent by minimum number of students.

(c) 15 students spent ` 70 or more.

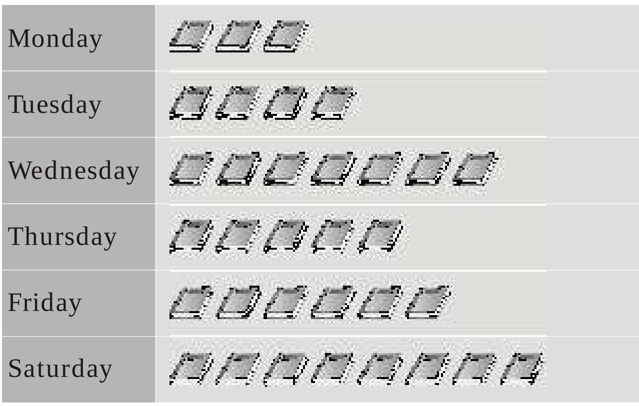
Exercise 14.2

1. We can express this information by a pictograph, as under :



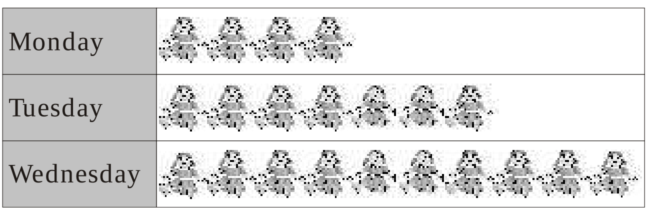
One  represents 5 kg of wheat.

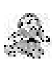
2. We can represent this information by a pictograph, as under :



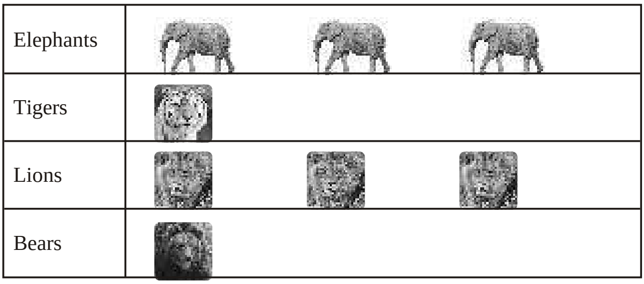
One  represents 3 books.

3. We can express this information by a pictograph, as under :



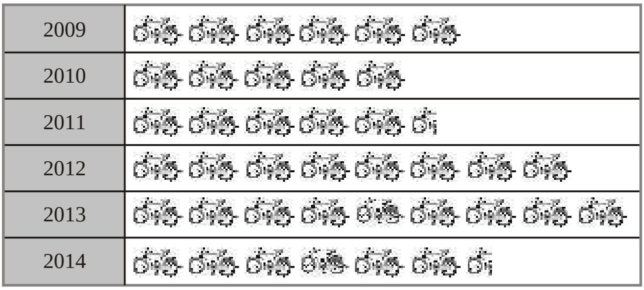
One  represents 50 dolls.

4. We can express this information by a pictograph, as under :



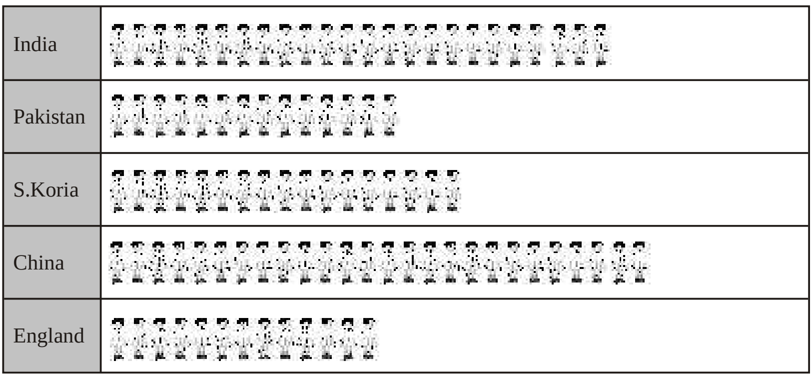
One picture of animals represents 5 animals.

5. We can Represent this information a pictograph, as under :



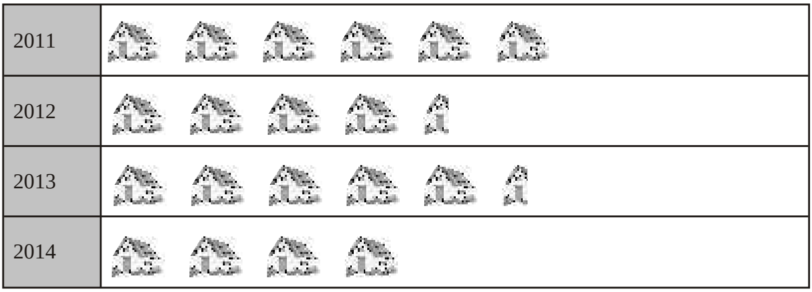
One  represents 5,000 bicycles.

6. We can express this information by a pictograph, as under :



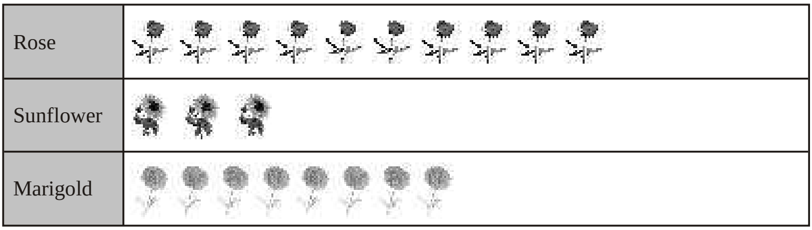
One  represents 5,00,00,000 people.

7. We can represent this information by a pictograph, as under ;



One  represents 500 houses.

8. We can represent this information by a pictograph, as under :



One  represents 25 flowers.

Exercise 14.3

1.

	Name of place	No. of tourists
1.	Kashmir	$10 \times 200 = 2000$
2.	Golden Temple	$9 \times 200 = 1800$
3.	Silliguri	$8 \times 200 = 1600$
4.	Taj Mahal	$12 \times 200 = 2400$

2. (a) 100 CFLs he sold altogether in 6 days.
(b First day he sold maximum number of CFLs.
(c) Two days (third and fourth day) he sold equal number of CFLs.
(d) 14 CFLs he sold on the sixth day.

3. (a) There are 450 apples trees in the orchard.
(b) Papaya trees are minimum.
(c) Orange trees are maximum.
(d) 250 trees are more than papaya trees.
(e) The total number of trees in the orchard is 1850.

4. (a) 3250 computers were produced in the factory during the year.
(b) The least production of computers was on June month.
(c) 200 less computers were produced on March than on January.
(d) Feb and July the production of computers was equal.

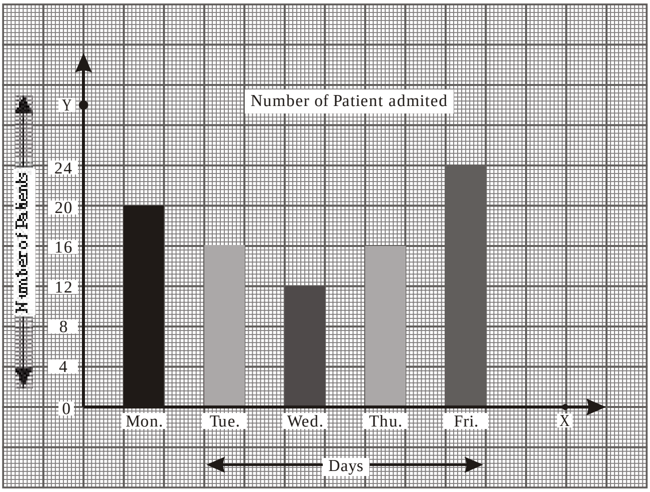
5. (a) There are 4-Guppy, 6-Algae eater 6-Angelfish, 8-Neon and 4-zebra fish in the aquarium together.

(b) There are 4 neons fishes more th;an guppes.
(c) There are 2 angle fishes more than zebra dish.
(d) The total number of fishes is 28 in the aquarium.

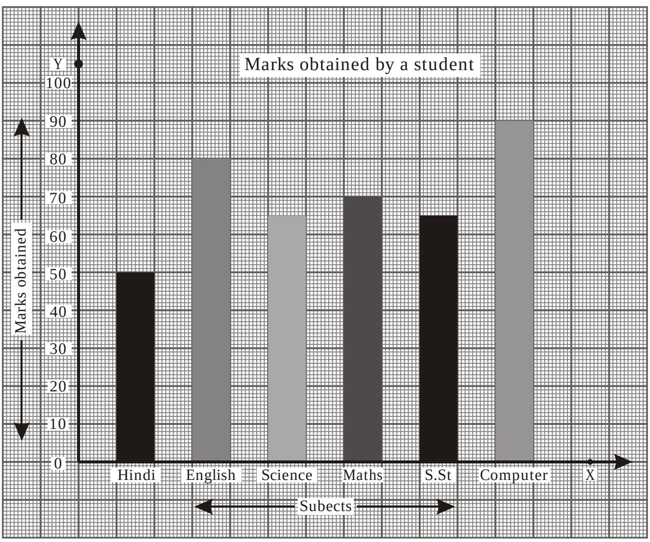
6. (a) Saturday, the phone seller sell the maximum number of mobile phone.
(b) 20 Android mobile phone were sold on Wednesday.
(c) In friday no mobile phone was sold.
(d) Sunday and Thursday, equal number of mobile phone were sold..
(e) 240 Android mobile were sold during the week.

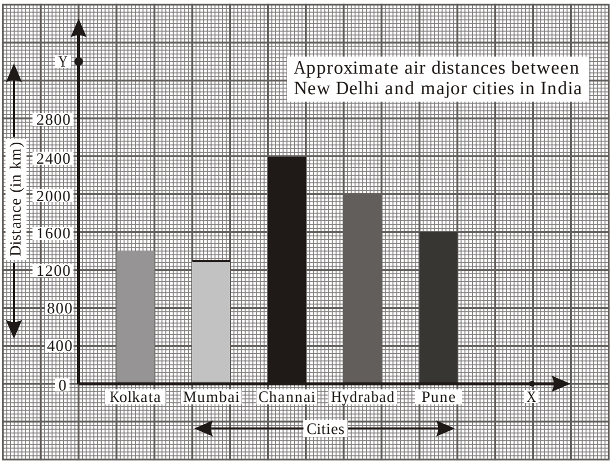
Exercise 14.4

1.



2.



3. 

4. (a) $(12+20+16+6+12+2)=68$ matches were played in all.

(b) In 12 matches, 4 goals were scored.

(c) In 12 matches, no goal was scored.

Multiplce Choice Questions

Tick (3) the correct questions :

1. (b), 2. (b), 3. (c), 4 (a), 5. (c), 6. (c), 7. (a), 8. (a), 9. (b).

1 Integers

Exercise 1.1

1. Arrange the following integers in ascending order.

(a) $-9<-7<-5<0<5<12$ (b) $-19<-3<0<5<9<15$

2. Write all the integers lying between :

(a) -5 and 4

The integers $-4, -3, -2, -1, 0, 1, 2, 3$ and 4 are in between -5 and 4.

(b) -13 and -4

The integers $-12, -11, -10, -9, -8, -7, -6$ and -5 are in between -13 and -4.

3. Replace $\boxed{}$ by >, < or = so that the statement is true.

(a) $-5\boxed{<}-3$ (b) $4\boxed{>}0$ (c) $-5\boxed{<}4$

(d) $-15\boxed{<}7$ (e) $-7\boxed{<}-11$ (f) $13\boxed{>}-25$

4. Write the absolute value of :

(a) The absolute value of -4 is $|-4|=4$.

(b) The absolute value of 0 is $|0|=0$.

(c) The absolute value of $+7$ is $|+7|=7$.

(d) The absolute value of -8 is $|-8|=8$.

5. Subtract :

(a) -7 from -8 $=-8-(-7)=-8+7=-1$

(b) 4 from $-15=-15-4=-19$

(c) -17 from $25=25-(-17)=25+17=42$ (d) 15 from $35=35-15=20$

6. Find the following sums :

(a) $(-4)+3+(-5)=-4+3-5=-9+3=-6$

(b) $5+(-2)+(-5)=5-2-5=5-7=-2$

(c) $16+(-4)+(-7)=16-4-7=16-11=5$

(d) $(-4)+(15)+(-12)=-4+15-12=-16+15=-1$

(e) $(-25)+(50)+20=-25+50+20=-25+70=45$

(f) $(40)+(-5)+(-20)=40-5-20=40-25=15$

7. Circle the greater integer and write its successor.

(a) $15, -12$ The successor of 15 is $15+1=16$.

(b) $-4, 7$ The successor of 7 is $7+1=8$.

(c) $-14, 25$ The successor of 25 is $25+1=26$.

(d) $-3, -9$ The successor of -3 is $-3+1=-2$.

(e) $-12, -5$ The successor of -5 is $-5+1=-4$.

(f) $0, -5$ The successor of 0 is $0+1=1$.

8. Circle the smaller integer and write its predecessor.

(a) $-4, -7$ The successor of -7 is $-7-1=-8$.

(b) $-2, -5$ The successor of -5 is $-5-1=-6$.

(c) $2, -3$ The successor of -3 is $-3-1=-4$.

(d) $-10, 15$ The successor of -10 is $-10-1=-11$
(e) $-5, 13$ The successor of -5 is $-5-1=-6$
(f) $-4, 2$ The successor of -4 is $-4-1=-5$.

9. Add the following integers without using number line.

(a) 23 and 56
$= 23+56=79$

(b) -23 and 50
$=-23+50=-27$

(c) -97 and -24
$=-97+(-24)$
$=-97-24=-121$

(d) -14 and -20
$=-14+(-20)$
$=-34$

(e) 40 and -20
$=-14-20$
$=40+(-20)$
$=40-20=20$

(f) -17 and 25
$=-17+25$
$=-8$

(g) 0 and -5
$=0+(-5)$
$=0-5$
$=-5$

(h) 17 and -17
$=17+(-17)$
$=17-17$
$=0$

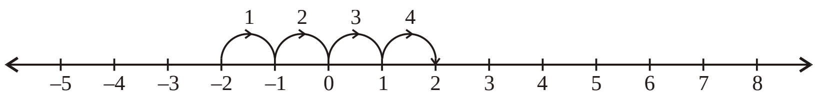
10. In three rounds of a quiz Reena secured -10, 5 and 25. Find her final score.

Reena secured $=-10, 5, 25$

$\therefore$ The final score of reena $=-10+5+25$
$=-10+30=20$

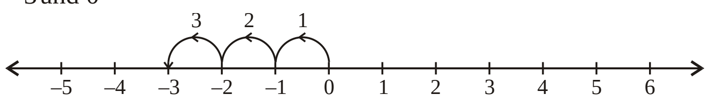
11. Add the following integers using number line.

(a) -2 and 4



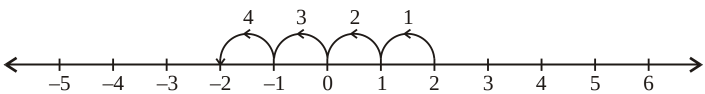
$(\therefore -2+4=2)$

(b) -3 and 0



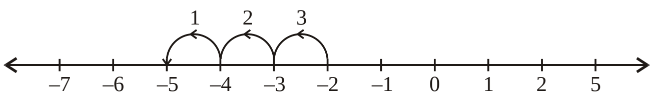
$(\therefore -3+0=-3)$

(c) 2 and -4



$(\therefore 2+(-4)=2-4=-2)$

(d) -5 and 3



$(\therefore -5+3=-2)$

12. Write 3 integers just preceding -4.

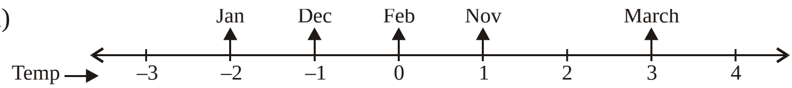
3 preceding $-4=3-(-4)=3+4=7$

13. Write 2 integers just preceding – 7.

2 preceding $-7 = 2-(-7) = 2+7 = 9$

14. The following table shows the temperature in degree celsius (°C) in Kashmir in various months :

(a)



(b) The hottest month is March and the coldest month is January.

(c) The hottest temperature = $3°C$

The oldest temperature = $-2°C$

So, difference = $3°C-(-2°C) = 3°C+2°C = 5°C$

(d) The temperature in month of November = $1°C$

The temperature in month of February = $0°C$

So, difference = $1°C-0°C = (1-0)°C = 1°C$

15. Fill in the blanks using >, < or = .

(a) $(-10)+(-14) < (-10)-(-14)$ (b) $(-31)+17-(29) < 25-8+(-29)$

(c) $23+40+(-51) > 23-51-40$

(d) $17+(-22)-(35) > 35+(-51)+(-36)$

16. At Leh, the temperature was $-6°C$ on Monday and then it dropped by 4°C on Tuesday. On Wednesday, it rose by 3°C. Again on Thursday it rose by 1°C. Find the temperature on Tuesday, Wednesday and Thursday.

At Leh,

The temperature on Monday = $-6°C$

The temperature on Tuesday = $-6°C-4°C = -10°C$

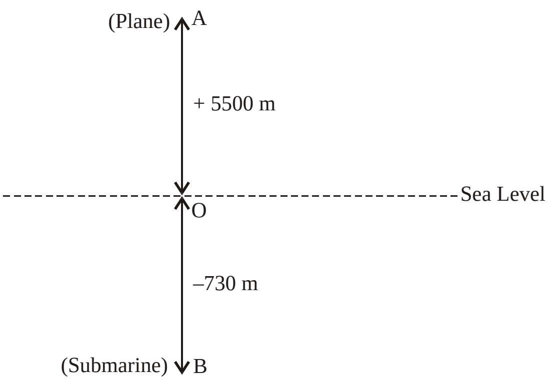
The temperature on Wednesday = $-10°C+3°C = -7°C$

The temperature on Thursday = $-7°C+1°C = -6°C$

17. A plane flying at the height of 5500 m above the sea level, exactly lies in a straight line with a submarine which is 730 m below the sea level. Calculate the vertical distance between them.

The height of a flying plane above sea level = 5500 m.

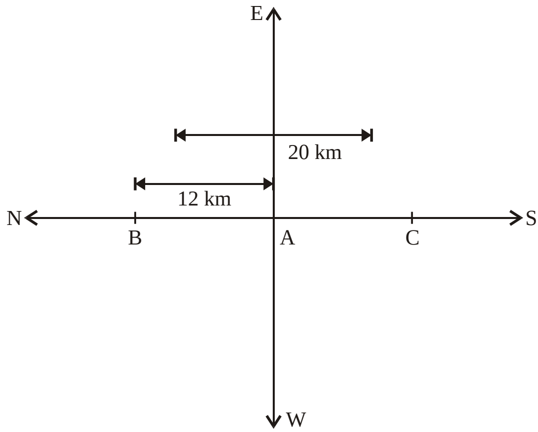
The depth of a submarine below sea level = 730.



So, the vertical distance between then

$$AB = |AO| + |BO| = |+5500| + |-730|\,\text{m}$$
$$= (5500 + 730)\,\text{m}$$
$$= 6{,}230\,\text{m}$$

18. Rohan goes 12 km north from a point A, then he travels 20 km south along the same road. If the distance towards north is represented by a positive integer then how will you represent the distance travelled towards south? What will be Rohan's final position represented as?



Rohan goes in North direction $= 12\,\text{km}$

Then, he travells in south direction $= 20\,\text{km}$

We will represent the distance travelled towards north positive and towards south negative.

So, the final position of Rohan from point $A = 12\,\text{km} - 20\,\text{km}$

$$= -8\,\text{km}.$$

Exercise 1.2

1. Add these integers :

(a) $86; +345 = 86 + 345 = 431$

(b) $-462\,; +169 = -462 + 169 = -293$

(c) $-198\,; 548 = -198 + 548 = 350$

(d) $516\,; +516 = 516 + 516 = 1032$

(e) $625; -626 = 625 + (-626) = 625 - 626 = -1$

(f) $-42; -36 = -42 + (-36) = -42 - 36 = -78$

(g) $-19\,; -272 = -19 + (-272) = -19 - 272 = -291$

(h) $-493\,; -642 = -493 + (-642) = -493 - 642 = -1135$

(i) $-888; -222 = -888 + (-222) = -888 - 222 = -1110$

(j) $0\,; -1000 = 0 + (-1000) = 0 - 1000 = -1000$

(k) $-5\,; -18\,; +64 = -5 + (-18) + 64 = -5 - 18 + 64 = -23 + 64 = 41$

(l) $-524\,; -4328\,; +524 = -524 + (-4328) + 524$

$$= -524 - 4328 + 524 = 0 - 4328 = -4328$$

2. Write the additive inverse of the following integers :

(a) 52 — The additive inverse of 52 is -52.

(b) -86 — The additive inverse of -86 is $+86$.

(c) -103 — The additive inverse of -103 is $+103$.

(d) -1 The additive inverse of -1 is $+1$.
(e) -23 The additive inverse of -23 is $+23$.

3. Write down (various answers are possible) :
(a) The sum of (-5) and (-3) is -8.
(b) The sum of $(+5)$ and (-8) is -3.
(c) The difference of $(+2)$ and (-2) is 4.
(d) The sum of $(+9)$ and (-5) is 4.
(e) The difference of (-7) and (-3) is -4.
(f) The sum of (-2) and (-3) is -5.

4. Fill in the blanks to make the following statements true. Also name the property used.
(a) $(-5)+(-4)=(-4)+(-5)$. (commutative property of addition)
(b) $4+0=4$ (property of additive identity)
(c) $-53+0=-53$ (Property of additive identity)
(d) $4+[(-5)+(7)]=[4+(7)]+(-5)$
(Associative property of addition)
(e) $25+[(-50)+5]=(25+5)+(-50)$
(Associative property of addition)
(f) $(-4)+0=-4$ (Property of additive identity)
(g) $4+(-4)=0$ (Property of additive inverse)
(h) $5+(-5)=0$. (Property of additive inverse)

5. Use >, < or = to make the following statements correct.
(a) $(-4)+(-5)\boxed{<}10+(-5)$
(b) $(-25)+(50)\boxed{=}50+(-25)$
(c) $75+(-100)\boxed{>}25+(-60)$
(d) $(48)+(120)\boxed{>}(-48)+(-120)$
(e) $-24+5+(-7)\boxed{<}36+(-52)$

6. Verify $a-(-b)=a+b$ for the following values of and b.

(a) $a=25, b=3$
$a-(-b)=a+b$
$25-(-3)=25+3$
$25+3=28$
$28=28$
L.H.S. = R.H.S. (verify)

(b) $a=50, b=75$
$a-(-b)=a+b$
$50-(-75)=50+75$
$50+75=125$
$125=125$
L.H.S. = R.H.S. (verify)

(c) $a=18, b=26$
$a-(-b)=a+b$
$18-(-26)=18+26$
$18+26=44$
$44=44$
L.H.S. = R.H.S. (verify)

(d) $a=100, b=200$
$a-(-b)=a+b$
$100-(-200)=100+200$
$100+200=300$
$300=300$
L.H.S. = R.H.S. (verify)

7. Find the value of :
(a) $|-5-8|=|-13|=13$
(b) $|-10+10|=|0|=0$
(c) $|5-9|=|-4|=4$
(d) $|0|-|-9|=0-9=-9$
(e) $|-4|+|19|=-4+19=15$

8. The sum of two integers is -20. If one of them is 65, find the other.
The sum of two integers $=-20$

One of the integer $= 65$

Then, other integer $= -20 - 65 = -86.$

9. The sum of two integers is 45. If one of them is 21, find the other.

The sum of two integers $= 45$

One of the integer $= 21$

Then, the other integer $= 45 - 21 = 24.$

10. Rehana had ` 2000 in her account in March 2018. She deposited ` 700 in the month of April 2018 and withdrew ` 1000 in the month of May 2018. Find her balance.

The balance in the account of Rehana is in the month of March = ` 2000

She deposited in April = ` 700

She withdraw in May = ` 1000

So, her balance in the month of May = ` 2000 + ` 700 – ` 1000

= ` (2000 + 700 – 1000)

= ` (2700 – 1000)

= ` 17000

11. Simplify :

(a) $(-41) + (-82) + 72$
$= -41 - 82 + 72$
$= -123 + 72 = -51$

(b) $59 + (-14) + (-73)$
$= 59 - 14 - 73$
$= 59 - 87 = -28$

(c) $382 + (-126) + (-464)$
$= 382 - 126 - 464$
$= 382 - 590 = -208$

(d) $(-623) + (235) + (745)$
$= -623 + 235 + 745$
$= -623 + 980 = 357$

(e) $(-441) + (-354) + (-205)$
$= -625 + 925 + 100 - 200$
$= 1025 - 825 = 200$

(f) $(-625) + 925 + 100 + (-200)$
$= -441 - 354 - 205$
$= -795 - 205 = -1000$

Exercise 1.3

1. Subtract :

(a) 16 from -22
$= -22 - 16$
$= -38$

(b) -31 from -67
$= -67 - (-31)$
$= -67 + 31 = -36$

(c) -15 from 40
$= 40 - (-15)$
$= 40 + 15 = 55$

(d) 65 from -98
$= -98 - 65$
$= -163$

(e) -410 from 560
$= 560 - (-410)$
$= 560 + 410 = 970$

(f) -650 from 1750
$= 1750 - (-650)$
$= 1750 + 650 = 2400$

(g) 0 from -90
$= -90 - 0$
$= -90$

(h) -1020 from 0
$= 0 - (-1020)$
$= 0 + 1020 = 1020$

2. Fill in the blanks :

(a) $-9 + (-5) = -14$

(b) $-27 + 27 = 0$

(c) To subtract 4 from an integer, we can add (-4) to it.
(d) $0+(-72)=-72$

3. The sum of two integers is -17. If one of them is -21, find the other.

The sum of two integers $=-17$
One of the integer $=-21$
Then, the other integer $=-17-(-21)=-17+21=4$

4. Subtract -3 from 11

$$=11-(-3)$$
$$=11+3=14$$

Subtract 11 from -3

$$=-3-11=-14$$

So, $11-(-3)\neq -3-11$.

5. Name the integer which is neither positive nor negative.
0 is the integer, which is neither positive nor negative.
6. Subtract 24 from the sum of -18 and 26.

$$=[(-18)+26]-24$$
$$=[-18+26]-24$$
$$=8-24=-16$$

7. Subtract the sum of -7 and -17 from the sum of -36 and 42.

$$=[(-36)+42]-[(-7)+(-17)]$$
$$=[-36+42]-[-7-17]$$
$$=6-(-24)$$
$$=6+24=30$$

8. Insert the symbols $>, =$ or $<$ to make these statements true :

(a) $-5+(5)=8+(-8)$
(b) $-30+(-70)<30+70$
(c) $-48+78>-305+180$
(d) $-15+(-15)<-15-(-15)$
(e) $-11+(-9)<(-11)-(-9)$

Exercise 1.4

1. Multiply the following :

(a) 12 and $7=12\times 7=84$
(b) -8 and $8=-8\times 8=-64$
(c) 9 and $-11=9\times -11=-99$
(d) -6 and $-5=(-6)\times(-5)=-30$
(e) 0 and $-45=0\times(-45)=0$
(f) 3 and $-7=3\times(-7)=-21$

2. Find each of the following products :

(a) $2\times 3\times(-8)=6\times(-8)=-48$
(b) $(-5)\times 7\times(-4)=-35\times(-4)=+140$
(c) $(-6)\times(-7)\times(-9)=+42\times(-9)=-378$
(d) $(-11)\times(21)\times 0\times 0\times(-34)=-231\times 0\times(-34)=0$
(e) $(-2)\times(-5)\times(-4)\times(-10)=(+10)\times(+40)=400$
(f) $2\times(-4)\times(-5)\times(-6)=-8\times(+30)=-240$

3. Divide the following :

(a) 75 by $-5=75\div(-5)=\dfrac{-75}{5}=-15$

(b) $-36 \text{ by } -12 = -36 \div (-12) = \dfrac{-36}{-12} = +3$

(c) $34 \text{ by } -17 = 34 \div (-17) = \dfrac{34}{-17} = -2$

(d) $0 \text{ by } -98 = 0 \div (-98) = \dfrac{0}{-98} = 0$

4. Fill in the blanks :

(a) $45 \div (-9) = -5$ (b) $-60 \div (-12) = 5$ (c) $23 \div (-23) = -1$

(d) $-11 \div (-11) = 1$ (e) $-76 \div (-2) = 38$ (f) $45 \div 1 = 45$

5. State true or false for each of the following :

(a) $0 \div 7 = 0$ (True)

(b) $(-18) \div 0 = 0$ (False)

(c) $0 \div 0 = 0$ (False)

(d) $(-10) \div (-2) = 5$ (True)

6. Simplify using suitable properties of multiplication of integers :

(a) $(-3) \times 5 + (-3) \times 3$
$= (-3) \times [5 + 3]$
$= (-3) \times 8 = -24$

(b) $7 \times (-13) + 7 \times (-10)$
$= 7 \times [-13 + (-10)]$
$= 7 \times [-13 - 10]$
$= 7 \times (-23) = -161$

(c) $10 \times (-4) + 5 \times (-4)$
$= (-4) \times [10 + 5]$
$= (-4) \times 15 = -60$

(d) $(-12) \times (-7) + (-12) \times (-3)$
$= (-12) \times [(-7) + (-3)]$
$= (-12) \times [-7 - 3]$
$= (-12) \times (-10) = 120$

7. The company makes a profit on product A = ` 52 per unit.
The company makes a loss on product B = ` 10 per unit
Number of units sell of product A = 3600
Number of units sell of product B = 4,000
So, Profit on product A = ` $52 \times 3600$ = ` 1,87,200.
And, loss on product B = ` $10 \times 4{,}000$ = ` 40,000
$\because$ 1,87,200 > 40,000
$\therefore$ company makes a profit.
Total profit = 1,87,200 – 40,000 = 1,47,200
Hence, the company makes a profit of ` 1,47,200.

Exercise 1.5

1. Simplify each of the following :

(a) $-25 + 12 \div (9 - 3)$
$= -25 + 12 \div 6$
$= -25 + 2$
$= -23$

(b) $29 - [38 - \{40 \div 2 - (6 - 9 \div 3) \div 3\}]$
$= 29 - [38 - \{20 - (6 - 3) \div 3\}]$
$= 29 - [38 \{20 - 3 \div 3\}]$

$$= 29-[38-\{20-1\}]$$
$$= 29-[38-19]$$
$$= 29-19 = 10$$

(c) $14-\frac{1}{2}\{13+2-(7+5-\overline{2+3})\}$

$$= 14-\frac{1}{2}\{15-(12-5)\}$$
$$= 14-\frac{1}{2}\{15-7\}$$
$$= 14-\frac{1}{4}\times\{8\} = 14-4 = 10$$

(d) $14+\frac{1}{5}[\{-10\times(25-\overline{13-3})\}\div(-5)]$

$$= 14+\frac{1}{5}[\{-10\times(25-10)\}\div(-5)]$$
$$= 14+\frac{1}{5}[\{-10\times15\}\div(-5)]$$
$$= 14+\frac{1}{5}[\{-150\}\div(-5)]$$
$$= 14+\frac{1}{5}[-150\div(-5)]$$
$$= 14+\frac{1}{5}[+30]$$
$$= 14+6 = 20$$

(e) $27-\frac{1}{4}\{-5-(-48)\div(-16)\}$

$$= 27-\frac{1}{4}\{-5-(-48)\div(-16)\}$$
$$= 27-\frac{1}{4}\{-5-(+3)\}$$
$$= 27-\frac{1}{4}\{-5-3\}$$
$$= 27-\frac{1}{4}\{-8\}$$
$$= 27+\frac{8}{4} = 27+2 = 29$$

(f) $-5-(-48)\div12+(-2)\times6$

$$= -5+48\div12-2\times6$$
$$= -5+4-2\times6$$
$$= -5+4-12$$
$$= -17+4$$
$$= -13$$

(g) $140-12\times[3-4\{2\times3-2\times(-8)\}]$

$$=140-12\times[3-4\{6+16\}]$$
$$=140-12\times[3-4\times22]$$
$$=140-12\times[3-88]$$
$$=140-12\times(-85)$$
$$=140+1020$$
$$=1160$$

(h) $120-\frac{1}{17}[3-4\{2\times3-2\times(-8)\}]$

$$=120-\frac{1}{17}[3-4\{6+16\}]$$
$$=120-\frac{1}{17}[3-4\times\{22\}]$$
$$=120-\frac{1}{17}[3-88]$$
$$=120-\frac{1}{17}\times(-85)$$
$$=120+\frac{85}{17}=120+5=125$$

2. Which one is greater in the following :

(a) $7+6\times(-4)$ or $-8+(-2)\times(-8)(-1)$

$$=7+(-24)=-8-2\times(+8)$$
$$=7-24=-8-16$$
$$=-17=-24$$

$\because$ $(-17>-24)$

$\therefore$ $[7+6\times(-4)]>[-8+(-2)\times(-8)(-1)]$

(b) $(-4)\times(-22)\times4\times(-3)$ or $(-2)\times(-1)\times(-1)\times(-2)$

$$=+88\times(-12)=(+2)\times(+2)$$
$$=-1056=+4$$

$\because$ $(-1056<4)$

$\therefore$ $[(-4)\times(-22)\times4\times(-3)<[-(-2)\times(-1)\times(-1)\times(-2)]$

(c) $(-9)\times(2)\div(-2)\times(7)$ or $(9)\times(-2)\div(2)\times7$

$$=(-9)\times(-1)\times(7)=(9)\times(-1)\times7$$
$$=(+9)\times(7)=(-9)\times7$$
$$=63=-63$$

$\because$ $(63>-63)$

$\therefore$ $[(-9)\times(2)\div(-2)\times(7)]>[(9)\times(-2)\div(2)\times7]$

Multiple Choice Questions

Mark (3) the correct answer in each of the following :

1. (c), 2. (a), 3. (b), 4. (c), 5. (c), 6. (a), 7. (a), 8. (c), 9. (a), 10. (b), 11. (c), 12. (a), 13. (d), 14. (b)

Exercise 2.1

1. (a) $\frac{12}{5} = 2\frac{2}{5}$ (b) $\frac{23}{6} = 3\frac{5}{6}$ (c) $\frac{55}{12} = 4\frac{7}{12}$ (d) $\frac{67}{15} = 4\frac{7}{15}$
2. (a) $1\frac{1}{3} = \frac{4}{3}$ (b) $2\frac{3}{5} = \frac{13}{5}$ (c) $3\frac{1}{9} = \frac{28}{9}$ (d) $3\frac{5}{14} = \frac{47}{14}$
3. $\frac{1}{5}, \frac{1}{20}, \frac{1}{2}$ and $\frac{1}{7}$ are unit fractions.
4. (a) and (c) are the pair of like fractions.
5. (a) ascending order $= \frac{1}{11} < \frac{3}{11} < \frac{6}{11} < \frac{9}{11}$

   (b) convert first into improper fractions

   $$1\frac{1}{2} = \frac{3}{2}, 2\frac{1}{4} = \frac{9}{4}, 1\frac{2}{5} = \frac{7}{5}$$

   The fraction is $\frac{3}{2}, \frac{9}{4}$ and $\frac{7}{5}$.

   So, denominator of the fractions are 2, 4 and 5

   LCM of 2, 4 and $5 = 20$

   we convert each one of the given fractions into an equivalent fraction with denominator 20.

   $$\frac{3}{2} = \frac{3\times 10}{2\times 10} = \frac{30}{20}, \frac{9}{4} = \frac{9\times 5}{4\times 5} = \frac{45}{20}, \frac{7}{5} = \frac{7\times 4}{5\times 4} = \frac{28}{20}$$

   Clearly, $\frac{28}{20} < \frac{30}{20} < \frac{45}{20}$

   $\therefore$ $$\frac{7}{5} < \frac{3}{2} < \frac{9}{4}$$

   or $$1\frac{2}{5} < 1\frac{1}{2} < 2\frac{1}{4}$$
6. (a) Descendng order $= \frac{11}{7} > \frac{5}{7} > \frac{3}{7} > \frac{1}{7}$

   (b) Convert first into improper fraction

   $1\frac{1}{3} = \frac{4}{3}, 2\frac{5}{6} = \frac{17}{6}, 1\frac{7}{12} = \frac{19}{12}, \frac{7}{18}$

   The fractions is $\frac{4}{3}, \frac{17}{6}, \frac{19}{12}$ and $\frac{7}{18}$

   So, denominator of the fraction are 3, 6, 12 and 18.

   LCM of 3, 6, 12 and $18 = 36$

   We convert each one of the given fractions into an equivalent fraction with denominator 36

$$\frac{4}{3}=\frac{4\times12}{3\times12}=\frac{48}{36},\ \frac{17}{6}=\frac{17\times6}{6\times6}=\frac{102}{36}$$

$$\frac{19}{12}=\frac{19\times3}{12\times3}=\frac{57}{36},\ \frac{7}{18}=\frac{7\times2}{18\times2}=\frac{14}{36}$$

Clearly, $\frac{102}{36}>\frac{57}{36}>\frac{48}{36}>\frac{14}{36}$

So, $\frac{17}{6}>\frac{19}{12}>\frac{4}{3}>\frac{7}{18}$

or, $2\frac{5}{6}>1\frac{7}{12}>1\frac{1}{3}>\frac{7}{18}$

7. (a) $\frac{1}{9}+\frac{2}{9}$

$=\frac{1+2}{9}$

$=\frac{3}{9}=\frac{1}{3}$

(b) $\frac{6}{13}+\frac{7}{13}$

$=\frac{6+7}{13}$

$=\frac{13}{13}=1$

(c) $\frac{3}{7}+\frac{5}{28}$

$=\frac{3\times4+5}{28}$

$=\frac{12+5}{28}$

$=\frac{17}{28}$

(d) $\frac{13}{25}+\frac{9}{5}$

$=\frac{13+9\times5}{25}$

$=\frac{13+45}{25}$

$=\frac{58}{25}=2\frac{8}{25}$

8. (a) $\frac{3}{8}-\frac{1}{8}$

$=\frac{3-1}{8}$

$=\frac{2}{8}=\frac{1}{4}$

(b) $\frac{7}{12}-\frac{3}{12}$

$=\frac{7-3}{12}$

$=\frac{4}{12}=\frac{1}{3}$

(c) $\frac{47}{11}-\frac{25}{11}$

$=\frac{47-25}{11}$

$=\frac{22}{11}=2$

(d) $7\frac{1}{6}-2\frac{3}{42}$

$=\frac{43}{6}-\frac{87}{42}$

$=\frac{43\times7-87}{42}$

$=\frac{301-87}{42}=\frac{214}{42}=5\frac{2}{21}$

Exercise 2.2

1. (a) $\frac{22}{3}$ (b) $\frac{1}{5}$ (c) $\frac{13}{2}$

(d) $\frac{3}{17}$ (e) 1 (d) $\frac{3}{16}$

2. (a) $\frac{1}{5}$ (b) $\frac{1}{11}$ (c) $\frac{1}{24}$ (d) $\frac{12}{5}$

(e) 14 (f) $\frac{7}{3}$ (g) $\frac{7}{20}$ (h) $\frac{23}{18}$

(i) $\frac{7}{39}$ (j) $\frac{11}{42}$

3. (a) $\frac{3}{4}\times 24 = 3\times 6 = 18$

(b) $\frac{1}{5}\times\frac{18}{5}=\frac{18}{25}$

(c) $\frac{1}{2}\times\frac{19}{2}=\frac{19}{4}$

(d) $\frac{1}{10}\times 360\text{ kg} = 36\text{ kg}$

(e) $\frac{2}{5}\times\frac{15}{4}=\frac{3}{2}\text{ kg}$

(f) $\frac{4}{5}\times$ ` 2 = ` $\frac{8}{5}$ = ` $1\frac{3}{5}$

(g) $2\frac{1}{3}\times 18\text{ m}$

$=\frac{7}{3}\times 18\text{ m}$

$=7\times 6\text{ m}$

$=42\text{ m}$

(h) $1\frac{2}{3}\times 3600\text{ m}$

$=\frac{5}{3}\times 3600\text{ m}$

$=5\times 1200\text{ m}$

$=6000\text{ m}$

(i) $3\frac{1}{5}\times 250\text{ min} = \frac{16}{5}\times 250\text{ min}$

$= 16\times 50\text{ min} = 800\text{ min}$

Exercise 2.3

1. (a) $\frac{3}{4}\times\frac{16}{9}$

$=\frac{4}{3}=1\frac{1}{3}$

(b) $\frac{2}{3}\times 3\frac{1}{4}=\frac{2}{3}\times\frac{13}{4}$

$=\frac{2\times 13}{3\times 4}=\frac{13}{6}=2\frac{1}{6}$

(c) $\frac{9}{28}\times 4\frac{1}{3}$

$=\frac{9}{28}\times\frac{13}{3}$

$=\frac{3}{28}\times 13=\frac{39}{28}=1\frac{11}{28}$

(d) $\frac{5}{6}\times\frac{36}{25}\times\frac{2}{3}$

$=\frac{6}{5}\times\frac{2}{3}$

$=\frac{2\times 2}{5}=\frac{4}{5}$

(e) $2\frac{2}{3}\times 3\frac{3}{4}$

$=\frac{8}{3}\times\frac{15}{4}$

$=2\times 5$

$=10$

(f) $1\frac{1}{2}\times 1\frac{1}{3}\times 1\frac{1}{4}$

$=\frac{3}{2}\times\frac{4}{3}\times\frac{5}{4}$

$=\frac{5}{2}$

$=2\frac{1}{2}$

(g) $3\frac{1}{3}\times 2\frac{2}{5}\times 1\frac{1}{7}$

$=\frac{10}{3}\times\frac{12}{5}\times\frac{8}{7}$

$=2\times 4\times\frac{8}{7}$

$=\frac{64}{7}=9\frac{1}{7}$

(h) $22\frac{2}{3}\times 3\frac{1}{7}$

$=\frac{68}{3}\times\frac{22}{7}$

$=\frac{1496}{21}$

$=71\frac{5}{21}$

(i) $3\frac{1}{2}\times 2\frac{1}{5}\times\frac{25}{35}$

$=\frac{7}{2}\times\frac{11}{5}\times\frac{25}{35}$

$=\frac{7\times 11\times 5}{70}$

$=\frac{11\times 5}{10}$

$=\frac{11}{2}=5\frac{1}{2}$

(j) $40\frac{5}{8}\times 2\frac{2}{5}$

$=\frac{325}{8}\times\frac{12}{5}$

$=\frac{65}{2}\times 3$

$=\frac{195}{2}$

$=97\frac{1}{2}$

(k) $5\frac{5}{6}\times 2\frac{1}{7}$

$=\frac{35}{6}\times\frac{15}{7}$

$=\frac{5}{2}\times 5=\frac{25}{2}=12\frac{1}{2}$

(l) $18\frac{2}{3}\times 3\frac{3}{8}$

$=\frac{56}{3}\times\frac{27}{8}$

$=7\times 9=63$

2. (a) $\frac{2}{3}\times\left[\frac{3}{4}+\frac{2}{3}+\frac{5}{2}\right]=\frac{2}{3}\times\left[\frac{3\times 3+2\times 4+5\times 6}{12}\right]$

$=\frac{2}{3}\times\left[\frac{9+\ 8+30}{12}\right]$

$=\frac{2}{3}\times\frac{47}{12}=\frac{47}{18}=2\frac{11}{18}$

(b) $\left[\frac{7}{9}-\frac{5}{27}\right]\times\left[\frac{1}{3}-\frac{5}{18}\right]=\left[\frac{7\times 3-5}{27}\right]\times\left[\frac{6-5}{18}\right]$

$=\left[\frac{21-5}{27}\right]\times\left[\frac{1}{18}\right]$

$=\frac{16}{27}\times\frac{1}{18}$

$=\frac{8}{27\times 9}=\frac{8}{243}$

(c) $\left(11\frac{1}{4}\times 3\frac{1}{5}\right)+\left(4\frac{2}{3}\times 5\frac{6}{7}\right)=\left(\frac{45}{4}\times\frac{16}{5}\right)+\left(\frac{14}{3}\times\frac{41}{7}\right)$

$$= 9 \times 4 + \left(2 \times \frac{41}{3}\right)$$

$$= 36 + \frac{82}{3}$$

$$= \frac{36 \times 3 + 82}{3}$$

$$= \frac{108 + 82}{3}$$

$$= \frac{190}{3} = 63\frac{1}{3}$$

(d) $$\left(6\frac{2}{5} \times \frac{25}{8}\right) - \left(\frac{4}{3} \times 1\frac{1}{8}\right) = \left(\frac{32}{5} \times \frac{25}{8}\right) - \left(\frac{4}{3} \times \frac{9}{8}\right)$$

$$= (4 \times 5) - \left(\frac{3}{2}\right)$$

$$= 20 - \frac{3}{2}$$

$$= \frac{40 - 3}{2} = \frac{37}{2} = 18\frac{1}{2}$$

(e) $$\left(3\frac{1}{4} \times \frac{12}{39}\right) - \left(\frac{2}{3} - \frac{3}{7}\right) = \left(\frac{13}{4} \times \frac{12}{39}\right) - \left(\frac{2 \times 7 - 3 \times 3}{21}\right)$$

$$= 1 - \left(\frac{14 - 9}{21}\right) = \left(\frac{21 - 5}{21}\right) = \frac{16}{21}$$

(f) $$\left(\frac{3}{11} + \frac{5}{22}\right) \times \left(\frac{14}{9} + \frac{5}{6}\right) = \left(\frac{3 \times 2 + 5}{22}\right) \times \left(\frac{14 \times 2 + 5 \times 3}{18}\right)$$

$$= \left(\frac{6+5}{22}\right) \times \left(\frac{28+15}{18}\right)$$

$$= \frac{11}{22} \times \frac{43}{18}$$

$$= \frac{11 \times 43}{22 \times 18} = \frac{43}{36} = 1\frac{7}{36}$$

Exercise 2.4

1. The side of a square $= 16\frac{3}{4}$ m $= \frac{67}{4}$ m

$\therefore$ the area of square $= (\text{side})^2$

$$= \frac{67}{4} \times \frac{67}{4} \text{ m}^2$$

$$= \frac{4489}{16} \text{ m}^2$$

$= 280\frac{9}{16}\ \text{m}^2.$

The perimeter of square $= 4 \times \text{side}$

$= 4 \times \frac{67}{4}\ \text{m} = 67\ \text{m}.$

2. The cost of 1 m cloth = ` $44\frac{4}{5}$

= ` $\frac{224}{5}$

the cost of $3\frac{3}{4}$ m of cloth = ` $\frac{224}{5} \times \frac{15}{4}$

= ` 56×3

= ` 168.

3. Total number of students $= 50$

No of girls $= 50 \times \frac{3}{5}$

$= 10 \times 3 = 30$

$\therefore$ No of boys = Total number of students – No of girls

$= 50 - 30$

$= 20$ boys

Hence, there are 20 boys in the class.

4. The weight of one bag of cement $= 15\frac{2}{3}$ kg

$= \frac{47}{3}$ kg

$\therefore$ the weight of $22\frac{4}{7}$ bag of cement

$= \frac{47}{3} \times \frac{158}{7}$ kg

$= \frac{7426}{21}$ kg

$= 353\frac{13}{21}$ kg.

5. The duration of one period $= \frac{2}{3}$ hour

$\therefore$ The duration of 9 period $= 9 \times \frac{2}{3}$ hours

$= 3 \times 2$ hours

$= 6$ hours.

6. A bucket can hold of water $= 25\frac{3}{4}\ l$

$\therefore \quad 2\frac{2}{3}$ of bucket will hold of water $= 25\frac{3}{4} \times 2\frac{2}{3}$

$$= \frac{103}{4} \times \frac{8}{3} l$$

$$= \frac{103 \times 2}{3} l = \frac{206}{3} l = 68\frac{2}{3} l.$$

7. In 1 hour, Amar walked $= 5\frac{1}{3}$

$\therefore$ In $2\frac{1}{4}$ hour, Amar walked $= \frac{16}{3} \times \frac{9}{4}$ km

$$= 4 \times 3 \text{ km}$$

$$= 12 \text{ km.}$$

8. The length of each piece $= 6\frac{3}{4}$ m $= \frac{27}{4}$ m

$\therefore$ the original length of the iron rod $= 8 \times \frac{27}{4}$m

$$= 2 \times 27 \text{ m}$$

$$= 54 \text{ m.}$$

9. The length of a rectangular field $= 16\frac{1}{2}$ m $= \frac{33}{2}$ m

The breadth of a recntangular field $= 12\frac{3}{4}$ m $= \frac{51}{4}$ m

The perimeter of a rectangular filed $= 2(l + b)$

$$= 2\left(\frac{33}{2} + \frac{51}{4}\right)$$

$$= 2 \times \left(\frac{33 \times 2 + 51}{4}\right)$$

$$= \frac{66 + 51}{2} = \frac{117}{2} = 58\frac{1}{2} \text{ m.}$$

10. The given,

length in rectangular park $= 36\frac{3}{5}$ m $= \frac{183}{5}$ m

breadth in rectangular park $= 16\frac{2}{3}$ m $= \frac{50}{3}$ m

$\therefore$ the area of the rectangular park $= l \times b$

$$= \frac{183}{5} \times \frac{50}{3} \text{ m}^2$$

$$= 61 \times 10 \text{ m}^2$$

$$= 610 \text{ m}^2.$$

Exercise 2.5

1. $6 \div \frac{9}{5} = 6 \times \frac{5}{9}$

$= \frac{2 \times 5}{3}$

$= \frac{10}{3} = 3\frac{1}{3}$

2. $\frac{6}{11} \div 15 = \frac{6}{11} \times \frac{1}{15}$

$= \frac{2}{11 \times 5}$

$= \frac{2}{55}$

3. $6\frac{4}{5} \div \frac{7}{35} = \frac{34}{5} \times \frac{35}{7}$

$= \frac{34 \times 5}{5} = 34$

4. $\frac{8}{27} \div \frac{16}{9} = \frac{8}{27} \times \frac{9}{16}$

$= \frac{1}{3 \times 2} = \frac{1}{6}$

5. $\frac{9}{35} \div \frac{1}{7} = \frac{9}{35} \times \frac{7}{2}$

$= \frac{9}{5} = 1\frac{4}{5} = 4\frac{1}{7}$

6. $36\frac{1}{4} \div 8\frac{3}{4} = \frac{145}{4} \times \frac{4}{35}$

$= \frac{145}{35} = \frac{29}{7}$

7. $\left(5\frac{1}{4} \times \frac{16}{7}\right) \div \frac{2}{3}$

$= \left(\frac{21}{4} \times \frac{16}{7}\right) \div \frac{2}{3}$

$= (3 \times 4) \times \frac{3}{2}$

$= 3 \times 3 \times 2 = 18$

8. $\left(18\frac{2}{9} \div 9\frac{1}{9}\right) \div 1\frac{1}{3}$

$= \left(\frac{164}{9} \div \frac{82}{9}\right) \div \frac{4}{3}$

$= \left(\frac{164}{9} \times \frac{9}{82}\right) \times \frac{3}{4}$

$= 2 \times \frac{3}{4} = \frac{3}{2} = 1\frac{1}{2}$

9. $\left(2\frac{1}{7} \times 2\frac{4}{5}\right) \div \frac{1}{10}$

$= \left(\frac{15}{7} \times \frac{14}{5}\right) \times 10$

$= (3 \times 2) \times 10 = 6 \times 10 = 60$

10. $\left[\frac{2}{7} \div \frac{40}{21}\right] \times \left[\frac{3}{10} \div \frac{9}{20}\right]$

$= \left[\frac{2}{7} \times \frac{21}{40}\right] \times \left[\frac{3}{10} \times \frac{20}{9}\right]$

$= \frac{3}{20} \times \frac{2}{3} = \frac{2}{20} = \frac{1}{10}$

Exercise 2.6

1. The total length of a rope $= 58\frac{13}{20}$ m

If 17 ropes of equal length are cut from a rope.

Then, the length of each piece $= \left(58\frac{13}{20} \div 17\right)$ m

$= \frac{1173}{20} \times \frac{1}{17}$

$= \frac{69}{20} = 3\frac{9}{20}$ m

Hence, $3\frac{9}{20}$ m is the length of each piece.

2. Total capacity of a tank $= 28\frac{1}{8}\,l$

the capacity of a jar $= 2\frac{1}{4}\,l$

$\therefore$ Total number of jar $= 28\frac{1}{8} \div 2\frac{1}{4}$

$$= \frac{225}{8} \times \frac{4}{9}$$

$$= \frac{25}{2} = 12\frac{1}{2}$$

Hence, the number of jars is $12\frac{1}{2}$

3. In $9\frac{1}{2}$ hours, Deepak covered distance $= 432\frac{1}{4}$ km

(a) In 1 hour, Deepak covered $= \left(432\frac{1}{4} \div 9\frac{1}{2}\right)$ km

$\therefore$ In $6\frac{1}{2}$ hours, Deepak covered $= \left(432\frac{1}{4} \div 9\frac{1}{2}\right) \times 6\frac{1}{2}$ km

$$= \left(\frac{1729}{4} \div \frac{19}{2}\right) \times \frac{13}{2} \text{ km}$$

$$= \frac{1729 \times 2 \times 13}{4 \times 19 \times 2} \text{ km}$$

$$= \frac{91 \times 13}{4} \text{ km} = \frac{1183}{4} \text{ km}$$

$$= 295\frac{3}{4} \text{ km.}$$

(b) time taken by Deepak $= 256\frac{31}{50} \div \left(432\frac{1}{4} \div 9\frac{1}{2}\right)$

$$= \frac{12831}{50} \div \left(\frac{1729}{4} \div \frac{19}{2}\right)$$

$$= \frac{129831}{50} \times \frac{4 \times 19}{1729 \times 2}$$

$$= \frac{12831 \times 2}{50 \times 91} = \frac{141}{25} = 5\frac{16}{25} \text{ h}$$

4. The product of two numbers $= 15\frac{5}{6} = \frac{95}{6}$

One of the number $= 6\frac{1}{3} = \frac{19}{3}$

$$\begin{aligned}\text{the other number} &= \text{The product of two number} \\ &\div \text{One of the number} \\ &= \frac{95}{6} \div \frac{19}{3} \\ &= \frac{95}{6} \times \frac{3}{19} = \frac{5}{2} = 2\frac{1}{2}\end{aligned}$$

Hence, the othere number is $2\frac{1}{2}$.

5. Let, the required number be x

Then, according to the quations

$$\begin{aligned}x \times 9\frac{4}{5} &= 42 \\ x \times \frac{49}{5} &= 42 \\ x &= \frac{42 \times 5}{49} \\ x &= \frac{6 \times 5}{7} \\ x &= \frac{30}{7} = 4\frac{2}{7}\end{aligned}$$

Hence, the number is $4\frac{2}{7}$.

6.

$$\begin{aligned}\text{The total contribution} &= \text{\`{}}\ 676\frac{1}{2} \\ \text{Each student contribution} &= \text{\`{}}\ 61\frac{1}{2} \\ \therefore \quad \text{No of student} &= \frac{\text{total contribution}}{\text{Each student contribution}} \\ &= \frac{\text{\`{}}\ 676\frac{1}{2}}{\text{\`{}}\ 61\frac{1}{2}} \\ &= \frac{\frac{1353}{2}}{\frac{123}{2}} \\ &= 11 \text{ students}\end{aligned}$$

Hence, there are 11 students in the group.

7. A bought $18\frac{1}{2}$ m or $\frac{37}{2}$ m of cloth

$= \text{`}\ 245\frac{1}{8}$

$$
\begin{aligned}
\text{Cost of 1 m of cloth} &= \text{`}\ 245\frac{1}{8} \div 18\frac{1}{2} \\
&= \text{`}\left(\frac{1961}{8} \div \frac{37}{2}\right) \\
&= \text{`}\left(\frac{1961}{8} \times \frac{2}{37}\right) \\
&= \text{`}\left(\frac{53}{4}\right)
\end{aligned}
$$

$$
\begin{aligned}
\therefore \quad \text{Cost of } 26\frac{1}{2} \text{ m of same cloth} &= \text{`}\ \frac{53}{4} \times \frac{53}{2} \\
&= \text{`}\ \frac{2809}{8} = \text{`}\ 351\frac{1}{8}
\end{aligned}
$$

Hence, the required amount is ` $351\frac{1}{8}$.

8.

$$
\begin{aligned}
\text{The area of a rectangle} &= 162\frac{1}{2} \text{ sq m} \\
&= \frac{325}{2} \text{ sq. m} \\
\text{If its length} &= 16\frac{2}{3} \text{ m} = \frac{50}{3} \text{ m} \\
\text{breadth} &= ? \\
\therefore \quad \text{area of a rectangle} &= l \times b \\
\frac{325}{2} \text{ sq. m} &= \frac{50}{3} \text{ m} \times b \\
\Rightarrow \quad b &= \frac{325}{2} \times \frac{3}{50} = \frac{39}{4} \text{ m.} \\
\text{or} \quad &= 9\frac{3}{4} \text{ m}
\end{aligned}
$$

Hence, the breadth of a rectangle is $9\frac{3}{4}$ m.

9.

$$
\begin{aligned}
\text{The weight of 18 bags of cement} &= 56\frac{4}{7} \text{ kg} \\
\therefore \quad \text{the weight of 1 bag of cement} &= \left(56\frac{4}{7} \div 18\right) \text{kg} \\
&= \left(\frac{396}{7} \times \frac{1}{18}\right) \text{kg}
\end{aligned}
$$

$$= \frac{22}{7}\text{ kg}$$

$$\therefore \quad \text{Number of bags of cement} = \frac{\text{Total weight of cement}}{\text{Total weight of 1 bag}}$$

$$= \frac{78\frac{4}{7}\text{ kg}}{\frac{22}{7}\text{ kg}} = \frac{\frac{550}{7}\text{ kg}}{\frac{22}{7}\text{ kg}} = 25\text{ bags}$$

Hence, 25 bags are required to pack $78\frac{4}{7}$ kg of cement.

10. The capacity of 14 bottles of milk $= 25\frac{1}{5}\,l = \frac{126}{5}\,l$

$$\therefore \quad \text{the capacity of each bottle} = \left(\frac{126}{5} \div 14\right)l$$

$$= \left(\frac{126}{5} \times \frac{1}{14}\right)l = \frac{9}{5}\,l = 1\frac{4}{5}\,l$$

Hence, $1\frac{4}{5}\,l$ is the capacity of each bottle.

Multiplce Choice Questions

Mark (3) agaisnt the correct answer in each of the following.

1. (c), 2. (d), 3. (d), 4. (b), 5. (c), 6. (d), 7. (d), 8. (a), 9. (c), 10. (a)

3 Rational Numbers

1. (a) $-\frac{108}{204}$

$\because$ HCF of 108 and 204 is 12.

$$\therefore \quad \frac{-108 \div 12}{204 \div 12} = \frac{-9}{17}$$

```
108)204(1
   -108
     96)108(1
         96
         12)96(8
            96
             ×
```

(b) $\frac{-81}{-99}$

$$= \frac{-81 \times (-1)}{-99 \times (-1)} = \frac{81}{99}$$

$\because$ HCF of 81 and 99 is 9

$$\therefore \quad \frac{81 \div 9}{99 \div 9} = \frac{9}{11}$$

```
81)99(1
   81
   18)81(4
      72
       9)18(2
         18
          ×
```

(c) $\dfrac{7}{-56} = \dfrac{7 \times (-1)}{-56 \times (-1)} = \dfrac{-7}{56}$

7) 56 (8
56
×

$\because$ HCF of 7 and 56 is 7.

$\therefore$ $\dfrac{-7 \div 7}{56 \div 7} = \dfrac{-1}{8}$

(d) $-\dfrac{195}{275}$

195) 275 (1
195
80) 195 (2
160
35) 80 (2
70
10) 35 (3
30
5) 10 (2
10
×

$\because$ HCF of 195 and 275 is 5.

$\therefore$ $\dfrac{-195 \div 5}{275 \div 5} = \dfrac{-39}{55}$

2. (a) $-\dfrac{4}{9} = \dfrac{-4 \times 2}{9 \times 2} = \dfrac{-4 \times 3}{9 \times 3} = \dfrac{-4 \times 4}{9 \times 4} = \dfrac{-4 \times 5}{9 \times 5} = -\dfrac{4 \times 6}{9 \times 6}$

$\therefore$ $\dfrac{-4}{9} = \dfrac{-8}{18} = \dfrac{-12}{27} = \dfrac{-16}{36} = \dfrac{-20}{45} = \dfrac{-24}{54}$

Thus, five rational numbers equivalent to $\dfrac{-4}{9}$ are $\dfrac{-8}{18}, \dfrac{-12}{27}, \dfrac{-16}{36}, \dfrac{-20}{45}$ and $\dfrac{-24}{54}$

(b) $\dfrac{7}{-3} = \dfrac{7 \times 2}{-3 \times 2} = \dfrac{7 \times 3}{-3 \times 3} = \dfrac{7 \times 4}{-3 \times 5} = \dfrac{7 \times 5}{-3 \times 5} = \dfrac{7 \times 6}{3 \times 6}$

$\therefore$ $\dfrac{7}{-3} = \dfrac{14}{-6} = \dfrac{21}{-9} = \dfrac{28}{-12} = \dfrac{35}{-15} = \dfrac{42}{-18}$

Thus, five rational number equivalent to $\dfrac{7}{-3}$ are $\dfrac{14}{-6}, \dfrac{21}{-9}, \dfrac{28}{-12}, \dfrac{35}{-15}$ and $\dfrac{42}{-18}$.

3. (a) Denominator of $\dfrac{5}{9}$ is 9. To find a number which when multiplied by 9 gives –27, we would divide –27 by 9. Then

$$-27 \div 9 = -3$$

$\therefore$ $\dfrac{5}{9} = \dfrac{5 \times (-3)}{9 \times (-3)} = \dfrac{-15}{-27}$

(b) Denominator of $\frac{5}{9}$ is 9. To find a number which when multiplied by 9 gives 54, We would divide 54 by 9.

Then $54 \div 9 = 6$

$$\therefore \qquad \frac{5}{9} = \frac{5 \times 6}{9 \times 6} = \frac{30}{54}$$

(c) Denominator of $\frac{5}{9}$ is 9. To find a number which when multiplied by 9 gives 108, we would divide 108 by 9.

Then $108 \div 9 = 12$

$$\therefore \qquad \frac{5}{9} = \frac{5 \times 12}{9 \times 12} = \frac{60}{108}$$

(d) Denominator of $\frac{5}{9}$ is 9. To find a number which when multiplied by 9 gives 9000, we would divide 9000 by 9.

Then,

$$900 \div 9 = 1$$

$$\therefore \qquad \frac{5}{9} = \frac{5 \times 1000}{9 \times 1000} = \frac{5000}{9000}$$

4. (a) Numerator of $\frac{126}{-196}$ is 126. To find a number which when divided by 126 gives 63, you should multiply 63 by 2. Then,

$63 \times 2 = 126$

$$\therefore \qquad \frac{126 \div 2}{-196 \div 2} = \frac{63}{-98}$$

(b) Numerator of $\frac{126}{-196}$ is 126. To find a number which when divided by 126 gives -9, you should multiply -9 by -14 Then

$-9 \times (-14) = 126$

$$\therefore \qquad \frac{126 \div (-14)}{-196 \div (-14)} = \frac{-9}{14}$$

(c) Numertor of $\frac{126}{-196}$ is 126. To find a number which when divided by 126 gives -126, you should multiply -126 by -1. Then,

$126 \times (-1) = -126$

$$\therefore \qquad \frac{126}{-196} = \frac{126 \div (-1)}{-196 \div (-9)} = \frac{-126}{196}$$

(d) Numrator of $\frac{126}{-196}$ is 126. To find a number which when multiplied by 126 gives 12600,

you should divide 12600 by 126. Then

$12600 \div 126 = 100$

$$\therefore \qquad \frac{126}{-196} = \frac{126 \times 100}{-196 \times 100} = \frac{12600}{-19600}$$

5. (a) $\dfrac{45}{-51}$

Denominator of $\dfrac{45}{-51}$ is -51

So, multiplied by $(-)$ sign in numerator and denominator.

$$\frac{45 \times (-1)}{-51 \times (-1)} = \frac{-45}{51}$$

(b) $\dfrac{12}{-19} = \dfrac{12 \times (-1)}{-19 \times (-1)} = \dfrac{-12}{19}$

(c) $\dfrac{-68}{-117} = \dfrac{68}{117}$

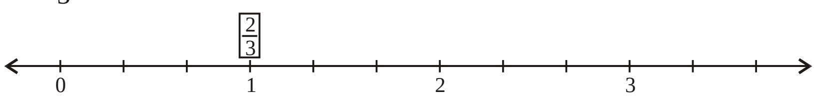
6. Positive rational number $= \dfrac{15}{8}, \dfrac{-4}{-13}, \dfrac{-89}{-201}$

Negative rational number $= \dfrac{-5}{7}, \dfrac{-16}{23}, \dfrac{25}{-37}$

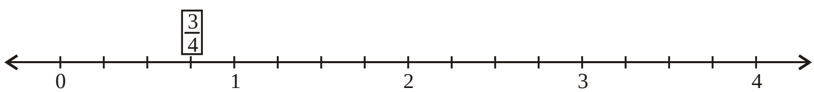
None $= 0$

Exercise 3.2

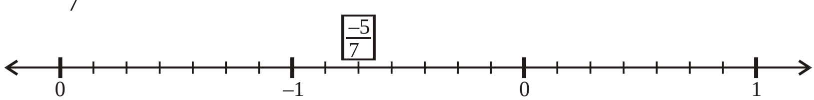
1. (a) $\dfrac{2}{3}$



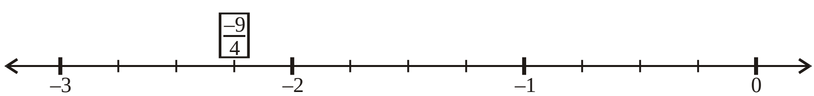
(b) $\dfrac{3}{4}$



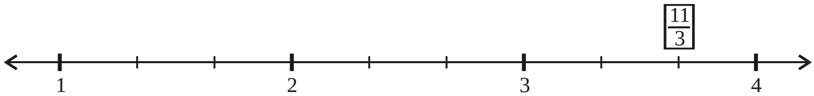
(c) $\dfrac{-5}{7}$



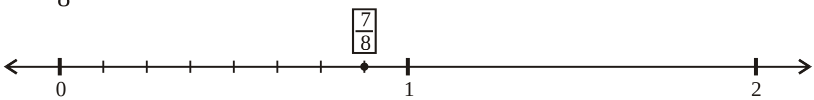
(d) $\dfrac{-9}{4}$



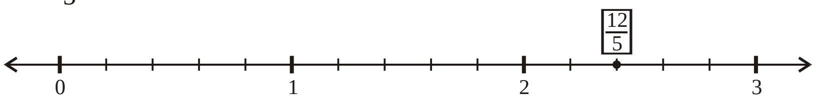
(e) $\frac{11}{3}$



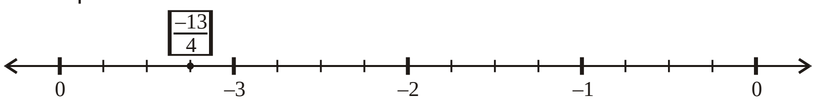
(f) $\frac{7}{8}$



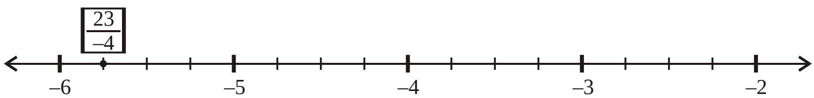
(g) $\frac{12}{5}$



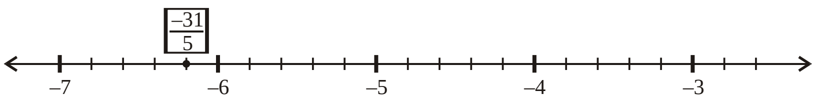
(h) $\frac{-13}{4}$



(i) $\frac{23}{-4}$



(j)



taken from answerwheet

2. Converting the given rational number into their standard forms, you have :

(a) $\frac{-8}{24}$ and $\frac{4}{-12}$

$\therefore \quad \frac{-8}{24} = \frac{-8 \div 8}{24 \div 8} = \frac{-1}{3}$ HCF of 8 and 24 is 8.

and $\frac{4}{-24} = \frac{4 \div 4}{-12 \div 4} = \frac{1}{-3}$ HCF of 4 and 12 is 4.

$\therefore \quad \frac{-8}{24} = \frac{4}{-12}$

(b) $\frac{-5}{-6}$ and $\frac{5}{6}$

$$\frac{-5}{-6} = \frac{5 \div -1}{6 \div -1} = \frac{5}{6} \quad \text{HCF of 5 and 6 is 1}$$

$$\therefore \quad \frac{-5}{-6} = \frac{5}{6}$$

(c) $\frac{-2}{5}$ and $\frac{-20}{50}$

$$\frac{-2}{5} = \frac{-2 \div 1}{5 \div 1} = \frac{-2}{5} \text{ HCF of 2 and 5 is 1}$$

And

$$\frac{-20}{50} = \frac{-20 \div 10}{590 \div 10} = \frac{-2}{5} \text{ HCF of 20 and 50 is 10}$$

$$\therefore \quad \frac{-2}{5} = \frac{-20}{50}$$

Hence, option *a*, *b* and *c* are same rational number.

3. (a) $\frac{3}{29}$ or 0

$$\frac{3}{29} \qquad \frac{0}{1}$$

$\Rightarrow$ 3×1 $\qquad$ 0×29

3 $\qquad$ 0

Since, $3 > 0$

$$\therefore \quad \frac{3}{29} > 0$$

(b) $\frac{-5}{11}$ or 0

$$\frac{-5}{11} \qquad \frac{0}{1}$$

-5×1 $\qquad$ 0×11

-5 $\qquad$ 0

Since, $-5 < 0$

$$\therefore \quad -\frac{5}{11} < 0$$

(c) $\frac{15}{7}, \frac{-93}{4}$

$$\frac{15}{7} \qquad \frac{-93}{4}$$

15×4 $\qquad$ -93×7

60 $\qquad$ -651

Since, $60 > -651$

$$\therefore \quad \frac{15}{7} > \frac{-93}{4}$$

(d) $4\frac{3}{5}$ or $4\frac{7}{5}$

$$\frac{23}{5} \qquad \frac{27}{5}$$

23×5 $\qquad$ 27×5

115 $\qquad$ 135

Since, $115 < 135$

$$\therefore \quad 4\frac{3}{5} < 4\frac{7}{5}$$

(e) $\frac{-7}{12}$ or $\frac{9}{-12}$

$$-\frac{7}{12} \qquad \frac{9}{-12}$$

$\Rightarrow$ -7×12 $\qquad$ -12×9

-84 $\qquad$ -108

Since, $-84 > -108$

$$\therefore \quad \frac{-7}{12} > \frac{9}{-12}$$

(f) $\frac{4}{-3}$ or $\frac{-5}{6}$

$$\frac{4}{-3} \qquad \frac{-5}{6}$$

-4×6 $\qquad$ -3×5

-24 $\qquad$ -15

Since, $-24 < -15$

$$\therefore \quad -\frac{4}{3} < -\frac{5}{6}$$

4. (a) $\frac{-2}{30} \boxed{<} \frac{-1}{30}$ (b) $0 \boxed{<} \frac{-4}{-9}$ (c) $-3 \boxed{<} \frac{-14}{5}$

(d) $\frac{8}{19} \boxed{>} \frac{-4}{13}$ (e) $\frac{-7}{8} \boxed{>} \frac{-8}{9}$ (f) $\frac{2}{-3} \boxed{>} \frac{-4}{5}$

5. (a) Asending order $= -\frac{8}{3} < \frac{-8}{9} < \frac{-8}{11}$

(b) Ascending order $= \frac{-9}{10} < \frac{11}{-15} < \frac{2}{-15} < 0$

6. (a) Descining order $= 0 > \frac{-1}{6} > -2 > \frac{7}{-3}$

(b) Desceinding order $= -\frac{1}{10} > \frac{17}{-20} > \frac{2}{-5} > -3$

7. (a) $-\frac{1}{8} = \frac{8}{x}$

$x = -8 \times 8$

$x = -64$

(b) $\frac{15}{x} = -5$

$x = -5 \times 15$

$x = -75$

(c) $\frac{-36}{x} = \frac{2}{3}$

$x \times 2 = -36 \times 3$

$x = \frac{-36 \times 3}{2}$

$x = -18 \times 3$

$x = -54$

(d) $\frac{13}{6} = \frac{-65}{x}$

$x = \frac{-65 \times 6}{13}$

$x = -5 \times 6$

$x = -30$

(e) $\frac{4}{5} = \frac{x}{-25}$

$x = \frac{4 \times (-25)}{5}$

$x = 4 \times (-5)$

$x = -20$

(f) $-\frac{4}{11} = \frac{x}{77}$

$x = \frac{4 \times 77}{11}$

$x = -4 \times 7$

$x = -28$

8. (a) -3 and 0

Represent the two integers as rational numbers wih common denominators.

$$-3 = \frac{-3 \times 5}{5} = \frac{-15}{5}$$

We know that,

$-15 < -14 < -13 <` -12 < -11$

Now rational numbers between $\frac{-15}{5}$ and 0 are $\frac{-14}{5}$, $\frac{-13}{5}$, $\frac{-12}{5}$ and $\frac{-11}{5}$.

(b) $\frac{-4}{5}$ and $-\frac{1}{3}$

The LCM of the denominator 5 and 3 is 15.

$\therefore \quad \frac{-4}{5} = \frac{-4 \times 3}{5 \times 3} = \frac{-12}{15}$ and $\frac{-1}{3} = \frac{-1 \times 5}{3 \times 5} = \frac{-5}{15}$

Therefore, rational numbers between $\frac{-4}{5}$ and $\frac{-1}{3}$ are $\frac{-6}{15}, \frac{-7}{15}, \frac{-8}{15}, \frac{-9}{15}$

(c) $\frac{1}{4}$ and $\frac{1}{6}$

The LCM of the denominator 4 and 6 is 12.

$\therefore \quad \frac{1}{4} = \frac{1 \times 3}{4 \times 3} = \frac{3}{12}$ and $\frac{1}{6} = \frac{1 \times 2}{6 \times 2} = \frac{2}{12}$

Now, $\frac{1}{4} = \frac{3}{12} = \frac{3 \times 8}{12` \times 8} = \frac{24}{96}$

$\frac{1}{6} = \frac{2}{12} = \frac{2 \times 8}{12 \times 8} = \frac{16}{96}$

We know that, integers between 16 and 24 are 17, 18, 19, 20, 21, 22, 23.

Therefore, rational numbere between $\frac{16}{96}$ and $\frac{24}{96}$ are

$\frac{17}{96}, \frac{18}{96}, \frac{19}{96}, \frac{20}{96}, \frac{21}{96}, \frac{22}{96}, \frac{23}{96}$ (Any four of these can be chosen).

9. (a) $\frac{26}{54}$

$\because$ HCF of 26 and 54 is 2.

$\therefore \quad \frac{26}{54} = \frac{26 \div` 2}{54 \div 2} = \frac{13}{27}$

Which is not equivalent to $\frac{2}{3}$

So, The statement is false.

(b) The statement is true because it has numerator and denominator.

(c) The statement is true because a rational number is said to be in standard form if its denominator is a positive integer.

(d) The statement is true because zero is a rational number. Since 0 can be written as $\frac{0}{1}, \frac{0}{2}, \frac{0}{3} \ldots \frac{0}{20}$ and soon. i.e. $0 = \frac{0}{2}$, where 20 is any non-zero integer.

(e) The statement is false beause the denominator of given rational number is zero.

(f) The statement is true.

$\frac{-2}{5} < \frac{5}{-4}$

Since $(-2) \times (-4) < 5 \times 5$

$\therefore \quad 8 < 25$

(g) The statement is false, since $\frac{16}{9}$ is positive rational number, it lies on right hand side of zero on the number line.

(h) The statement is true, $\frac{-5}{-7}$ is a positive rational number, it lies on right hand side of zero on the number line and $\frac{-8}{11}$ is a negative rational number, it lies on left side of zero on the number line.

(i) The statement is true as preious statement.

Exercise 3.3

1. (a) $\frac{7}{-15}$ and $\frac{4}{15}$

$\frac{7}{-15}+\frac{4}{15}$ The LCM of denominator -15 and 15 is 15.

$$\therefore \quad \frac{7}{-15}+\frac{4}{15}=\frac{7\times(-1)+4\times 1}{15}=\frac{-7+4}{15}=\frac{-3}{15}=\frac{-1}{5}$$

(b) $\frac{-3}{19}$ and $\frac{-9}{19}$

$-\frac{3}{19}+\left(\frac{-9}{19}\right)$

The LCM of denominator 19 and 19 is 19.

$$\therefore \quad -\frac{3}{19}+\left(\frac{-9}{19}\right)=\frac{-3\times 1+(-9)\times 1}{19}=\frac{-3-9}{19}=\frac{-12}{19}$$

(c) $\frac{-23}{35}$ and $\frac{8}{-35}$

$\frac{-23}{35}+\left(\frac{8}{-35}\right)$ $\quad\therefore \frac{-23+(-8)}{35}=\frac{-23-8}{35}=\frac{-31}{35}$

2. (a) $\frac{-2}{3},\frac{6}{7}$

$\frac{6}{7}-\left(-\frac{2}{3}\right)$ The LCM of denominator 7 and 3 is 21.

$$\therefore \quad \frac{6}{7}+\frac{2}{3}=\frac{6\times 3+2\times 7}{21}=\frac{18+14}{21}=\frac{32}{21}=1\frac{11}{21}$$

(b) $\frac{3}{-11},\frac{-1}{11}$

$\frac{-1}{11}-\left(\frac{3}{-11}\right)$ – The LCM of denominator is 11.

$$\therefore \quad -\frac{1}{11}+\frac{3}{11}=\frac{1\times 1+3\times 1]}{11}=\frac{-1+3}{11}=\frac{2}{11}$$

(c) $\frac{-4}{-7}, \frac{3}{-7}$

$\frac{3}{-7} - \left(\frac{4}{7}\right)$ The LCM of denominator is 7

$\therefore \quad \frac{3}{-7} - \frac{4}{7} = \frac{3 \times (-1) - 4 \times 1}{7} = \frac{-3-4}{7} = \frac{-7}{7} = -1$

3. (a) $\frac{-2}{5} + \frac{3}{15} - \frac{7}{10}$

The LCM of denomiantor 5, 15 and 10 is 30.

2	5, 15, 10
3	5, 15, 5
5	5, 5, 5
	1, 1, 1

$\therefore \quad \frac{-2}{5} + \frac{3}{15} - \frac{7}{10}$

$= \frac{-2 \times 6 + 3 \times 2 - 7 \times 3}{30}$

$= \frac{-12 + 6 - 21}{30} = \frac{6 - 33}{30} = \frac{-27}{30} = -\frac{9}{10}$

(b) $\frac{-8}{-9} - \frac{11}{12} + \frac{3}{4}$

or $\frac{8}{9} - \frac{11}{12} + \frac{3}{4}$

The LCM of denominator 9, 12 and 4 is 36.

2	9, 12, 4
2	9, 6, 2
3	9, 3, 1
3	3, 1, 1
	1, 1, 1

$\therefore \quad \frac{8}{9} - \frac{11}{12} + \frac{3}{4} = \frac{8 \times 4 - 11 \times 3 + 3 \times 9}{36}$

$= \frac{32 - 33 + 27}{36}$

$= \frac{59 - 33}{36} = \frac{59 - 33}{36} = \frac{26}{36} = \frac{13}{18}$

(c) $\frac{6}{11} - \left(\frac{-2}{33}\right) + \left(\frac{-5}{44}\right) + 0$

$\frac{6}{11} + \frac{2}{33} - \frac{5}{44} = \frac{6}{11} + \frac{2}{33} - \frac{5}{44}$

The LCM of denominator

2	11, 33, 44
2	11, 33, 22
3	11, 33, 11
11	11, 11, 11
	1, 1, 1

$= \frac{6 \times 12 + 2 \times 4 - 5 \times 3}{132}$

$= \frac{72 + 8 - 15}{132} = \frac{80 - 15}{132} = \frac{65}{132}$

(d) $\frac{8}{21} - \frac{15}{-19} - \frac{3}{21}$

or $\frac{8}{21} + \frac{15}{19} - \frac{3}{21}$

The LCM of denominatr 21, 19 and 21 is 399.

3	21, 19, 21
7	7, 19, 7
19	1, 19, 1
	1, 1, 1

$$\therefore \quad \frac{8}{21}+\frac{15}{19}-\frac{3}{21}=\frac{8\times19+15\times21-3\times19}{399}$$

$$=\frac{152+315-57}{399}=\frac{467-57}{399}=\frac{410}{399}=1\frac{11}{399}$$

4. Let the number be x

$$\therefore \quad \frac{2}{5}+x=-\frac{5}{13} \Rightarrow x=\frac{-5}{13}-\frac{2}{5}$$

The LCM of 13 and 5 is 65.

$$\Rightarrow \quad x=\frac{-5\times5-2\times13}{65}$$

$$\Rightarrow \quad x=\frac{-25-26}{65}=\frac{-51}{65}$$

Hence, the required number is $\frac{-51}{65}$.

5. Let the number be x.

$$\therefore \quad -4+x=-\frac{1}{6}$$

$$\Rightarrow \quad x=4-\frac{1}{6}$$

$$\Rightarrow \quad x=\frac{4\times6-1}{6}=\frac{24-1}{6}=\frac{23}{6}=3\frac{5}{6}$$

6. Let the number be x.

$$\therefore \quad \frac{4}{3}+x=-35$$

$$\Rightarrow \quad x=-35-\frac{4}{3}$$

$$=\frac{-105-4}{3}=\frac{-109}{3}=-36\frac{1}{3}$$

Hence, the required number is $-36\frac{1}{3}$

7. Let the number be x.

$$\therefore \quad -\frac{8}{9}+x=1$$

$$\Rightarrow \quad x=1+\frac{8}{9}=\frac{1\times9+8}{9}$$

$$\Rightarrow \quad x=\frac{9+8}{9}=\frac{17}{9}=1\frac{8}{9}$$

Hence, $\frac{17}{9}$ should be added to $\frac{-8}{9}$ to get 1.

8. Let the number be x.

$$\therefore \qquad -\frac{119}{37}+x=0$$

$$\Rightarrow \qquad x=0+\frac{119}{37}$$

$$\Rightarrow \qquad x=\frac{119}{37}$$

Hence, $\frac{119}{37}$ should be added to $-\frac{119}{37}$ to get 0.

9. Let the number be *x*.

$$\therefore \qquad \frac{13}{18}-x=\frac{12}{27} \Rightarrow \frac{13}{18}=x+\frac{12}{27}$$

$$\Rightarrow \qquad x=\frac{13}{18}-\frac{12}{27}=\frac{13\times 3-12\times 2}{54}=\frac{39-24}{54}$$

$$\Rightarrow \qquad x=\frac{15}{54}=\frac{5}{18}$$

Hence, $\frac{5}{18}$ should be subtracted from $\frac{13}{18}$ to get $\frac{12}{27}$.

10. Let the number be *x*

$$\therefore \qquad \frac{-3}{14}-x=\frac{-5}{6}$$

$$\frac{-3}{14}=x-\frac{5}{6}$$

$$\Rightarrow \qquad x=\frac{5}{6}-\frac{3}{14}$$

$$\Rightarrow \qquad x=\frac{5\times 7-3\times 3}{42}=\frac{35-9}{42}$$

$$\Rightarrow \qquad x=\frac{26}{42}=\frac{13}{21}$$

$\frac{13}{21}$ shold be subtracted from $\frac{-3}{14}$ to get $\frac{-5}{6}$.

11. According to questions.

$$=\left[\frac{4}{15}-\left(-\frac{2}{5}\right)\right]-\left[2\frac{3}{7}+\left(-5\frac{4}{7}\right)\right]$$

$$=\left[\frac{4}{15}+\frac{2}{5}\right]-\left[\frac{17}{7}-\frac{39}{7}\right]$$

$$=\left[\frac{4+2\times 3}{15}\right]-\left[\frac{17-39}{7}\right]=\left(\frac{4+6}{15}\right)-\left(-\frac{22}{7}\right)$$

12. Let the number be *x*

(a) $$\frac{-7}{9}+x=2$$

$$\Rightarrow \quad x = 2 + \frac{7}{9}$$

$$\Rightarrow \quad x = \frac{2 \times 9 + 7 \times 1}{9} = \frac{18 + 7}{9} = \frac{25}{9}$$

(b) $$x + \frac{14}{27} = 3$$

$$\Rightarrow \quad x = 3 - \frac{14}{27}$$

$$\Rightarrow \quad x = \frac{3 \times 27 -`14 \times 1}{27}$$

$$\Rightarrow \quad x = \frac{81 - 14}{27}$$

$$\Rightarrow \quad x = \frac{67}{27} = 2\frac{13}{27}$$

(c) $$\frac{-3}{17} - \left(\frac{-2}{51}\right) = x$$

$$\Rightarrow \quad x = \frac{-3}{17} + \frac{2}{51}$$

$$\Rightarrow \quad x = \frac{-3 \times 3 + 2 \times 1}{51} = \frac{-9 + 2}{51} = -\frac{7}{51}$$

(d) $$x + \left(-\frac{5}{18}\right) = -1$$

$$\Rightarrow \quad x = -1 + \frac{5}{18}$$

$$\Rightarrow \quad x = \frac{-1 \times 8 + 5}{18} = \frac{-18 + 5}{18} = \frac{-13}{18}$$

Exercise 3.4

1. (a) $\frac{4}{5}$ by $\frac{35}{7} = \frac{4}{5} \times \frac{35}{7} = 4 \times 1 = 4$ (b) $\frac{-6}{13}$ by $0 = \frac{-6}{13} \times 0 = 0$

(c) $\frac{25}{-9}$ by $\left(\frac{-36}{5}\right) = \frac{25}{-9} \times \left(\frac{-36}{5}\right) = 5 \times 4 = 20$

2. (a) $-6 \div \frac{12}{5} = -6 \times \frac{5}{12} = -1 \times \frac{5}{2} = -\frac{5}{2}$

(b) $\frac{-2}{3} \div 16 = \frac{-2}{3} \times \frac{1}{16} = \frac{-1}{3} \times \frac{1}{8} = -\frac{1}{24}$

(c) $\frac{7}{-8} \div (-14) = \frac{7}{-8} \times \left(-\frac{1}{14}\right) = \frac{7}{8 \times 14} = \frac{1}{16}$

(d) $\frac{9}{13} \div \left(\frac{-27}{78}\right) = \frac{9}{13} \times \left(\frac{-78}{27}\right) = \frac{-6}{3} = -2$

(e) $\frac{-19}{23} \div \frac{1}{3} = \frac{-19}{23} \times \frac{3}{1} = \frac{-57}{23}$

3. (a) $\left(\frac{36}{11} \times \frac{88}{18}\right) + \left(\frac{-26}{14} \times \frac{-28}{13}\right) = (2 \times 8) + (-2) \times (-2)$

$$= (2 \times 8) + (2 \times 2) = 16 + 4 = 20$$

(b) $\left(\frac{-16}{17} \times \frac{-65}{64}\right) - \left(\frac{-8}{45} \times \frac{9}{24}\right)$

$$= \left(\frac{65}{17 \times 4}\right) - \left(\frac{-1}{5} \times \frac{1}{3}\right) = \frac{65}{68} + \frac{1}{15} = \frac{975 + 68}{1020} = \frac{1043}{1020}$$

(c) $\left(\frac{-9}{4} \times \frac{2}{3}\right) + \left(\frac{1}{2} \times 0\right) - \left(\frac{5}{-6} \times \frac{18}{15}\right) = \frac{-3}{2} + 0 + \frac{3}{3} = \frac{-3}{2} + 1 = \frac{-3+2}{2} = -\frac{1}{2}$

4. The given rational number itself.

5. Yes, 1 and -1.

6. According to the questions

$$\left(\frac{2}{5} + \frac{3}{4}\right) \div \left(\frac{2}{5} - \frac{3}{4}\right) = \left(\frac{2 \times 4 + 3 \times 5}{20}\right) \div \left(\frac{2 \times 4 - 3 \times 5}{20}\right)$$

$$= \left(\frac{8+15}{20}\right) \div \left(\frac{8-15}{20}\right)$$

$$= \frac{23}{20} \div \left(-\frac{7}{20}\right) = \frac{23}{20} \times \left(\frac{-20}{7}\right) = -\frac{23}{7} = -3\frac{2}{7}$$

7. Let the number be x

$\therefore$ $$\frac{13}{21} \times x = \frac{-65}{14}$$

$\Rightarrow$ $$x = \frac{-65 \times 21}{14 \times 13} = \frac{-5 \times 21}{14} = \frac{-5 \times 3}{2} = \frac{-15}{2}$$

Hence, the required number is $-\frac{15}{2}$.

8. The given,

$$\text{Speed} = 50\frac{2}{5} \text{ Km/h} = \frac{252}{5} \text{ Km/h}$$

$$\text{Time} = 3\frac{1}{2} h = \frac{7}{2} h$$

$$\text{Distance} = ?$$

$$\text{Distance} = \text{Speed} \times \text{Time} = \frac{252}{5} \times \frac{7}{2} = \frac{126 \times 7}{5} = \frac{882}{5} 176\frac{2}{5} \text{ Km}$$

Hence, the required distance is $176\frac{2}{5}$ Km.

9. Let the number be x

$\therefore \quad \frac{-15}{4} \times x = \frac{10}{3}$

$\Rightarrow \quad x = \frac{10}{3} \times \frac{4}{-15} \quad \Rightarrow \quad x = \frac{2 \times 4}{3 \times -3} = \frac{8}{-9}$

Hence, the required number is $\frac{-8}{9}$.

10. The cost of $5\frac{1}{2}$ m cloth = ` 675

$\therefore$ the cost of 1 m cloth = ` $675 \div 5\frac{1}{2}$

= ` $675 \times \frac{2}{11}$ = ` = $\frac{1350}{11}$ = ` $122\frac{8}{11}$.

Hence, the cost of per metre is ` $122\frac{8}{11}$.

11. The cost of two dozen handkerchieffs = ` $85\frac{1}{3}$

= ` $\frac{256}{3} \div 24$

= ` $\frac{256}{3} \times \frac{1}{24}$ = ` $\frac{32}{3} \times \frac{1}{3}$ = ` $\frac{32}{9}$ = ` $3\frac{5}{9}$

Hence, the cost of 1 handkerchief is ` $3\frac{5}{9}$.

12. Let the required number be x

Given number $= \frac{-98}{17}$, quotient $= \frac{28}{119}$

$\therefore \quad \frac{-98}{17} \div x = \frac{28}{119}$

$\Rightarrow \quad \frac{-98}{17} \times \frac{1}{x} = \frac{28}{119}$

$\Rightarrow \quad -98 \times 119 = 28 \times 17 \times x$

$\Rightarrow \quad x = \frac{-98 \times 119}{28 \times 17}$

$\Rightarrow \quad x = \frac{-49}{14} \times 7 = \frac{-7 \times 7}{2} = -24\frac{1}{2}$

Hence, the required number is $-24\frac{1}{2}$.

Multiplce Choice Questions

Mark (3) against the correct naswer in each of the following :

1. (c), 2. (b), 3. (a), 4. (a), 5. (b), 6. (c), 7. (a), 8. (a), 8. (b)

Exercise 4.1

1. (a) 43.451 = Forty-three point four five one.
= 4 tens + 3 ones + 4 tenths + 5 hundredths + 1 thousandths

(b) 106.23 = One hundred six point two three.
= 1 hundreds + 6 ones + 2 tenths + 3 hundred

(c) 97.056 = Ninety-seven point zero five six
= 9 tens + 7 ones + 5 hundredths + 6 thousandths.

(d) 342.009 = three hundred forty-two point zero zero nine.
= 3 hundreds + 4 tens + 2 ones + 9 thousandths.

2. Converting the given decimals into like decimals.

(a) 0.4 = 0.40
and 0.04 = 0.04

0.40 0.04

4 > 0

$\therefore$ 0.40 > 0.04
So,0.4 is greater.

(b) 0.8 = 0.8
and 0.5 = 0.5

0.8 0.5

8 > 5

$\therefore$ 0.8 > 0.5
So, 0.8 is greater.

(c) 1.42 = 1.42
and 1.24 = 1.24

1.42 1.24

same

4 > 2

4 > 2
$\therefore$ 1.42 > 1.24
So, 1.42 is greater.

(d) 3.33 = 3.33
and 33.3 = 33.30

3.33 33.30

3 < 33

$\therefore$ 3.33 < 33.30
So, 33.3 is greater.

(e) 4.527 = 4.527
4.546 = 4.546

4 . 5 2 7 4 . 5 4 6

same

same

2 < 4

$\therefore$ 4.527 < 4.546
So, 4.546 is greater.

(f) 12.05 = 12.050
12.005 = 12.005

12 . 0 5 0 12 . 0 0 5

=

=

5 > 0

$\therefore$ 12.050 > 12.005
So, 12.050 is greater.

3. (a) Since 100 cm = 1 cm

$8 \text{ cm} = \frac{8}{100} = 0.08 \text{ m}$

(b) Since 1000 g = 1 kg

$450 \text{ g} = \frac{450}{1000} = 0.45 \text{ kg}$

(c) Since 100 paise = ` 1

$11 \text{ paise} = \frac{11}{100} =$ ` 0.11

(d) Since 1000 g = 1 kg

$50 \text{ g} = \frac{50}{1000} = 0.05 \text{ kg}$

4. To add the given decimal numbers we convert them into like decimals as shown below.

(a) 0.5, 0.02, 0.7

0.50, 0.02, 0.70 like decimial

$$\therefore \quad \begin{array}{r} 0.50 \\ 0.02 \\ +\ 0.70 \\ \hline 1.22 \\ \hline \end{array}$$

(b) 1.1, 5.21, 0.44

= 1.10, 5.21, 0.44 like decimal

$$\therefore \quad \begin{array}{r} 1.10 \\ 5.21 \\ +\ 0.44 \\ \hline 6.75 \\ \hline \end{array}$$

(c) 12.2, 13.32, 14

= 12.20, 13.32, 14.00 like decimal

$$\therefore \quad \begin{array}{r} 12.20 \\ 13.32 \\ +\ 14.00 \\ \hline 39.52 \\ \hline \end{array}$$

(d) 582.25, 100. 5, 63.41

= 582.25, 100.50, 63.41 like decimal

$$\therefore \quad \begin{array}{r} 582.25 \\ 100.50 \\ +\ 63.41 \\ \hline 746.16 \\ \hline \end{array}$$

5. By converting into like decimal, we have

(a) $\begin{array}{r} 2.000 \\ -\ 0.452 \\ \hline 1.548 \\ \hline \end{array}$ (b) $\begin{array}{r} 18.00 \\ -\ 7.91 \\ \hline 10.09 \\ \hline \end{array}$ (c) $\begin{array}{r} 62.5 \\ -\ 45.2 \\ \hline 17.3 \\ \hline \end{array}$ (d) $\begin{array}{r} 250.52 \\ -\ 102.25 \\ \hline 148.27 \\ \hline \end{array}$

6. (a) $\begin{array}{r} 3.42 \text{ m} \\ 2.83 \text{ m} \\ 1.78 \text{ m} \\ +\ 1.66 \text{ m} \\ \hline 9.69 \text{ m} \\ \hline \end{array}$

(b) $\begin{array}{r} 3.42 \text{ m} \\ -\ 1.66 \text{ m} \\ \hline 1.76 \text{ m} \\ \hline \end{array}$ longest piece, smallest piece

Exercise 4.2

1. (a) 94.6 × 11 = 1040.6 (b) 25.645 × 2 = 51.290

(c) 13.459 × 7 = 94.213 (d) 0.835 × 21 = 17.535

(e) 6.145 × 19 = 116.755 (f) 12.65 × 13 = 164.45

2. (a) 0.009 × 1000 = 9.000 = 9 (b) 14.007 × 10 = 140.07

(c) 24.795 × 100 = 2479.5 (d) 2.968 × 10000 = 29680

(e) 0.014 × 100 = 1.4 (f) 473.6 × 10000 = 47636000

3. (a) 23.2×1.96

or

$$\begin{array}{r} 23.20 \\ \times 1.96 \\ \hline 13920 \\ 20880\times \\ 2320\times\; \\ \hline 45.4720 \\ \hline \end{array}$$

(b) 9.46×0.18

or

$$\begin{array}{r} 9.46 \\ 0.18 \\ \hline 75.68 \\ 946\;\times \\ \hline 1.7028 \\ \hline \end{array}$$

(c) 18.75×0.002

or

$$\begin{array}{r} 18.75 \\ \times\; 0.002 \\ \hline 0.0375 \\ \hline \end{array}$$

4. You need to just insert the decimal point carefully because the product of 265 and 397 is given as 105205

(a) $26.5 \times 0.03976 = 1.05205$ (b) $2.65 \times 0.00397 = 0.0105205$

(c) $2.65 \times 39700 = 105205$

5. (a) $1.1 \times 2.2 \times 0.2$
$= 1.1 \times 0.44 = 0.484$

(b) $0.002 \times 0.2 \times 200$
$= 0.002 \times 40 = 0.08$

(c) $0.5 \times 5 \times 0.005 \times 500 = 2.5 \times 2.5 = 6.25$

6. The cost of 1 m of cloth = ` 150.50
∴ The cost of 14.25 m of cloth = ` 150.50 × 14.25
= 2144.625

7. One bag contains of sugar = 85.25 kg
29 bags contains of sugar = 85.25 × 29 kg
= 2472.25 kg

8. $l = 352.85$ m, $b = 155.25$ m
∴ the area of a playground = 352.85 × 155.25
= 54779.963 sq.m

9. The wages for a labourer per hour = ` 24.60
∴ he will earn in 6.5 hours = ` 24.60 × 6.5 = ` 159.9
or = ` 160 (approx)

10. Samuel can travel in one hour = 50.75 km
∴ he will cover the distance in 3.25 hours = 50.75 × 3.25 = 164.9375 km

Exercise 4.3

1. (a) $7.2 \div 4$

$$4\overline{)72}(18$$
$$\begin{array}{r} -\underline{4} \\ 32 \\ -\underline{32} \\ \underline{0} \end{array}$$

∴ $7.2 \div 4 = 1.8$

(b) $3.24 \div 9$

$$9\overline{)324}(36$$
$$\begin{array}{r} -\underline{27} \\ 54 \\ -\underline{54} \\ \underline{0} \end{array}$$

∴ $3.24 \div 9 = 0.36$

(c) $60.72 \div 12$

$$12\overline{)6072}(506$$
$$\begin{array}{r} -\underline{60} \\ 072 \\ -\underline{72} \\ \underline{0} \end{array}$$

∴ $69.72 \div 12 = 5.06$

(d) $85.956 \div 12$

$$12\overline{)85956}(7163$$
$$\begin{array}{r} -\underline{84} \\ 19 \\ -\underline{12} \\ 75 \\ -\underline{72} \\ 36 \\ -\underline{36} \\ \underline{0} \end{array}$$

∴ $85.956 \div 12 = 7.163$

(e) $82.04 \div 14$

$$14\overline{)8204}(586$$
$$\begin{array}{r} -\underline{70} \\ 120 \\ -\underline{112} \\ 84 \\ -\underline{84} \\ \underline{0} \end{array}$$

∴ $82.04 \div 14 = 5.86$

(f) $77.055 \div 15$

$$15\overline{)77055}(5137$$

$$
\begin{array}{r}
-\underline{75} \\
20 \\
-\underline{15} \\
55 \\
-\underline{45} \\
105 \\
-\underline{105} \\
\underline{0}
\end{array}
$$

∴ 77.055 ÷ 15 = 5.137

(g) 1.877 ÷ 25

$$
\begin{array}{r}
25\overline{)1877}(75.08 \\
-\underline{175} \\
127 \\
-\underline{125} \\
200 \\
-\underline{200} \\
\underline{0}
\end{array}
$$

∴ 1.877 ÷ 25 = 0.07508

(h) 1125.3 ÷ 11

$$
\begin{array}{r}
11\overline{)11253}(1023 \\
-\underline{11} \\
25 \\
-\underline{22} \\
33 \\
-\underline{33} \\
\underline{0}
\end{array}
$$

∴ 1125.3 ÷ 11 = 102.3

2. (a) 14.23 ÷ 10 = 1.423 (b) 23.64 ÷ 10 = 2.364

(c) 0.456 ÷ 10 = 0.0456 (d) 0.05 ÷ 10 = 0.005

(e) 8.12 ÷ 100 = 0.0812 (f) 217.4 ÷ 100 = 2.174

(g) 476.35 ÷ 1000 = 0.47635 (h) 38.9 ÷ 1000 = 0.0389

3. (a) $4.9 \div 0.7 = \frac{4.9}{0.7} = \frac{49}{7} = 7$

$$
\begin{array}{r}
7\overline{)49}(7 \\
-\underline{49} \\
\underline{0}
\end{array}
$$

(b) $9.69 \div 1.9 = \frac{9.69}{1.9} = \frac{969}{190} = 5.1$

$$
\begin{array}{r}
190\overline{)969}(5.1 \\
-\underline{950} \\
190 \\
-\underline{190} \\
\underline{0}
\end{array}
$$

(c) $2.0484 \div 0.18 = \dfrac{2.0484}{0.1800} = \dfrac{20484}{1800} = 11.38$

1800) 20484 (11.38
– 1800
2484
– 1800
6840
– 5400
14400
–14400
0

(d) $56.192 \div 3.2$

$= \dfrac{56.192}{3.200} = \dfrac{56192}{3200} = 17.56$

3200) 56192 (17.56
– 3200
24192
– 22400
17920
– 16000
19200
– 19200
0

(e) $236.6 \div 0.26$

$= \dfrac{236.60}{0.26} = \dfrac{23660}{26}$

26) 23660 (910
– 234
26
– 26
0
– 0
0

(f) $0.625 \div 0.025$

$= \dfrac{0.625}{0.025} = \dfrac{625}{25} = 25$

25) 625 (25
– 50
125
– 125
0

(g) $1.296 \div 0.108$

$$= \frac{1.296}{0.108}$$

$$= \frac{1296}{108} = 12$$

$$\begin{array}{r} 108\overline{)1296}(12 \\ -\underline{108} \\ 216 \\ -\underline{216} \\ \underline{0} \end{array}$$

(h) $7.45 = 0.32$

$$= \frac{7.45}{0.32} = \frac{745}{32} = 23.28125$$

$$\begin{array}{l} 32\overline{)745}(23.28125 \\ -\underline{64} \\ \;\;105 \\ -\;96 \\ \;\;\;\;90 \\ \;\;-\underline{64} \\ \;\;\;\;260 \\ \;\;-\underline{256} \\ \;\;\;\;\;\;40 \\ \;\;\;\;-\underline{32} \\ \;\;\;\;\;\;\;80 \\ \;\;\;\;\;-\underline{64} \\ \;\;\;\;\;\;\;\;160 \\ \;\;\;\;\;\;-\underline{160} \\ \;\;\;\;\;\;\;\;\;0 \end{array}$$

4. (a) The perimeter of a square = 260.8 m

$\therefore$ the side of a square = $260.8 \div 4$

= 65.2 m

$\because$ the area of a square = side^2

$\therefore$ the area of a square = $(65.2)^2$

= 4251.04 sq.m.

5. The cost of 16.5 kg onions = ` 255.75

$\therefore$ the cost of 1 kg onions = ` $255.75 \div 16.5$

= ` 15.5

Hence, the cost of 2 kg onions = ` $15.5 \times 2$ = ` 31.0

6. The cost of 19 books = ` 1206.50

$\therefore$ the cost of 1 book = ` $1206.50 \div 19$ = ` 63.50

$\therefore$ the cost of 22 books = ` $63.50 \times 22$ = ` 1397

Thus, she payed = ` 1397 – ` 1206.50

$= ₹\ (190.5)$

7. Sohail travels in 17 minutes $= 11.05$ km

$\therefore$ Sohail travels in 1 minute $= 11.05 \div 17 = 0.65$ km

$\therefore$ he will travel in 19.5 minute $= 0.65 \times 19.5$ km

$= 12.675$ km

8. The required cloth for 17 shirts $= 316.25$ m

$\therefore$ The required cloth for 1 shirts $= 316.25$ m

$= 18.603$ m.

$\therefore$ The required cloth for 24 shirts $= 18.603 \times 24$

$= 446.4790$ m

9. The capacity of a jar $= 2.15\ l$

and the capacity of a tank $= 53.75\ l$

$\therefore$ No. of jars $= \dfrac{\text{The capacity of a tank}}{\text{The capacity of a jar}}$

$= \dfrac{53.75\,l}{2.15\,l} = 25$ jars.

10. The cost of 254.50 l of petrol $= ₹\ 11452.50$

$\therefore$ the cost of 1 l of petrol $= ₹\ 11452.50 \div 254.50$

$= ₹\ 45$

Multiple Choice Questions

Mark (✓) against the correct answer in each of the following :

1. (c), 2. (c), 3. (b), 4. (b), 5. (c), 6. (b), 7. (c), 8. (c)

5 Ratio, Proportion and Percentage

Exercise 5.1

1. We first convert all unt into their same units.

(a) 7 kg to 140 g $= \dfrac{7 \times 1000\text{g}}{140\text{g}}$ $\qquad (\because 1 \text{ kg} = 1000\text{g})$

$= \dfrac{7000}{140} = \dfrac{50}{1} = 50 : 1$

(b) 6 km to 150 m $\qquad (\because 1\text{ km} = 1000\text{m})$

$= \dfrac{6 \times 1000\text{m}}{150\text{m}} = \dfrac{6000}{150} = \dfrac{6000}{150} = \dfrac{40}{1} = 40 : 1$

(c) 50 p to ₹ 3 $= \dfrac{50\text{P}}{3 \times 100\text{P}}$ $\qquad (\because ₹\ 1 = 100\text{P})$

$= \dfrac{1}{3 \times 2} = \dfrac{1}{6} = 1 : 6$

(d) 16 hrs to 2 days (∵ 1 day = 24 hrs)

$$= \frac{16\,\text{hrs}}{2 \times 24\,\text{hrs}} = \frac{1}{3} = 1 : 3$$

(e) 160 cm to 1 m

$$= \frac{160\text{cm}}{1 \times 100\text{cm}} \qquad (\because 1\,\text{m} = 1000\,\text{cm})$$

$$= \frac{160}{100} = \frac{8}{5} = 8 : 5$$

(f) 1 crore to 1 million

$$= \frac{1\text{crore}}{1\text{million}} = \frac{1 \times 10\text{ million}}{1\text{million}} \qquad (\because 1 \text{ crore} = 10 \text{ million}$$

$$= \frac{10}{1} = 10:1$$

(g) 1.5 l to 2.7 $l = \frac{1.5l}{2.7l} = \frac{15}{27} = \frac{5}{9} = 5:9$

(h) 60 minutes to 35 seconds

$$= \frac{60\,\text{minutes}}{35\text{seconds}}$$

$$= \frac{60 \times 60\text{seconds}}{35\text{seconds}} (\therefore 1 \text{ min} = 60 \text{ seconds})$$

$$= \frac{60 \times 12}{7} = \frac{720}{7} = 720 : 7$$

2. (a) 2 : 5 or 3 : 7

$\frac{2}{5}$ and $\frac{3}{7}$

No, compare the two fractions $\frac{2}{5}$ and $\frac{3}{7}$ making their denominators equal.

$\therefore \quad \frac{2}{5} = \frac{2 \times 7}{5 \times 7} = \frac{14}{35}; \qquad \frac{3}{7} = \frac{3 \times 5}{7 \times 5} = \frac{15}{35}$

$\because \quad 14 < 15,$

$\therefore \quad \frac{14}{35} < \frac{15}{35} \qquad$ or $\qquad \frac{2}{5} < \frac{3}{7}$

Hence, (3 : 7) is greater.

(b) 4 : 5 or 5 : 6

$4:5 = \frac{4}{5}$ and $5:6 = \frac{5}{6}$

Now, compare the two fractions $\frac{4}{5}$ and $\frac{5}{6}$ making their denominators equal.

LCM of 5 and 6 = 30

$\therefore \quad \frac{4}{5} = \frac{4 \times 6}{5 \times 6} = \frac{24}{30}; \qquad \frac{5}{6} = \frac{5 \times 5}{6 \times 5} = \frac{25}{30}$

$\because \quad 24 < 25$

$\therefore \quad \frac{24}{30} < \frac{25}{30}$ or $\frac{4}{5} < \frac{5}{6}$

Hence, (5 : 6) is greater.

3. Let required sweet be x kg.

Here, $50 : x :: 200 : 700$

Product of the extreme $= 50 \times 700$

Product of the means $= 200x$

$\Rightarrow \quad 200x = 50 \times 700$

$\Rightarrow \quad x = \frac{50 \times 700}{200}$

$= 25 \times 7 = 175$ kg.

4. The given ratio = 5 : 3 and 5 + 3 = 8

Total sum Mr. Chatterjee has = ` 1,200

One sum will get = $\frac{5}{8}$ × ` 1200 = ` 5 × 150

= ` 750

And other sum will get = $\frac{3}{8}$ × ` 1200

= 3 × ` 150 = ` 450.

5. The number of students obtained `A' grade by class VII-A = 9

The number of students obtained `A' grade by class VII-B = 6

$\because \quad 9 > 6$

$\therefore$ The section-A of class VII is better record of `A' grades.

6. Total number of plants = 1050

$\because$ School A planted = 615 plants

$\therefore$ School B planted $= 1050 - 615 = 435$

Therefore, the ratio of plants of school A and school B

$= \frac{615}{435} = \frac{123}{87} = 123 : 87$

or $= 41 : 29$.

7. $a = ?$

$b = 15, c = 40$

If a, b, c are in proportion

then

$a : b :: b : c$

$a : 15 :: 15 : 40$

$\frac{a}{15} = \frac{15}{40}$

$$a = \frac{15 \times 15}{40} = \frac{3 \times 15}{8} = \frac{45}{8}$$

8. Let the distance between A and C be x km

Here, $5:11::700:x$

$$\text{product of the extreme} = 5x$$
$$\text{product of the means} = 11 \times 700$$
$$\Rightarrow \quad x = \frac{11 \times 700}{5} = 11 \times 140$$
$$= 1540 \text{ km}$$

So, the distance between the two cities A and C is 1540 m.

9. Let require fuel be x kg

Here, $\quad 45:120::600:x$

$$\frac{45}{120} = \frac{600}{x}$$
$$45x = 120 \times 600$$
$$x = \frac{120 \times 600}{45}$$
$$x = 1600 \text{ kg.}$$

10. The height of the tree be x m

Here, $2.5:2::17.5:x$

$$\text{product of the extreme} = 2.5x$$
$$\text{product of the means} = 2 \times 17.5$$
$$\Rightarrow \quad 2.5x = 2 \times 17.5$$
$$\Rightarrow \quad x = \frac{2 \times 17.5}{2.5}$$
$$\Rightarrow \quad x = 2 \times 7 = 14 \text{ m.}$$

Hence, the height of the tree is 14 m.

11. (a) $4:x::20:35$

$$\frac{4}{x} = \frac{20}{35}$$
$$\Rightarrow \quad 20x = 4 \times 35$$
$$\Rightarrow \quad x = \frac{4 \times 35}{20}$$
$$\Rightarrow \quad x = 7$$

(b) $2.5:7.5::x:10.5$

$$\frac{2.5}{7.5} = \frac{x}{10.5}$$
$$7.5x = 2.5 \times 10.5$$
$$\Rightarrow \quad x = \frac{2.5 \times 10.5}{7.5}$$

$\Rightarrow \quad x = \dfrac{10.5}{3}$

$\Rightarrow \quad x = 3.5$

(c) $x : 19 :: 142 : 71$

$$\frac{x}{19} = \frac{142}{71}$$

$\Rightarrow \quad x = \dfrac{142 \times 19}{71}$

$\Rightarrow \quad x = 2 \times 19 \quad \Rightarrow$

$x = 38$

12. Let raffle tickets sell be x

Here, $500 : 1500 :: 50 : x$

product of the extermes $= 500x$

product of the means $= 1500 \times 50$

$\Rightarrow \quad 500x = 1500 \times 50$

$\Rightarrow \quad x = \dfrac{1500 \times 50}{500}$

$\Rightarrow \quad x = 3 \times 50$

$\Rightarrow \quad x = 15$ tickets.

Exercise 5.2.

1. In ` 1650, the quantity of rice = 50 kg

$\therefore$ In ` 1, the quantity of rice $= \dfrac{50}{1650}$ kg

$\therefore$ In ` 4,125, the quantity of rice $= \dfrac{50}{1650} \times 4125$ kg

$= \dfrac{1}{33} \times 4125$ kg

$= 1 \times 125$ kg = 125 kg.

2. The cost of 17 metres of cloth = ` 1028.50

$\therefore$ The cost of 1 meters of cloth = ` $\dfrac{1028.50}{17}$

$\therefore$the cost of 80 meters of cloth = ` $\dfrac{1028.50}{17} \times 80$

= ` $60.5 \times 80$ = ` 4840.

3. Let Seema take x mins. to cover 438 km

Distance (in km)	Time (in min.)
73 $\downarrow$	57 $\downarrow$
438	x

$73 : 57 :: 438 : x$

$73 \times x = 57 \times 438$

$\Rightarrow$ $x = \dfrac{57 \times 438}{73}$ $\Rightarrow$

$x = 57 \times 6$

$\Rightarrow$ $x = 342$ minutes.

4. The weight of packets of tea $= 35$ kg

$\therefore$ the weight of packets of tea $= \dfrac{35}{10}$ kg

$\therefore$ the weight of 53 packets of tea $= \dfrac{35}{10} \times 53 = 185.5$ kg.

5. A train travelled in 5 hrs $= 275$ km

train travelled in 1 h $= \dfrac{295}{5}$ km

train travelled in 8 hrs 15 min $= \dfrac{295}{5} \times \dfrac{33}{4}$ km

$= \dfrac{59 \times 33}{4}$ km $= 486.75$ km.

6. Let the height of the glass building be x m

So, $7.5 : 5 :: 97.5 : x$

$$\frac{7.5}{5} = \frac{97.5}{x}$$

$\Rightarrow$ $7.5x = 5 \times 97.5$

$\Rightarrow$ $x = \dfrac{5 \times 97.5}{7.5}$

$\Rightarrow$ $x = 5 \times 13$

$\Rightarrow$ $x = 65$ m

Hence, the height of the glass building is 65 m.

7. Let it take x sec. to fill a container of capacity 2.5 litre

Then, litre : litre :: sec : sec

1 : 2.5 : : 10 : x

Since product of extremes = product of means

Therefore,

$1 \times x = 2.5 \times 10$ $x = 25$ sec.

Hence, it will take 25 sec. to fill a container of capacity 2.5 litre.

8. Let the parking fee be ` x $(\because 2\frac{3}{4} = 3\text{h round off})$

Then, Time : Time : : ` : `

1 : 3 : : 10 : x

Since product of extremes = product of means

$1 \times x =$ ` $3 \times 10$ $x =$ ` 30

Hence, ` 30 is the parking fee for $2\frac{3}{4}$ hrs.]

9. (a) Let time taken be x min

Then, Sheets : Sheets : : Time : Time

$$150 : 3000 :: 3 : x$$

Since product of extreme = product of means

Therefore,

$$150 \times x = 3000 \times 3$$

$$\Rightarrow \quad x = \frac{3000 \times 3}{150}$$

$$\Rightarrow \quad x = 20 \times 3$$

$$\Rightarrow \quad x = 60 \text{ minutes.}$$

(b) Sheets : Sheets : : Time : Time

$150 : x :: 3 : 90$

Since product of extremes $=$ product of means

$$150 \times 90 = 3 \times x$$

$$x = \frac{150 \times 90}{3}$$

$$x = 150 \times 30$$

$$x = 4500 \text{ sheets.}$$

10. In 500 km, a car used petrol $= 20\,l$

1 km, a car used petrol $= \dfrac{20\,l}{500}$

In 750, km a car will use the petrol $= \dfrac{20}{500} \times 750$

$= 2 \times 15\,l = 30\,l$

and

In 20 litre of petrol, car covers $= 500$ km

$\therefore$ In 1 litre of petrol, car covers $= \dfrac{500}{20}$ km

Therefore, in 27 litre of petrol, car covers $= \dfrac{500}{20} \times 27$

$= 25 \times 27 = 675$ km.

Hence, the car covers 750 km in $30\,l$ of petrol and 675 km in $27\,l$ of petrol.

Exercise 5.3

1. (a) $30\% = 30 \times \dfrac{1}{100} = \dfrac{30}{100} = \dfrac{3}{10}$

(b) $12\dfrac{1}{2}\% = \dfrac{25}{2}\% = \dfrac{25}{2} \times \dfrac{1}{100} = \dfrac{1}{2 \times 4} = \dfrac{1}{8}$

(c) $1.45\% = \dfrac{145}{100}\% = \dfrac{145}{100} \times \dfrac{1}{100} = \dfrac{29}{2000}$

(d) $0.5\% = \dfrac{5}{10} \times \dfrac{1}{100} = \dfrac{5}{1000} = \dfrac{1}{200}$

2. (a) $\frac{51}{100} = 51 \times \frac{1}{100} = 51\%$

(b) $2\frac{3}{5} = \frac{13}{5} = \frac{13}{5} \times \frac{100}{100} = \frac{1300}{5} \times \frac{1}{100} = 260\%$

(c) $\frac{75}{40} = \frac{75}{40} \times \frac{100}{100} = \frac{750}{4} \times \frac{1}{100} = 187.5\%$

(d) $6\frac{1}{4} = \frac{25}{4} \times \frac{100}{100} = 25 \times 25 \times \frac{1}{100} = 625\%$

3. (a) $200\% = 200 \times \frac{1}{100} = \frac{200}{100} = \frac{2}{1} = 2:1$

(b) $6\frac{1}{4}\% = \frac{25}{4}\% = \frac{25}{4} \times \frac{1}{100} = \frac{1}{4 \times 4} = \frac{1}{16} = 1:16$

(c) $0.35\% = \frac{35}{100}\% = \frac{35}{100} \times \frac{1}{100} = \frac{7}{20} \times \frac{1}{100} = \frac{7}{2000} = 7:2000$

(d) $0.05\% = \frac{5}{100}\% = \frac{5}{100} \times \frac{1}{100} = \frac{1}{20} \times \frac{1}{100} = 1:2000$

4. (a) $11 : 125 \quad = \frac{11}{125} = \frac{11}{125} \times \frac{100}{100}$

$= \frac{11}{5} \times \frac{4}{100} = \frac{44}{5} \times \frac{1}{100} = 8\frac{4}{5}\%$

(b) $2 : 3 = \frac{2}{3} = \frac{2}{3} \times \frac{100}{100} = \frac{200}{3}\% = 66\frac{2}{3}\%$

(c) $25:75 = \frac{25}{75} \times \frac{100}{100} = \frac{25 \times 4}{3} \times \frac{1}{100} = \frac{100}{3}\% = 33\frac{1}{3}\%$

(d) $20 : 25 = \frac{20}{25} = \frac{20}{25} \times \frac{100}{100} = 20 \times 4 \times \frac{1}{100} = 80\%$

5. (a) $145\% = 145 \times \frac{1}{100} = \frac{145}{100} = 1.45$

(b) $0.3\% = \frac{3}{10}\% = \frac{3}{10} \times \frac{1}{100} = \frac{3}{1000} = 0.003$

(c) $1\frac{1}{4}\% = \frac{5}{4} \times \frac{1}{100} = \frac{5}{400} = 0.0125$

(d) $2\frac{1}{3}\% = \frac{7}{3}\% = \frac{7}{3} \times \frac{1}{100} = \frac{7}{3} = 0.0233$

6. (a) $0.04 = \frac{4}{100} = \frac{4}{1} \times \frac{1}{100} = 4\%$

(b) $2.35 = \frac{235}{100} = 235 \times \frac{1}{100} = 235\%$

(c) $7.50 = \frac{750}{100} = 750 \times \frac{1}{100} = 750\%$

7. (a) $4\frac{1}{2}\%$ of ` 180 $= \frac{9}{2}\%$ of ` 180

$$= \text{`}\,\frac{9}{2} \times \frac{1}{100} \times 180$$

$$= \text{`}\,\frac{81}{10} = \text{`}\ 8.10$$

(b) $$2.25\% \text{ of } 10000 \text{ m} = \left(\frac{225}{100} \times \frac{1}{100} \times 10000\right) \text{m}$$

$$= 225 \text{ m}$$

(c) $$3\frac{1}{3}\% \text{ of } 60 \text{ litres} = \left(\frac{10}{3}\% \times 60\right) \text{litres}$$

$$= \left(\frac{10}{3} \times \frac{1}{100} \times 60\right) \text{litres}$$

$$= \frac{600}{300} \text{ litres} = 2 \text{ litres}$$

(d) $$0./5\% \text{ of } 250 \text{ km} = \left(0.5 \times \frac{1}{100} \times 250\right) \text{km}$$

$$= \left(\frac{5}{10} \times \frac{1}{100} \times 250\right) \text{km}$$

$$= \left(\frac{5 \times 25}{100}\right) \text{km}$$

$$= \frac{5}{4} = 1.25 \text{ km.}$$

8. (a) $$\text{Required percent} = \left(\frac{\text{`}\ 100}{\text{`}\ 500} \times 100\right)\%$$

$$= \frac{100}{5}\% = 20\%$$

(b) $$\text{Required percent} = \left(\frac{160\text{m}}{5\text{km}} \times 100\right)\%$$

$$(\because 1 \text{ km} = 1000 \text{ m}) = \left(\frac{160\text{m}}{5 \times 1000\text{m}} \times 100\right)\%$$

$$= \left(\frac{160}{5000} \times 100\right)\% = \frac{16}{5}\%$$

$$= 3.2\%$$

(c) $$\text{Required percent} = \left(\frac{75 \text{ paise}}{\text{`}\ 8} \times 100\right)\%$$

$$(\because \text{`}\ 1 = 100 \text{ paise}) = \left(\frac{75 \text{ paise}}{\text{`}\ 8} \times 100\right)\%$$

$$= \left(\frac{75}{800} \times 100\right)\%$$

$$= \frac{75}{8}\% = 9.375\%$$

(d) Required percent $= \left(\frac{0.5}{5} \times 100\right)\%$

$$= \left(\frac{5}{50} \times 100\right)\%$$

$$= (5 \times 2)\% = 10\%$$

(e) Required percent $= \left(\frac{450\text{g}}{2.75\,\text{kg}} \times 100\right)\%$

$$= \left(\frac{450\text{g}}{2.75 \times 1000\text{g}} \times 100\right)\%$$

$$= \left(\frac{4500}{275}\right)\% = \left(\frac{180}{11}\right)\%$$

$$= 16\frac{4}{11}\%$$

(f) Required percent $= \left(\frac{12\,\text{min}}{3\,\text{hour}} \times 100\right)\%$

$$= \left(\frac{12\,\text{min}}{3 \times 60\,\text{min}} \times 100\right)\%$$

$$= \frac{1200}{180}\% = \frac{120}{18}\%$$

$$= \frac{20}{3}\% = 6\frac{2}{3}\%$$

9. Let the required number be x

$\therefore$ $3\frac{1}{4}\%$ of $x = 13$

$\Rightarrow$ $\frac{13}{4}\% \times x = 13$

$\Rightarrow$ $\frac{13}{4} \times \frac{1}{100} \times x = 13$

$\Rightarrow$ $x = \frac{13 \times 100 \times 4}{13}$

$\Rightarrow$ $x = 400$

Hence, the required number is 400.

10. Let the required number be x

$\therefore$ 0.05% of $x = 200$

$$\frac{5}{100} \times \frac{1}{100} \times x = 200$$

$$\Rightarrow \quad x = \frac{200 \times 100 \times 100}{5}$$

$$\Rightarrow \quad x = 40 \times 100 \times 100 \quad \Rightarrow$$

$$x = 400000$$

Hence, the required number is 400000.

11.
$$y\% \text{ of } 250 = 21$$

$$y\% \times 250 = 21$$

$$y \times \frac{1}{100} \times 250 = 21$$

$$y = \frac{21 \times 10}{25}$$

$$y = \frac{21 \times 2}{5} = \frac{42}{5} = 8.4$$

Hence, the value of y is 8.4

12. Total number of oranges $= 120$

Number of distributed oranges $= 25$

Remain oranges $= 120 - 25 = 95$

the percentage of left oranges $= \left(\frac{95}{120} \times 100\right)\%$

$$= \left(\frac{95 \times 5}{6}\right)\% = \frac{475}{6}\%$$

$$= 79\frac{1}{6}\%.$$

Exercise 5.4

1. The total number of tomatoes $= 450$

The percentage of rotten tomatoes $= 16\%$

The number of remaining tomatoes $= ?$

The number of rotten tomatoes $= 450 \times 16\%$

$$= 450 \times \frac{16}{100} = 9 \times 8 = 72$$

So, the number of remaining tomatoes $= 450 - 72 = 378.$

2. The total number of eligible voters $= 105000$

the number of cast voters $= 65000$

$\therefore$ the percentage $= \frac{\text{cast voters}}{\text{eligible voters}} \times 100\%$

$$= \left(\frac{65000}{105000} \times 100\right)\%$$

$$= \left(\frac{65}{105} \times 100\right)\% = \frac{65 \times 20}{21}\% = 61\frac{19}{21}\%.$$

3. The price of a shirt = ₹ 225

Reduce percentage = 8%

Net price = ?

$$\text{Reduced price} = ₹\ 225 \times \frac{8}{100}$$

$$= ₹\ \frac{9 \times 8}{4} = ₹\ 18$$

$\therefore$ Net price = ₹ 225 – ₹ 18

= ₹ 207.

4. The speed of a train = 120 km/h

increase percentage = 10%

We know that,

$$\text{Increase \%} = \left(\frac{\text{Increase}}{\text{Original speed}} \times 100\right)$$

$$10 = \left(\frac{\text{Increase}}{120} \times 100\right)$$

$$10 \times 12 = 10 \times \text{Increase}$$

$$\text{Increase} = \frac{10 \times 12}{10} = 12\,\text{km/h}$$

Hence, the increase speed is 12 km/h and new speed is (120 + 12) km/h or 132 km/h.

5. Nishan's salary = ₹ 9000

Increase percentage in salary = 5%

Increase salary = ?

$$\text{Increase \%} = \left(\frac{\text{Increase}}{\text{Original Value}} \times 100\right)$$

$$5 = \frac{\text{Increase}}{₹\ 900} \times 100$$

$$₹\ 5 \times 90 = \text{Increase}$$

or Increase salary = ₹ 450

Hence, he will get ₹ $(9000 + 450)$ or ₹ 9450

6. Let the total number of students be x.

$\because$ Percentage of girls = 40%

$\therefore$ Percentage of boys = $(100 - 40)\% = 60\%$

Then, 60% of x = 840

$$\frac{60}{100} \times x = 840$$

$$\Rightarrow \quad x = \frac{840 \times 100}{60}$$

$\Rightarrow \quad x = 14 \times 100$

$\Rightarrow \quad x = 1400$

So, the number of girls $= (1400 - 840) = 560.$

7. The maximum marks $= 500$

percentage of obtained marks $= 65\%$

So, marks obtained by Amit $500 \times 65\%$

$$= 500 \times \frac{65}{100} = 5 \times 65 = 325$$

Hence, the marks obtained by Amti is 325.

8. Total distance covered by Naveen $= 15$ km

percentage of the distance by bus $= 75\%$

distance covered by bus $= 75\% \times 15$

$$= \frac{75}{100} \times 15$$

$$= \frac{3}{4} \times 15 = \frac{45}{4} = 11.25 \text{ km}$$

And the distance cover on foot $= (15 - 11.25)$ km

$= 3.75$ km.

9. Present monthly tuition fees $=$ ` 350

Percentage increase $= 15\%$

the increased tuition fees $=$ ` $(350 + 350 \times 15\%)$

$$= \text{` } \left(350 + 350 \times \frac{15}{100}\right)$$

$=$ ` $(350 + 52.5)$

$=$ ` 402.50.

10. The percentage of Rohit's scored $= \left(\frac{565}{650} \times 100\right)\%$

$$= \frac{565 \times 10}{65}\% \text{ or } 87\%$$

Similarly,

The percentage of Raman's scored

$$= \left(\frac{420}{500} \times 100\right)\%$$

$$= \frac{420}{5}\% = 84\%$$

Since, 87% > 84%

Therefore, Rohit's performance is better than Raman.

11. The price of a car $=$ ` 195000

and the percent price of a car $=$ ` 210600

The percentage $= \dfrac{210600 - 195000}{210600} \times 100$

$$= \frac{15600}{195000} \times 100 = 8\%$$

Hence, increase percent of price of the car is 8%.

12. The total income of a state $= ₹\ 2120$ crores

percentage spent on education $= 25\%$

(i) spent on education $= ₹\ 2120 \times 25\%$

$$= ₹\ 2120 \times \frac{25}{100}$$

$$= ₹\ 2120 \times \frac{1}{4}$$

$= ₹\ 530$ crores.

(ii) And spent on other items $= ₹\ (2120 - 530)$ crores.

$= 1590$ crores.

13. Total number of matches $= 18$

number of won matches $= 8$

number of lost matches $= 4$

(i) percentage of win matches $= \left(\frac{8}{18} \times 100\right)\%$

$$= \left(\frac{8 \times 50}{9}\right)\% = 44\frac{4}{9}\%.$$

(ii) percentage of lose matches $= \left(\frac{4}{18} \times 100\right)\%$

$$= \left(\frac{4}{9} \times 50\right)\%$$

$$= 22\frac{2}{9}\%.$$

14. The population of India $= 100$ crores

percentage of increased population $= 2.5\%$

So, Increase population $= 100 \times 2.5\%$

$$= 100 \times 2.5 \times \frac{1}{100}$$

$= 2.5$ crore

Therefore, after 1 year the population

$= (100 + 2.5)$ crore

$= 102.5$ crores

15. Let the total number of teachers be x

percentage of women employees $= 12\%$

number of men employees $= 264$

percentage of men employees $= (100 - 12)\%$

$= 88\%$

Then, 88% of x $= 264$

$$88 \times \frac{1}{100} \times x = 264$$

$\Rightarrow$ $$x = \frac{264 \times 100}{88}$$

$\Rightarrow$ $$x = \frac{24 \times 100}{8} = 3 \times 100$$

$\Rightarrow$ $$x = 300$$

the number of female employees $= 300 - 264 = 36$

Hence, the total number of employees is 300 and female employees is 36.

Exercise 5.5

1. (a) C.P. = ` 4550, S.P. = ` 5060

Since, S.P. > C.P.

$\therefore$ profit = S.P. – C.P.

= ` (5060 – 4550)

= ` 510.

(b) C.P. = ` 6560, S.P. = ` 6000

Since, C.P. > S.P.

Then loss = C.P. – S.P.

= ` (6560 – 6000)

= ` 560.

2. (a) C.P. = ` 24

profit = ` 4

$\because$ $$\text{profit \%} = \frac{\text{proft}}{\text{C.P.}} \times 100$$

$$= \frac{4}{24} \times 100 = \left(\frac{1}{6} \times 100\right)\%$$

$$= 16\frac{4}{6}\%$$

or $$= 16\frac{2}{3}\%.$$

(b) C.P. = ` 150, loss = ` 12

$$\text{loss\%} = \left(\frac{\text{loss}}{\text{C.P.}} \times 100\right)\%$$

$$= \left(\frac{12}{150} \times 100\right)\%$$

$$= \left(\frac{12 \times 2}{3}\right)\%$$

$$= (4 \times 2)\% = 8\%.$$

3. Let, cost price of a book $= x$

and, cost price of 12 books $= 12x$

$$\text{cost price of 15 books} = 15x$$

Accoriding to question,

$$\text{C.P. of 15 books} = \text{S.P. of 12 books} = 15x$$

Since, S.P. > C.P., then their is a profit

$$\text{Profit} = \text{S.P.} - \text{C.P.} = 15x - 12x = 3x$$

So, $$\text{gain percent} = \frac{\text{gain}}{\text{C. P.}} \times 100\%$$

$$= \frac{3x}{12x} \times 100 = \frac{100}{4} = 25\%$$

4. $$\text{Total C.P.} = ` \, (670 + 45) = ` \, 715$$

and $$\text{S.P.} = ` \, 880$$

$$\text{profit} = \text{S.P.} - \text{C.P.}$$

$$= ` \, (880 - 715) = ` \, 165$$

So, $$\text{gain percent} = \left(\frac{165}{715} \times 100\right)\%$$

$$= \left(\frac{3}{13} \times 100\right)\% = \frac{300}{13}\% = 23\frac{1}{13}\%.$$

5. The cost price of 6 dozens of banana

$$= ` \, 6 \times 15 = ` \, 90$$

$$\text{The selling price} = ` \, 6 \times 10 = ` \, 60$$

Since, C.P. > S.P.

So, $$\text{loss} = \text{C.P.} - \text{S.P.}$$

$$= ` \, (90 - 60) = ` \, 30$$

$$\text{loss \%} = \left(\frac{\text{loss}}{\text{C. P.}} \times 100\right)\%$$

$$= \left(\frac{30}{90} \times 100\right)\%$$

$$= \left(\frac{1}{3} \times 100\right)\% = \frac{100}{3}\% = 33\frac{1}{3}\%$$

or $$= 33\frac{1}{3}\%$$

6. $$\text{The total cost price} = ` \left(\frac{120}{3} + \frac{120}{2}\right) = ` \, (40 + 60) = ` \, 100$$

$$\text{Selling price} = ` \, \frac{240}{5} \times 2 = ` \, 48 \times 2 = ` \, 96$$

Since Cost price > Selling price

$\therefore$ $$\text{loss} = ` \, (100 - 96) = ` \, 4$$

and $$\text{loss\%} = \left(\frac{\text{loss}}{\text{cost price}} \times 100\right)\%$$

$$= \left(\frac{4}{100} \times 100\right)\% = 4\%.$$

7. Total cost price $=$ ` $(300000 + 65000) =$ ` 365000

Selling price $=$ ` 325000

Since, Cost price > Selling prince

$\therefore$ Loss $=$ C.P. – S.P.

$=$ `$(365000 - 325000) =$ ` 40000

$$\text{Loss \%} = \left(\frac{\text{Loss}}{\text{Cost price}} \times 100\right)\%$$

$$= \left(\frac{40000}{365000} \times 100\right)\%$$

$$= \frac{4000}{365}\% = \frac{800}{73}\% = 10\frac{70}{73}\%$$

8. Let, C.P. of a table $= x$

Then, C.P. of 20 tables $= 20x$

and, C.P. of 25 tables $= 25x$

According to question,

C.P. of 20 tables $=$ S.P. of 25 tables $= 20x$

C.P. > S.P. (their is a loss).

Loss $=$ C.P. – S.P $= 25x - 20x = 5x$

$$\text{Loss percent} = \frac{\text{Loss}}{\text{C.P.}} \times 100\%$$

$$= \frac{5x}{25x} \times 100\% = \frac{1}{5} \times 100 = 20\%$$

9. S.P. $=$ ` 5950

loss % $= 15\%$

C.P. $= ?$

And new S.P. $= ?$

$$\text{Loss \%} = \left(\frac{\text{Loss}}{\text{C.P.}} \times 100\right)$$

$$15 = \frac{\text{C.P.} - \text{S.P.}}{\text{C.P.}} \times 100$$

15 C.P. $= 100$ C.P. – 100 S.P.

100 C.P. – 15 C.P. $= 100$ S.P.

85 C.P. $=$ ` 100×5950

$$\text{C.P.} = \text{`}\ \frac{100 \times 5950}{85}$$

C.P. $=$ ` 100×70

C.P. $=$ ` 7000

So, to get a profit of 10%

$$\text{Profit \%} = \frac{\text{profit}}{\text{C.P.}} \times 100$$
$$10 = \frac{\text{S.P.} - 7000}{7000} \times 100$$
$$10 = \frac{\text{S.P.} - 7000}{70}$$
$$700 = \text{S.P.} - 7000$$
$$\text{S.P.} = 7000 + 700$$
$$\text{S.P.} = ` \ 7700$$

Hence, the selling price is ` 7700.

10. (a) Let, the cost price be x

$$\therefore \quad \text{profit \%} = \frac{\text{profit}}{x} \times 100$$
$$\text{profit \%} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100$$
$$12\frac{1}{2} = \frac{249.75 - x}{x} \times 100$$
$$\frac{25}{2} \times x = 24975 - 100x$$
$$\frac{25}{2}x + 100x = 24975$$
$$x\left(\frac{25 + 200}{2}\right) = 24975$$
$$x = \frac{24975 \times 2}{225}$$
$$x = 111 \times 2$$
$$x = 222$$

Hence, the cost price is ` 222.

(b) Let the selling price be ` y.

$$\therefore \quad \text{profit \%} = \frac{\text{profit}}{\text{C.P.}} \times 100$$
$$\text{profit \%} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100$$
$$25 = \frac{y - 222}{222} \times 100$$
$$222 = 4y - 4 \times 222$$
$$4y = 222 + 888$$
$$4y = 1110$$
$$y = 277.50$$

Hence, the selling price is ` 277.50

11. The cost price of one dozen oranges

$$= ` 24$$

$$\text{loss \% of oranges} = 10\%$$

$$\text{Selling price} = ?$$

$$\text{loss \%} = \frac{\text{loss}}{\text{C. P.}} \times 100$$

$$\text{loss \%} = \frac{\text{C. P.} - \text{S. P.}}{\text{C. P.}} \times 100$$

$$10 = \frac{24 - \text{S. P.}}{24} \times 100$$

$$24 = (24 - \text{S. P.}) \times 10$$

$$24 = 240 - 10 \times \text{S. P.}$$

$$10 \times \text{S.P.} = 240 - 24$$

$$\text{S.P.} = 216/10$$

$$\text{S.P.} = ` 21.6$$

So, the Selling price of one dozen oragnes

$$= ` 21.6$$

$\therefore$ The selling price of an ornage $= ` \dfrac{21.6}{12} = ` 1.80$

12. Total C.P. $= 25 \times 8 + 30 \times 10 = ` 200 + ` 300$

$$= ` 500$$

The cost price of one kg apples $= ` 500 \div (25 + 30)$

$$= ` 500 \div 55 = \frac{100}{11}$$

$$\text{gain \%} = 21, \text{ Selling price } = ?$$

$$\text{gain \%} = \frac{\text{gain}}{\text{C. P.}} \times 100$$

$$21 = \frac{\text{S. P.} - \text{C. P.}}{\text{C. P.}} \times 100$$

$$21 = \frac{\text{S. P.} - \frac{100}{11}}{\frac{100}{11}} \times 100$$

$$21 = \frac{(11 \times \text{S. P.} - 100)}{100} \times 100$$

$$11 \times \text{S. P.} = 21 + 100$$

$$11 \times \text{S. P.} = 121$$

$$\text{S.P.} = \frac{121}{11} = 11$$

Hence, he should sell apples at rate ` 11 per kg.

13. Let the C.P. of a book be x

$$\because \quad \text{profit percent} = \frac{\text{S. P.} - \text{C. P.}}{\text{C. P.}} \times 100$$

$$\begin{aligned}
15 &= \frac{230 - x}{x} \times 100 \\
15x &= 23000 - 100x \\
115x &= 23000 \\
x &= ₹\ 23000 \div 115 \\
x &= ₹\ 200 \\
\text{Actual profit} &= \text{S.P.} - \text{C.P.} = ₹\ (230 - 200) = ₹\ 30
\end{aligned}$$

Hence, the C.P. and actual profit is ₹ 200, ₹ 30 respetively.

14.

$$\begin{aligned}
\text{S.P.} &= ₹\ 240, \\
\text{profit } \% &= 20\% \\
\text{C.P.} &= ?
\end{aligned}$$

$$\because \quad \text{C.P.} = \frac{\text{S. P.} \times 100}{100 + \text{profit}}$$

$$\therefore \quad \text{C.P.} = \frac{240 \times 100}{100 + 20}$$

$$\begin{aligned}
\text{C.P.} &= \frac{24000}{120} \\
\text{C.P.} &= ₹\ 200
\end{aligned}$$

If he sells the articles for ₹ 275

So, new profit = ?

$$\begin{aligned}
\text{New profit } \% &= \left(\frac{275 - 200}{200} \times 100\right)\% \\
&= \frac{75}{2}\% = 37.5\%
\end{aligned}$$

15. Let the C.P. of a T.V. set be ₹ x

$$\begin{aligned}
\text{Therefore, loss } \% &= \frac{\text{loss}}{\text{C. P.}} \times 100 \\
5 &= \frac{x - \text{S. P.}}{x} \times 100 \\
\frac{5x}{100} &= x - \text{S.P.} \\
\text{S.P.} &= x - \frac{1}{20}x = \frac{20x - x}{20} \\
\text{S.P.} &= \frac{19}{20}x
\end{aligned}$$

To make a profit 10%

$$10 = \frac{\frac{19}{20}x + 2880 - x}{x} \times 100$$

$$x = \frac{19}{20}x \times 10 + 28800 - 10x$$

$$11x = \frac{19}{2}x + 28800$$

$$\frac{22x - 19x}{2} = 28800$$

$$\frac{3x}{2} = 28800$$

$$x = \frac{28800 \times 2}{3}$$

$$x = ₹\ 9600 \times 2$$

$$x = ₹\ 19200$$

Hence, the C.P. of the T.V. set is ₹ 19200.

Exercise 5.6

1. $P =$ ₹ 1600, $T = 36$ months $= 3$ years, $R = 4\%$, $I = ?$

$$I = \frac{P \times R \times T}{100}$$

$$= \frac{1600 \times 3 \times 4}{100} = 16 \times 12 = ₹\ 192.$$

2. $P =$ ₹ 750, $A =$ ₹ 900, $R = 4\%$, $T = ?$

$\because$ $A = P + \text{S.I.}$

$$\text{S.I.} = A - P$$

$\therefore$ $\text{S.I.} = ₹\ (900 - 750) = ₹\ 150$

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$150 = \frac{750 \times 4 \times T}{100}$$

$$1500 = 75 \times 4 \times T$$

$$T = \frac{1500}{300}$$

$$T = 5 \text{ years.}$$

3. $P =$ ₹ 3000, $A =$ ₹ 3360, $T = 3$ years, $R = ?$

$\because$ $\text{S.I.} = \dfrac{P \times R \times T}{100}$

$$A - P = \frac{P \times R \times T}{100}$$

$$\begin{aligned} 3360 - 3000 &= \frac{3000 \times R \times 3}{100} \\ 360 &= 30 \times R \times 3 \\ R &= \frac{360}{90} \\ R &= 4\%.. \end{aligned}$$

4. The given,

$A =$ ` $2600, T = 3$ years, $R = 10\%, P = ?$

$$\begin{aligned} \because \qquad \text{S.I.} &= \frac{P \times R \times T}{100} \quad (\because A = P + \text{S.I.}) \\ A - P &= \frac{P \times R \times T}{100} \\ \therefore \qquad 2600 - P &= \frac{P \times 10 \times 3}{100} \\ 26000 - 10P &= 3P \\ 13P &= 26000 \\ P &= \text{` } 2000. \end{aligned}$$

5. The given,

$A =$ ` $1472, T = 3$ years, $R = 5\%, P = ?$

$$\begin{aligned} \text{S.I.} &= \frac{P \times R \times T}{100} \\ A - P &= \frac{P \times 5 \times 3}{100} \\ 1472 - P &= \frac{3P}{20} \\ 1472 \times 20 - 20P &= 3P \\ 23P &= 29440 \\ P &= \text{` } 1280. \end{aligned}$$

6. $A =$ ` $364.80, R = 3\frac{1}{2}\%, T = 8$ years, $P = ?$

$$\begin{aligned} \text{S.I.} &= \frac{P \times R \times T}{100} \\ A - P &= \frac{P \times R \times T}{100} \\ 364.80 - P &= \frac{P \times 3\frac{1}{2} \times 8}{100} \\ 36480 - 100P &= P \times \frac{7}{2} \times 8 \\ 36480 - 100P &= 28P \\ 128P &= \text{` } 36480 \end{aligned}$$

$$P = \text{\`{}}\ 36480 \div 128 = \text{\`{}}\ 285.$$

7. $P = \text{\`{}}, 1820,\ R = 7\frac{1}{2}\% = \frac{15}{2}\%$

$$\begin{aligned}
\text{Time} &= (22 + 30 + 21) = 73 \text{ days} \\
\text{S.I.} &= ? \\
\text{S.I.} &= \frac{P \times R \times T}{100} \\
&= \frac{1820 \times \frac{15}{2} \times \frac{73}{365}}{100} \\
&= \frac{182 \times 15 \times 73}{10 \times 2 \times 365} \\
&= \frac{91 \times 15 \times 1}{10 \times 5} = \frac{91 \times 3}{10} = \frac{273}{10} = 27.30
\end{aligned}$$

So, $\text{S.I.} = \text{\`{}}\ 27.30$

8. $P = \text{\`{}}\ 1250,\ R = 18\%,\ T = \left(2 + \frac{4}{12}\right) \text{years} = \frac{7}{3} \text{ years}$

$$\begin{aligned}
\text{S.I.} &= \frac{P \times R \times T}{100} \\
&= \frac{1250 \times 18 \times 7}{100 \times 3} = \frac{125 \times 3 \times 7}{5} = \text{\`{}}\ 25 \times 21 \\
\text{S.I.} &= \text{\`{}}\ 525.
\end{aligned}$$

9. Here, $P = \text{\`{}}\ 5000,\ R = 8\%,\ T = 4$ years, S.I. = ?

$$\begin{aligned}
\text{S.I.} &= \frac{P \times R \times T}{100} \\
\text{S.I.} &= \frac{5000 \times 8 \times 4}{100} = 50 \times 8 \times 4 = \text{\`{}}\ 1600.
\end{aligned}$$

10. $P = \text{\`{}}\ 600,\ T = 3$ years, $R = 6\%$, S.I. = ?, $A = ?$

$$\begin{aligned}
\text{S.I.} &= \frac{P \times R \times T}{100} \\
&= \frac{600 \times 6 \times 3}{100} = \text{\`{}}\ 108
\end{aligned}$$

And $A = P + \text{S.I.} = \text{\`{}}\ 600 + \text{\`{}}\ 108 = \text{\`{}}\ 708$

Hence, the amount to be paid at the end of 3 years is ` 708.

11. $A = \text{\`{}}\ 504,\ P = \text{\`{}}\ 450,\ T = 3$ years

$$\begin{aligned}
\text{S.I.} &= \frac{P \times R \times T}{100} \\
A - P &= \frac{P \times R \times T}{100}
\end{aligned}$$

$$504-450 = \frac{450\times R\times 3}{100}$$
$$54 = \frac{45\times R\times 3}{10}$$
$$540 = 135\times R$$
$$R = \frac{540}{135}$$
$$R = 4\%$$

for same rate of interest :

$$\text{S.I.} = \frac{P\times R\times T}{100}$$
$$\text{S.I.} = \frac{615\times 4\times 5}{100\times 2}$$
$$= \frac{123\times 2\times 5}{20}$$
$$= \frac{123}{2} = 61.50$$

S.I.= ` 61.50, $A = 615 + 61.50 =$ ` 676.50

Hence, ` 676.50 will a amount at same rate of interest.

12. Let the first part be x

Then, second part = ` $(2500 - x)$

So, according to the questions

$$\frac{x\times 4\times 5}{100} = 2\frac{(2500-x)\times 5\times 3}{100}$$
$$20x = 30(2500 - x)$$
$$2x = 3\times 2500 - 3x$$
$$5x = 3\times 2500$$
$$x = 3\times 500$$
$$x = \text{` } 1500$$

So, first part = ` 15second part = ` $(2500 - 1500) =$ ` 1000.

13. $P =$ ` 2600, $R = 6\%$, $T = (8 + 31 + 30 + 4) = 73$ days, $A = ?$

$$\text{S.I.} = \frac{P\times R\times T}{100} = \frac{2600\times 6\times 73}{100\times 365}$$
$$\text{S.I.} = \frac{26\times 6}{5} = \frac{156}{5} = 31.20$$

So, S.I. = ` 31.20

Hence, she received = ` $(2600 + 31.20)$ = ` 2631.20

Multiple Choice Questions

Mark (3) against the correct answer in each of the following :

1. (c), 2. (b), 3. (b), 4. (b), 5. (c), 6. (a), 7. (b), 8. (c), 9. (d), 10. (a).

Exercise 6.1

1. (a) $3x^2, -7x^2, 5x^2$

Adding $= 3x^2 + (-7x^2) + 5x^2$

$= 3x^2 - 7x^2 + 5x^2$

$= 3x^2 + 5x - 7x^2$

$= 8x^2 - 7x^2$

$= x^2$

(b) $-2x^2y^2, \frac{4}{3}x^2y^2, -\frac{1}{6}x^2y^2, \frac{1}{3}x^2y^2$

Adding $-2x^2y^2 + \frac{4}{3}x^2y^2 + \left(-\frac{1}{6}x^2y^2\right) + \frac{1}{3}x^2y^2$

$= \left(\frac{4}{3} \times \frac{1}{3}\right)x^2y^2 - \left(2 + \frac{1}{6}\right)x^2y^2$

$= \frac{5}{3}x^2y^2 - \frac{13}{6}x^2y^2$

$= \left(\frac{5}{3} - \frac{13}{6}\right)x^2y^2 = \left(\frac{10-13}{6}\right)x^2 = \frac{-3}{6}x^2y^2 = -\frac{1}{2}x^2y^2$

(c) $2x^2 - 2y^2, 3y^2 - 7x^2, 5x^2 - y^2$

Adding $= 2x^2 - 2y^2 + 3y^2 - 7x^2 + 5x^2 - y^2$

$= (2x^2 + 5x^2 - 7x^2) + (3y^2 - 2y^2 - y^2)$

$= (7x^2 - 7x^2) + (3y^2 - 3y^2)$

$= 0 + 0 = 0$

(d) $\frac{3}{2}x^2y - \frac{1}{2}xy, 3x^2y + 2xy, \frac{-1}{2}x^2y + \frac{3}{2}xy$

Adding $= \frac{3}{2}x^2y - \frac{1}{2}xy + 3x^2y + 2xy + \left(\frac{-1}{2}x^2y + \frac{3}{2}xy\right)$

$= \left(\frac{3}{2} + 3 - \frac{1}{2}\right)x^2y + \left(2 - \frac{1}{2} + \frac{3}{2}\right)xy$

$= \left(\frac{9-1}{2}\right)x^2y + \left(\frac{4-1+3}{2}\right)xy$

$= 4x^2y + 3xy$

(e) $2x^2 - 3y^2 + 4z^2, 2y^2 - 3x^2 + 4z^2, 2y^2 - 3x^2 + 4z^2$

Adding

$= 2x^2 (-3y^2 + 4z^2) + (2y^2 - 3x^2 + 4z^2)$

$$+ (2y^2 - 3x^2 + 4z^2)$$

$$= (2 - 3 - 3)x^2 + (-3 + 2 + 2)y^2 + (4 + 4 + 4)z^2$$

$$= (2 - 6)x^2 + (-3 + 4)y^2 + 12z^2$$

$$= -4x^2 + y^2 + 12z^2$$

(f) $3x^2 + \frac{2}{3}x + 1, -5x^2 - \frac{1}{4}x + \frac{2}{5}, 2x^2 - \frac{5}{12}x - \frac{7}{5}$

Adding

$$= \left(3x^2 + \frac{2}{3}x + 1\right) + \left(-5x^2 - \frac{1}{4}x + \frac{2}{5}\right)$$

$$+ \left(2x^2 - \frac{5}{12}x - \frac{7}{5}\right)$$

$$= (3 - 5 + 2)x^2 + \left(\frac{2}{3} - \frac{1}{4} - \frac{5}{12}\right)x + \left(1 + \frac{2}{5} - \frac{7}{5}\right)$$

$$= (5 - 5)x^2 + \left(\frac{8 - 8}{12}\right)x + \left(\frac{5 + 2 - 7}{5}\right)$$

$$= 0 + 0 + 0 = 0$$

2. (a) $-7x^2$ from $3x^2$

Subtracting $= 3x^2 - (-7x^2)$

$= 3x^2 + 7x^2$

$= 10x^2$

(b) $\frac{1}{6}x^2y^2$ from $-2x^2y^2$

Subtracting $= -2x^2y^2 - \left(\frac{1}{6}x^2y^2\right)$

$= \left(-2 - \frac{1}{6}\right)x^2y^2 = \left(\frac{-12 - 1}{6}\right)x^2y^2$

$= \frac{-13}{6}x^2y^2$

(c) $-a - b$ from $a + b$

Subtracting $= a + b - (-a - b)$

$= a + b + a + b = 2(a + b)$

(d) $a^2 - 2a + \frac{1}{2}$ from $-a^2 + 2a - \frac{1}{2}$

Subtracting $= \left(-a^2 + 2a - \frac{1}{2}\right) - \left(a^2 - 2a + \frac{1}{2}\right)$

$= -a^2 - a^2 + 2a + 2a - \frac{1}{2} - \frac{1}{2}$

$= -2a^2 + 4a - 1$

(e) $2x^2 + 3y^2 - 4z^2$ from $3z^2 - zx^2 + 4y^2$

Subtracting $= 2z^2 - 3x^2 + 4y^2 - 2x^2 - 3y^2 + 4z^2$

$= (-3-2)x^2 + (4-3)y^2 + (2+4)z^2$

$= -5x^2 + y^2 + 6z^2$

(f) $3 + 2x + 3y - z$ from 1

Subtracting $= 1 - 3 - 2x - 3y + z$

$= -2 - 2x - 3y + z$

$= -2x - 3y + z - 2$

(g) 1 from $3 + 2x + 3y - z$

Subtracting $= 3 + 2x + 3y - z - 1$

$= 2x + 3y - z + 2$

3. (a) $[3 + 4z + 3y - x + 3x + 2y - 3z + 2)]$

$-(3x + 4y - 2z) = [(3x - x) + (3y + 2y) + (4z - 3z) + (3 + 2)]$

$= (3x + 4y - 2z)$

$= (2x + 5y + z + 5) - (3x + 4y - 2z)$

$= 2x + 5y + z + 5 - 3x - 4y + 2z$

$= -x + y + 3z + 5$

(b) $[(5x^2 - 2x) + (3x^2 - x + 3)] - [3x^2 + 2x - 1) + (-2x^2 + 3x - 5)$

$= [(5x^2 + 3x^2) - (2x + x) + 3] - [(3x^2 - 2x^2) + (2x + 3x) - (1 + 5)]$

$= [8x^2 - 3x + 3] - [x^2 + 5x - 6]$

$= 8x^2 - 3x + 3 - x^2 - 5x + 6$

$= (8x^2 - x^2) - (3x + 5x) + 3 + 6$

$= 7x^2 - 8x + 9$

4. (a) $(a^2 - b^2) - (2a^2 - 2b^2)$

$= a^2 - b^2 - 2a^2 + 2b^2$

$= (a^2 - 2a^2) + (-b^2 + 2b^2)$

$= -a^2 + b^2 = b^2 - a^2$

(b) $(2a^2 - 2b^2) - (a^2 - b^2)$

$= 2a^2 - 2b^2 - a^2 + b^2$

$= (2a^2 - a^2) + (-2b^2 + b^2)$

$= a^2 - b^2$

(c) $(x + y) - \frac{1}{2}(2 + x - 2y)$

$= x + y - \frac{1}{2} \times 2 - \frac{1}{2}x + \frac{1}{2}2y$

$= x + y - 1 - \frac{1}{2}x + y$

$$=\left(x-\frac{1}{2}x\right)+2y-1$$
$$=\left(\frac{2x-x}{2}\right)+2y-1$$
$$=\frac{x}{2}+2y-1$$

(d) $[5z-(x+2y)]-[3x-(y-2z)]$
$$=[5z-x-2y-3x+y-2z]$$
$$=(-x-3x)+(y-2y)+(5z-2z)$$
$$=-4x-y+3z$$
$$=3z-y-4x$$

(e) $\left(\frac{1}{2}x^2+\frac{1}{2}y^2+\frac{1}{2}z^2\right)-\left(\frac{1}{2}+\frac{3}{2}x^2+\frac{5}{2}y^2+\frac{7}{2}z^2\right)$
$$=\frac{1}{2}x^2+\frac{1}{2}y^2+\frac{1}{2}z^2-\frac{1}{2}-\frac{3}{2}x^2$$
$$-\frac{5}{2}y^2-\frac{7}{2}z^2$$
$$=\left(\frac{1}{2}-\frac{3}{2}\right)x^2+\left(\frac{1}{2}-\frac{5}{2}\right)y^2+\left(\frac{1}{2}-\frac{7}{2}\right)z^2-\frac{1}{2}$$
$$=\frac{-2}{2}x^2+\left(\frac{-4}{2}\right)y^2+\left(-\frac{6}{2}\right)z^2-\frac{1}{2}$$
$$=-x^2-2y^2-3z^2-\frac{1}{2}$$

Exercise 6.2

1. (a) $2a^2\times(-3ab)=-2a^2\times 3ab=-6a^3b$

(b) $\frac{6}{5}ab\times 2b^2\times 0=\frac{2\times 6}{5}ab^3\times 0=0$

(c) $6x\times(-2xy)=-6\times 2\times x\times xy\quad=-12x^2y$

(d) $-3xy\times(-4xy)\quad=(-3)\times(-4)\times xy\times xy=12x^2y^2$

2. (a) $\left(\frac{5}{6}x^5\right)\left(\frac{-3}{10}y^4\right)\left(\frac{9}{5}xy\right)=\left(\frac{-5}{6}\times\frac{3}{10}x^5y^4\right)\left(\frac{9}{5}xy\right)$
$$=\left(\frac{-1}{4}x^5y^4\right)\left(\frac{9}{5}xy\right)$$
$$=\left(\frac{-1}{4}\times\frac{9}{5}\right)x^6y^5$$
$$=\frac{-9}{20}x^6y^5$$

(b) $(-2x^6y)\left(\frac{6}{22}xy^4\right)\left(\frac{11}{2}x^3y^3\right)$

$$= \left(-2 \times \frac{6}{22} \times x^7 y^5\right)\left(\frac{11}{12} x^3 y^3\right)$$

$$= \left(\frac{-6}{11} x^7 y^5\right)\left(\frac{11}{12} x^3 y^3\right)$$

$$= \frac{-6}{11} \times \frac{11}{12} x^7 y^5 \times x^3 y^3$$

$$= \frac{-1}{2} x^{10} y^8$$

(c) $\left(\frac{-1}{3} x^2\right)\left(\frac{-2}{3} y\right)\left(\frac{-4}{5} xyz\right)$

$$= \left(\frac{1}{3} \times \frac{2}{3}\right) x^2 y \left(\frac{-4}{5} xyz\right)$$

$$= \left(\frac{2}{9} x^2 y\right)\left(\frac{-4}{5} xyz\right)$$

$$= \frac{-2 \times 4}{9 \times 5} x^3 y^2 z + \frac{-8}{45} x^3 y^2 z$$

3. (a) $(-3x^2)(4xy^3)\left(\frac{-2}{3} x^3\right)$

$$= -3 \times 4 \times \left(\frac{-2}{3}\right) x^2 \times xy^3 \times x^3$$

$$= 8x^6 y^3$$

Putting the values of x and y is $\frac{3}{4}$, 3 respectively.

We get, $= 8 \times \left(\frac{3}{4}\right)^6 \times (3)^3$

$$= 8 \times \frac{3^{6+3}}{4^6} = 8 \times \frac{3^9}{4^6} = 8 \times \frac{19683}{4096} = \frac{19683}{512}$$

(b) $\left(\frac{-8}{6} p^3\right)(2q^4)\left(\frac{-8}{3} pq\right) = \left(\frac{64}{18} \times 2\right)(p^4 q^5)$

$$= \frac{64}{9} p^4 q^5$$

Putting the values of p and q

We get, $= \frac{64}{9} \times \left(\frac{3}{8}\right)^4 (3)^5 = \frac{64 \times 19683}{4096} = \frac{19683}{64}$

4. (a) $3a(a-3) = 3a^2 - 9a$

(b) $-3x^2(2x+7) = -6x^3 - 21x^2$

(c) $10y(0.02x^2 - 0.02y) = 0.2x^2 y^2 - 0.2y^2$

$$= 0.2(x^2 y - y^2)$$

(d) $3a^3(6a + 7) = 18a^4 + 21a^3$

(e) $\frac{3}{4}a(a^3 + b^3) = \frac{3}{4}a^4 + \frac{3}{4}ab^3$

(f) $0.2s(0.02s + 0.002r) = 0.004s^2 + 0.0004rs$

(g) $3a^2(2a^2 - 4) + 6a^4 - 12a^2$

(h) $2x^3(2x^2 - 4y^2) = 4x^5 - 8x^3y^2$

(i) $\frac{-2}{3}x\left(\frac{3}{4}x + \frac{3}{8}y\right) = \frac{-2}{3} \times \frac{3}{4}x^2 + \left(\frac{-2}{3} \times \frac{3}{8}xy\right)$

$$= -\frac{1}{2}x^2 - \frac{1}{4}xy$$

5. (a) $3p^6 \times (= -4q^2) = (-4q^2) \times 3p^6$

L.H.S. $= 3p^6 \times (-4q^2)$

For $p = -1, q = -2$

$= 3 \times (-1)^6 \times [-4 \times (-2)^2]$

$= 3 \times [-4 \times 4]$

$= 3 \times (-16)$

$= -48$

R.H.S. $= (-4q^2) \times 3p^6$

$= [-4 \times (-2)^2] \times 3 \times (-1)^6$

$= [-4 \times 4] \times 3$

$= -16 \times 3 = -48$, L.H.S. = R.H.S.

Thus, the commutative property is proved.

(b) $\frac{-3}{8}pq^2 \times \frac{4}{9}p^2qr = \frac{4}{9}p^2qr \times \frac{-3}{8}pq^2$

L.H.S. $= \frac{-3}{8}pq^2 \times \frac{4}{9}p^2qr$

$= \frac{-1}{6}p^3q^3r$

For $p = 1, q = -1, r = 2$

$= \frac{-1}{6}(1)^3(-1)^3 \times (2)$

$= \frac{2}{6} = \frac{1}{3}$

R.H.S. $= \frac{4}{9}p^2qr \times \frac{-3}{8}pq^2$

$= \frac{-1}{6}p^3q^3r$

$= \frac{-1}{6}(1)^3(-1)^3 \times (2) = \frac{1}{3}$

L.H.S.= R.H.S.

Thus, the commutative property is hold good.

6. (a) $32a^2\ (1-2a) = 32a^2 - 64a^3$

For $a = 2,\ b = 0.5,\ c = 0.1$

$= 32\times(2)^2 - 64\times(2)^3$

$= 32\times 4 - 64\times 8$

$= 128 - 512$

$= -384$

(b) $ab\,(a^3 - b^3) = a^4 b - ab^4$

For, $a = 2,\ b = 0.5,\ c = 0.1$

$= (2)^4\times(0.5) - 2\times(0.5)^4$

$= 16\times 0.5 - 2\times 0.0625$

$= 8.0 - 0.125$

$= 7.875$

7. (a) $1.25xy\left(x+\dfrac{x}{0.5y}+\dfrac{1}{y}\right) = 12.5x^2 y + 2.5x^2 + 12.5x$

For, $x = 2,\ y = 1$

L.H.S. $= 1.25xy\left(x+\dfrac{x}{0.5y}+\dfrac{1}{y}\right)$

$= 1.25\times 2\times 1\left(2+\dfrac{2}{0.5\times 1}+\dfrac{1}{1}\right)$

$= 2.5(2+4+1) = 2.5\times 7 = 17.5$

R.H.S. $= 1.25x^2 y + 2.5x^2 + 1.25x$

$= 1.25\times 2^2\times 1 + 2.5\times 2^2 + 1.25\times 2$

$= 5+10+2.5 = 17.5$

L.H.S. = R.H.S.

Thus, the commutative property is holds good.

(b) $\dfrac{3}{4}ab\left(a^2 - \dfrac{1}{2}b^2 + 4\right) = \dfrac{3}{4}a^3 b - \dfrac{3}{8}ab^3 + 3ab$

For $a = \dfrac{1}{2},\ b = -1$

L.H.S. $= \dfrac{3}{4}\times\dfrac{1}{2}\times(-1)\left[\left(\dfrac{1}{2}\right)^2 - \dfrac{1}{2}(-1)^2 + 4\right]$

$= \dfrac{-3}{8}\left[\dfrac{1}{4} - \dfrac{1}{2} + 4\right]$

$= \dfrac{-3}{8}\left[\dfrac{1-2+16}{4}\right] = \left(\dfrac{-3}{8}\right)\times\dfrac{15}{4} = \dfrac{-45}{32}$

$$\text{R.H.S. } \frac{3}{4}\times\left(\frac{1}{2}\right)^3(-1)-\frac{3}{8}\times\left(\frac{1}{2}\right)(-1)^3+3\times\frac{1}{2}\times(-1)$$

$$=\frac{-3}{4}\times\frac{1}{8}+\frac{3}{8}\times\frac{1}{2}+\frac{3}{2}\times(-1)$$

$$=\frac{-3}{32}+\frac{3}{16}-\frac{3}{2}$$

$$=\frac{-3+6-48}{32}=\frac{6-51}{32}=\frac{-45}{32}$$

$\therefore$ L.H.S. = R.H.S

Thus, the commutative property is proved.

8. (a) $2a(a^2+b^2)-2b^2(b+a)+2$

$$=2a^3+2ab^2-2b^3-2ab^2+2$$

$$=2a^3-2b^3+2=2(a^3-b^3+1)$$

(b) $x^2(x+1)-x(x^2+1)-x^3$

$$=x^3+x^2-x^3-x-x^3$$

$$=x^3-2x^3+x^2-x$$

$$=x^3+x^2-x=x(-x^2+x-1)$$

$$=-x(x^2-x+1)$$

(c) $x^2(3x^3-2x^2+1)-x(x^4-2x^3+x)$

$$=3x^5-2x^4+x^2-x^5+2x^4-x^2$$

$$=2x^5$$

(d) $a^3(b^3-c^3)+b^3(c^3-a^3)+c^3(a^3-b^3)$

$$=a^3b^3-a^3c^3+b^3c^3-b^3a^3+c^3a^3-b^3c^3$$

$$=0$$

(e) $a^2b(b^2-2a)+a(b-a^2b)-b(a+2a^3)$

$$=a^2b^3-2a^3b+ab-a^2b-ab-2a^3b$$

$$=a^2b^3-5a^3b$$

(f) $\frac{5}{9}x(x^2-x^3)-\frac{1}{3}x^2(x^3-x)+\frac{1}{3}x^3(1-x^2)$

$$=\frac{5}{9}x^3-\frac{5}{9}x^4-\frac{1}{3}x^5+\frac{1}{3}x^3+\frac{1}{3}x^3-\frac{1}{3}x^5$$

$$=\left(\frac{5}{9}+\frac{1}{3}+\frac{1}{3}\right)x^3-\frac{5}{9}x^4+\left(\frac{-1}{3}-\frac{1}{3}\right)x^5$$

$$=\left(\frac{5+3+3}{9}\right)x^3-\frac{5}{9}x^4-\frac{2}{3}x^5$$

$$=\frac{11}{9}x^3-\frac{5}{9}x^4-\frac{2}{3}x^5$$

Exercise 6.3

1. (a) $(2a^3 + 3b)(6a - 4b^2)$

$\Rightarrow$ **Vertical method :**

$$\begin{array}{l} \quad 2a^3 + 3b \\ \times\ 6a - 4b^2 \\ \hline -8a^3b^3 - 12b^3 \\ \ 12a^4 + 18ab \\ \hline 12a^4 - 8a^3b^2 + 18ab - 12b^3 \end{array}$$

Horizontal method :

$$(2a^3 + 3b)(6a - 4b^2)$$
$$= 2a^3(6a - 4b^2) + 3b(6a - 4b^2)$$
$$= 12a^4 - 8a^3b^2 + 18ab - 12b^2$$

(b) $(6p^5 - 5q^2)(4p + 7q)$

Vertical method :

$$\begin{array}{l} \quad 6p^5 - 5q^2 \\ \quad 4p + 7q \\ \hline 42p^5q - 35q^3 \\ 24p^6 - 20pq^2 \\ \hline 24p^6 + 42p^5q - 20pq^2 - 35q^3 \end{array}$$

Horizontal method:

$$(6p^5 - 5q^2)(4p + 7q)$$
$$= 6p^5 + (4p + 7q) - 5q^2(4p + 7q)$$
$$= 24p^6 + 42p^5q - 20pq^2 - 35q^3$$

2. (a) $(3x - 7y)(7x + 2y)$

$$= 3x(7x + 2y) - 7y(7x + 2y)$$
$$= 21x^2 + 6xy - 49xy - 14y^2$$
$$= 21x^2 - 43xy - 14y^2$$

(b) $(x^5 - y^5)(x^5 + y^5)$

$$= x^5(x^5 + y^5) - y^5(x^5 + y^5)$$
$$= x^{10} + x^5y^5 - x^5y^5 - y^{10}$$
$$= x^{10} - y^{10}$$

(c) $\left(\frac{1}{3}a - b\right)\left(\frac{2}{5}a + b\right)$

$$= \frac{1}{3}a\left(\frac{2}{5}a + b\right) - b\left(\frac{2}{5}a + b\right)$$

$$= \frac{2}{15}a^2 + \frac{1}{3}ab - \frac{2}{5}ab - b^2$$
$$= \frac{2}{15}a^2 - \frac{1}{15}ab - b^2$$

3. (a) $\frac{1}{3}(2a^3 - 3b^2)(3a^2 - 2b)$

$$= \frac{1}{3}[2a^3(3a - 2b) - 3b^2(3a^2 - 2b)]$$
$$= \frac{1}{3}[6a^5 - 4a^3b - 9a^2b^2 + 6b^3]$$
$$= 2a^5 - \frac{4}{3}a^3b - 9a^2b^2 + 2b^3$$

(b) $(3x^2 - 2y)(4x^2 - y)$

$$= 3x^2(4x^2 - y) - 2y(4x^2 - y)$$
$$= 12x^4 - 3x^2y - 8x^2y + 2y^2$$
$$= 12x^4 - 11x^2y + 2y^2$$

(c) $(3x + (-y))(-x + y^2)$

$$= 3x(-x + y^2) - y(-x + y^2)$$
$$= 3x^2 + 3xy^2 + xy - y^3$$
$$= -3x^2 + xy + 3xy^2 - y^3$$

4. (a) $(2a^2 + 3b)(2a^2 + 3b)$

$$= 2a^2(2a^2 + 3b) + 3b(2a^2 + 3b)$$
$$= 4a^4 + 6a^2b + 6a^2b + 9b^2$$
$$= 4a^4 + 12a^2b + 9b^2$$

(b) $(-4p + 7q)(-4p + 7q)$

$$= -4p(-4p + 7q) + 7q(-4p + 7q)$$
$$= 16p^2 - 28pq - 28pq + 49q^2$$
$$= 16p^2 - 56pq + 49q^2$$

(c) $\left[\frac{2}{3}x + \frac{5}{7}y\right] + \left[\frac{2}{3}x + \frac{5}{7}y\right]$

$$= \frac{2}{3}x\left[\frac{2}{3}x + \frac{5}{7}y\right] + \frac{5}{7}y\left[\frac{2}{3}x + \frac{5}{7}y\right]$$
$$= \frac{4}{9}x^2 + \frac{10}{21}xy + \frac{10}{21}xy + \frac{25}{49}y^2$$
$$= \frac{4}{9}x^2 + \frac{20}{21}xy + \frac{25}{49}y^2$$

5. (a) $(x^2 + 2x + 3)(x^2 - 2)$

$$= (x^2 + x + 3)x^2 - 2(x^2 + 2x + 3)$$

$$= x^4 + 2x^3 + 3x^2 - 2x^2 - 4x - 6$$
$$= x^4 + 2x^3 + x^2 - 4x - 6$$

(b) $(4x - 3y + 4)(2x - 3)$
$$= 2x(4x - 3y + 4) - 3(4x - 3y + 4)$$
$$= 8x^2 - 6xy + 8x - 12x + 9y - 12$$
$$= 8x^2 - 4x - 6xy + 9y - 12$$

(c) $(x^2 - xy + y^2)(x + y)$
$$= x(x^2 - xy + y^2) + y(x^2 - xy + y^2)$$
$$= x^3 - x^2y + xy^2 + x^2y - xy^2 + y^3$$
$$= x^3 + y^3$$

(d) $(x^2 + xy + y^2)(x - y)$
$$= x(x^2 + xy + y^2) - y(x^2 + xy + y^2)$$
$$= x^3 + x^2y + xy^2 - x^2y - xy^2 - y^3$$
$$= x^3 - y^3$$

(e) $(x + 4)(x - 4)(x - 1)$
$$[x(x - 4) + 4(x - 4)](x - 1)$$
$$= [x^2 - 4x + 4x - 16](x - 1)$$
$$= (x^2 - 16)(x - 1)$$
$$= x^3 - x^2 - 16x + 16$$

6. (a) $(2y + 3)(y - 2) - (5y + 3)(y - 2)$
$$= [2y(y - 2) + 3(y - 2)] - [5y(y - 2)$$
$$+ 3(y - 2]$$
$$= [2y^2 - 4y + 3y - 6] - [5y = 10y + 3y - 6]$$
$$= 2y^2 - y - 6 - 5y^2 + 7y - 6$$
$$= -3y^2 + 6y$$

(b) $(3x - 4y)(x + y) + (5x + 7y)(x - y)$
$$= 3x(x + y) - 4y(x + y) + 5x(x - y) + 7y(x - y)$$
$$= 3x^2 + 3xy - 4xy - 4y^2 - 4y^2 + 5x^2 - 5xy + 7xy - 7y^2$$
$$= 8x^2 - xy + 2xy - 11y^2$$
$$= 8x^2 + xy - 11y^2$$

(c) $(3x + 4y)(3x - 4y) - (3x + 4y)^2$
$$= 3x(3x - 4y) + 4y(3x - 4y) - (3x + 4y)(3x + 4y)$$
$$= 9x^2 - 12xy + 12xy - 16y^2 - 3x(3x + 4y)$$
$$- 4y(3x + 4y)$$
$$= 9x^2 - 16y^2 - 9x^2 - 12xy - 12xy - 16y^2$$
$$= -32y^2 - 24xy$$

(d) $(5a-3)(a+4)-(2a+5)(3a-4)$

$= 5a(a+4)-3(a+4)-2a(3a-4)-5(3a-4)$

$= 5a^2+20a-3a-12-6a^2+8a-15a+20$

$= -a^2+10a+8$

Exercise 6.4

1. (a) $(2a^2+3b)(2a^2+3b)$

We use the dentity $(A+B)^2 = A^2+2AB+B^2$

with $A = 2a^2$, $B = 3b$

$(A+B)(A+B) = (A+B)^2 = A^2+2AB+B^2$

$= (2a)^2+2(2a^2)(3b)+(3b)^2$

$= 4a^2+12a^2b+9b^2$

(b) $(4p+7q)(4p+7q)$

We use the identity $(a+b)^2 = a^2+2ab+b^2$

with $a = 4p$, $b = 7q$

$= (4p+7q)^2 = (4p)^2+2\times 4p+7q+(7q)^2$

$= 16p^2+56pq+49q^2$

(c) $\left(\frac{2}{3}x+\frac{5}{7}y\right)\left(\frac{2}{3}x+\frac{5}{7}y\right)$

We use identity $(a+b)^2 = a^2+2ab+b^2$

$\Rightarrow$ with $a = \frac{2}{3}x$, $b = \frac{5}{7}y$

$= \left(\frac{2}{3}x+\frac{5}{7}y\right)^2 = \left(\frac{2}{3}x\right)^2+2\times\frac{2}{3}x\times\frac{5}{7}y+\left(\frac{5}{7}y\right)^2$

$= \frac{4}{9}x^2+2\frac{10}{21}xy+\frac{25}{49}y^2$

$= \frac{4}{9}x^2+\frac{20}{21}xy+\frac{25}{49}y^2$

(d) $(3x-2y)(3x-2y)$

We use the identity $(a-b)^2 = a^2-2ab+b^2$

$= (3x-2y)^2 = (3x)^2+(2y)^2-2\times 3xy\times 2y$

$= 9x^2+4y^2-12xy$

or $= 9x^2-12xy+4y^2$

(e) $\left(x-\frac{1}{x}\right)\left(x-\frac{1}{x}\right)$

$= \left(x-\frac{1}{x}\right)^2 = x^2+\frac{1}{x^2}-2x\times\frac{1}{x}$

$$= x^2 + \frac{1}{x^2} - 2$$

or $$x^2 - 2 + \frac{1}{x^2}$$

(f) $\left(a + \frac{1}{a}\right)\left(a + \frac{1}{a}\right) = \left(a + \frac{1}{a}\right)^2 = a^2 + 2 \times a \times \frac{1}{a} + \frac{1}{a^2}$

$$= a^2 + 2 + \frac{1}{a^2}$$

2. (a) $(2a - 3b)^2$

We use the identty $(A - B)^2 = A^2 - 2AB + B^2$

with $A = 2a$, $B = 3b$

$$(2a - 3b)^2 = (2a)^2 - 2 \times 2a \times 3b + (3b)^2$$

$$= 4a^2 - 12ab + 9b^2$$

(b) $\left[\frac{1}{4}b + \frac{1}{3}c\right]^2$

We use the identity $(A + B)^2 = A^2 + 2AB + B^2$

with $A = \frac{1}{4}b$, $B = \frac{1}{3}c$

$$\left(\frac{1}{4}b + \frac{1}{3}c\right)^2 = \left(\frac{1}{4}b\right)^2 + 2\frac{1}{4}b \times \frac{1}{3}c + \left(\frac{1}{3}c\right)^2$$

$$= \frac{1}{16}b^2 + \frac{1}{6}bc + \frac{1}{9}c^2$$

(c) $(2q + 3r)^2$

We use the identity $(a + b)^2 = a^2 + 2ab + b^2$

with $a = 2q$, $b = 3r$

$$(2q + 3r)^2 = (2q)^2 + 2 \times 2q + 3r\,(3r)^2$$

$$= 4q^2 + 12qr + 9r^2$$

(d) $(5x + 6y)^2$

We use the identity $(a + b)^2 = a^2 + 2ab + b^2$

with $a = 5x$, $b = 6y$

$$(5x + 6y)^2 = (5x)^2 + 2 \times 5x \times 6y + (6y)^2$$

$$= 25x^2 + 60xy + 36y^2$$

(e) $(25b + 3)^2$

We use the identity $(a + b)^2 = a^2 + 2ab + b^2$

with $a = 25b$, $b = 3$

$$(25b + 3)^2 = (25b)^2 + 2 \times 25b \times 3 + (3)^2$$

$$= 625b^2 + 150b + 9$$

(f) $[2f^2 + \frac{1}{3}g^2]^2$

We use the identity $(a+b)^2 = a^2 + 2ab + b^2$

$\Rightarrow$ with $a = 2f^2$, $b = \frac{1}{3}g^2$

$$(2f^2 + \frac{1}{3}g^2) = (2f)^2 + 2 \times 2f^2 \times \frac{1}{3}g^2 + \left(\frac{1}{3}g^2\right)^2$$

$$= 4f^4 + \frac{4}{3}f^2g^2 + \frac{1}{9}g^4$$

3. (a) $(x+9)(x-9)$

Here, $a = x$, $b = 9$

$\therefore$ $(x+9)(x-9) = (x)^2\ (9)^2 = x^2 - 81$

(b) $(2x+3y)(2x-3y)$

Here, $a = 2x$, $b = 3y$

$\therefore$ $(2x+3y)(2x-3y) = (2x)^2 - (3y)^2$

$$= 4x^2 - 9y^2$$

(c) $(x^2 + y^2)(x^2 - y^2)$

Here, $a = x^2$, $b = y^2$

$\therefore$ $(x^2 + y^2)(x^2 - y^2) = (x^2)^2 - (y^2)^2$

$$= x^4 - y^4$$

(d) $\left(\frac{2}{3}x^2 + \frac{1}{2}y^2\right)\left(\frac{-2}{3}x^2 + \frac{1}{2}y^2\right)$

Here, $a = \frac{2}{3}x^2$, $b = \frac{1}{2}y^2$

$\therefore$ $\left(\frac{2}{3}x^2 + \frac{1}{2}y^2\right)\left(\frac{-2}{3}x^2 + \frac{1}{2}y^2\right)$

$$= \left(\frac{1}{2}y^2\right)^2 - \left(\frac{2}{3}x^2\right)^2$$

$$= \frac{1}{4}y^4 - \frac{4}{9}x^4$$

(e) $\left(\frac{x}{2} - \frac{y}{3}\right)\left(\frac{x}{2} + \frac{y}{3}\right)$

Here, $a = \frac{x}{2}$, $b = \frac{y}{3}$

$\therefore$ $\left(\frac{x}{2} - \frac{y}{3}\right)\left(\frac{x}{2} + \frac{y}{3}\right) = \left(\frac{x}{2}\right)^2 - \left(\frac{y}{3}\right)^2 = \frac{x^2}{4} - \frac{y^2}{4}$

(f) $\left(x+\frac{a}{y}\right)\left(x-\frac{a}{y}\right)$

Here, $a = x$, $b = \frac{a}{y}$

$\therefore$ $\left(x+\frac{a}{y}\right)\left(x-\frac{a}{y}\right) = (x)^2 - \left(\frac{a}{y}\right)^2$

$= x^2 - \frac{a^2}{y^2}$

4. (a) $1002^2 = (1000+2)^2$

$= 1000^2 + 2 \times 1000 \times 2 + 2^2$

$= 1000000 + 4000 + 4^2 = 1004004$

(b) $98^2 = (100-2)^2 = 100^2 - 2 \times 100 \times 2 + 2^2$

$= 10000 - 400 + 4 = 9604$

(c) $92 \times 88 = (90+2)(90-2) = 90^2 - 2^2 = 8100 - 4 = 8096$

(d) $1005^2 = (1000+5)^2$

$= 1000^2 + 2 \times 1000 \times 5 + 5^2$

$= 1000000 + 10000 + 25 = 1010025$

(e) $7.4 \times 8.6 = (8.6 - 0.6)(8.0 + 0.6)$

$= (8.0)^2 - (0.6)^2 = 64 - 0.36 = 63.64$

(f) $99.2 \times 100.8 = (100 - 0.8)(100 + 0.8)$

$= 100^2 - 0.8^2 \quad = 10000 - 0.64 = 9999.36$

(g) $104^2 - 4^2 = 10816 - 16 = 10800$

(h) $49^2 - 39^2 = 2401 - 1521 = 880$

(i) $(635)^2 - (625)^2 = (635 + 625)(635 - 625)$

$= 1260 \times 10 = 12600$

(j) $155 \times 155 - 145 \times 145 = (155)^2 - (145)^2$

$= (155 + 145)(155 - 145)$

$= 300 \times 10 = 3000$

(k) $225 \times 225 - 175^2 = 225^2 - 175^2$

$= (225 + 175)(225 - 175)$

$= 400 \times 50 = 20000$

(l) $(14^2 - 4^2)(20^2 - 2^2)$

$= [(14+4)(14-4)][(20+2)(20-2)]$

$= [18 \times 10][22 \times 18]$

$= 18^2 \times 22 \times 10$

$$= 18^2 \times 220$$
$$= 324 \times 220$$
$$= 71280$$

5. (a) $8a = 34^2 - 26^2$

$\Rightarrow$ $8a = (34 + 26)(34 - 26)$

$\Rightarrow$ $8a = (34 + 26)(34 - 26)$

$\Rightarrow$ $8a = 60 \times 8$

$\Rightarrow$ $a = \dfrac{60 \times 8}{8}$

$\Rightarrow$ $a = 60$

(b) $16x = 536^2 - 136^2$

$\Rightarrow$ $16x = (536 + 136)(536 - 136)$

$\Rightarrow$ $16x = 672 \times 400$

$\Rightarrow$ $x = \dfrac{672 \times 400}{16}$

$\Rightarrow$ $x = 42 \times 400$ $\qquad\Rightarrow x = 16800$

(c) $0.03^2 - 0.01^2 + 0.4\, p$

or $0.4\, p = (0.03 + 0.01)(0.03 - 0.01)$

$\Rightarrow$ $0.4\, p = 00.4 \times 0.02$

$\Rightarrow$ $p = \dfrac{0.04 \times 0.02}{0.4} = 0.1 \times 0.02 = 0.002$

6. (a) $(x + a)(x - a)(x^2 + a^2) = (x^2 - a^2)(x^2 + a^2)$
$$= (x^2)^2 - (a^2)^2$$
$$= x^4 - a^4$$

(b) $(a^2 - 1)(a^2 + 1)(a^4 + 1) = [(a^2)^2 - (1)^2](a^4 + 1)$
$$= (a^4 - 1)(a^4 + 1)$$
$$= (a^4)^2 - (1)^2 = a^8 - 1$$

7. The given
$$x + \frac{1}{x} = 4$$

Squaring the both side, get
$$\left(x + \frac{1}{x}\right)^2 = 4^2$$
$$x^2 + 2 \times x \times \frac{1}{x} + \frac{1}{x^2} = 16$$
$$x^2 + 2 + \frac{1}{x^2} = 16$$
$$x^2 + \frac{1}{x^2} = 16 - 2$$

$$x^2 + \frac{1}{x^2} = 14$$

8. $\left(x - \frac{1}{x}\right) = 5$

Squaring the both side, we get

(a) $$\left(x - \frac{1}{x}\right)^2 = 5^2$$

$$x^2 - 2 \times x \times \frac{1}{x} + \frac{1}{x^2} = 25$$

$$x^2 - 2 + \frac{1}{x^2} = 25$$

$$x^2 + \frac{1}{x^2} = 25 + 2$$

$$x^2 + \frac{1}{x^2} = 27 \qquad \text{... (1)}$$

(b) Again the squaring both side of equation (i) we get

$$\left(x^2 + \frac{1}{x^2}\right) = 27^2$$

$$x^4 + \frac{1}{x^4} + 2 \times x^2 \times \frac{1}{x^2} = 27 \times 27$$

$$x^4 + \frac{1}{x^4} + 2 = 729$$

$$x^4 + \frac{1}{x^4} = 729 - 2$$

$$x^4 + \frac{1}{x^4} = 727$$

Multiplce Choice Questions

Mark (3) agianst the correct answer in each of the following :

1. (c), 2. (a), 3. (c), 4. (c), 5. (a), 6. (b), 7. (c), 8. (d), 9. (b), 10. (b).

7 Simple Euqations

Exercise 7.1

1. (a) $n + 10 = 25$ (b) $d - 11 = 40$ (c) $7m = 84$ (d) $\frac{y}{2} = 33$

(f) $5x + 3 = 18$ (g) $\frac{1}{6} \times c + 2 = 8$ (h) $\frac{p}{4} + 4 = 40$ (i) $8e - 8 = 80$

(e) $5b-3=12$ (j) $\frac{t}{7}+13=20$ (k) $(x+2)-9=53$

2. (a) The sum of x and 3 is 14.
(b) The difference between 5 and y is -3.
(c) 16 times m is 96.
(d) Quotient of q and 9 is 9.
(e) Three-fourth of a number p is 15.
(f) 6 times x added to 11 gives 35.
(g) 3 less than quotient of b and 7 is 8.
(h) 14 less than 3 times x is 4.
(i) 7 subtracted from one-fifth of y is 8.
(j) 5 subtracted from y given -12.
(k) Negative quotient of p and 7 is 7.

3. (a) $2x \pm 1 = 51$
$[x+(x+1)]$ or $[x-(x+1)]$
(b) $2x+6=64$
(c) $x+\frac{x}{2}=33$
(d) $2(l+b)=240$, where, $l=2b-6$
(e) $\angle A+\frac{\angle A}{3}+\frac{\angle A}{3}+180°$ $\left(\angle B=\angle C=\frac{\angle A}{8}\right)$
(f) $3x+4=43$ (Where x is Vaibhav's age)
(g) $3x=195$ (Where x is the number of runs scored by Gautam).
(h) $\frac{2x}{5}+x=35$ (Where x is the number of boys in the class.)

Exercise 7.2

1.	$x-5=0$	$x=5$	
2.	$x+4=0$	$x=-4$	
3.	$b-7=9$	$b=7+9$	$b=16$
4.	$y+8=20$	$y=20-8$	$y=12$
5.	$p+6=-6$	$p=-6-6$	$p=-12$
6.	$q+9=9$	$q=9-9$	$q=0$
7.	$5d=45$	$d=\frac{45}{5}$	$d=9$
8.	$30t=-60$	$t=\frac{-60}{30}$	$t=-2$
9.	$\frac{-r}{8}=6$	$-r=6\times 8$	$r=-48$
10.	$\frac{-a}{11}=\frac{18}{55}$	$-a=\frac{18\times 11}{55}$	$a=\frac{-18}{5}$

11. $\frac{y}{16} = \frac{7}{48}$ $\quad y = \frac{16 \times 7}{48}$ $\quad y = \frac{7}{3}$

12. $3n - 2 = 22$ $\quad 3n = 22 + 2$ $\quad 3n = 24$

$n = 24 \div 3$ $\quad n = 8$

13. $4x + 9 = 45$ $\quad 4x = 45 - 9$ $\quad 4x = 36$

$x = 36 \div 4$ $\quad x = 9$

14. $14l = 56$ $\quad l = 56 \div 14$ $\quad l = 4$

15. $15p + 15 = 90$ $\quad 15p = 90 - 15$ $\quad 15p = 75$ $\quad p = 5$

16. $-5x - 8 = 107$ $\quad -5x = 107 + 8$ $\quad -5x = 115$

$x = -115 \div 5$ $\quad = -23$

17. $4y + 3y = 84$ $\quad 7y = 84$ $\quad y = 12$

18. $5 + 9x - 7 = 9x - 2 - x$ $\quad 9x + x - 9x = 7 - 2 - 5$

$x = 7 - 7$ $\quad x = 0$

19. $x + \frac{1}{2} = 19$ $\quad x = 19 - \frac{1}{2}$ $\quad x = \frac{38 - 1}{2}$ $\quad x = \frac{37}{2}$

20. $2s - \frac{1}{2} = \frac{-1}{3}$ $\quad 2s = -\frac{1}{3} + \frac{1}{2}$ $\quad 2s = \frac{-2 + 3}{6}$

$2s = \frac{1}{6}$ $\quad s = \frac{1}{12}$

Exercise 7.3

1. $12t + 1 = 37$

$12t = 37 - 1$

$12t = 36$

$t = 36 \div 12 = 3$

Hence, $t = 3$

Check : L.H.S. $= 12 \times 3 + 1 = 36 + 1 = 37 =$ R.H.S.

2. $\frac{x}{4} + 9 = 7$

$\frac{x}{4} = 7 - 9$

$\frac{x}{4} = -2$

$\Rightarrow$ $x = -2 \times 4 = -8$

Hence $x = -8$

Check : L.H.S. $= \frac{x}{4} + 9 = 8$

$= \frac{-8}{4} + 9 = -2 + 9 = 7 =$ R.H.S.

3.
$$\begin{aligned}\frac{5}{2}y &= 60\\ 5y &= 60\times 2\\ 5y &= 120\\ y &= 120\div 5 = 24\end{aligned}$$

Hence, $y = 24$

Check : L.H.S. $= \frac{5}{2}y = \frac{5}{2}\times 24 = 5\times 12 = 60 =$ R.H.S.

4.
$$\begin{aligned}2m+\frac{5}{2} &= \frac{37}{2}\\ 2m &= \frac{37}{2}-\frac{5}{2}\\ 2m &= \frac{37-5}{2}\\ 2m &= \frac{32}{2}\\ 2m &= 16\\ m &= 16\div 2 = 8\end{aligned}$$

Check : L.H.S. $= 2m+\frac{5}{2} = 2\times 8+\frac{5}{2} = 16+\frac{5}{2}$

$$= \frac{32+5}{2} = \frac{37}{2} = \text{R.H.S.}$$

5. $8z + 20 + 52$

$$\begin{aligned}8z &= 52-20 \quad \text{Transposing 20 to R.H.S.}\\ 8z &= 32\\ z &= 32\div 8 \quad \text{(By transposing)}\\ z &= 4\end{aligned}$$

Hence, $z = 4$ is a solution of given equation.

Check : L.H.S. $= 8z + 20 = 8\times 4 + 20 = 32 + 20 = 52$

$=$ R.H.S.

6. $\frac{a}{13}+6 = 5$

$$\frac{a}{13} = 5-6$$

Transposing 6 to R.H.S.

$$\begin{aligned}\frac{a}{13} &= -1\\ a &= -1\times 13\end{aligned}$$

Hence, $a = -13$

Check : L.H.S. $= \frac{-13}{13}+6 = -1+6 = 5 =$ R.H.S.

7.

$$\begin{aligned} -2(y+3) &= 7 \\ -2y &= -3\times 2 = 7 \\ -2y-6 &= 7 \\ -2y &= 7+6 \\ -2y &= 13 \\ y &= -13\div 2 \text{ (By transposing)} \\ y &= \frac{-13}{2} \end{aligned}$$

Hence, $y = \frac{-13}{2}$ is the solution of given equation

Check : L.H.S.$-2\left(\frac{-13}{2}+3\right) = -2\left(\frac{-13+6}{2}\right) +13-6=7$

= R.H.S.

8.

$$\begin{aligned} -3(4-x) &= 2x+5 \\ -3\times 4+3\times x &= 2x+5 \\ 3x-2x &= 5+12 \\ x &= 17 \end{aligned}$$

Hence, $x = 17$ is a solution of the given equation.

Check : L.H.S. $-3(4-17) = 2\times 17+5$

$\Rightarrow \quad -3(-13) = 34+5$

$\Rightarrow \quad 39 = 34+5$

$\Rightarrow \quad 39 = 39 =$ R.H.S.

9.

$$\begin{aligned} 4x-\frac{1}{3} &= \frac{1}{5}+3x \\ 4x-3x &= \frac{1}{5}+\frac{1}{3} \\ x &= \frac{3+5}{15} \\ x &= \frac{8}{15} \end{aligned}$$

Hence, $x = \frac{8}{15}$ is a solution of the equation.

Check : L.H.S. $= 4x-\frac{1}{3} = 4\times\frac{8}{15}-\frac{1}{3}$

$$= \frac{32}{15}-\frac{1}{3} = \frac{32-5}{15} = \frac{27}{15} = \frac{9}{5}$$

R.H.S. $= \frac{1}{5} = 3x = \frac{1}{5}+3\times\frac{8}{15}$

$$= \frac{1}{5}+\frac{8}{5} = \frac{1+8}{5} = \frac{9}{5}$$

L.H.S.= R.H.S.

10.

$$\begin{aligned} 4(5x-4)+3(2x-1) &= 7 \\ 4\times 5x-4\times 4+3\times 2x-3 &= 7 \\ 20x+6x-16-3 &= 7 \\ 26x-19 &= 7 \\ 26x &= 19+7 \\ 26x &= 26 \\ x &= 26\div 26 = 1 \end{aligned}$$

Hence, $x = 1$ is a solution of the given equation.

Check : LHS $= 4(5\times 1-4)+3(3(2\times 1-1)$

$= 4(5-4)+3(2-1)$

$= 4\times 1+3\times 1 = 4+3 = 7 = \text{RHS}$

11.

$$\begin{aligned} 7x+2(x+2) &= 20-(2x-5) \\ 7x+2x+2\times 2+2x-5 &= 20 \\ 9x+12x+4-5 &= 20 \\ 11x-1 &= 20 \\ 11x &= 20+1 \\ 11x &= 21 \\ x &= \frac{21}{11} \end{aligned}$$

Hence, $x = \frac{21}{11}$ is a solution of the given equation.

Check : L.H.S. $= 7\times\frac{21}{11}+2\left(\frac{21}{11}+2\right)$

$= \frac{147}{11}+\frac{2\times(21+22)}{11} = \frac{147}{11}+\frac{43\times 2}{11}$

$= \frac{147}{11}+\frac{86}{11} = \frac{147+86}{11} = \frac{233}{11}$

R.H.S. $= 20-(2x-5)$

$= 20-\left(2\times\frac{12}{11}-5\right)$

$= 20-\left(\frac{42-55}{11}\right) = 20+\frac{13}{11}$

$= \frac{220+13}{11} = \frac{233}{11}$

LHS = RHS

12.

$$\frac{y}{5}-\frac{y}{6} = \frac{1}{30}$$

$\Rightarrow$ $$\frac{6y-5y}{5\times 6} = \frac{1}{30}$$

$\Rightarrow$ $$\frac{y}{30} = \frac{1}{30}$$

$\Rightarrow \qquad y = 1$

Hence, $y = 1$ is a solution of the gien equation.

Check : LHS $= \frac{1}{5} - \frac{1}{6} = \frac{6-5}{30} = \frac{1}{30}$ = RHS

13.
$$23 - 4x = -25 + 4x$$
$$23 + 25 = 4x + 4x$$

or $\qquad 8x = 48$

$\Rightarrow \qquad x = 48 \div 8 = 6$

Hence, $x = 6$ is a solution of the given equation.

Check : L.H.S. $= 23 - 4 \times 6 = 23 - 24 = -1$

RHS $= -25 + 4 \times 6 = -1$

LHS = RHS

14.
$$\frac{2x}{3} - \frac{x}{2} = 30$$
$$\frac{2 \times 2x - 3x}{3 \times 2} = 30$$

$\Rightarrow \qquad \frac{4x - 3x}{6} = 30$

$\Rightarrow \qquad x = 30 \times 6$

$\Rightarrow \qquad x = 180$

Hence, $x = 180$ is a solution of the given equation.

Check : LHS $= \frac{2 \times 180}{3} = \frac{180}{2} = 120 - 90 - 30 =$ RHS

15.
$$0 = 18 + 9(m - 2)$$
$$9m = -18 + 18$$
$$9m = 0$$
$$m = 0$$

Hence, m is a solution of the given equation.

Check : RHS $= 18 + 9(0 - 2) = 18 - 18 = 0 = 0$

16.
$$5(n - 3) = -45$$
$$5n - 5 \times 3 = -45$$
$$5n - 15 = -45$$
$$5n - 45 = 15$$
$$5n = -30$$
$$n = 30 \div 5 = -6$$

Hence, $n = -6$ is a solution of the given equation.

Check : LHS $= 5(-6 - 3) = 5 \times (-9) = -45$

17.
$$\frac{7b}{8} - 15 = -1$$
$$\frac{7b}{8} = 15 - 1$$

$$\frac{7b}{8} = 14$$
$$7b = 14 \times 8$$
$$b = (14 \times 8) \div 7$$
$$b = 2 \times 8 = 16$$

Hence, $b = 16$ is a solutioni of the given equation.

Check : LHS $\frac{7b}{8} - 15 = \frac{7 \times 16}{8} - 15 = 14 - 15 = -1 =$ RHS

18.
$$\frac{x}{4} = \frac{x}{5} + 1$$
$$\frac{x}{4} - \frac{x}{5} = 1$$
$$\Rightarrow \quad \frac{5x - 4x}{20} = 1$$
$$\Rightarrow \quad \frac{1}{20}x = 1$$
$$x = 20$$

Hence, $x = 20$ is a solution of the given equation.

Check : LHS $= \frac{x}{4} = \frac{20}{4} = 5$

RHS $= \frac{x}{5} + 1 = \frac{20}{5} + 1 = 4 + 1 = 5$

LHS = RHS

19.
$$34 - 5(n - 1) = 4$$
$$5(n - 1) = 34 - 4$$
$$5n - 5 = 30$$
$$5n = 30 + 5$$
$$5n = 30 + 5$$
$$5n = 35$$
$$n = 35 \div 5 = 7$$

Hence, $n = 7$ is a solution of the given equation.

Check : LHS $= 34 - 5(n - 1)$

$= 34 - 5(7 - 1) \qquad = 34 - 5 \times 6$

$= 34 - 30 = 4 =$ RHS

20.
$$3p - 2(2p - 5) = 2(p + 3) - 8$$
$$3p - 4p + 10 = 2p + 6 - 8$$
$$-p + 10 = 2p - 2$$
$$2p + p = 10 + 12$$
$$3p + 12 = 10 + 12$$
$$p = 12 \div 3 = 4$$

Hence, $p = 4$ is a solution of the given equation.

Check : LHS $= 3p - 2(2p - 5)$

$= 3 \times 4 - 2 \times (2 \times 4 - 5)$

$= 12 - 2(8 - 5)$

$= 12 - 2 \times 3 = 12 - 6 = 6$

RHS $= 2(p + 3) - 8 = 2(4 + 3) - 8 \quad = 14 - 8 = 6$

LHS = RHS

Exercise 7.4

1. Let the number be x

Then, $x + \frac{3}{4}x = 91$

$\Rightarrow \frac{4x + 3x}{4} = 91$

$7x = 91 \times 4$

$x = \frac{91 \times 4}{7} = 13 \times 4 = 52$

Hence, the required number is 52.

2. Let the number be x

Then, $x \times \frac{5}{6} = 60$

$5x = 60 \times 6$

$x = \frac{60 \times 6}{5} = 12 \times 6$

$x = 2$

Hence, the required number is 72.

3. Let the number be x

Then, $2x + 7 = 59$

$2x = 59 - 7$

$2x = 52$

$\Rightarrow x = 52 \div 2 = 26$

Hence, the required number is 56.

4. Let the number be x

Then, $5x - 3 = 42$

$5x = 42 + 3$

$5x = 45$

$x = 45 \div 5$

$x = 9$

Hence, the required number is 9.

5. Let the number be x

Then, $\frac{2}{3}x - \frac{1}{3}x = 3$

$$\frac{2x-x}{3} = 3$$

$$\frac{x}{3} = 3$$

$$x = 3 \times 3$$

$$x = 9$$

Hence, the required number is 9.

6. Let the three consecutive integer be $x, (x+1)$, and $(x+2)$.

Then, $x+(x+1)+(x+2) = 24$

$$x+x+1+x+2 = 24$$

$$3x+3 = 24$$

$$3x = 24-3$$

$$x = 21 \div 3$$

$$x = 7$$

So, the number $x, x+1, x+2 = 7, 7+1, 7+2$

$$= 7, 8, 9$$

Hence, the tree consecutive number is 7, 8, and 9.

7. Let the two consecutive even number be $(x+2), x$

Then, $x+(x+2) = 502$

$$x+x+2 = 502$$

$$2x = 502-2$$

$$2x = 500$$

$$x = 500 \div 2 = 250$$

So, the number x, $x+2 = 250, 250+2$

$$= 250, 252$$

Hence, the two consecutive even number is 250 and 252.

8. Let the two consecutive odd number be $x, (x+2)$

Then, $x+(x+2) = 136$

$$x+x+2 = 136$$

$$2x+2 = 136$$

$$2x = 136-2$$

$$2x = 136-2$$

$$2x = 134$$

$$x = 67$$

So, the number $x, x+2$ $= 67, 67+2$

$$= 67, 69$$

Hence, the two consecutie odd number and 69.

9. Let the number be x

Then, $x+\frac{1}{2}x = 45$

$$\Rightarrow \quad \frac{2x+x}{2} = 45$$

$$\Rightarrow \quad \frac{3x}{2} = 45$$

$$\Rightarrow \quad 3x = 45 \times 2$$

$$\Rightarrow \quad = \frac{45 \times 2}{3}$$

$$= 15 \times 2$$

$$= 30$$

Hence, the required number is 30.

10. Let the number of boys be x

Then, the number of girls is $\frac{3}{5}x$

So, according to the questions

$$x + \frac{3}{5}x = 40$$

$$\frac{5x+3x}{5} = 40$$

$$8x = 40 \times 5$$

$$x = 5 \times 5$$

$$x = 25$$

So, the number of boys is 25.

Therefore, the number of girls = $40 - 25 = 15$ girls

Hence, the number of girls is 15.

11. Let the Sahil's age be x years

Then, the age of Sahil's mother wll be $5x$ years

According to the questions

$$5x + x = 48$$

$$6x = 48$$

$$x = 48 \div 6$$

$$= 8$$

So, Sahil's age = 8 years

and the age of Sahil's mother = $5 \times 8 = 48$ years

Hence, Sahil is 8 years old and her mother is 48 years old.

12. Let present age of Mayannk be x years

So, According to the questions

$$(x+15) = 4x$$

$$\Rightarrow \quad x+15 = 4x$$

$$\text{or} \quad 4x - x = 15$$

$$\Rightarrow \quad 3x = 15$$

$$\Rightarrow \quad x = 15 \div 3$$

$$= 5 \text{ years.}$$

Hence, the present age of Mayank is 5 years.

13. Let the age of Isha be x years

Then, brother's age $= x + 5$ years

So, According to the questions

$$\begin{aligned}
\frac{x+4}{(x+5)+4} &= \frac{2}{3} \\
x+12 &= 2(x+5)+8 \\
3x+12 &= 2x+10+8 \\
3x-2x &= 18-12 \\
x &= 6 \text{ years} \\
\text{and brother's age} &= x+5 \\
&= 6+5 = 11 \text{ years}
\end{aligned}$$

Hence, the age of Isha and her brother 6 years and 11 years old respectively.

14. Let the length and breadth of a rectangle be l and b respectively.

So, $$\begin{aligned}
4b &= 3+l \\
4b-l &= 3 \text{.... (i)}
\end{aligned}$$

and we know that,

$$\begin{aligned}
\text{perimeter of a rectangle} &= 2(l+b) \\
\therefore \quad a^4 &= 2(l+b)
\end{aligned}$$

and $$l+b = 47 \text{ ... (ii)}$$

Solving the equaton (i) and (ii), we get

$$\begin{aligned}
4b-l &= 3 \quad \text{....(i)} \\
l+b &= 47 \text{ .... (ii)}
\end{aligned}$$

Adding $$\begin{aligned}
5b &= 50 \\
b &= 10m
\end{aligned}$$

Puttng the value of b in equation (i), we get

$$\begin{aligned}
l+10 &= 47 \\
l &= 47-10 \\
l &= 37m
\end{aligned}$$

Hence, the length and breadth of a rectangle is 37 m and 10 m respectively.

15. Let the angles of a triangle be $x, 2x, 3x$ respectively.

We know that,

$$\begin{aligned}
\text{The sum of angles of a triangle} &= 180^\circ \\
\therefore \quad x+2x+3x &= 180^\circ \\
6x &= 180^\circ \\
x &= 180 \div 6 \\
x &= 30^\circ \\
\text{The angles are } x, 2x, 3x &= 30^\circ,\ 2\times 30^\circ,\ 3\times 30^\circ = 30^\circ,\ 60^\circ,\ 90^\circ
\end{aligned}$$

16. Let the number of 1 rupee coins be x

$$\therefore \quad \text{the number of 2 rupee coins} = \frac{x}{3}$$

Value of x 1-rupee coins = ` $1x$

Value of x 5-rupe coins = ` $\frac{x}{3}$

Total value of 1 rupee and 2 rupee coins

= ` $\left(1+\frac{2x}{3}\right)$

So, ` $\left(1x+\frac{2x}{3}\right)$ = ` 50

$$\frac{(3+2)}{3} = 50$$

$$5x = 50\times 2$$

$$x = 10\times 3 = 30$$

Hence, the number of 1 rupee coins is 30 and number of 2 rupee coins is 10.

17. Let the number of notes of ` 100 and ` 500 be x, and y respectively.

Then, total number of notes $= x + y$

$$x + y = 30 \text{ .... (i)}$$

And $$100x + 500y = 5000$$

$$x + 5y = 50 \text{ ..... (ii)}$$

Solving the equation (i) and (ii), we get

$$x + 5y = 50 \quad \text{....(i)}$$

$$x + y = 30 \quad \text{.... (ii)}$$

$$- \quad - \quad - \quad \text{Subtracting}$$

$$4y = 20$$

$$y = 5$$

Putting the value of y n equation (i), we get

$$x + 5 = 30 \text{ ...... (i)}$$

$$x = 30 - 5$$

$$x = 25$$

Hence, the No. of ` 500 notes = 5 and No. of ` 100 notes = 25.

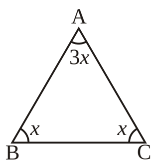
18. Let the bases angles be x, x

$\because$ $$\angle A + \angle B + \angle C = 180^\circ$$

$$3x + x + x = 180^\circ$$

$$5x = 180^\circ$$

$$x = 36^\circ$$



$\therefore$ $\angle A = 3\times 36 = 108^\circ$,

$\angle B = 36^\circ$ and $\angle C = 36^\circ$

Multiplce Choice Questions

Mark (3) agianst the correct answer in each of the following :

1. (c), 2. (d), 3. (d), 4. (c), 5. (b), 6. (b), 7. (b), 8. (a), 9. (a), 10. (c)

Exercise 8.1

1. (a) $\frac{81}{625} = \frac{3\times3\times3\times3}{5\times5\times5\times5} = \frac{3^4}{5^4} = \left(\frac{3}{5}\right)^4$

(b) $\frac{1}{216} = \frac{1\times1\times1}{6\times6\times6} = \frac{1^3}{6^3} = \left(\frac{1}{6}\right)^3$

(c) $-\frac{1}{27} = \frac{(-1)\times(-1)\times(-1)}{3\times3\times3} = \frac{(-1)^3}{3^3} = \left(\frac{-1}{3}\right)^3$

(d) $-\frac{64}{125} = \frac{(-4)\times(-4)\times(-4)}{5\times5\times5} = \frac{(-4)^3}{5^3} = \left(\frac{-4}{5}\right)^3$

2. (a) $\left(\frac{2}{7}\right)^2 = \frac{2\times2}{7\times7} = \frac{4}{49}$

(b) $\left(\frac{-3}{5}\right)^3 = \frac{(-3)\times(-3)\times(-3)}{5\times5\times5} = \frac{-27}{125}$

(c) $\left(\frac{-1}{6}\right)^4 = \frac{(-1)\times(-1)\times(-1)\times(-1)}{6\times6\times6\times6} = \frac{1}{1296}$

(d) $\left(\frac{2}{10}\right)^5 = \frac{2\times2\times2\times2\times2}{10\times10\times10\times10\times10} = \frac{32}{100000}$

3. (a) The reciprocal of $(-2)^4$ is $\left(-\frac{1}{2}\right)^4$

(b) The reciprocal of $(-3)^3$ is $\left(-\frac{1}{3}\right)^3$

(c) The reciprocal of $\left(-\frac{4}{9}\right)^2$ is $\left(-\frac{9}{4}\right)^2$

(d) The reciprocal of $\left(-\frac{5}{11}\right)^5$ is $\left(-\frac{11}{5}\right)^5$

4. (a) $\frac{3}{17}\times\frac{3}{17}\times\frac{3}{17}\times\frac{3}{17}\times\frac{3}{17}\times\frac{3}{17}$

$= \frac{3\times3\times3\times3\times3\times3}{17\times17\times17\times17\times17\times17} = \frac{3^6}{17^6} = \left(\frac{3}{17}\right)^6$

(b) $\left(\frac{-2}{13}\right)\times\left(\frac{-2}{13}\right)\times\left(\frac{-2}{13}\right)\times\left(\frac{-2}{13}\right)\times\left(\frac{-2}{13}\right)$

$$= \frac{(-2)\times(-2)\times(-2)\times(-2)\times(-2)}{13\times13\times13\times13\times13} = \frac{(-2)^5}{13^5} = \left(\frac{-2}{13}\right)^5$$

5. (a) The reciprcal of $(-2)^3 = \left(\frac{-1}{2}\right)^3 = \frac{(-1)\times(-1)\times(-1)}{2\times2\times2} = -\frac{1}{8}$

(b) The reciprocal of $(-5)^2 = \left(-\frac{1}{5}\right)^2 = \frac{(-1)\times(-1)}{5\times5} = \frac{1}{25}$

(c) The reciprocal of $\left(\frac{-2}{11}\right)^2 = \left(\frac{-11}{2}\right)^2 = \frac{(-11)\times(-11)}{2\times2} = \frac{121}{4}$

(d) The reciprocal of $\left(\frac{-3}{4}\right)^3 = \left(\frac{-4}{3}\right)^3 = \frac{(-4)\times(-4)\times(-4)}{3\times3\times3} = \frac{-64}{27}$

6. (a) $\left(\frac{-4}{3}\right)^3 \times \left(\frac{9}{8}\right)^2 = \frac{(-4)\times(-4)\times(-4)}{3\times3\times3} \times \frac{9\times9}{8\times8} = \frac{-64}{27} \times \frac{81}{64} = -3$

(b) $\left(\frac{-3}{7}\right)^4 \times \left(\frac{14}{3}\right)^4$

$$= \frac{(-3)\times(-3)\times(-3)\times(-3)}{7\times7\times7\times7} \times \frac{14\times14\times14\times14}{3\times3\times3\times3}$$

$$= \frac{9\times9}{49\times49} \times \frac{196\times196}{9\times9} = \frac{196\times196}{49\times49} = 4\times4 = 16$$

(c) $\left(\frac{2}{3}\right)^4 \div \left(\frac{4}{5}\right)^2 = \left(\frac{2}{3}\right)^4 \times \left(\frac{5}{4}\right)^2$

$$= \frac{2\times2\times2\times2}{3\times3\times3\times3} \times \frac{5\times5}{4\times4} = \frac{4\times4}{7\times9} \times \frac{25}{4\times4} = \frac{25}{81}$$

(d) $\left(\frac{-5}{8}\right)^3 \times \left(\frac{-24}{5}\right)^2$

$$= \frac{(-5)\times(-5)\times(-5)}{8\times8\times8} \times \frac{(-24)\times(-24)}{5\times5}$$

$$= \frac{25\times(-5)}{8\times8\times8} \times \frac{24\times24}{25} = \frac{(-5)\times3\times3}{8} = \frac{-45}{8}$$

7. (a) $(4^3 - 3^4)\times\left(\frac{1}{17}\right)^2$

$$= (4\times4\times4 - 3\times3\times3\times3)\times\frac{1}{17\times17} + (64-81)\times\frac{1}{17\times17}$$

$$= -17\times\frac{1}{17\times17} = \left(-\frac{1}{17}\right)$$

(b) $\left[\left(\frac{-3}{4}\right)^2 - \left(\frac{1}{2}\right)^3\right] \times \frac{(5)^2}{133}$

$$= \left[\frac{(-3)(-3)}{4\times 4} - \frac{1\times 1\times 1}{2\times 2\times 2}\right] \times \frac{5\times 5}{133}$$

$$= \left[\frac{9}{6} - \frac{1}{8}\right] \times \frac{25}{133} = \frac{9-2}{16} \times \frac{25}{133} = \frac{7}{16} \times \frac{25}{133} = \frac{25}{16\times 19} = \frac{25}{304}$$

(c) $\left[\left(\frac{-3}{4}\right)^2 - \left(\frac{1}{2}\right)^3\right] \times 4^3$

$$= \left[\frac{(-3)\times(-3)}{4\times 4} - \frac{1\times 1\times 1}{2\times 2\times 2}\right] \times 4\times 4\times 4 + \left[\frac{9}{16} - \frac{1}{8}\right] \times 64$$

$$= \left(\frac{9-2}{16}\right) \times 64 = \frac{7}{16} \times 64 = 7\times 4$$

(d) $\left(\frac{1}{2}\right)^4 \times 4^2 \times \left(\frac{-1}{5}\right)^3$

$$= \frac{1\times 1\times 1\times 1}{2\times 2\times 2\times 2} \times 4\times 4\times \frac{(-1)\times(-1)\times(-1)}{5\times 5\times 5}$$

$$= \frac{1}{16} \times 4\times 4\times \frac{(-1)}{125} = \frac{-1}{125}$$

Exercise 8.2

1. (a) $(-2)^3 \times (-2)^2 \qquad (\because x^m \times x^n = x^{m+n})$

$\therefore \quad (-2)^{3+2} = (-2)^5 = (-2)\times(-2)\times(-2)\times(-2)\times(-2)$

$= -32$

(b) $3^2 \times 3^2 = 3^{2+2} = 3^4 = 3\times 3\times 3\times 3 = 81$

(c) $\left(\frac{1}{2}\right)^3 \times \left(\frac{1}{2}\right)^3 = \left(\frac{1}{2}\right)^{3+3} = \left(\frac{1}{2}\right)^6 = \frac{1\times 1\times 1\times 1\times 1}{2\times 2\times 2\times 2\times 2} = \frac{1}{64}$

(d) $(-3)^8 \div (-3)^6$

$$= (-3)^8 \times \frac{1}{(-3)^6} \qquad (\because x^m \div x^n = x^{m-n})$$

$$= (-3)^{8-6} = (-3)^2 + (-3)\times(-3) = 9$$

(e) $4^{10} \div 4^7 = 4^{10-7} = 4^3 = 4\times 4\times 4 = 64$

(f) $\left(\frac{-1}{5}\right)^{17} \div \left(\frac{-1}{5}\right)^{14} = \left(-\frac{1}{15}\right)^{17-14} = \left(-\frac{1}{5}\right)^3$

$$= \frac{(-1)\times(-1)\times(-1)}{5\times 5\times 5} = \frac{-1}{125}$$

(g) $\left[\left(\frac{-3}{4}\right)^3\right]^2 = \left(\frac{-3}{4}\right)^{3\times 2} \qquad [\because (x^m)^{mn} = x^{mn}]$

$$= \left(\frac{-3}{4}\right)^6$$

$$= \frac{(-3)\times(-3)\times(-3)\times(-3)\times(-3)\times(-3)}{4\times 4\times 4\times 4\times 4\times 4}$$

$$= \frac{9\times 9\times 9}{16\times 16\times 16} = \frac{729}{4096}$$

2. (a) $\left(\frac{4}{5}\right)^8 \times \left(\frac{4}{5}\right)^7 = \left(\frac{4}{5}\right)^{8+7} = \left(\frac{4}{5}\right)^{15}$

(b) $\left(\frac{-3}{11}\right)^3 \times \left(\frac{-3}{11}\right)^8 = \left(\frac{-3}{11}\right)^{3+8} = \left(\frac{-3}{11}\right)^{11}$

(c) $\left(\frac{-2}{13}\right)^{17} \div \left(\frac{-2}{13}\right)^5 = \left(\frac{-2}{13}\right)^{17-5} = \left(\frac{-2}{13}\right)^{12}$

(d) $\left(\frac{-1}{4}\right)^3 \div \left(\frac{-1}{4}\right)^7 \quad \left(\frac{-1}{4}\right)^{3-7} = \left(\frac{-1}{4}\right)^{-4} \quad \frac{1}{\left(\frac{-1}{4}\right)^4} = (+4)^4 = 256$

(e) $(-6)^3 \div (-6)^9 \quad = (-6)^{3-9} = (-6)^{-6} \quad = \frac{1}{(6)^6}$

(f) $\left[\left(\frac{-3}{13}\right)^6\right]^3 \quad = \left(\frac{-3}{13}\right)^{6\times 3} = \left(\frac{-3}{13}\right)^{18}$

3. (a) $\left(\frac{-2}{3}\right)^2 \qquad\qquad \left(\frac{-3}{2}\right)^2$

$\frac{(-2)\times(-2)}{3\times 3} \qquad\qquad \frac{(-3)\times(-3)}{2\times 2}$

$\frac{4}{9} \qquad \frac{9}{4}$

$4\times 4 \qquad 9\times 9$

$16 \qquad 81$

Since, $16 < 81$

$\therefore \quad \frac{4}{9} < \frac{9}{4}$ or $\left(\frac{-2}{3}\right)^2 < \left(\frac{-3}{2}\right)^2$

(b) $2^5 \qquad\qquad 5^2$

$2\times 2\times 2\times 2\times 2 \qquad 5\times 5$

$32 \qquad 25$

Since, $32 > 25$

$\therefore$ $2^5 > 5^2$

(c) $(-3)^4$ $(-4)^3$

$(-3)\times(-3)\times(-3)\times(-3)\times(-3)$ $(-4)\times(-4)\times(-4)$

9×9 -64

81 -64

Since, $81 > (-64)$

$\therefore$ $(-3)^4 > (-4)^3$

4. (a) $2^5 \times -3^4 = 2\times 2\times 2\times 2\times 2\times(-3)\times(-3)\times(-3)\times(-3)$

$= 32\times 9\times 9$

$= 32\times 81 = 2592$

(b) $\left(\frac{1}{2}\right)^3 \times \left(\frac{3}{4}\right)^2 = \frac{1\times 1\times 1}{2\times 2\times 2}\times\frac{3\times 3}{4\times 4} = \frac{1}{8}\times\frac{9}{16} = \frac{9}{128}$

(c) $2^3 \times (-3)^2 = 2\times 2\times 2\times(-3)\times(-3) = 8\times 9 = 72$

(d) $\left(\frac{-2}{7}\right)\div\left(\frac{5}{14}\right)^2 = \frac{(-2)\times(-2)}{7\times 7}\times\frac{14\times 14}{5\times 5}$

$= \frac{4}{49}\times\frac{192}{25} = \frac{4\times 4}{25} = \frac{16}{25} = \frac{4}{5}$

(e) $\left(\frac{1}{3}\right)^4 \div\left(\frac{1}{6}\right)^3 = \frac{1\times 1\times 1\times 1\times 1}{3\times 3\times 3\times 3}\times\frac{6\times 6\times 6}{1\times 1\times 1}$

$= \frac{36\times 36}{9\times 9} = \frac{4\times 2}{3} = \frac{8}{3} = 2\frac{2}{3}$

(f) $\left(\frac{-6}{7}\right)^2 \div\left(\frac{1}{3}\right)^3 = \frac{(-6)\times(-6)}{7\times 7}\times\frac{3\times 3\times 3}{1\times 1\times 1}$

$= \frac{36}{49}\times\frac{9\times 13}{1} = \frac{972}{49} = 19\frac{41}{49}$

5. (a) $\left[\left(\frac{-2}{11}\right)^4 \left(\frac{-2}{11}\right)^7\right]\div\left(\frac{-2}{11}\right)^9 = \left[\left(\frac{-2}{11}\right)^{4+7}\right]\div\left(\frac{-2}{11}\right)^9$

$= \left[\left(\frac{-2}{11}\right)^{11}\right]\div\left(\frac{-2}{11}\right)^9$

$= \left(\frac{-2}{11}\right)^{11-9} = \frac{4}{121}$

(b) $[(-3)^{10} \div (-3)^9]\times(-3)$

$= [(-3)^{10-9}]\times(-3)^2 = (-3)\times(-3)^2 = (-3)^3$

$= -27$

(c) $\left[\left(\frac{-4}{5}\right)^{5} \left(\frac{-4}{5}\right)^{9}\right] \times \left(\frac{-4}{5}\right)^{6}$

$= \left[\left(\frac{-4}{5}\right)^{5-9}\right] \times \left(\frac{-4}{5}\right)^{6}$

$= \left(\frac{-4}{5}\right)^{-4} \times \left(\frac{-4}{5}\right)^{6} = \left(\frac{-4}{5}\right)^{-4+6} = \left(\frac{-4}{5}\right)$

$= \frac{(-4)\times(-4)}{5\times 5} = \frac{16}{25}$

(d) $\left[\left(\frac{-1}{2}\right)^{11} \div \left(\frac{-1}{2}\right)^{10}\right]^{3} = \left[\left(\frac{-1}{2}\right)^{11-10}\right]^{3} + \left[\left(\frac{-1}{2}\right)\right] = \left(\frac{-1}{2}\right)^{3} = \frac{-1}{8}$

6. $16\times 16\times 16\times 16 = (4\times 4)\times(4\times 4)\times(4\times 4)\times(4\times 4)$

$= 4^{2+2+2+2} = 4^{8}$

7. (a) $54\times 36 = 2\times 3\times 3\times 3\times 2\times 2\times 3\times 3 = 2^{3}\times 3^{5}$

(b) $64\times 243 = 2\times 2\times 2\times 2\times 2\times 3\times 3\times 3\times 3\times 3 = 2^{6}\times 3^{5}$

8. (a) $\left(\frac{-2}{5}\right)^{3} \times \left(\frac{-2}{5}\right)^{7}$ $\quad (\because x^{m}\times x^{n} = x^{m+n})$

$= \left(\frac{-2}{3}\right)^{3+7} = \left(\frac{-2}{3}\right)^{10}$

(b) $\left[\left(\frac{3}{4}\right)^{7}\right]^{3}$ $\quad (\because (x^{m})^{n} = x^{mn})$

$= \left[\left(\frac{3}{4}\right)^{7\times 3}\right]^{3} = \left[\frac{3}{4}\right]^{21} = \left(\frac{3}{4}\right)^{21}$

(c) $\left(\frac{-11}{25}\right)^{14} \div \left(\frac{-11}{25}\right)^{8} = \left(\frac{-11}{25}\right)^{14-8} = \left(\frac{-11}{25}\right)^{6}$

(d) $\left(\frac{-2}{5}\right)^{3} \times \left(\frac{-2}{5}\right)^{-2} \times \left(\frac{-2}{5}\right)^{-4} = \left(\frac{-2}{5}\right)^{3-2-4} = \left(\frac{-2}{5}\right)^{3-6} = \left(\frac{2}{5}\right)^{-3}$

Exercise 8.3

1. (a) $\left(\frac{-7}{17}\right)^{0}$ $\quad (\because x^{0} = 1)$

$\therefore \quad = 1$

(b) $10^{0} \div 5^{0} = 1\div 1 = 1$

(c) $(8^{\circ} - 2^{\circ}) - 4^{\circ} = (1-1) - 4^{\circ} = 0 - 1 = -1$

(d) $1^{\circ} + 2^{\circ} + 3^{\circ} = 1 + 1 + 1 = 3$

(e) $5^{\circ} \times 6^{\circ} \times 7^{\circ} = 1 \times 1 \times 1 = 1$

(f) $(6^{\circ} + 5^{\circ})(2^{\circ} - 1^{\circ}) = (1 + 1)(1 - 1) = 2 \times 0 = 0$

2. (a) $(3)^{-1} = \left(\frac{1}{3}\right)$

(b) $\left(\frac{-4}{11}\right)^{-1} = \frac{1}{\left(\frac{-4}{11}\right)} = \left(\frac{-11}{4}\right)$

(c) $(-2)^{-1} \times \left(\frac{2}{3}\right)^{-1} = \left(\frac{1}{-2}\right) \times \frac{1}{\left(\frac{2}{3}\right)} = \left(\frac{-1}{2}\right) \times \left(\frac{3}{2}\right) = \frac{-3}{4}$

(d) $\left(\frac{-7}{5}\right)^{-1} \div 7^0 = \frac{1}{\left(\frac{-7}{5}\right)} \div 1 = \left(\frac{-5}{7}\right)$

(e) $90^0 \times \left(\frac{-3}{2}\right)^{-1} = 1 \times \frac{1}{\left(\frac{-3}{2}\right)} = \left(\frac{-2}{3}\right)$

(f) $\left(\frac{4}{9}\right)^{-1} \times \left(\frac{3}{8}\right)^{-1} = \frac{1}{\left(\frac{4}{9}\right)} \times \frac{1}{\left(\frac{3}{8}\right)} = \frac{9}{4} \times \frac{8}{3} = 3 \times 2 = 6$

3. (a) $\left[\left(\frac{5}{21}\right)^0\right]^3 = [1]^3 = 1 \times 1 \times 1 = 1$

(b) $\left[\left(\frac{-8}{5}\right)^{-12}\right]^0 = \left[\left(\frac{-8}{5}\right)^0\right]^{12} = [1]^{12} = 1$

(c) $\left[\left(\frac{2}{19}\right)^{15} \div \left(\frac{2}{19}\right)^{13}\right] \div \left(\frac{2}{19}\right)^2$

$= \left[\left(\frac{2}{19}\right)^{15-13}\right] \div \left(\frac{2}{19}\right)^2 = \left(\frac{2}{19}\right)^2 \div \left(\frac{2}{19}\right)^2 = \left(\frac{2}{19}\right)^{2-2} = \left(\frac{2}{19}\right)^0 = 1$

(d) $\left[\left(\frac{-2}{7}\right)^2 \times \left(\frac{-2}{7}\right)^4\right] \div \left(\frac{4}{49}\right)^3 = \left[\left(\frac{-2}{7}\right)^{2+4}\right] \div \left(\frac{4}{49}\right)^3$

$= \left[\left(\frac{-2}{7}\right)^6\right] \div \left(\frac{4}{49}\right)^3$

$$=\left[\left(\frac{-2}{7}\right)^6\right]\times\left[\left(\frac{49}{4}\right)^3\right]$$

$$=\left[\left(\frac{-2}{7}\right)^6\right]\times\left[\left(\frac{7^2}{2^2}\right)\right]=\frac{(-2)^6}{7^6}\times\frac{7^6}{2^6}=\frac{1}{1}\times\frac{1}{1}=1$$

(e) $(-5)^3 \div 5^3 = (-5)\times(-5)\times(-5)\times\frac{1}{5\times5\times5}$

$$=-125\times\frac{1}{125}=-1\times1=-1$$

(f) $(4^5\times4^6)\div4^{11}=4^{5+6}\div4^{11}=4^{11}\div4^{11}$

$$=4^{11-11}=4^0=1$$

4. (a) $(5^{-1}\times8^{-1})\div16^{-1}=\left(\frac{1}{5}\times\frac{1}{8}\right)\div\frac{1}{16}=\frac{1}{40}\times16=\frac{16}{40}=\frac{2}{5}$

(b) $(4^{-1}-5^{-1})+(5^{-1}-6^{-1})=\left(\frac{1}{4}-\frac{1}{5}\right)+\left(\frac{1}{5}-\frac{1}{6}\right)$

$$=\left(\frac{5-4}{20}\right)+\left(\frac{6-5}{30}\right)$$

$$=\frac{1}{20}+\frac{1}{30}=\frac{3+2}{60}=\frac{5}{60}=\frac{1}{12}$$

(c) $(6^{-1}\div12^{-1})\times\frac{1}{2}=\left(\frac{1}{6}\div\frac{1}{12}\right)\times\frac{1}{2}=\left(\frac{1}{6}\times12\right)\frac{1}{2}=2\times\frac{1}{2}=1$

(d) $(9^{-1}-10^{-1})\div45-1=\left(\frac{1}{9}-\frac{1}{10}\right)\div\frac{1}{45}$

$$=\left(\frac{10-9}{90}\right)\div\frac{1}{45}=\frac{1}{90}\times45=\frac{45}{90}=\frac{1}{2}$$

5. Option a, c and d are true statement.

6. Let the other number be x

Then, $(-3)^{-1}\times x=(-5)^{-1}$

$$\frac{1}{(-3)}\times x=\frac{1}{(-5)}$$

$\Rightarrow$ $x=\frac{1}{(-5)}\times(-3)$

$\Rightarrow$ $x=\frac{3}{5}$

Hence, the other number is $\frac{3}{5}$.

7. Let the number be x

Then, $\left(\frac{-2}{3}\right)^{-1} \times x = \left(\frac{-3}{2}\right)^{-1}$

$\Rightarrow$ $x = \left(\frac{-3}{2}\right)^{-1} / \left(\frac{-2}{3}\right)^{-1}$

$\Rightarrow$ $x = \frac{1}{(-3/2)} / \frac{1}{(-2/3)}$

$\Rightarrow$ $x = \frac{-2/3}{-3/2} = \frac{4}{9}$

Hence, the number is 4/9.

Exercise 8.4

1. (a) $4.3 \times 10^{-1} = \frac{43}{10} \times 10^{-1} = 43 \times 10^{-1} \times 10^{-1} = 43 \times 10^{-2} = 0.43$

(b) $2.45 \times 10^{6} = \frac{245}{100} \times 10^{6} = 245 \times 10^{6-2} = 245 \times 10^{4} = 2450000$

(c) $2.7931 \times 10^{6} = 27931 \times 10^{6-4} = 2793100$

(d) $3.8 \times 10^{6} = \frac{38}{10} \times 10^{6} = 38 \times 10^{6-1} = 38 \times 10^{5} = 3800000$

(e) $0.032 \times 10^{2} = \frac{32}{1000} \times 10^{2} = 32 \times 10^{2-3} = 3.2$

(f) $1.09 \times 10^{7} = \frac{109}{100} = 109 \times 10^{7-2} = 109 \times 10^{5} = 10900000$

2. (a) $4.7 = 4.7 \times 1 = 4.7 \times 10^{0}$ (b) $68000 = 6.98 \times 10^{5}$

(c) $52 \text{ lakh} = 52 \times 10^{5} = 5.2 \times 10^{6}$ (d) $2 \text{ crore} = 2 \times 10^{7}$

3. (a) $330 \text{ ms}^{-1} = 3.30 \times 10^{2}$ m/s (b) $150000000 = 1.5 \times 10^{8}$ km

(c) $9500000000000000 = 9.5 \times 10^{15}$ m

Mutiple Choice Questions

Mark (3) against the correct answer in each of the following :

1. (c), 2. (b), 3. (c), 4. (b), 5. (a), 6. (d), 7. (a), 8. (d), 9. (c), 10. (c), 11. (b), 12. (c)

9 Lines And Angles

Exercise 9.1

1. $\because$ $\angle 1 = \angle 5$ (corresponding angles)

$\therefore$ $65° = \angle 5$

or $\angle 5 = 65°$

$\because$ $\angle 1 = \angle 7$ (alternate angles)

$\therefore$ $65° = \angle 7$

or $\angle 7 = 65^\circ$

$\therefore$ $\angle 3 = \angle 7$ (corresponding angles)

$\therefore$ $\angle 3 = 65^\circ$

$\because$ $\angle 3 + \angle 6 = 180^\circ$

(The sum of interior angles on the same side of the transversal is 180°)

$\therefore$ $65^\circ + \angle 6 = 180^\circ$

$\angle 6 = 180^\circ - 65^\circ$

$\angle 6 = 115^\circ$

$\because$ $\angle 2 = \angle 6$ (corresponding angles)

$\therefore$ $\angle 2 = 115^\circ$

Similarly $\angle 4 + \angle 5 = 180^\circ$

$\angle 4 + 65 = 180^\circ$

$\angle 4 = 180^\circ - 65^\circ$

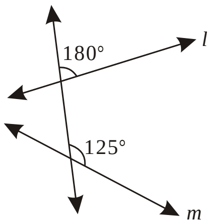
$\angle 4 = 115^\circ$

$\angle 4 = \angle 8 = 115^\circ$

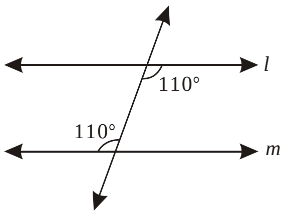
[interior angles on the same side of the transversal]

Hence, the all the other angles are $\angle 2 = 115^\circ$; $\angle 3 = 65^\circ$; $\angle 4 = 115^\circ$; $\angle 5 = 65^\circ$; $\angle 6 = 115^\circ$; $\angle 7 = 65^\circ$; $\angle 8 = 115^\circ$.

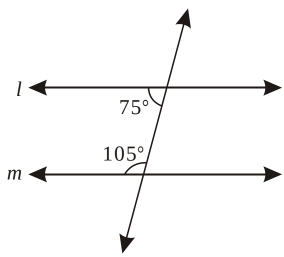
2. (i) Since, corresponding angles are not same.
Hence, the lines l and m are not parallel line.



(ii) Since, alternate angles are same or equal.
Hence, the lines l and m are parallel.



(iii) Since the sum of the interior angles on the same side of the transversal is $75^\circ + 105^\circ = 180^\circ$
Hence, the lines l and m are parallel.



3. $\because$ $\angle c = \angle a$ (Vertically opposite angles)

$\because$ $50^\circ = \angle a$

or $\angle a = 50°$

$\because \angle a = \angle e$ (Corresponding angles)

$\therefore \angle e = 50°$

$\because \angle g = \angle e$ (Vertically opposite angles)

$\therefore \angle g = 50°$

$\because \angle d + \angle e = 180°$

(Interior angles on the same side of the transversal)

$\therefore \angle d + 50° = 180°$

$\angle d = 180° - 150°$

$\angle d = 130°$

Similarly $\angle c = \angle f = 180°$

$50° + \angle f = 180°$

$\angle f = 180° - 50°$

$\angle f = 130°$

$\therefore \angle b = \angle d$ (Vertically opposite angles)

$\therefore \angle b = 130°$

$\angle h = \angle d = 130°$ (Corresponding angles)

And $\angle 0 = \angle m$ (Vertically opposite angles)

$\therefore \angle 0 = 115°$

$\angle k = \angle o$ (Corresponding angles)

$\angle i = \angle k$ (Vertically opposite angles)

$\therefore \angle i = 115°$

Also $\angle l + \angle m = 180°$

(Interior angles oni the same side of the transversal)

$\therefore \angle l + 115° = 180°$

$\angle l = 180° - 115°$

$\angle l = 65°$

$\angle n = \angle j = \angle p$

(Corresponding and vertically opposite angles respectively)

$\therefore \angle i = \angle p = 65°$

Hence, all the other angles are $b = 130°$; $a = 50°$; $d = 130°$; $e = 50°$; $f = 130°$; $g = 50°$; $h = 130°$; $= 115°$; $j = 65°$; $k = 115°$; $l = 65°$; $n = 65°$; $o = 115°$; and $p = 65°$.

4. If the two parallel lines are cut by a transversal, then the sum of one exterior and one interior angles $180°$

$\therefore 110° + \angle b = 180°$

$\angle b = 180° - 110°$

$\angle b = 70°$

Similarly $\angle a + 125° = 180°$

$\angle a = 180° - 125°$

$\angle a = 55°$

Hence, the values of a and b are $55°$, $70°$ respectively.

5. Since $AB \parallel CE$

$\angle ABC = \angle ECB$

(two parallel lines are cut by a transversal line, the pairs of alternate angles are equal

$\therefore \quad \angle ECB = 65°$

or $\quad \angle BCE = 65°$

6. Since $l \parallel m$

$\therefore \quad \angle a = 115°$ (Vertically opposite angles)

$\angle a = \angle d = 115°$ (Corresponding angles)

$\therefore \quad \angle d = 115°$

Also $\quad \angle b = 70°$ (Vertically opposite angles)

and $\quad \angle b = \angle c = 70°$ (Corresponding angles)

Hence, the values of a, b, c and d are $115°, 70°, 70°, 115°$ respectively.

7. Since $AD \parallel BC$ and $AB \parallel DC$

Therefore $\quad \angle C = \angle DAB$

$\therefore \quad \angle C = 75°$

$\angle DAB + \angle CBA = 180°$

(interior angles on the same side of the transversal)

$\therefore \quad 75° + \angle a = 180°$

$\angle a = 180° - 75°$

$\angle a = 105°$

Similarly $\quad \angle b + \angle a = 180°$

$\angle b + 105° = 180°$

$\angle b = 180° - 105°$

$\angle b = 75°$

Hence, the measure of a, b and c are $75°, 75°$ respectively.

8. (i) Since $l \parallel m$ and P is transversal

$\angle a = 110°$ (Vertically opposite angles)

And $\quad \angle a + \angle b = 180°$

(Interior angles on the same side of the transversal)

$110° + \angle b = 180°$

$\angle b = 180° - 110°$

$\angle b = 70°$

(ii) $\quad \angle b = 130°$ (Vertically opposite angles)

and $\quad 130° + \angle a = 180°$

Interior angles on the same side of the transversal)

$\therefore \quad \angle a = 180° - 130°$

$\angle a = 50°$

` (iii) $\quad \angle b = 102°$ (Corresponding angles)

and $\quad \angle a + \angle b = 180°$

(Interior angles on the same side of the transversal)

$$\therefore \quad \angle a + 102 = 180^\circ$$
$$\angle a = 180^\circ - 102^\circ$$
$$\angle a = 78$$
(iv) $\angle a + 60^\circ = 180^\circ$

(Interior angles on the same side of the transversal)

$$\therefore \quad \angle a = 180^\circ - 60^\circ$$
$$\angle a = 120^\circ$$
$$\angle b = 60^\circ \quad \text{(alternate angles)}$$

9. Since $l \,||\, m$

$$\therefore \quad \angle y = 110^\circ \quad \text{(Corresponding angles)}$$

Since, the sum of two exterior angles is 180°

$$\therefore \quad 130^\circ + \angle x = 180^\circ$$
$$\angle x = 180^\circ - 130^\circ$$
$$\angle x = 50^\circ$$

And $\angle x$ and $\angle x$ are corresponding angles

$$\therefore \quad \angle x = \angle x$$
$$\angle x = 50^\circ$$

Hence, the value of x and y is 50° and 110° respectively.

10. (i) $\because \angle BAC + \angle CDA = 180^\circ$

(Interior angles on the same side of the transversal)

$$32^\circ + \angle C = 180^\circ$$
$$C = 180^\circ - 32^\circ$$
$$\angle C = 148^\circ$$

Since $\angle C + 66^\circ + \angle b = 360^\circ$ (Complete angles)

$$\therefore \quad 148 + 66 + \angle b = 360^\circ$$
$$\angle b = 360 - 214$$
$$\angle b = 146^\circ$$
$$\angle a + \angle b = 180^\circ$$

(Interior angles on the same side of the transversal)

$$\angle a + 146^\circ = 180^\circ$$
$$\angle a = 180^\circ - 146^\circ$$
$$\angle a = 34^\circ$$

Hence, the values a, b and c are 34°, 146° and 148° respectively.

(ii) Since $\angle QAC = \angle BCA$ (Alternate angles)

$$\therefore \quad 65^\circ = \angle C$$

or $\angle C = 65^\circ$

$\because$ line segment AB = line segment AC

$$\therefore \quad \angle b = \angle C$$
$$\angle b = 65^\circ$$

In ΔABC,

$$\because \quad \angle A + \angle B + \angle C = 180^\circ$$

$$\angle a + 65° + 65 = 180°$$
$$\angle a = 180° - 130° = 50°$$

Hence, the values of a, b and are 50, 65° and 65° respectively.

(iii) In $\Delta\, ABC$,

$\because \quad \angle b + \angle B + \angle C = 180°$

$\therefore \quad \angle b + 80° + 40° = 180°$

$$\angle b = 180° - 120°$$
$$\angle b = 60°$$

$\because \quad \angle PAC = \angle BCA$ (Alternate angles)

$\therefore \quad \angle C = 40°$

Similarly $\quad \angle PAB = \angle CBA$

$$\angle a = 80°$$

Hence, the values of a, b and c are 80°, 60° and 40° respectively.

(iv) Since, $\quad \angle OAB = \angle CBA$ (Alternate angles)

$\therefore \quad 60° = \angle a$

or $\quad \angle a = 60°$

Similarly

$\angle OAC = \angle RCA$ (Alternate angles)

$$60° + \angle b = 110°$$
$$\angle b = 110° - 60°$$
$$\angle b = 50°$$

And $\quad \angle c + \angle b = \angle a = 180°$

(Interior angles on the same side of the transversal is 180°

$\therefore \quad \angle C + 50° + 60° = 180°$

$$\angle C = 180° - 110°$$
$$\angle C = 70°$$

Hence, the values of a, b and c are 60°, 50° and 70° respectively.

11. Since, $\quad \angle PRA = \angle BRS$ (Vertically opposite angles)

$\therefore \quad 118° = \angle BRS$

or $\quad \angle BRS = 118°$

$\because \quad \angle BRS + \angle DSR = 180°$

(Interior angles on the same side of the tarnsversal is 180°)

$\therefore \quad 118° + \angle RSD = 180°$

$$\angle RSD = 180° - 118°$$
$$\angle RSD = 62°$$

And, $\quad \angle PRA = \angle QSD$

(Alternate exterior angles are equal)

$$118° = \angle QSD$$

or $\quad \angle QSD = 118°$

Hence the values of $\angle RSD$ and $\angle QSD$ is 62° and 118° respectively.

12. (i) Since, $PQ \,||\, RS$ and RQ is transversal.

$\therefore \quad \angle PQR = \angle QRS$

$28° = \angle x$

or $\quad \angle x = 28°$

(ii) Since $\quad AB || CD$

$\angle A + x + 48° = 180°$

(Interior angles on the same side of the transversal is 180°)

$\therefore \quad 50° + \angle x + 48° = 180°$

$\angle x = 180° - (50° + 48°)$

$\angle x = 180 - 98°$

$\angle x = 82°$

13. (a) We have

$\angle AEG = \angle EGH = 70°$

And $\quad \angle EGH = \angle CGQ$ (Vertically opposite angles)

$\therefore \quad \angle d = 70°$

Also $\quad \angle EFH = \angle d = 70°$

$\because \angle AEG$ and $\angle EGH$ are alternate interior angles.

$\therefore \quad AB || CD$

(b) $\angle EGH + \angle FHG = 180°$

(The sum of the interior angles on the same of the transversal is 180)

Similarly,

$\angle EFG + \angle d = 180°$

$\angle FEG + 180° - 70° = 110°$

So, $\quad PQ || RS$

(c) $\quad \angle PEF = \angle AEG$ (Vertically opposite angles)

And

$\angle FHG = \angle DHS$ (Vertically opposite angles)

$\angle C = +110°$

$\because \quad \angle d = \angle b$ (Alternate angles)

$\therefore \quad 70° = \angle b$

or $\quad \angle b = 70°$

Hence, the values of a, b, c and d are 70°, 70°, 110° and 70° respectively.

14. (a) T (b) F (c) T (d) T (e) F

Exercise 9.2

1. Let the other complement angle

(a) $x° + 20° = 90°$

$x° = 90° - 20°$

$x = 70°$

(b) $x° + 45° = 90°$

$x° = 90° - 45°$

$x° = 45°$

(c) $x° + 58° = 90°$

$x° = 90° - 58°$

$x° = 32°$

(d) $x° + 60° = 90°$

$x° = 90° - 60°$

$x° = 30°$

(e) $x° + 89° = 90°$

$x° = 90° - 89°$

(f) $x° + 5° = 90°$

$x° = 90° - 5°$

$x^\circ = 1$ $\qquad\qquad$ $x^\circ = 85^\circ$

2. Let the other supplement angle by y°

(a) $y^\circ + 15^\circ = 180^\circ$
$y^\circ = 180^\circ - 15^\circ$
$y = 165^\circ$

(b) $y^\circ + 32^\circ = 180^\circ$
$y^\circ = 180^\circ - 32^\circ$
$y = 148^\circ$

(c) $y^\circ + 45^\circ = 180^\circ$
$y^\circ = 180^\circ - 45^\circ$
$y^\circ = 135^\circ$

(d) $y^\circ + 90^\circ = 180^\circ$
$y^\circ = 180^\circ - 90^\circ$
$y^\circ = 90^\circ$

(e) $y^\circ + 113^\circ = 180^\circ$
$y^\circ = 180^\circ - 113^\circ$
$y^\circ = 67^\circ$

(f) $y^\circ + 172^\circ = 180^\circ$
$y^\circ = 180^\circ - 172^\circ$
$y^\circ = 8^\circ$

3. (a) The sum $= 26^\circ + 54^\circ = 80^\circ \neq 90^\circ \neq 180^\circ$

So, it is pairs neither complementary or supplementary.

(b) The sum $= 30^\circ + 72^\circ = 102^\circ \neq 90^\circ \neq 180^\circ$

So, it is pairs neither complementary or supplementary.

(c) The sum of $50^\circ + 40^\circ = 90^\circ$ So, it is pairs of complementary.

(d) The sm $= 120^\circ + 60^\circ = 180^\circ$, it is pairs supplementary.

(e) The sum $= 100^\circ + 80^\circ = 180^\circ$. So, it is pairs supplementary.

(f) The sum of $110^\circ + 90^\circ = 200 \neq 180^\circ$. So it is pairs neither complementary of supplementary.

(g) The sum $= 40^\circ + 140^\circ = 180^\circ$. So, it is pairs supplementary.

(h) The sum $= 89^\circ + 1^\circ = 90^\circ$. So, it is pairs of complementary.

4. The angle is 90°

5. The angle is 120°

6. The angle is 45°

7. Let the other angle be x°

$\because$ The sum of linear pair angles is 180°

$$90^\circ + x^\circ = 180^\circ$$
$$x^\circ = 180^\circ - 90^\circ$$
$$x^\circ = 90^\circ$$

Hence, the measure of the other angle is 90°.

8. The supplementary angles has minimum one obtuse or one acute angle.

$\therefore$ (i) No (ii) No

9. If two complementary angles are equal, then the measure of each is 45°

10. If two supplementary angles are equal, then the measure of each angle is 90°.

11. (i) $120^\circ + x^\circ = 180^\circ$ (Linear pairs of angles)

$\therefore$ $x^\circ = 180^\circ - 120^\circ$

$x = 60^\circ$

(ii) $45^\circ + 65^\circ + x^\circ = 180^\circ$

$x^\circ = 180^\circ - (45^\circ + 65^\circ)$

$x^\circ = 180^\circ - 110^\circ$

$x^\circ = 70^\circ$

(iii) $x° + 152° = 180°$

$x° = 180° - 152°$

$x° = 28°$

12. (a) Adjacent angles are $(\angle AOB, \angle BOC)$; $(\angle DOC, \angle COB)$; $(\angle COD, \angle DOE)$ and $(\angle EOA, \angle AOB)$.

(b) Linear pairs of angles are $(\angle DOE, \angle EOA)$; $(\angle EOA, \angle AOB)$

(c) Pairs of vertically opposite angles are $(\angle DOE, \angle AOB)$

(d) Pairs of supplementary angles are $(\angle AOC, \angle DOC)$, $(\angle EOA, \angle AOB)$.

(e) Pairs of complementary angles are $(\angle AOB, \angle BOC)$.

13. (a) $\angle 2 = \angle 4$ (Vertically opposite angles)

(b) $\angle 1 = \angle 3$ (Vertically opposite angles)

(c) $(\angle 3, \angle 2)$, $(\angle 2, \angle 1)$, $(\angle 3, \angle 4)$, $(\angle 4, \angle 1)$.

14. $\because \quad \angle AOC + \angle BOC = 180°$ (Linear pairs of angles)

$\therefore (6x° + 4)° + (x + 8)° = 180°$

$6x° + x° + 12° = 180°$

$7x° + 12° = 180°$

$7x° = 180° - 12°$

$7x° = 168°$

$x° = 168 \div 7°$

$x° = 24°$

And $\angle BOC = (x + 8)° = 24° + 8° = 32°$

$\angle AOC = (6x + 4)° = (6 \times 24 + 4) = 148°$

Hence, the value of $\angle BOC$, $\angle AOC$ and x are $32°$, $148°$ and $24°$ respectively.

15. Since $\angle ABC = 90°$

(a) $\angle CBD + \angle ABD = 90°$

$(2x + 5)° + (x - 5)° = 90°$

$2x° + 5° + x° - 5° = 90°$

$3x° = 90°$

$x° = 90° \div 3$

$= 30°$

So, $\angle CBD = 2 \times 30° + 5° + 65°$

and $\angle ABD = 30° - 5°$

$= 25°$

(b) Supplement of $\angle ABD = 180° - 65°$

$= 115°$.

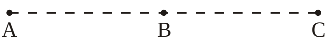
Multiplce Choice Questions

Mark (3) against the correct answer in each of the following :

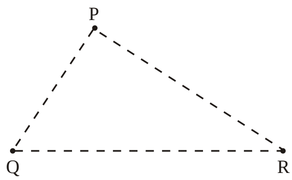
1. (c), 2. (c), 3. (a), 4. (a), 5. (a), 6. (d), 7. (b), 8. (b), 9. (a), 10. (c)

Exercise 10.1

1. (a) (i) angles $= \angle A, \angle B, \angle C$;
Sides $= AB, BC, CA$
(ii) angles $= \angle X, \angle Y, \angle Z$, Sides $= XY, YZ, ZX$
(iii) Angles $= \angle P, \angle Q, \angle R$ Sides $= PQ, QR, PR$
(b) (i) a, b, c (ii) x, y, z (iii) p, q, r
2. (a) Interior points of $\Delta\, ABC = T, Q$
(b) Exterior points of $\Delta\, ABC = U, P$
(c) The point on the $\Delta\, ABC = A, B, C, R, V$
3. (a) (a), (d), (e) are acute angled triangle
(b) (f) are obtuse angled triangle.
(c) is a right angled triangle.
4. (a), (e) are scalene triangle.
(b), (c) are isosceles triangle.
(d), (f) are equilateral triangle.
5. (a), (d), (f) are isosceles triangle.
(c) is equilateral triangle.
(d), (e) are scalene triangle.
6. (a)



We can't draw a triangle by joining these true point.
(b)



Yes, a triangle can be formed only by joining any three non-collinear points.

Exercise 10.2

1. If the sum of measure of three angles is $180°$, then groups can form a triangle.
$\therefore$ (a), (c), (f) can form triangles.
2. Since the sum of angles of triangle is $180°$
(a) Let the third angle be $x°$

$$\therefore \quad 60° + 30° + x° = 180°$$
$$x° = 180° - (60 + 30)°$$
$$x° = 180° - 90° = 90°$$

Hence, the third angle is 90° and triangle right-angled triangle.

(b) Let the third angle be $x°$

$$\therefore \quad 45° + 65° + x° = 180°$$
$$x° = 180° - (45 + 65)°$$
$$x° = 180° - 110°$$
$$x° = 70°$$

Hence, the third angle is 70° and triangle acute-angled traingle.

(c) Let the third angle be x

$$\therefore \quad 15° + 28° + x° = 180°$$
$$x° = 180° - (15° + 28)°$$
$$x° = 180° - 43°$$
$$x° = 137°$$

Hence, the third angle is 137° and triangle is obtuse angled triangle.

(d) Let the third angle be $x°$

$$\therefore \quad 30° + 95° + x° = 180°$$
$$x° = 180° - (30 + 95°)$$
$$x° = 180° - 125°$$
$$x° = 55°$$

Hence, the third angle is 55° and triangle is obtuse-angled triangle.

(e) Let the third angle be $x°$

$$\therefore \quad 67° + 13° + x° = 180°$$
$$x° = 180° - (67 + 13)°$$
$$x° = 180° - 80°$$
$$x° = 100°$$

Hence, the third angle is 100° and triangle is obtuse-angled triangle.

(f) Let the third angle be $x°$

$$\therefore \quad 45° + 45° + x° = 180°$$
$$x° = 180° - (45° + 45°)$$
$$x° = 180° - 90°$$
$$x = 90°$$

Hence, the third angle is 90° and triangle is right-angled triange.

If the two angles given add up to less than 90°, the triangle is obtuse, if they add up to 90°, the triangle is right, if they add up to greater than 90° and each of them is less than 90°, triangle is acute.

3. (a) No (b) Yes (c) No (d) No (e) No (f) Yes

4. The sum of all interior angles of regular polygon

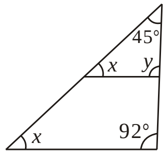
$$= 2(n-2) \times 90°$$
$$= 2(5-2) \times 90°$$

Where, n = No. of side of Pentagon $= 6 \times 90° = 540°$

5. (a) Let the vertex points of given triangle be A, B, C, D and E respectively.

In ΔABC,

$$\angle A + \angle B + \angle C = 180°$$



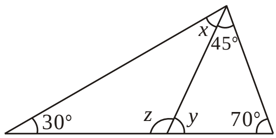
$$45^\circ + \angle B + 92^\circ = 180^\circ$$
$$\angle B = x^\circ = 180^\circ - (92^\circ + 45^\circ)$$
$$x^\circ = 43^\circ$$
And since $\angle D = \angle B$

$\therefore$ $DE \,||\, BC$

$\therefore$ $\angle Y = 92^\circ$ (Corresponding angle)

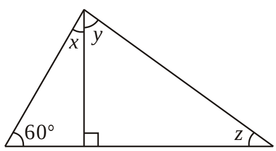
or In $\Delta\, ADE$,
$$\angle A + \angle D + \angle E = 180^\circ$$
$$45^\circ + \angle x^\circ + \angle y = 180^\circ \qquad (\because x^\circ = 43^\circ)$$
$$\therefore \quad 45^\circ + 43 + y^\circ = 180^\circ$$
$$\angle y^\circ = 180^\circ - (45^\circ + 43^\circ)$$
$$\angle y = 180^\circ - 88^\circ$$
$$\angle y = 92^\circ$$
Hence, the value of x and y are 43° and 92° respectively.

(b) In $\Delta\, ABC$,
$$\angle A + \angle B + \angle C = 180^\circ$$
$$(x^\circ + 45^\circ) + 30^\circ + 70^\circ = 180^\circ \qquad (\therefore \angle A = x^\circ + 45^\circ)$$
$$x^\circ = 180^\circ - (45^\circ + 30^\circ + 70^\circ)$$
$$x^\circ = 180^\circ - 145^\circ$$
$$x^\circ = 35^\circ$$



Similarly In $\Delta\, ABC$
$$\angle A + \angle B + \angle D = 180^\circ$$
$$x^\circ + 30^\circ + z^\circ = 180^\circ$$
$$35^\circ + 30^\circ + z^\circ = 180^\circ$$
$$z^\circ = 180^\circ - (35^\circ + 30)$$
$$z^\circ = 180^\circ - 65^\circ$$
$$z^\circ = 115^\circ$$
In$\Delta\, ADC$
$$\angle A + \angle D + \angle C = 180^\circ$$
$$45^\circ + y^\circ + 70^\circ = 180^\circ$$
$$y^\circ = 180^\circ - (45^\circ + 70^\circ)$$
$$y^\circ = 180^\circ - 115^\circ$$
$$y^\circ = 65^\circ$$
Hence, the value of x, y and z are 43°, 65° and 115° respectively.

(c) In $\Delta\, ABC$,



$$\angle A + \angle B + \angle C = 180^\circ$$
$$x^\circ + 60^\circ + 90^\circ = 180^\circ$$
$$x^\circ = 180^\circ - (90^\circ + 60^\circ)$$
$$x^\circ = 180^\circ - 150^\circ$$
$$x = 30^\circ$$
In $\Delta\, ABD$,
$$\because \quad x + y = 90 \qquad \text{(given)}$$

$$30° + y = 90°$$
$$y = 90° - 30° = 60°$$
And $\angle Y + \angle C + \angle Z = 180°$
$$60° + 90° + \angle Z° = 180°$$
$$\angle Z° = 180° - 150°$$
$$\angle Z° = 30°$$
Hence, the values of x, y and $z°$ are $30°$, $60°$ and $30°$ respectively.

6. Let the measure of the angles be $2x, 3x$ and $4x$

Then $2x° + 3x° + 4x° = 180°$
$$9x° = 180°$$
$$x° = 180° \div 9$$
$$x° = 20°$$
Thereore the three angles are $2x = 2 \times 20° = 40°$, $3x° = 3 \times 20° = 60°$, $4x = 4 \times 20° = 80°$

7. In an isosceles triangle, two angles are equal. But there cannot be two obtuse angles in a triangle.

Therefore the two angles other than the angle of $50°$ must be equal. Let each of these angles be x

Then $x + x + 50° = 180°$
$$2x + 50° = 180°$$
$$2x = 180° - 50°$$
$$2x = 130°$$
$\therefore$ $x = 65°$

The angles of the triangle are $65°, 65°, 50°$.

8. (a) Exterior angle

$\angle XZA = \angle YXZ + \angle XYZ = 40° = 60° = 100°$

(b) The sum of the three interior angles of triangle is $180°$
$$\angle YXZ + \angle XYZ + \angle XZY = 180°$$
$$36° + 45° + \angle XZY = 180°$$
$$\angle XZY = 180° - (36° + 45°)$$
$$\angle XZY = 180° - 81°$$
$$\angle XZY = 99°$$
Exterior angle $\angle ZYC = \angle YXZ + \angle XZY$
$$= 36° + 99°$$
$$= 135°$$

(c) $\angle YXZ = 180° - (34° + 110°)$
$$\angle YXZ = 180° - 144° = 36°$$
Exterior angle $\angle YXB = \angle XYZ + \angle XZY$
$$= 34° + 110° = 144°$$

(d) $\angle XYZ =$ Exterior angle
$$\angle AZX - \angle YXZ = 120° - 30° = 90°$$
And $\angle XZY = 180° - (\angle YXZ + \angle XYZ)$

$$\begin{aligned}\angle XZY &= 180^\circ - (30^\circ + 90^\circ)\\ &= 180^\circ - 120^\circ = 60^\circ\end{aligned}$$

(e) $\angle XYZ$ = Exterior angle

$\angle ZYC - \angle YXZ$ ¥ $98^\circ - 45^\circ = 53^\circ$

And
$$\begin{aligned}\angle XZY &= 180^\circ - (\angle YXZ + \angle XYZ)\\ &= 180^\circ - (45^\circ + 53^\circ)\\ &= 180^\circ - 98^\circ\\ &= 82^\circ\end{aligned}$$

(f)
$$\begin{aligned}\angle YXZ &= \text{Exterior } \angle BXY - \angle XYZ\\ \angle YXZ &= 90^\circ - 30^\circ = 60^\circ\end{aligned}$$
And

$\angle XZY$ ¥ 180° – Exterior $\angle BXY$

$$= 180^\circ - 90^\circ = 90^\circ$$

(g)
$$\begin{aligned}\angle XYZ &= 180^\circ - (\angle YXZ + \angle XZY)\\ &= 180^\circ - (40^\circ + 55^\circ)\\ &= 180^\circ - 95^\circ\\ &= 85^\circ\end{aligned}$$

And
$$\begin{aligned}\text{Exterior } \angle XZA &= \angle YXZ + \angle XYZ\\ &= 40^\circ + 85^\circ\\ &= 125^\circ\end{aligned}$$

(h)
$$\begin{aligned}\angle XZY &= 180^\circ - (\angle YXZ + \angle XYZ)\\ &= 180^\circ - (78^\circ + 56^\circ)\\ &= 180^\circ - 134^\circ = 46^\circ\end{aligned}$$

$$\begin{aligned}\text{And Exterior } \angle ZYC &= \angle YXZ + \angle XZY\\ &= 78^\circ + 46^\circ = 124^\circ\end{aligned}$$

9. $\angle CAB + \angle CAE = 180^\circ$ (Linear pairs of angles)

$$\begin{aligned}\therefore \quad x^\circ + 120^\circ &= 180^\circ\\ x^\circ &= 180^\circ - 120^\circ\\ \angle x^\circ &= 60^\circ = \angle A\end{aligned}$$

In ΔABC,
$$\begin{aligned}\angle A &= \angle B + \angle C = 180^\circ\\ 60^\circ + 35^\circ + \angle Y &= 180^\circ\\ \angle Y &= 180^\circ - (60 + 35^\circ)\\ \angle Y &= 180^\circ - 95^\circ\\ \angle Y &= 85^\circ\\ \text{Exterior } \angle Z &= \angle x + 35^\circ\\ &= 60^\circ + 35^\circ = 95^\circ\end{aligned}$$

Hence, the values of x, y and are 60°, 85° and 95 respectively.

10. The sum of angles of straight line $= 180^\circ$

$$\begin{aligned}70^\circ + \angle 3 + 60^\circ &= 180^\circ\\ \angle 3 &= 180^\circ - (70^\circ + 60^\circ)\\ \angle 3 &= 180^\circ - 130^\circ = 50^\circ\end{aligned}$$

$$\begin{aligned}
\text{In } \Delta\, ACD, \quad \angle A + \angle C + \angle D &= 180^\circ \\
\angle 3 + 120^\circ + \angle 4 &= 180^\circ \\
50^\circ + 120^\circ + \angle 4 &= 180^\circ \\
\angle 4 &= 180^\circ - (50^\circ + 120^\circ) \\
\angle 4 &= 180^\circ - 170^\circ \\
\angle 4 &= 10^\circ \\
\angle ACB + \angle ACD &= 180^\circ \text{ (Linear pairs of angles)} \\
\angle 1 + 120^\circ &= 180^\circ \\
\angle 1 &= 180^\circ - 120^\circ \\
\angle 1 &= 60^\circ \\
\text{In } \Delta\, ABC, \quad \angle A + \angle B + \angle C &= 180^\circ \\
60^\circ + \angle 2 + \angle 1 &= 180^\circ \\
60^\circ + \angle 2 + 60^\circ &= 180^\circ \\
\angle 2 &= 180^\circ - (60^\circ + 60^\circ) \\
\angle 2 &= 180^\circ - 120^\circ \\
\angle 2 &= 60^\circ
\end{aligned}$$

Hence, the value of $\angle 1, \angle 2, \angle 3$ and $\angle 4$ are $60^\circ, 60^\circ, 50^\circ$ and 10° respectively.

11. Since $\angle BAD = \angle CAE$ (Vertically opposite angle)

$$\begin{aligned}
\therefore \quad 110^\circ &= \angle 5 \\
\text{or} \quad \angle 5 &= 110^\circ \\
\text{Exterior} \quad \angle BAD &= \angle BCA + \angle ABC \\
110^\circ &= 30^\circ + \angle 3 \\
\angle 3 &= 110^\circ - 30^\circ \\
\angle 3 &= 80^\circ \\
\text{In } \Delta\, ABC, \quad \angle A + \angle B + \angle C &= 180^\circ \\
\angle 4 + \angle 3 + 30^\circ &= 180^\circ \\
\angle 4 &= 180^\circ - (30^\circ + \angle 3) \\
\angle 4 &= 180^\circ - (30^\circ + 80^\circ) \\
\angle 4 &= 70^\circ \\
\angle BAC &= \angle DAE \qquad \text{(Vertically opposite angle)} \\
\therefore \quad \angle 4 &= \angle 2 \\
\text{or} \quad \angle 2 &= 70^\circ \\
\text{In } \Delta\, ADE, \quad \angle A + \angle D + \angle E &= 180^\circ \\
\angle 2 + 60^\circ + \angle 1 &= 180^\circ \\
\angle 1 &= 180^\circ - (\angle 2 + 60^\circ) \\
\angle 1 &= 180^\circ - (70^\circ + 60^\circ) \\
\angle 1 &= 180^\circ - 180^\circ - 130^\circ \\
\angle 1 &= 50^\circ
\end{aligned}$$

Hence, the values of $\angle 1, \angle 2, \angle 3, \angle 4$ and $\angle 5$ are $50^\circ, 70^\circ, 80^\circ, 70^\circ$ and 110° respectively.

12. In $\Delta\, ABC$,

$$\begin{aligned}
\angle A + \angle B + \angle C &= 180^\circ \\
30^\circ + 60^\circ + \angle 5 &= 180^\circ \\
\angle 5 &= 180^\circ - (30^\circ + 60^\circ) \\
\angle 5 &= 180^\circ - 90^\circ \\
\angle 5 &= 90^\circ
\end{aligned}$$

Since the linear pairs o angles is 180°

$$\begin{aligned}
\therefore \quad \angle ACB &= \angle ACD \\
\angle 5 &= \angle 1 \\
\Rightarrow \quad \angle 1 &= 90^\circ \\
\text{And} \quad \angle 3 + \angle 1 + \angle 4 &= 180^\circ \quad (\because \angle 3 = \angle 4) \\
2\angle 3 + \angle 1 &= 180^\circ \\
2\angle 3 + 90^\circ &= 180^\circ \\
2\angle 3 &= 180^\circ - 90^\circ \\
2\angle 3 &= 90^\circ \\
\angle 3 &= 45^\circ \\
\therefore \quad \angle 3 &= \angle 4 = 45^\circ \\
\text{Exterior } \angle 2 &= \angle 1 + \angle 4 \\
&= 90^\circ + 45^\circ = 135^\circ
\end{aligned}$$

Hence, the values of $\angle 1, \angle 2, \angle 3, \angle 4$ and $\angle 5$ are 90°, 135°, 45°, 45° and 90° respectively.

13. (a) Because these are $7 + 8 > 14, 8 + 14, 7$ and $14 + 7 > 8$,

Hence, 7 m, 8 m and 14 m may be measured of sides of a triangle.

(b) Because these are $2 + 3 > 4$, $3 + 4 > 2$ and $4 + 2 > 3$

Hence, 2 cm, 3 cm and 4 cm may be measured of sides of a triangle.

(c) Because there are $1.3 + 2.3 > 3.5$, $2.3 + 3.5 > 3$ and $3.5 + 1.3 > 2.3$

Hence, 1.3 cm, 2.3 cm and 3.5 may be measured of sides of a triangle

(d) Because these are $1.8 + 3.9 > 5.2$, $3.9 + 5.2 > 1.8$ and $5.2 + 1.8 > 3.9$

Hence, 1.8 cm, 3.9 cm and 5.2 may be measured of sides of a triangle.

(e) Because these are $8.4 + 16.5 > 5.8$, $16.5 + 5.8 > 8.4$ and $5.8 + 8.4 < 16.5$

Hence, 8.4 cm, 16.5 cm and 5.8 cm may be measured of sides of a triangle.

(f) Because there are $15.5 + 8 > 7$, $8 + 7\ \ 15.5$ and $7 + 15.5 > 8$.

Hence, 15.5 m, 8 m and 7 m may not be measured of a triangle.

14. Let the sides of a triangle be $2x$, $3x$ and $4x$

The perimeter of a triangle = The sum of its sides

$$\begin{aligned}
\therefore \quad 2x + 3x + 4x &= 4 + 3x + 4x \\
9x &= 4 + 7x \\
\Rightarrow \quad 9x - 7x &= 4 \\
\Rightarrow \quad 2x &= 4 \\
\Rightarrow \quad x &= 2\,\text{cm}
\end{aligned}$$

So, the other two sides = $3x = 3 \times 2 = 6\,\text{cm}$

Hence, the other sides are 6 cm and 8 cm.

15. Let the sides of a triangle be $3x, 4x$ and $4x$.

The perimeter of a triangle $= 3x + 4x + 4x = 11x$

But one side of a triangle is given

$$\therefore \quad 11x = 6 + 4x + 4x$$
$$\Rightarrow \quad 11x - 8x = 6$$
$$\Rightarrow \quad 3x = 6$$
$$\Rightarrow \quad x = 2\,\text{cm}$$

So, $4x = 4 \times 2 = 8\,\text{cm}$

Hence, the length of equal sdes is 8 cm.

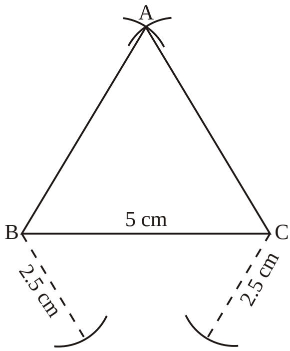
16. According to the questions

The sides of a triangle PCB will $BC = 5$ cm, $PC = 2.5$ cm and $PB = 2.5$ cm.

Since, the sum of two sides of a triangle PCB is equal to the third side

$$2.5 + 2.5 = 5$$

Hence, it is not possible to construct an isosceles triangle PCB omn the other side of BC



17. In ΔOAB,

$$OA + OC > AC \text{ .... (i)}$$

In ΔOBC,

$$OB + OC > BC \text{ .... (ii)}$$

In ΔOAB,

$$OA + OB > AB \text{ .... (iii)}$$

Adding the equaton of (i), (ii) and (iii), we get

$$OA + OC + OB + OC + OA + OB > AB + BC + CA$$
$$2OA + 2OB + 2OC < AB + BC + CA$$
$$2(OA + OB + OC) > AB + BC + CA$$
$$OA + OB + OC > \frac{1}{2}(AB + BC + CA)$$

18. In $\Delta\, AXB$,

$$AB + BX > AX \text{ ..... (i)}$$

And in $\Delta\, AXC$,

$$AC + XC > AX \text{ ... (ii)}$$

Adding the equation of (i) and (ii), we get

$$AB + BX + AC + XC > AX + AX$$
$$AB + AC + (BX + XC) > 2AX$$
$$AB + AC + BC > 2AX \quad (\because BC = BX + XC)$$

Exercise 10.3

1. By pythaogoras theorem

(a) $a = 1\text{cm}$, $c = 2.6$ cm and $b = ?$

$$\therefore \quad a^2 + b^2 = c^2$$
$$\therefore \quad 1^2 + b^2 = 2.6^2$$
$$b^2 = 6.76 - 1$$
$$b^2 = 5.76$$
$$b = \sqrt{5.76} = \pm 2.4 \text{ cm}$$

Hence the third side is 2.4 cm.

(b) $a = 16\,\text{m}$, $b = 30\,\text{m}$ and $c = ?$

$$a^2 + b^2 = c^2$$
$$16^2 + 30^2 = c^2$$
$$256 + 900 = c^2$$
$$c^2 = 1156$$
$$c = \sqrt{1156} = 34 \text{ cm}$$

Hence the third side is 34 m.

(c) $b = 4.8$ cm, $c = 5\,\text{cm}$ and $a = ?$

$$a^2 + b^2 = a^2$$
$$a^2 + 4.8^2 = 5^2$$
$$a^2 = 25 - 23.04$$
$$a^2 = 1.96$$
$$a = \sqrt{1.96} = \pm 1.4 \text{ cm}$$

Hence, the third side is 1.4 cm.

(d) $a = 1.5$ cm, $b = 2\,\text{cm}$ and $c = ?$

$$a^2 + b^2 = c^2$$
$$(1.5)^2 + 2^2 = c^2$$
$$2.25 + 4 = c^2$$
$$6.25 = c^2$$
$$\text{or} \quad c^2 = 6.25$$
$$c = \sqrt{6.25} = \pm 2.5 \text{ cm}$$

Hence, the third side is 2.5 cm.

2. (a) $a = 8$, $b = 7$ and $c = 15$

$$8^2 + 7^2 = 113 \neq 225 = 15^2$$

So, the given point are not pythagorean triples.

(b) $a = 7, \; = 23$ and $c = 25$

$7^2 + 23^2 = 578 \neq 625 = 25^2$

So, the given point are not pythagorean triples.

(c) $a = 12, b = 35$ and $c = 37$

$12^2 + 35^2 = 1369 = 37^2$

So, the given point are pythagorean triples.

(d) $a = 55, b = 132$ and $c = 143$

$55^2 + 132^2 = 20449 = 143^2$

So, the given point are pythagorean triples.

(e) $a = 3, b = 4$ and $c = 5$

$3^2 + 4^2 = 25 = 5^2$

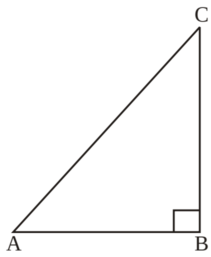
So, the given point are pythagorean triples.

(f) $a = 0.8$, $b = 2.4$ and $c = 2.5$

$(0.3)^2 + (2.4)^2 = 6.25 = (2.5)^2$

So, the given point are pythagorean triples.

3. The given $AC^2 = 50$



Since $\Delta\ ABC$ is a isosceles triangle.

$\therefore \quad AB = BC$

$AC^2 = AB^2 + BC^2$

(By pythagoras theorem)

$$50 = AB^2 + AB^2$$

$$2AB^2 = 50$$

$$AB^2 = 25$$

$$AB = \sqrt{25} = 5$$

Hence, the length of each side of its is 5 unit.

4. (a) $a = 6\,\text{cm}$, $b = 8\,\text{cm}$ and $c = 10\,\text{cm}$.

$\because \quad a^2 + b^2 = c^2$

L.H.S. $= a^2 + b^2 = 6^2 + 8^2 = 36 + 64 = 100\,\text{cm}^2$

R.H.S. $= c^2 = 10^2 = 100\,\text{cm}^2$

LHS = RHS

Hence, the triangle is a right triangle.

(b) $a = 2.5$ cm, $b = 3.5$ cm and $c = 4.5$ cm

$a^2 + b^2 = c^2$

LHS = $a^2 + b^2 = 2.5^2 + 3.5^2 = 6.25 + 12.25$

$= 18.50\ \text{cm}^2$

RHS = $c^2 = 4.5^2 = 20.25\ \text{cm}^2$

LHS = RHS

Hence, the triangle is a right triangle.

(c) $a = 8\,\text{cm}, b = 15\,\text{cm}$ and $c = 17\,\text{cm}$

$$a^2 + b^2 = c^2$$

$$\text{LHS} = a^2 + b^2 = 8^2 + 15^2 = 64 + 225 = 289\,\text{cm}^2$$

$$\text{RHS} = c^2 = 17^2 = 289\,\text{cm}^2$$

$$\text{LHS} = \text{RHS}$$

Hence, the triangle is a right triangle.

(d) $a = 0.3, b = 0.4$ m and $c = 0.5$ m

$$a^2 + b^2 = c^2$$

$$\text{LHS} = a^2 + b^2 = (0.3)^2 + (0.4)^3 = 0.09 + 0.16$$

$$= 0.25\,\text{cm}^2$$

$$\text{RHS} = c^2 = (0.5)^2 = 0.25\,\text{m}^2$$

$$\text{LHS} = \text{RHS}$$

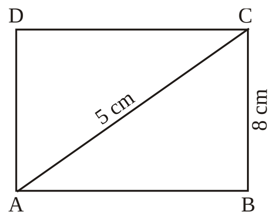
Hence, the triangle is a right triangle.

5. Let the length of the ladder be x,

$\therefore$
$$x^2 = (20)^2 + (15)^2$$
$$= 400 + 225$$
$$x^2 = 625$$
$$x = \sqrt{625}$$
$$x = 25\,\text{m}$$

Hence, the length of the ladder is 25 cm.

6.

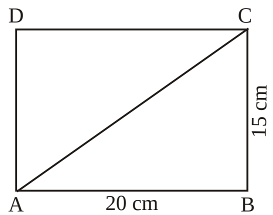


$$AC^2 = AB^2 + BC^2$$
$$(10)^2 = AB^2 + 8^2$$
$$100 = AB^2 + 64$$
$$AB^2 = 100 - 64$$
$$AB^2 = 36$$
$$AB = \sqrt{36}$$
$$AB = 6\,\text{cm}$$

So, the perimeter of rectangle $= 2(AB + BC)$

$$= 2(6 + 8) = 28\,\text{cm}$$

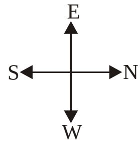
7. In ΔABC



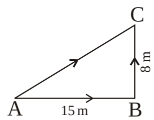
$$AB = 20\,\text{cm}$$
$$BC = 15\,\text{cm}$$
$$AC^2 = AB^2 + BC^2$$
$$AC^2 = (20\,\text{cm}^2) + (15\,\text{cm})^2$$
$$AC^2 = 400 + 225\,\text{cm}^2$$
$$AC^2 = 625\,\text{cm}^2$$
$$AC = 25\,\text{cm}$$

Hence, the length of the diagonal is 25 cm.

8. By pythagoras theorem,



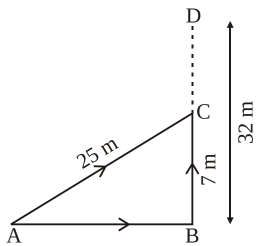
$$AC^2 = AB^2 + BC^2$$
$$= 15^2 + 8^2$$
$$AC^2 = 225 + 64$$
$$AC^2 = 289$$
$$AC = \sqrt{289}$$
$$AC = 17\,\text{cm}$$



Hence, the total distances covered by me is 17 m.

9. By pythagoras theorem

$$AC^2 = AB^2 + BC^2$$
$$25^2 = AB^2 + 7^2$$
$$25 = AB^2 + 49$$
$$AB^2 = 625 - 49$$
$$AB^2 = 576$$
$$AB = \sqrt{576}$$
$$AB = 24\,\text{m}$$



Hence, the distance is 24 m.

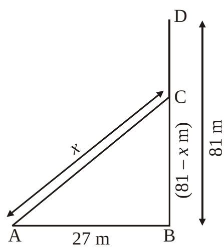
10. Let the $AC = x\,\text{m}$

Then, $BC = BD - DC$

$BC = (81 - x)\,\text{m}$

In $\Delta\, ABC$,

$$AC^2 = AB^2 + BC^2$$
$$x^2 = (81 - x)^2 + 27^2$$
$$x^2 = 81^2 + x^2 - 2 \times 81x + 27^2$$
$$0 = 6561 - 162x + 729$$
$$162x = 7290$$
$$x = 7290 \div 162$$
$$x = 45\,\text{m}$$



And $BC = 81 - x$

$= 81 - 45$

$= 36\,\text{m}$

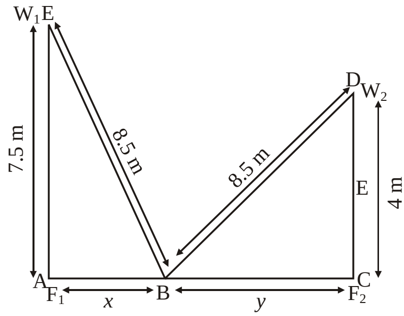
Hence, the height above the ground of the pole break is 36 m.

11. Let the total distance between two walls be $(x + y)$ m.

In $\Delta\, ABE$,

$$BE^2 = AB^2 + AE^2$$
$$8.5^2 = x^2 + 7.5^2$$

$$72.25 = x^2 + 56.25$$
$$x^2 = 72.25 - 56.25$$
$$x^2 = 16$$
$$x = \sqrt{16} = 4 \text{ m}$$



Without moving the bottom of the ladder.

In $\Delta\, BCD$,

$$BD^2 = BC^2 + CD^2$$
$$8.5^2 = Y^2 + 4^2$$
$$Y^2 = 72.25 - 16$$
$$Y^2 = 56.25$$
$$Y = \sqrt{56.25} = 7.5$$

So, $\quad x + y = (4 + 7.5) \text{ m} = 11.5 \text{ m}$

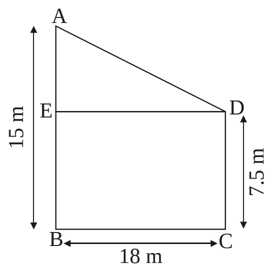
Hence, the total distance between two walls is 11.5 m.

12. We have

$AB = 15 \text{ m}, CD = 7.5$

and $\quad BC = 18 \text{ m} = ED$

$$AE = AB - BE = 15 - 7.5 = 7.5$$



In $\quad \Delta\, AED$,

$$AD^2 = AE^2 + ED^2$$
$$= 7.5^2 + 18^2$$
$$= 380.25$$
$$AD = \sqrt{380.25}$$
$$AD = 19.5 \text{ m}$$

Hence, the distance from the top of one pole to the top of other pole is 19.5 m.

13. In $\Delta\, ABC$

$$BC = 12 \text{ m (given)}$$
$$AC^2 = AB^2 + BC^2$$

and $\quad 5m = AB$

$$AC^2 = 5^2 + 12^2$$
$$AC^2 = 25 + 144$$
$$AC^2 = 169$$
$$AC = \sqrt{169} = 13 \text{ m}$$

or $\quad AB + BC = 12 + 5 = 17 \text{ m}$

Hence, AC is shorter length and $17 - 13 = 4$ m.

14. We have

$AB = 12 \text{ cm}$ and $BC = 16 \text{ cm}$

$AC = ?$

In $\Delta\, ABC$,

$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ AC^2 &= 12^2 + 16^2 \\ AC^2 &= 144 + 256 \\ AC^2 &= 400 \\ AC &= \sqrt{400} \\ AC &= 20\,\text{cm} \end{aligned}$$

Pencil can not it into the box because

$$20 < 21$$

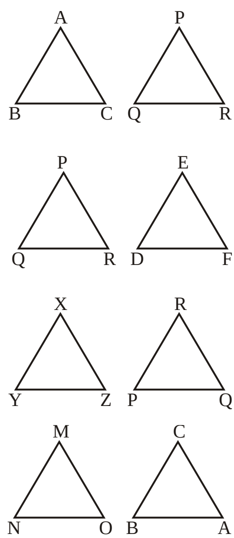
Multiple Choice Questions

Mark (3) against the correct answer in each of the following :

1. (b), 2. (a), 3. (c), 4. (b), 5. (c), 6. (b), 7. (d)

11 Congruence of Triangle

Exercise 11.1



1. (a) We have :

$\Delta\, ABC \cong \Delta\, XYZ$

$\Rightarrow$ $A \leftrightarrow P, B \leftrightarrow Q, C \leftrightarrow R$

$\Rightarrow$ $AB = PQ, BC = QR, AC = PR$

$\Rightarrow$ $\angle A = P, \angle B = \angle Q, \angle C = \angle R$

(b) We have

$\Delta\, PQR \cong \Delta\, EDF$

$\Rightarrow$ $P \leftrightarrow E, Q \leftrightarrow D, R \leftrightarrow F$

$\Rightarrow$ $PQ = ED, QR = DF, PR = EF$

$\Rightarrow$ $\angle P = \angle E, \angle Q = \angle D, \angle R = \angle F$

(c) We have :

$\Rightarrow$ $X \leftrightarrow R, Y \leftrightarrow P, Z \leftrightarrow Q$

$\Rightarrow$ $XY = RP, YZ = PQ, XZ = RQ$

$\Rightarrow$ $\angle X = \angle R, \angle Y = \angle P, \angle Z = \angle Q$

(d) We have $\Delta\, MNO \cong \Delta\, CBA$

$\Rightarrow$ $M \leftrightarrow C, N \leftrightarrow B, O \leftrightarrow A$

$\Rightarrow$ $MN = CB, NO = BA, MO = CA$

$\Rightarrow$ $\angle M = \angle C, \angle N = \angle B, \angle O = \angle A$

2. (a) We have $\Delta\, ABC \cong \Delta\, PRQ$

$\Rightarrow$ $\angle A = \angle P, \angle B = \angle R, \angle C = \angle Q$

$\Rightarrow$ $AB = PR, BC = RQ, AC = PQ$

(b) We have $\Delta\, DEF \cong \Delta\, QPR$

$\Rightarrow$ $\angle D = \angle Q, \angle E = \angle P, \angle F = \angle R$

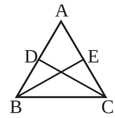
$\Rightarrow$ $DE = QP, EF = PR, DF = QR$

3. We have

$\angle B = \angle C$ (given)

$\therefore$ $AB = AC$ (SAS)

Hence, the angles opposite to the equal sides are equal.



4. Given

$\angle APQ = \angle LQP$

and $BP = QC$

To prove $ABP \cong \Delta ACQ$

Proof : $\angle APQ = \angle LQP$

$\therefore$ $AB = AC$

$\because$ $AB = AC$

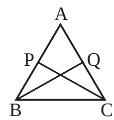
$\therefore$ $\angle B = \angle C$

$\therefore$ $\Delta ABP \cong \Delta ACQ$ [By ASA congruence condition)

5. Given $AB = AC$

and $\angle AB = \angle C$

To prove $\angle CDB = 90° = \angle BEC$



proof :$\because$ $AB = AC$

and $BE = DC$

$\therefore$ $\angle EBC = \frac{1}{2}\angle B$

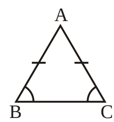
and $\angle DCB = \frac{1}{2}\angle A$

$\therefore$ $AD = BD$

and $AE = EC$

$\therefore$ $\angle CDB = 90° = \angle BFC$

6. The given



$AB = AC$

and $AP = PB,$

$AQ = QC$

To prove $BQ = CP$

proof :

$\because$ $AB = AC$

$\therefore$ $\angle B = \angle C$ (isoceles triangle)

$\therefore$ $\angle QBC = \angle CPB$

$\therefore$ $BQ = CP$

7. The given

$AC \,||\, BD$ and $AO = OB$

To prove $\Delta ACO\ \Delta BDO$

proof : $AO = OB$ and $\angle B = \angle A = 90°$

$\therefore$ $CO = OD$

Hence, $\Delta ACO \cong \Delta BDO$ [By SAS congruence condition]

8. Given $AB = AC$ and $\angle B = \angle C$

$AB \,||\, EF,\ AC \,||\, DE$

To prove $\Delta\, DBE \cong \Delta\, FCE$

proof : $AB \,||\, EF$

$\therefore$ $\angle B = \angle E$ (Corresponding angles)

Similarly $\angle C = \angle E$

$\therefore$ $BD = DE$ (isosceles triangle)

$\therefore$ $FC = EF$ (isosceles triangle)

Hence $\Delta\, DBE \cong \Delta\, FCE$ (By SAS congruence condition)

9. Given

$PQ = SR$

and $PR = SQ$

$QR = QR$ (Common side)

To prove $\Delta\, PQR \cong \Delta\, SQR$

proof : In $\Delta\, QSR$ and $\Delta\, QPR$

$PQ = SR$

and $PR = SQ$

and $QR = QR$ (common side)

Hence, $\Delta\, PQR \cong \Delta\, SQR$ (By SSS congruence condition)

10. The given

$PQ = QR,\ BQ = QC$

and $\angle P = \angle R = 90°$

To prove $AB = AC$

proof : In $\Delta\, BPQ$ and $\Delta\, CRQ$

$\because$ $BQ = QC$ and $PQ = QR$

$\angle P = \angle R = 90°$

$\therefore$ $\Delta\, BPQ \cong \Delta\, CRQ$ and $\angle B = \angle C$

[By SAS Congruence condition]

$\therefore$ In $\Delta\, ABC$,

$AB = AC$ (By isosceles triangle)

Hence, $AB = AC$

11. The given

$PQ = PR$ and $\angle Q = \angle R = 90°$

To prove :

BP bisects of $\angle ABC$

$\angle Q = 90° = \angle R$ (Given)

and $QP = RP$ (Given)

$BP = PB$ (Common side)

$\therefore$ $\angle PBQ = \angle PBQ$

Hence, PB is bisects of $\angle ABC$.

12. Given

$$\angle P = \angle Q \text{ and } BQ = CP\text{keâ}$$

To prove : $\Delta BCQ \cong \Delta CBP$

proof : In ΔCPB and ΔBQC

$\angle P = 90° = \angle Q$ (given)

$CP = BQ$ (given)

and $BC = CB$ (Common side)

$\therefore$ $\Delta BCQ \cong \Delta CBP$ (By SAS congruence condition)

13. Given $PQ = SR$, $PS = QR$ and $\angle SPR = \angle QRP$

To prove : $\Delta PQR \cong \Delta RSP$

Proof :

$\because$ $\angle SPR = \angle QRP$ (Alternal angles)

$\therefore$ $PS \parallel QR$

$PS = QR$

$PR = RP$ (Common side)

$\therefore$ $\Delta PQR \cong \Delta RSP$

(By SAS congruence condition)

14. Given

$BD = DC$

and $BA = CA$

To prove : $\Delta BDA \cong \Delta CDA$

proof : $BD = DC$

and $BA = CA$ (given)

$\because$ $BA = CA$

$\therefore$ $\angle B = \angle A$

$\therefore$ $AD = AD$ (Common side)

$\therefore$ $\Delta BDA \cong \Delta CDA$ (By SAS congruence condition)

15. Given $PO = OQ$

and $\angle P = \angle Q$

To prove : $\Delta POX \cong \Delta QOY$

proof : In ΔPXO and ΔOYQ

$\because$ $PO = QR$

and $\angle P = \angle Q$

$\therefore$ $PX \parallel YQ$

$\therefore$ $\angle X = 90° = \angle Y$

Hence, $\Delta POX \cong \Delta QOY$ (By ASA Cogruence condition)

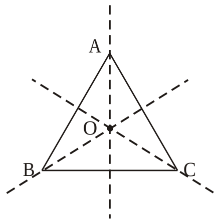
Multiple Choice Questions

Mark (3) against the correct answer in each of the following :

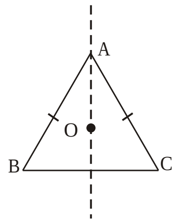
1. (a), 2. (c), 3. (b), 4. (c), 5. (c), 6. (b), 7. (b), 8. (b)

Exercise 12.1

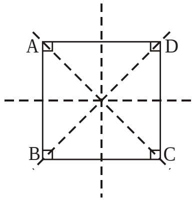
1. (a)



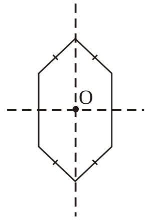
(b)



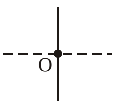
(c)



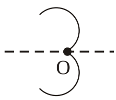
(d)



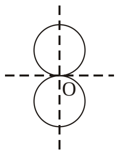
2. (a)



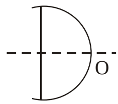
(b)



(c)



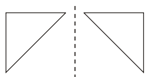
(d)



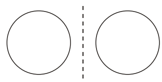
3. (a)

(b)

(c)



(d)



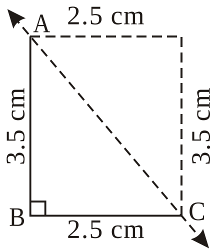
4. (a) Corresponding sides = $AB = AD$, $BC = DC$

Corresponding angles = $\angle ABC = \angle ADC$

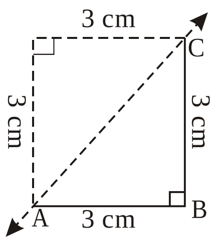
(b) Corresponding sides = $PS = RS$, $PQ = RQ$

and Corresponding angles = $\angle SPQ$ $\angle SRQ$

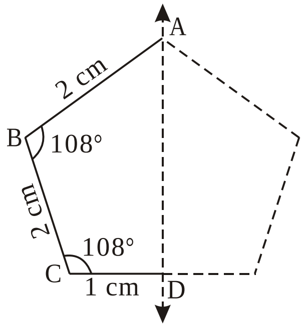
5. (a)



(b)

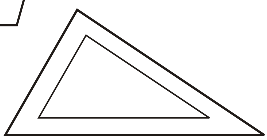


(c)



6.

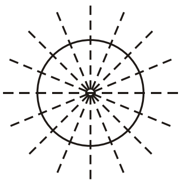
Parallelogram



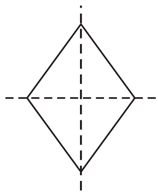
Scalene triangle

Cup

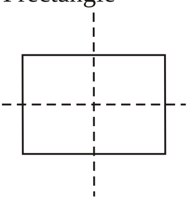
7. (a) Unlimited line



(b) A rhombus two line



(c) A rectangle

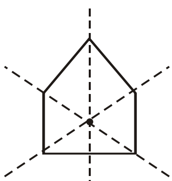


(d) A prallelogram No line

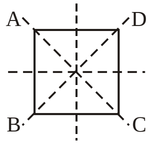
Exercise 12.2

1. (a) False (b) False (c) True (d) False
(e) True (f) False (g) False

2. The order of rotational symmetry of a regular pentagon is 5.

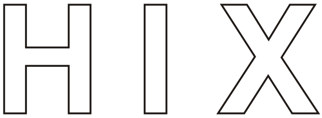


3. Rotational symmetry of order 4.

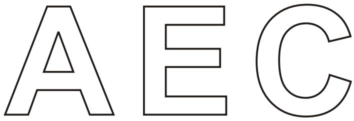


4. (a), (c) and (e) have rotational symmetry.

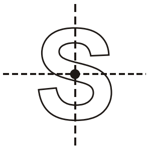
5.



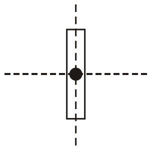
6.



7.

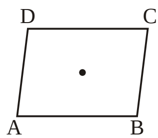


Rotational symmetry =2



Rotational symmetry =2

8. Rotational symmetry = 2



Multiple Choice Questions

Mark (3) the correct answer in each of the following :

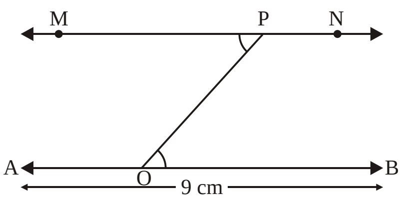
1. (d), 2. (c), 3. (a), 4. (a), 5. (c), 6. (d), 7. (b), 8. (b), 9. (c), 10. (c)

13 Constructions

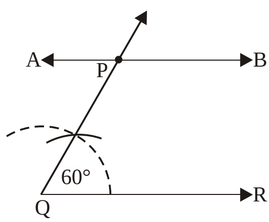
Exercise 13.1

1. Steps of Construction :

1. Take any point O and AB.
2. Join OP.
3. Draw $\angle MPO$, such that $\angle MPO = \angle POB$.
4. Extend MN on both sides to form a line as shown. Thus $AB \parallel MN$



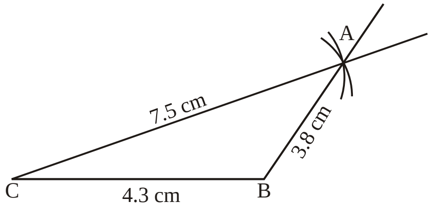
2. The perpendicular distance between AB and QR is 3.8 cm.



3. Steps of Construction :

1. Draw a line $BC = 4.3$ cm.
2. With C as centre and radius 7.5 cm, draw an arc.
3. With B as centre and radius 3.8 cm, draw another arc, cutting the previous arc at point A.
4. Join CA and BC.

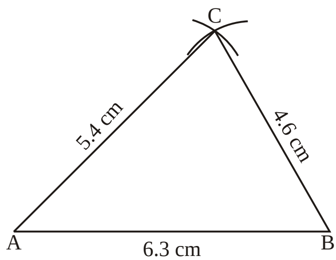
Then, $\Delta\, ABC$ is the required triangle.



4. Steps of Construction :

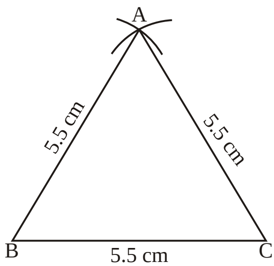
1. Draw a line segment $AB = 6.3$ cm
2. With A as centre and radius 5.4 cm, draw an a rc.
3. With B as centre and radius 4.6 cm, draw another arc, cutting the previous arc at point C.
4. Join AC and BC.

Then, $\Delta\, ABC$ is the required triangle.



5. Steps of Construction :

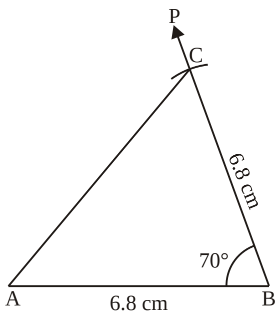
1. Draw a line segment $BC = 5.5$ cm.
2. With B as centre and radius 5.5 cm, draw an arc.
3. With C as centre and radius 5.5 cm, draw another arc, cutting the previous arc at point A.
4. Join BA and CA.



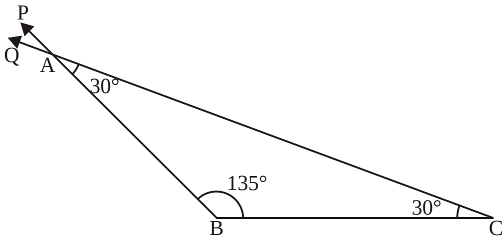
6. Steps of Construction :

1. Draw a line segment $AB = 6.8$ cm.
2. At point B, draw $\angle AB = 60°$.
3. With B as centre and radius 6.8 cm, draw an arc cutting BP and C.
4. Join AC.

Then, $\Delta\, ABC$ is the required triangle.

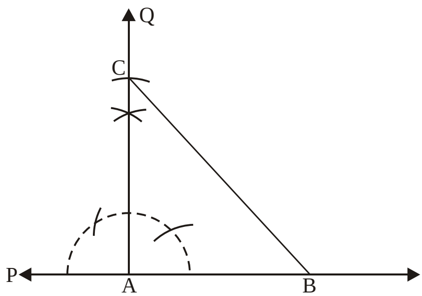


7. Steps of Construction :



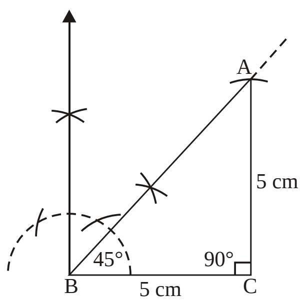
1. Draw a line segment $BC = 7.3$ cm.
2. At point B, draw $\angle PBC = 135°$.
3. At point C, draw $QCB = 30°$.
4. Let BP and CQ intersect each other at A.
   Then, $\Delta\, ABC$ is the required triangle.

8. Steps of Construction :

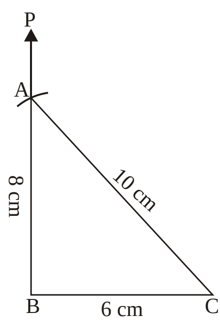


1. Draw a line BP. Cut off $BA = 5$ cm.
2. At point A, draw $\angle PAQ = 90°$.
3. With A as centre and radius 4.9 cm draw an arc, cutting AQ at C.
4. Join AC.
   Then, $\Delta\, ABC$ is the required triangle.

9. Yes, this is a right angled triangle.



10. Steps of Construction :



1. Draw a line segment $BC = 6$ cm.
2. With C as centre and radius 10 cm, draw on arc, cutting BP at A.

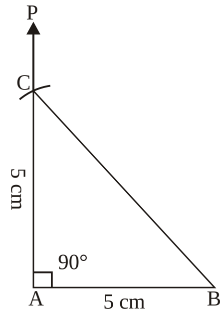
3. Join CA.

Then, $\Delta\, ABC$ is the required triangle and $AB = 8$ cm.

11. Steps of Construction :

1. Draw a line segment $AB = 5$ cm.
2. With A as centre and radius 5 cm, draw an arc, cutting AP at C.
3. Join BC.

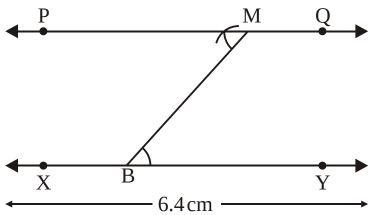
Then, $\Delta\, ABC$ is the required triangle.



12. Steps of Construction :

1. Take any point B on XY.
2. Join BM.
3. Draw $\angle PMB = \angle MBY$.
4. Extend PM on boths ides to form a line as shown.

Thus, $PQ \parallel XY$



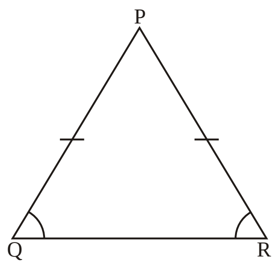
Verification : $\because$ $\angle PMB = \angle MBY$ and these are alternate interior angles.

$\therefore$ $PQ \parallel XY$.

Exercise 13.2

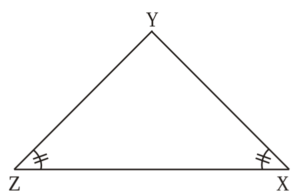
1. (a) $\angle Q = \angle R$ (b) $\angle V = \angle U$ (c) $\angle X = \angle Z$

2. $\angle Q = \angle R$

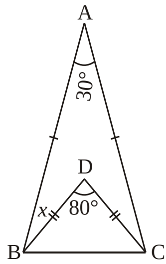


3. (a) $PQ = PR$ (b) $WV = VU$ (c) $YZ = XZ$

4. $XY = YZ$



5. (a) In $\Delta\, ABC$



$$AB = AC$$

[$\because$ Angles opposite equal sides of a Δ are always equal]

Using angle sum property of a triangle, we have

$$\angle A + \angle B + \angle C = 180°$$
$$30° + 2\angle B = 180° \ (\because \angle B = \angle C)$$
$$2\angle B = 180° - 30°$$
$$2\angle B = 150°$$
$$\angle B = 150° \div 2$$
$$\angle B = 75°$$

$\therefore$ $\angle ABC = 75°, \angle ACB = 75°$

(b) In $\Delta\, DBC$,

$$\angle D + \angle B + \angle C = 180° \ (\because \angle B = \angle C)$$
$$80° + 2\angle B = 180°$$
$$2\angle B = 180° - 80°$$
$$2\angle B = 100°$$
$$\angle B = 100° \div 2$$
$$\angle B = 50°$$

$\therefore$ $\angle DBC = 50° = \angle DCB$

(c) $\angle x = \angle ABC - \angle DBC$

$= 75° - 50°$

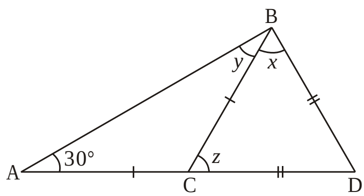
$= 25°$

6. In $\Delta\, ABC$

$\because$ $AC = BC$ (given)

$\therefore$ $\angle Y = \angle A$

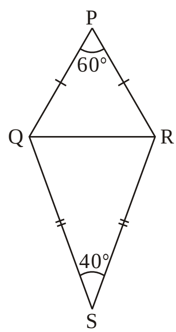
$\angle Y = 30°$



$\because$ $\Delta\, BCD$ is a equilateral triangle

$\therefore$ $\angle x = \angle Z = 60°$

7. (a) $\because$ $PQ = PR$ (given)



$\therefore$ $\angle PQR = \angle PRQ$

[$\because$ Angles opposite equal sides of a Δ are always equal]

In $\Delta\, PQR$,

$$\angle P + \angle Q + \angle R = 180° \ (\because \angle Q = \angle R)$$
$$60° + 2\angle Q = 180°$$
$$2\angle Q = 180° - 60°$$
$$2\angle Q = 120°$$
$$\angle Q = 120° \div 2$$
$$\angle Q = 60°$$

$\therefore \qquad \angle PQR = \angle PRQ = 60°$

(b) In ΔSQR,

$$\angle S + \angle Q + \angle R = 180°$$
$$40° + 2\angle Q = 180°$$
$$2\angle Q = 180° - 140°$$
$$2\angle Q = 140°$$
$$\angle Q = 140 \div 2$$
$$\angle Q = 70°$$

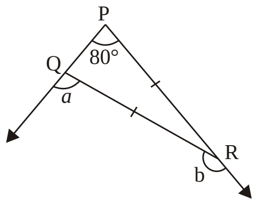
$\therefore \qquad \angle SQR = \angle PQR + \angle SQR$

$$= 60° + 70° = 130°$$

(c) $\qquad \angle PRS = \angle PRQ + \angle SRQ = 60° + 70° = 130°$

So, $\angle PQS$ and $\angle PRS$ are same angle.

8. (a) $\angle PQR$ and $\angle PRQ$ = ?



$\because$ Angles oposite equal sides of a Δ are always equal.

$\therefore \qquad \angle P = \angle Q$

$$\angle Q = 80°$$

$\therefore \qquad \angle PQR = 80°$

$\because \qquad \angle RPQ + \angle PQR + \angle PRQ = 180°$

$$80° + 80° + \angle PRQ = 180°$$
$$\angle PRQ = 180° - 160°$$
$$\angle PRQ = 20°$$

(b) $\qquad \angle PQR + \angle a = 180°$ ($\because$ Linear pair angles)

$$80° + \angle a = 180°$$
$$\angle a = 180° - 80°$$
$$\angle a = 100°$$

and $\qquad \angle PRQ + \angle b = 180°$

$$20° + \angle b = 180°$$
$$\angle b = 180° - 20°$$
$$\angle b = 60°$$

Multiple Choice Questions

Mark (3) against the correct answer in each of the following :

1. (c), 2. (c), 3. (b), 4. (b), 5. (b), 6. (b), 7. (a), 8. (b), 9. (b)

14 Perimeter and Area

Exercise 14.1

1. (a) The perimeter of figure

= (2 + 10 + 2 + 4 + 10 + 4 + 2 + 10 + 2 + 4 + 10 + 4) cm

= 64 cm.

(b) The perimeter of figure $= (10 + 8 + 8)\,\text{cm} = 26\,\text{cm}.$

(c) The perimeter of figure = circumference of semicircle + Diameter

$$= \pi r + 21\,\text{cm}$$

$$= \left(\frac{22}{7} \times \frac{21}{2} + 21\right)\text{cm}$$

$$= (11 \times 3 + 21)\,\text{cm} \quad = (33 + 21)\,\text{cm} = 54\text{ cm}.$$

(d) The perimeter of figure $= (5 + 5 + 5 + 5 + 5 + 5 + 5 + 5)\,\text{cm}$

$$= 40\,\text{cm}.$$

(e) The perimeter of figure $= (3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 15)\,\text{cm}$

$$= (33 + 15)\,\text{cm}$$

$$= 48\text{ cm}.$$

(f) The perimeter of figure $= 2r + \frac{3}{4} \times 2\pi r$

$$= 2 \times 7 + \frac{3}{4} \times 2 \times \frac{22}{7} \times 7$$

$$= 14 + 3 \times 11 = 14 + 33 = 47\,\text{cm}.$$

2. The radius of garden $= 28\,\text{m}$

The length of fence = Circumference

$$= 2\pi r = 2 \times \frac{22}{7} \times 28 = 44 \times 4 = 176\,\text{cm}$$

3. The length of a wire $= 15.7\,\text{cm}$

The perimeter of wire = the length of wire

$$= 157\text{ cm}$$

And $2\pi r = 157$

$$2 \times \frac{22}{7} \times r = 157$$

$$r = \frac{157 \times 7}{2 \times 22}$$

$$r = 24.97\text{ cm}$$

or $r = 25\,\text{cm}$

$\therefore$ radius $= 25$ cm

And diameter $= 2 \times r = 2 \times 25 = 50\,\text{cm}.$

4. The radius of a circle $= 10\,\text{cm}$

$\therefore$ The perimeter of a circle $= 2\pi r = 2 \times \frac{22}{7} \times 10$

According to the questions

The perimeter of a circle = perimeter of a square

$$2 \times \frac{22}{7} \times 10 = 4 \times \text{side}$$

$$\text{side} = \frac{440}{4 \times 7}$$

$$\text{side} = \frac{110}{7}$$

$$\text{side} = 15.7\,\text{cm.}$$

Hence, the side of the square is 15.7cm.

5. radius $= 28\,\text{cm.}$

$\because$ The perimeter of a car's tyre $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 28$$

$$= 2 \times 22 \times 4 = 176\,\text{cm.}$$

$\therefore$ Distance covered by car's tyre in 1000 revolutions $= 1000 \times 176\,\text{cm}$

$$= 176000\,\text{cm}$$

or $= 1.76\,\text{km.}$

6. (a) $l = 3x$, $b = x$, perimeter $= 48$unit

$\because$ the perimeter of rectangle $= 2(l + b)$

$$48 = 2(3x + x)$$

$$48 \div 2 = 4x$$

$$4x = 24$$

$$x = 24 \div 4$$

$$x = 6$$

$\therefore$ $l = 3 \times 6 = 18\,\text{unit.}$

$$b = x = 6\,\text{unit.}$$

(b) Each side $= x - 2$

perimeter $= 15\,\text{unit}$

The perimeter of triangle $= 3[x - 2]$

$$15 = 3x - 6$$

$$15 + 6 = 3x$$

$$3x = 21$$

$$x = 21 \div 3$$

$$x = 7\,\text{unit.}$$

(c) sides $= x - 2,\ 2x - 3,\ x - 2,\ 2x - 3$

perimeter $= 8\,\text{units}$

The perimeter of a rectangle $= 2(l + b)$

$$8 = 2[x - 2 + 2x - 3]$$

$$8 = 2[3x - 5]$$

or $3x - 5 = 4$

$$3x - 4 = 5$$

$$3x = 9$$

$$x = 9 \div 3$$

$$x = 3 \text{ unit.}$$

7. The perimeter of a rectangle = perimeter of a square

$$\begin{aligned} 2(l+b) &= 4 \times \text{side} \\ 2(10+14) &= 4 \times \text{side} \\ 2 \times 24 &= 4 \times \text{side} \\ \text{side} &= \frac{24 \times 2}{4} \\ \text{side} &= 6 \times 2 \\ \text{side} &= 12 \text{ cm} \end{aligned}$$

Hence, the length of each side of the square is 12 cm.

8.
$$\begin{aligned} \text{Total distance} &= 78.5 \text{ km} \\ &= 78.5 \times 1000 \\ &= 78500 \text{ m} \\ \text{The circumference of circle} &= 2\pi r \\ &= 2 \times 3.14 \times 0.5 \\ &= 3.14 \text{ m} \\ \therefore \quad \text{the number of revolutions} &= \frac{\text{Total distance}}{\text{Circumference of circle}} \\ &= \frac{78500}{3.14} = 25000. \end{aligned}$$

9.
$$\begin{aligned} \text{The length of the hour hand} &= 4.9 \text{ cm} \\ \text{The circumference of a clock} &= 2\pi r \\ &= 2 \times \frac{22}{7} \times 4.9 \\ &= 1.4 \times 22 = 30.8 \text{ cm} \end{aligned}$$

$\therefore$ the distance travelled by the tip of the hour hand in a week

$$\begin{aligned} &= 7 \times 24 \times 30.8 \\ &= 5174.4 \text{ cm.} \end{aligned}$$

10. (a)
$$\begin{aligned} \text{The perimeter of square} &= 4 \text{ side} \\ &= 4 \times 0.06 \\ &= 0.24 \text{ km} \\ \text{or} \quad &= 0.24 \times 1000 \text{ m} \\ &= 240 \text{ m.} \end{aligned}$$

(b)
$$\begin{aligned} \text{The perimeter of rectangle} &= 2(l+b) \\ &= 2(40+30) \text{ cm} \\ &= 2 \times 70 \text{ cm} \\ &= 140 \text{ cm} \\ \text{or} \quad &= 1.40 \text{ m.} \end{aligned}$$

(c)
$$\begin{aligned} \text{The perimeter of triangle} &= (80+78+61) \text{ m} \\ &= 219 \text{ m.} \end{aligned}$$

(d) The perimeter of circle $= 2\pi r = 2 \times \frac{22}{7} \times 3.5$

$= 44 \times 0.5$

$= 22\,\text{cm}.$

(e) The perimeter of figure = The perimeter of rectangle + The perimeter of isosceles triangle

$= 2(l+b) +$ (The sum of its sides)

$= 2(5+2)\,\text{m} + (5+4+4)\,\text{m}$

$= 2 \times 7\,\text{m} + 13\,\text{m}$

$= 14\,\text{m} + 13\,\text{m} = 27\,\text{m}.$

Exercise 14.2

1. (a) The area of parllelogram = side × altitude $= 10 \times 3\,\text{cm}^2 = 30\,\text{cm}^2$.

(b) the area of parallelograms = side × altitude $= 5 \times 13\,\text{cm}^2 = 65\,\text{cm}^2$.

(c) the area of parallelogram = side × altitude $= 10 \times 3\,\text{cm}^2 = 30\,\text{cm}^2$.

(d) the area of parallelogram $= 3 \times 6 = 18\,\text{cm}^2$.

(e) the area of parellogram $= 7 \times 2\,\text{cm}^2 = 14\,\text{cm}^2$.

2. (a) The area of given figure $= \frac{bh}{2}$

where, $b = 4$ cm, $h = 3\,\text{cm}$

$\therefore$ The area of given figure $= \frac{4 \times 3}{2} = 6\,\text{cm}^2$

And the area of $\Delta\, ABC = \frac{1}{2} \times$ base × height

$6 = \frac{1}{2} \times 6 \times x$

$x = 12 \div 6 = 2\,\text{cm}$

Hence, the area of triangle ABC and x is 6 cm^2 and 2 cm respectively.

(b) the area of $\Delta\, ABC = \frac{1}{2}$ base × altitude

$= \frac{1}{2} \times 8 \times 5$

$= \frac{1}{2} \times 40 = 20\,\text{cm}^2$

And $20 = \frac{1}{2} \times x \times 10$

$x = 2 \times 2 = 4\,\text{cm}^2$

(c) the area of $\Delta\, ABC = \frac{1}{2}$ base × altitude

$$= \frac{1}{2} \times 12 \times 5 = 6 \times 5 = 30\,\text{cm}^2$$

By pythagoras theorem

$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ x^2 &= 12^2 + 5^2 \\ x^2 &= 12^2 + 5^2 \\ x^2 &= 144 + 25 \\ x^2 &= 1.69 \\ x &= 13\,\text{cm.} \end{aligned}$$

3. (a) The area of parllelogram $ABCD = BC \times BQ$

$$\begin{aligned} &= 4 \times 9 \\ &= 36\,\text{cm}^2 \end{aligned}$$

$\therefore$ Area of $ABCD = OP \times AB$

$$\begin{aligned} 36 &= 6 \times x \\ x &= \frac{36}{6} = 6\,\text{cm.} \end{aligned}$$

(b) The area of parllelogram $PQRS = SR \times OQ$

$$\begin{aligned} &= 15 \times 5\,\text{cm}^2 \\ &= 75\,\text{cm}^2 \end{aligned}$$

$\therefore$ area of $PQRS = QR \times SU$

$$\begin{aligned} 75 &= 10 \times x \\ x &= 75 \div 10 = 7.5\ \text{cm.} \end{aligned}$$

4. (a) $l = 10\,\text{m},\ b = 12\,\text{m}$

The area of rectangle $= l \times b = 10 \times 12$

$$= 120\,\text{m}^2$$

(b) $l = 30\,\text{cm},\ b = 150\,\text{mm} = 15\ \text{cm}$

The area of rectangle $= 30 \times 15\,\text{cm}^2 = 450\ \text{cm}^2$

(c) $l = 55,\ b = 1000\,\text{cm} = 10\ \text{m}$

The area of rectangle $= l \times b = 55 \times 10\,\text{cm}^2 = 550\,\text{cm}^2$

5. (a) side $= 90\,\text{cm}$

The area of square $= \text{side}^2$

$$\begin{aligned} &= 90^2\ \text{cm}^2 \\ &= 8100\,\text{cm}^2 \end{aligned}$$

or $= 0.81\,\text{cm}^2$

(b) side $= 1\text{m}\ 50\ \text{cm} = 1.5\,\text{m}$

The area of square $= \text{side}^2$

$$= 1.5^2 = 2.25\,\text{m}^2$$

6. The area of a wall $= 4\text{ m} \times 3\text{ m}$

$= 12\text{ m}^2 = 12 \times 10000 = 120000\text{ cm}^2$

the area of a tile $= 25\text{ cm} \times 20\text{ cm} = 500\text{ cm}^2$

No. of tiles $= \dfrac{\text{The area of a wall}}{\text{The area of a tile}} = \dfrac{120000}{500} = 240$ tiles.

7. The area of a dor $= 4 \times 3\text{ m}^2$

and The area of a wall $= 10 \times 10\text{ m}^2 = 100\text{ m}^2$

Remain the area of a wall $= 100 - 12 = 88\text{ m}^2$

The cost of painting $= 88 \times 50 =$ ` 4400

8. height $= 6$ cm, area $= 18\text{ cm}^2$ base = ?

The area of parallelogram $=$ base $\times$ height

$18 =$ base $\times\ 6$

base $= 18 \div 6$

base $= 3$ cm

9. base $= 16.4$ cm, area $= 246\text{ cm}^2$ altitude = ?

The area of a triangle $= \dfrac{1}{2}$ base $\times$ altitude

$246 = \dfrac{1}{2} \times 16.4 \times$ altitude

$246 = 8.2 \times$ altitude

altitude $= 246 \div 8.2 = 30$ cm

10. side of a square $= 4$ cm

$\therefore$ the area of a square $=$ side$^2 = 4^2 = 16$ cm

According to the question

side is double means side $= 2 \times 4 = 8$ cm

So, the area of new square $= 8^2 = 64$ cm

11. The area of rectangle $= l \times b$

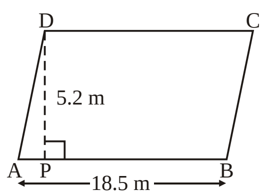
According to the question length $= 2l$

And breadth $= b/2$

So, the area of new rectangle $= 2l \times \dfrac{b}{2} = lb$

Yes, the two areas are equal.

12. The area of a garden



$ABCD = AB \times DP$

$= 18.5 \times 5.2\text{ m}^2$

$= 96.2\text{ m}^2$

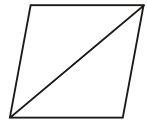
The cost of gardening of garden

$= 5 \times 96.2 =$ ` 481

13. The perimeter of rhombus $= 4 \text{ side}$

$= 4 \times 10$

$= 40 \text{ cm}$



$\because \quad d_1^2 + d_2^2 = 4a^2$

$d_1^2 + 12^2 = 4 \times 10^2$

$d_1^2 = 400 - 144 = 256$

$\Rightarrow \quad d_1 = 16 \text{ cm}$

the area of rhombus $= \frac{1}{2} d_1 \times d_2 = \frac{1}{2} \times 16 \times 12 = 8 \times 12 = 96 \text{ cm}$

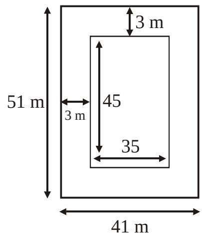
14. The area of constructed path

$= 2[45 \times 3 + 35 \times 3]$

$= 2[135 + 105] \text{ m}^2$

$= 2 \times 258 \text{ m}^2$

$= 516 \text{ m}^2$



$\therefore$ the cost of constructed area

= ` 516×100

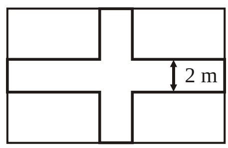
= ` 51600

15. The area of cross roads

$= 75 \times 2 \text{ m}^2 + (50 - 2) \times m^2$

$= 150 \text{ m}^2 + 48 \times 2 \text{ m}^2$

$= 150 \text{ m}^2 + 96 \text{ m}^2 = 246 \text{ m}^2$



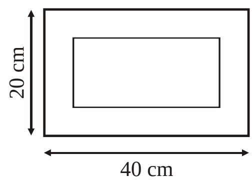
16. (a) The area of strip cut out

$= 2[40 \times 4 + 12 \times 4] \text{ cm}^2$

$= 2[160 + 48] \text{ cm}^2$

$= 2 \times 208 \text{ cm}^2$

ss $= 416 \text{ cm}^2$



(b) The area of remaining sheet of paper

= the area of sheet of paper – the area of strip cutout

$= 4 \times 20 - 416$

$= 800 - 416 = 384 \text{ cm}^2$

17. The area of a square $= x \times x = x^2$

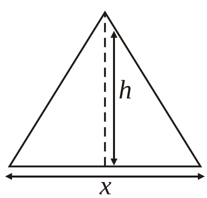
$\because$ The area of a triangle

= The area of a square

$\frac{1}{2} x \times h = x^2$

$h = 2x$

Hence, the altitude of a triangle is $2x$.



Exercise 14.3

1. (a)

$$\text{radius} = 7.7\,\text{cm}$$

$\therefore$ $$\text{the area of a circle} = \pi r^2 = \frac{22}{7} \times 7.7 \times 7.7$$

$$= 22 \times 1.1 \times 7.7 = 186.34\,\text{cm}^2$$

(b)

$$\text{radius} = 7\,\text{cm}$$

$\therefore$ $$\text{the area of a circle} = \pi r^2 = \frac{22}{7} \times 7 \times 7 = 22 \times 7 = 154\,\text{cm}^2$$

2. (a)

$$\text{The area of a circle} = \frac{77}{8}\,\text{m}^2$$

$$\text{Diameter} = 2r = ?$$

$\therefore$ $$\pi r^2 = \frac{77}{8}$$

$$\frac{22}{7} r^2 = \frac{77}{8}$$

$$\frac{2}{7} r^2 = \frac{7}{8}$$

$$r^2 = \frac{49}{16}$$

$$r = \sqrt{\frac{49}{16}} = \frac{7}{4}\,\text{m}$$

$\therefore$ $$\text{Diameter} = 2r = 2 \times \frac{7}{4} = \frac{7}{2}\,\text{m} = 3.5\,\text{m}$$

(b)

$$\text{The area of a circle} = 616\,\text{m}^2$$

$$\text{Diameter} = 2r = ?$$

$\therefore$ $$\pi r^2 = 616$$

$$\frac{22}{7} r^2 = 616$$

$$r^2 = 28 \times 7$$

$$r^2 = 28 \times 7$$

$$r^2 = 196$$

$$r^2 = \sqrt{196} = 14\,\text{m}$$

$\therefore$ $$\text{Diameter} = 2r = 2 \times 14 = 28\,\text{m}$$

3. The sum of the areas of three circles

$$= \pi r_1^2 + \pi r_2^2 + \pi r_3^2$$

$$= \pi (r_1^2 + r_2^2 + r_3^2)$$

$$= \frac{22}{7} (3^2 + 4^2 + 12^2)$$

$$= \frac{22}{7}(9+16+144) = \frac{22}{7} \times 169$$

The area of a big circle

= The sum of the areas of three circles

$$\pi r^2 = \frac{22}{7} \times 169$$

$$\frac{22}{7} r^2 = \frac{22}{7} \times 169$$

$$r^2 = 169$$

$$r = \sqrt{169} = 13\,\text{cm}$$

Hence the radius of a big circle is 13 cm.

4.

$$R = \frac{20}{2}\,\text{cm},$$

$$r = \frac{6}{2}\,\text{cm (given)}$$

$$= 10\,\text{cm} = 3\,\text{cm}$$

The area of a circular ring = Area of outer circle – Area of inner circle

$$= \pi R^2 - \pi r^2$$

$$= \pi (R^2 - r^2)$$

$$= \frac{22}{7}(10^2 - 3^2)$$

$$= \frac{22}{7}(100 - 9)$$

$$= \frac{22}{7} \times 91 = \frac{22}{7} \times 91 = 22 \times 13 = 286\,\text{cm}^2$$

Hence, the area of a circular ring is 286 cm^2.

5. The radius of first circle $= 3\,\text{m}$

$\therefore$ The area of first circle $= \pi r^2 = \frac{22}{7} \times 3^2 = \frac{22}{7} \times 9$

According to the questions

The area another circle $= 49 \times$ the area of first circle

$$\pi R^2 = 49 \times \frac{22}{7} \times 9$$

$$R^2 = 49 \times 9$$

$$R = \sqrt{49 \times 9}$$

$$R = 7 \times 3 = 21\,\text{m}$$

$\therefore$ the circumference of another circle

$$= 2\pi R = 2 \times \frac{22}{7} \times 21 = 44 \times 3 = 132\,\text{m}.$$

6. The ratio of radii $= 1:3$

$\therefore$ the ratio of their areas $= \dfrac{\pi r_1^2}{\pi r_2^2} = \left(\dfrac{r_1}{r_2}\right)^2 = \left(\dfrac{1}{3}\right)^2 = \dfrac{1}{9} = 1:9.$

7. The circumference of the circle $= 132\text{ cm}$

$$2\pi r = 132\text{ cm}$$

$$2 \times \frac{22}{7} r = 132$$

$$r = \frac{132 \times 7}{2 \times 22}$$

$$r = 3 \times 7 = 21\text{ cm}$$

$\therefore$ the area of circle $= \pi r^2$

$$= \frac{22}{7} \times 21^2$$

$$= \frac{22}{7} \times 441 = 22 \times 63 = 1386\text{ cm}^2.$$

8. The ratio of two circles of circumference

$$= 3:4$$

$\therefore$ $2\pi r_1 : 2\pi r_2 = 3:4$

$$r_1 : r_2 = 3:4$$

$\therefore$ the ratio of their areas $= \pi r_2^1 : \pi r_2^2 = \left(\dfrac{r_1}{r_2}\right)^2 = \left(\dfrac{3}{4}\right)^2 = \dfrac{9}{16} = 9:16.$

9. The ratio of two circles $= 25:49$

$\therefore$ $\pi r_1^2 : \pi r_2^2 = 25:49$

$$r_1^2 : r_2^2 = 25:49$$

$$r_1 : r_2 = 5:7$$

$\therefore$ the ratio of their circumference $= 2\pi r_1 : 2\pi r_2 = r_1 : r_2 = 5:7.$

10. Side of square $= 11\text{ cm}$

$\therefore$ The perimeter of square $= 4$ side

$$= 4 \times 11 = 44\text{ cm}$$

The perimeter of square $=$ The circumference of circle

$$2\pi r = 44$$

$$2 \times \frac{22}{7} r = 44$$

$$r = 7\text{ cm}$$

$\therefore$ the area of the circle $= \pi r^2 = \dfrac{22}{7} \times 7^2 = 22 \times 7 = 154\text{ cm}^2.$

11. (a) the area of shaded portion

$$= \text{Area of square} - \frac{1}{2}\text{area of circle} - 2\left[\frac{1}{4}\text{area of circle}\right]$$

$$= 7 \times 7 - \frac{1}{2} \times \frac{22}{7} \times \frac{7^2}{2^2} - 2\left[\frac{1}{4} \times \frac{22}{7} \times \frac{7^2}{2^2}\right]$$

$$= 49 - \frac{11 \times 7}{4} - 2\left[\frac{11}{2} \times \frac{7}{4}\right]$$

$$= 49 - \frac{-77}{4} - \frac{77}{4} = 49 - 2 \times \frac{77}{4} = 49 - \frac{77}{2}$$

$$= \frac{98 - 77}{2} = \frac{21}{2} = 10.5 \text{ cm}^2$$

(b) the area of shaded portion

$$= \text{Area of square} - 2\left[\frac{1}{2}\text{area of circle}\right]$$

$$= 7 \times 7 - 2\left[\frac{1}{2} \times \frac{22}{7} \times \frac{7^2}{2^2}\right]$$

$$= 49 - 2\left[\frac{11}{7} \times \frac{7^2}{4}\right] = 49 - \frac{77}{2} = \frac{98 - 77}{2}$$

$$= \frac{21}{2} = 10.5 \text{ cm}^2$$

(c) the area of shaded portion

$$= \text{Area of square} - 2\left[\frac{1}{2}\text{area of circle}\right]$$

$$= 7 \times 7 - 2\left[\frac{1}{2} \times \frac{22}{7} \times \frac{7^2}{2^2}\right]$$

$$= 49 - 2\left[\frac{77}{4}\right]$$

$$= 49 - \frac{77}{2}$$

$$= \frac{98 - 77}{2}$$

$$= \frac{21}{2}$$

$$= 10.5 \text{ cm}^2$$

Hence, the all areas are same.

Multiple Choice Questions

Mark (3) the correct answer in each of the following :

1. (c), 2. (a), 3. (a), 4. (b), 5. (b), 6. (b), 7. (d), 8. (b), 9. (b), 10. (c).

Exercise 15.1

1. (a), (b) and (d) are the form a cube.

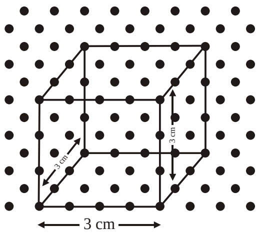
2. (a) Door ⟶ Cuboid
(b) Orange ⟶ Sphere
(c) Circular pipe ⟶ Cylinder
(d) Trunk ⟶ Cuboid
(e) Tennis ball ⟶ Sphere
(f) Dice ⟶ Cube
(g) Birthday cap ⟶ Cone
(h) Tube light ⟶ Cylinder
(i) Book ⟶ Cuboid
(j) Almirah ⟶ Cuboid

3. Do it yourself.

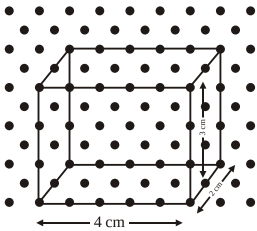
Exercise 15.2

1. (i) Cube, 3 cm
(ii) Cuboid, 6 cm, 3 cm, 3 cm

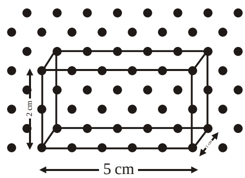
2. (a)



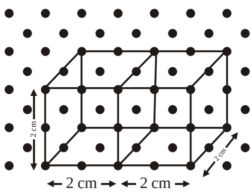
(b)



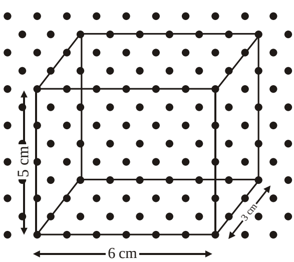
(c)



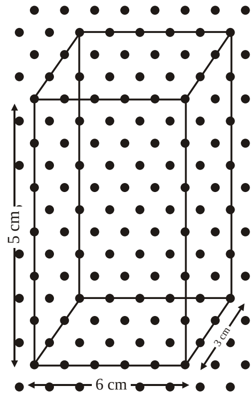
3.



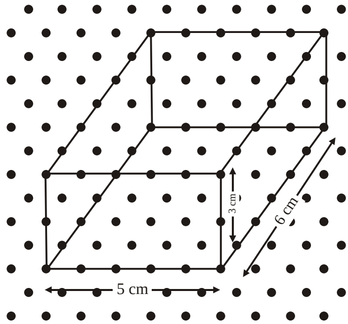
4. (i)



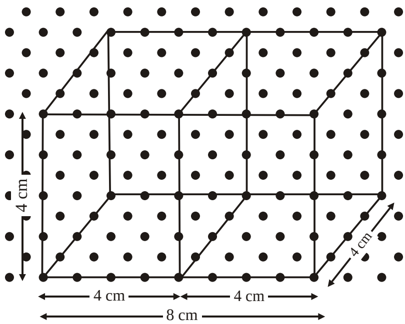
(ii)



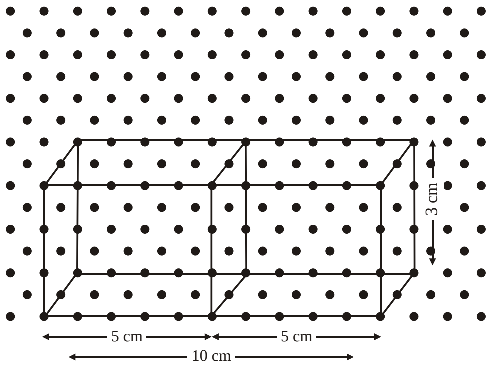
(iii)



5. the dimensions of the cuboid is 8 cm × 4 cm × 4 cm.



6. the diameter of the cuboid is 10 cm × 3 cm × 2 cm.



Multiple Choice Questions

Mark (3) against the correct answer in each of the following :

1. (b), 2. (d), 3. (d), 4. (c), 5. (b)

Exercise 16.1

1. (a) first ten odd numbers $= 1, 3, 5, 7, 9, 11, 13, 15, 17, 19$

$\because$ Arithmetic mean $= \dfrac{\text{Sum } \cancel{\text{of}} \text{ all odd number}}{\text{No. of odd number}}$

Arithmetic mean $= \dfrac{1+3+5+7+9+11+13+15+17+19}{10}$

$= \dfrac{100}{10} = 10$

(b) first 8 prime number $= 2, 3, 5, 7, 11, 13, 17, 19$

Arithmetic mean $= \dfrac{2+3+5+7+11+13+17+19}{8}$

$= \dfrac{77}{8} = 9.625$

2. (a) We first arrange the given data in ascending order as follows :

1, 2, 3, 4, 5, 6, 6, 6,7, 8, 9

$n = 11$ (No. of observationsis odd)

$\therefore$ Median $\left(\dfrac{n+1}{2}\right)^{th}$ terms

$= \left(\dfrac{11+1}{2}\right) = \dfrac{12}{2} = 6^{th}$ terms

$\therefore$ Median = 6

Calculation of mode : Her ~~the~~ the number 6 has come three time and other number once only.

$\therefore$ Mode = 6

(b) We first arrange the given data in ascending order as follows :

14, 15, 19, 19, 23

$n = 5$ (odd)

$\therefore$ Median $= \left(\dfrac{n+1}{2}\right)$ th terms $\left(\dfrac{15+1}{2}\right) = \dfrac{6}{2} = 3$th terms

$\therefore$ Median = 19

Calculation of mode = Here the number 19 has come twice and other number once only.

$\therefore$ Mode = 19

3. (a) Mean $= \dfrac{\text{Sum of all scores}}{\text{No. of scores}}$

$= \dfrac{10+42+14+20+32+22+38+34+27+16+9+18+17+25+36}{15}$

$$= \frac{360}{15} = 24$$

(b) $$\text{Mean} = \frac{3.8 + 4.2 + 3.3 + 3.7 + 4 + 3.7 + 4.6 + 3.9 + 4.4 + 4.4}{10}$$

$$= \frac{40}{10} = 4$$

4. $$\text{Mean} = \frac{\text{Sum of all number}}{\text{No. of number}}$$

$$7 = \frac{6 + 8 + 5 + x + 4}{5}$$

$$35 = 23 + x$$

$$x = 35 - 23 = 12$$

Hence, the value of x is 12.

5. We arrange the given data in ascending order as follows :

1, 2, 3, 4, 5 6, 6

$$\text{Mean} = \frac{1 + 2 + 3 + 4 + 5 + 6 + 6}{7}$$

$$\text{Mean} = \frac{27}{7} = 3.85$$

$$\text{Median} = \left(\frac{7+1}{2}\right) \text{th terms} = \frac{8}{2} = 4\text{th terms}$$

$\therefore$ Median = 4

Mode = 6(Since the value 6 occurs maximum number of times, i.e., 2 times.)

Hence, the mode is 6.

6. We arrange the given data in ascending order as follows :

35, 38, 38, 40, 42, 42, 45, 47, 49, 49, 50, 53, 55, 60, 65, 73

$$\text{Median} = \frac{\left(\frac{16}{2}\right)^{\text{th}} \text{ terms} + \left(\frac{16}{2} + 1\right)^{\text{th}} \text{ terms}}{2}$$

$$= \frac{8^{\text{th}} \text{ terms} + 9^{\text{th}} \text{ terms}}{2}$$

$$= \frac{47 + 49}{2} = \frac{96}{2} = 48 \text{ kg}$$

Hence, the median weight is 48 kg.

7. Arrange the heights in ascending order, we get

5, 9, 10, 12, 15, 16, 19, 20, 20, 20, 20, 23, 24, 25, 26

The number of marks $= 15$, which is odd

$\therefore$ $$\text{Median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ terms}$$

$$= \left(\frac{15+1}{2}\right)^{th} \text{ terms}$$

$$= \frac{16}{2}^{th} \text{ terms}$$

$$= 8^{th} \text{ terms}$$

Now, the 8^{th} terms is 20, hence the median is 20.

And, here the marks 20 has come 4 time and other marks once only.

$\therefore$ Mode $= 20$

Hence, Median and Mode are same.

8. (a) In the given data, 5 occurs maximum number of times, i.e., 16 times. Hence, mode is 5.

(b) Since, the value 7 occurs maximum number or times, i.e., 65 times. Hence, the mode is 7.

9.

Wages (in `)	Tally Marks	Frequency
150	$\vert\vert\vert$	3
200	$\cancel{\vert\vert\vert\vert}$	5
250	$\vert\vert\vert\vert$	4
300	$\vert\vert$	2
350	$\vert$	1

(a) Range = Maximum Value – Minimum Value

$\therefore$ Range = ` (350 – 150) = ` 200

(b) One worker is getting = ` 350.

(c) three workers are getting the minimum wages.

10.

Number of Members	Tally Marks	Frequency
2	$\vert$	1
3	$\vert$	1
5	$\vert\vert\vert\vert$	4
6	$\cancel{\vert\vert\vert\vert}\ \vert$	6
7	$\cancel{\vert\vert\vert\vert}$	5

8	|||	3

(a) 2 member is the smallest family size.
1 family is of the smallest size.

(b) 6 member is the most common family size.

Exercise 16.2

1. (a) IXth class has maximum number of students.

(b) VIth and VIIIth classes have minimum number of students.

(c) There are 50 students in class IX.

(d) There are 35 students in class VIII.

(e) The total number of students is 205.

2. (a) The given bar graph shows the production of cars (in lakh units) in various years in a factory.

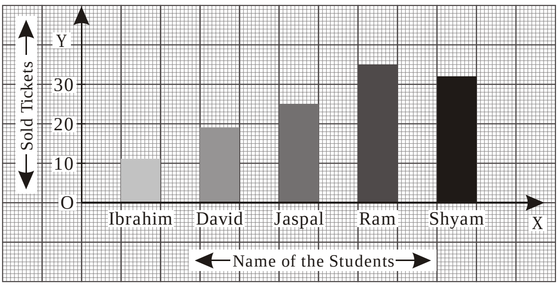
(b) In 2008 was the production maximum.

(c) In 2005 was the production minimum.

(d) 6 years have been covered in the survey.

(e) 11 : 4 is the ratio of minimum production during the survey period.

3.



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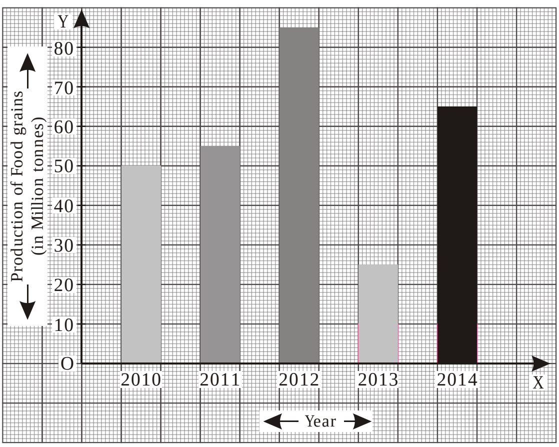

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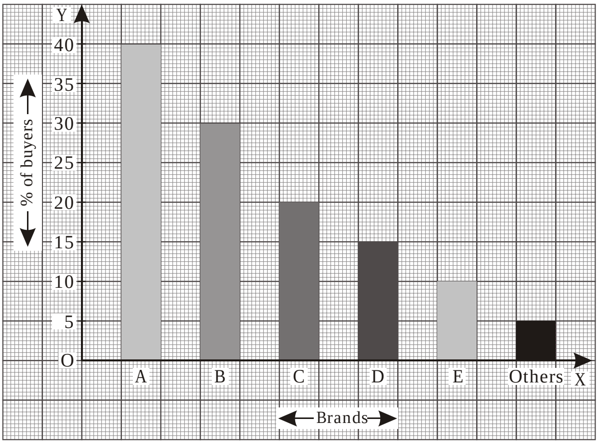
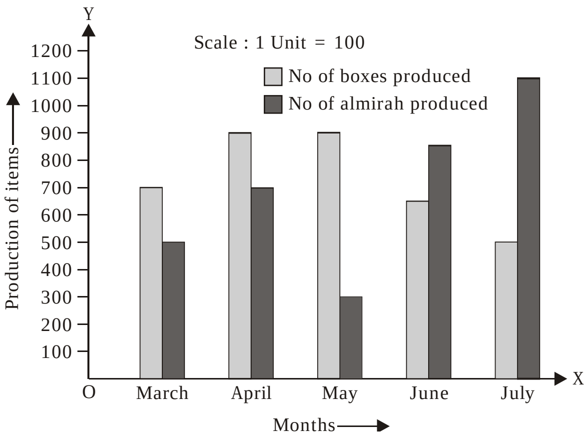
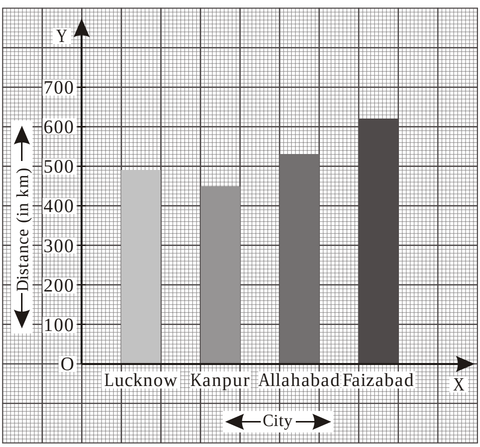

Y
40
35
30
25
20
15
10
5
O
% of buyers
A
B
C
D
E
Others
X
Brands

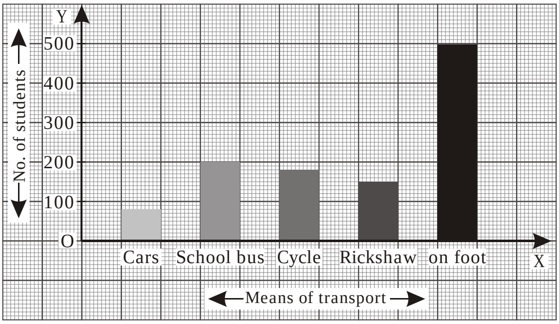
6.


Y
Scale : 1 Unit = 100
No of boxes produced
No of almirah produced
1200
1100
1000
900
800
700
600
500
400
300
200
100
Production of items
O
March
April
May
June
July
X
Months

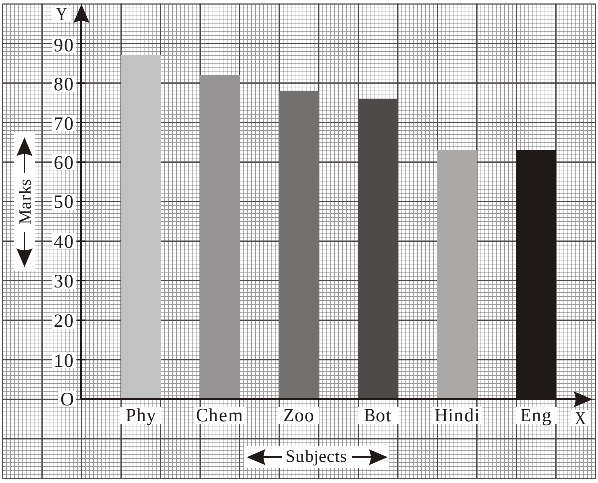
7.


Y
700
600
500
400
300
200
100
O
Distance (in km)
Lucknow
Kanpur
Allahabad
Faizabad
X
City

8.



9.



Exercise 16.3

1. (a) Impossible (b) certain (c) certain
(d) likely (e) likely (f) unlikely

2. (a) $\text{probability} = \dfrac{\text{No. of black beads}}{\text{Total No. of beads}} = \dfrac{3}{12} = \dfrac{1}{4}$

(b) $\text{probability} = \dfrac{\text{No.of while + No.of red beads}}{\text{Total no.of beads}}$

$= \dfrac{4+5}{12} = \dfrac{9}{12} = \dfrac{3}{4}$

(c) $\text{probability} = \dfrac{\text{No. of black + No.of white beads}}{\text{Total no. of beads}}$

$= \dfrac{3+4}{12} = \dfrac{7}{12}$

(d) $\text{probability} = \dfrac{\text{No. of black beads + No.of red beads}}{\text{Total no.of beads}}$

$$= \frac{3+5}{12} = \frac{8}{12} = \frac{2}{3}$$

3. (a) Total event of a dice = 6

$\because$ $(PCE) = \dfrac{\text{No. of favourable outcomes to E}}{\text{Total no. of possible outcomes}}$

$\therefore$ the probability of getting a '2' $= \dfrac{1}{6}$

(b) the probability of getting on even number $= \dfrac{3}{6} = \dfrac{1}{2}$

(c) the probability of getting a prime number $= \dfrac{3}{6} = \dfrac{1}{2}$

(d) the probability of getting a multiple of $3 = \dfrac{2}{6} = \dfrac{1}{3}$

(e) the probability of getting a factor of $6 = \dfrac{3}{6} = \dfrac{1}{2}$

4. Do it yourself.

5. (a) P (a composite number) $= \dfrac{2}{6} = \dfrac{1}{3}$

(b) P (a number less than 4) $= \dfrac{3}{6} = \dfrac{1}{2}$

(c) P (a number divisible by 3) $= \dfrac{2}{6} = \dfrac{1}{3}$

(d) P (a number between 2 and 6) $= \dfrac{3}{6} = \dfrac{1}{2}$

6. (a) the probability of getting a total of $12 = \dfrac{1}{36}$

(b) the probability of getting a total of $3 = \dfrac{2}{36} = \dfrac{1}{18}$

(c) the probability of getting a total of $8 = \dfrac{5}{36}$

7. (a) the total number of possible outcomes = 2^2

(b) the total number of possible outcomes = $2^3 = 8$

(c) the total number of possible outcomes = $2^5 = 32$

(d) the total number of possible outcomes = $2^{10} = 1024$

Multiple Choice Questions

Mark (3) against the correct answer in each of the following :

1. (b), 2. (c), 3. (b), 4. (d), 5. (b), 6. (a), 7. (b), 8. (b), 9. (d), 10. (b), 11. (c), 12. (a)

1 Rational Numbers

Exercise 1.1

1. Add the following rational numbers :

(a) $\frac{3}{2}$ and $\frac{-23}{2}$

$$=\frac{3}{2}+\left(\frac{-23}{2}\right)=\frac{3}{2}-\frac{23}{2}=\frac{3-25}{2}=\frac{-20}{2}=-10$$

(b) $\frac{-3}{8}$ and $\frac{5}{-12}$

$$=\frac{-3}{8}+\left(\frac{-5}{12}\right)=\frac{-3}{8}-\frac{5}{12}=\frac{-3\times3-5\times2}{24}=\frac{-9-10}{24}=\frac{-19}{24}$$

(c) $\frac{-8}{15}$ and $\frac{-7}{20}$

$$=\frac{-8}{15}+\left(\frac{-7}{20}\right)=\frac{-8}{15}-\frac{7}{20}=\frac{-8\times4-7\times3}{60}=\frac{-32-21}{60}$$

(d) $\frac{1}{3}$ and $\frac{1}{5}$

$$=\frac{1}{3}+\frac{1}{5}=\frac{5+3}{15}=\frac{8}{15}$$

(e) $\frac{1}{2}$ and $\frac{3}{5}$

$$=\frac{1}{2}+\frac{3}{5}=\frac{5\times1+2\times3}{10}=\frac{5+6}{10}=\frac{11}{10}$$

(f) $\frac{-2}{7}$ and $\frac{11}{21}$

$$=\frac{-2}{7}+\frac{11}{21}=\frac{-2\times3+11}{21}=\frac{-6+11}{21}=\frac{5}{21}$$

(g) $\frac{3}{4}$ and $\frac{-4}{5}$

$$=\frac{3}{4}+\left(\frac{-4}{5}\right)=\frac{3}{4}-\frac{4}{5}=\frac{3\times5-4\times4}{20}=\frac{15-16}{20}=\frac{-1}{20}$$

(h) $\frac{-8}{19}$ and $\frac{-2}{57}$

$$=\frac{-8}{19}+\left(\frac{-2}{57}\right)=\frac{-8}{19}-\frac{2}{57}=\frac{-8\times3-2\times1}{57}=\frac{-24-2}{57}=\frac{-26}{57}$$

2. Find the difference of the following :

(a) $\frac{12}{13}-\frac{7}{13}=\frac{12-7}{13}=\frac{5}{13}$

(b) $\frac{-6}{13}-\frac{-7}{15}=\frac{-6}{13}+\frac{7}{15}=\frac{-6\times15+7\times13}{13\times15}=\frac{-90+91}{195}=\frac{-1}{195}$

(c) $\frac{12}{35}-\frac{23}{105}=\frac{12\times3-23}{105}=\frac{36-23}{105}=\frac{13}{105}$

(d) $\frac{70}{100}-\frac{23}{150}=\frac{70\times3-23\times2}{300}=\frac{210-46}{300}=\frac{164}{300}=\frac{41}{75}$

(e) $\frac{6}{12}-\frac{3}{18}=\frac{6\times3-3\times2}{36}=\frac{18-6}{36}=\frac{12}{36}=\frac{1}{3}$

(f) $\frac{-7}{12}-\left(\frac{-4}{12}\right)=\frac{-7}{12}+\frac{4}{12}=\frac{-7+4}{12}=\frac{-3}{12}=\frac{-1}{4}$

(g) $\frac{2}{15}-\frac{1}{10}=\frac{2\times2-1\times3}{30}=\frac{4-3}{30}=\frac{1}{30}$

(h) $\frac{3}{25}-\left(\frac{-72}{75}\right)=\frac{3}{25}+\frac{72}{75}=\frac{3\times3+72\times1}{75}=\frac{9+72}{75}=\frac{81}{75}=\frac{27}{25}=1\frac{2}{25}$

3. Simplify :

(a) $\frac{-2}{3}+\frac{4}{9}-\frac{-5}{6}$

The L.C.M. of 3, 9, 6 is 18.

$$=\frac{-2}{3}+\frac{4}{9}+\frac{5}{6}$$

$$=\frac{-2\times6+4\times2+5\times3}{18}=\frac{-12+8+15}{18}=\frac{11}{18}$$

(b) $\frac{7}{8}-\frac{11}{12}+\frac{4}{15}$

The L.C.M. of 8, 12, 15 is 120.

$$=\frac{7\times15-11\times10+4\times8}{120}$$

$$=\frac{105-110+32}{120}=\frac{27}{120}=\frac{9}{40}$$

(c) $\frac{-1}{5}-\frac{4}{7}-\frac{5}{21}$

The L.C.M. of 5, 7 and 21 is 105.

$$=\frac{-1\times21-4\times15-5\times5}{105}$$

$$=\frac{-21-60-25}{105}$$

$$=\frac{106}{105}\text{ or }1\frac{1}{105}$$

(d) $\dfrac{5}{12}+\dfrac{-7}{18}-\dfrac{11}{24}$

The L.C.M. of 12, 18 and 24 is 72.

$$=\frac{5\times 6-7\times 4-11\times 3}{72}$$

$$=\frac{30-28-33}{72}$$

$$=\frac{-31}{72}$$

(e) $\dfrac{4}{3}+\dfrac{3}{5}+\dfrac{-2}{3}+\dfrac{-11}{5}$

$$=\frac{4}{3}+\frac{3}{5}-\frac{2}{3}-\frac{11}{5}$$

The L.C.M. of 3 and 5 is 15.

$$=\frac{4\times 5+3\times 3-2\times 5-11\times 3}{15}$$

$$=\frac{20+9-10-33}{15}$$

$$=\frac{29-43}{15}=\frac{-14}{15}$$

(f) $\dfrac{7}{6}+\dfrac{1}{2}-\dfrac{5}{4}+\dfrac{4}{3}$

The L.C.M. of 6, 2, 4 and 3 is 12.

$$=\frac{7\times 2+1\times 6-5\times 3+4\times 4}{12}$$

$$=\frac{14+6-15+16}{12}$$

$$=\frac{36-15}{12}=\frac{21}{12}=\frac{7}{4}=1\frac{3}{4}$$

4. Multiply :

(a) $\dfrac{4}{7}$ by $\dfrac{-2}{5}$

$$=\frac{4}{7}\times\left(\frac{-2}{5}\right)$$

$$=\frac{-4\times 2}{7\times 5}=\frac{-8}{35}$$

(b) $\dfrac{-9}{25}$ by $\dfrac{-5}{8}$

$$=\frac{-9}{25}\times\left(\frac{-5}{8}\right)$$

$$=\frac{-9\times -5}{25\times 8}=\frac{-9\times -1}{5\times 8}=\frac{+9}{40}$$

(c) $\dfrac{-5}{9}$ by $\dfrac{81}{35}$

$$=\frac{-5}{9}\times\frac{81}{35}$$

(d) $\dfrac{6}{7}$ by $\dfrac{-19}{18}$

$$=\frac{6}{7}\times\left(\frac{-19}{18}\right)$$

$$= \frac{-5\times 81}{9\times 35}$$

$$= \frac{-1\times 9}{1\times 7} = \frac{-9}{7}$$

(e) $\frac{8}{-11}$ by $\frac{33}{-24}$

$$= \frac{8}{-11}\times\frac{33}{-24}$$

$$= \frac{8\times 33}{-11\times -24}$$

$$= \frac{1\times 3}{-1\times -3} = 1$$

$$= \frac{-6\times 19}{7\times 18}$$

$$= \frac{-1\times 19}{7\times 3} = \frac{-19}{21}$$

(f) $\frac{-17}{3}$ by $\frac{-21}{85}$

$$= \frac{-17}{3}\times\frac{-21}{35}$$

$$= \frac{-17\times -21}{3\times 85}$$

$$= \frac{-1\times -7}{1\times 5} = \frac{7}{5}$$

5. Simplify :

(a) $\left(\frac{-3}{7}\times\frac{7}{5}\right)+\left(\frac{17}{15}\times\frac{3}{-34}\right)$

$$= \left(\frac{-3\times 7}{7\times 5}\right)+\left(\frac{1\times 1}{5\times -2}\right)$$

$$= \frac{-3}{5}+\frac{1}{(-10)} = \frac{-3}{5}-\frac{1}{10} = \frac{-3\times 2-1}{10} = \frac{-6-1}{10} = \frac{-7}{10}$$

(b) $\left(\frac{-7}{21}\times\frac{-3}{14}\right)\times\left(\frac{5}{14}\times\frac{-4}{15}\right)$

$$= \left(\frac{-7\times -3}{21\times 14}\right)\times\left(\frac{5\times -4}{14\times 15}\right)$$

$$= \left(\frac{+1}{1\times 14}\right)\times\left(\frac{1\times -2}{7\times 3}\right) = \frac{1}{14}\times\frac{-2}{21} = \frac{-1}{7\times 21} = \frac{-1}{147}$$

(c) $\left(\frac{3}{2}\times\frac{-7}{4}\right)-\left(\frac{-5}{2}\times\frac{3}{4}\right)$

$$= \left(\frac{3\times -7}{2\times 4}\right)-\left(\frac{-5\times 3}{2\times 4}\right)$$

$$= \frac{-21}{8}-\left(\frac{-15}{8}\right) = \frac{-21}{8}+\frac{15}{8} = \frac{-21+15}{8} = \frac{-6}{8} = \frac{-3}{4}$$

(d) $\left(\frac{9}{2}\times\frac{8}{3}\right)+\left(\frac{4}{3}\times\frac{5}{24}\right)-\left(\frac{3}{-5}\times\frac{-7}{6}\right)$

$$= \left(\frac{3\times 4}{1\times 1}\right)+\left(\frac{1\times 5}{3\times 6}\right)-\left(\frac{1\times 7}{5\times 2}\right)$$

$$= 12+\frac{5}{18}-\frac{7}{10}$$

$$= \frac{12\times 90 + 5\times 5 - 7\times 9}{90}$$

$$= \frac{108 + 25 - 63}{90} = \frac{133-63}{90} = \frac{70}{90} = \frac{7}{9}$$

6. Divide :

(a) -4 by $\frac{-3}{5}$

$$= -4 \div \left(\frac{-3}{5}\right)$$

$$= -4 \times \left(\frac{-5}{3}\right)$$

$$= \frac{-4\times -5}{3} = \frac{20}{3} = 6\frac{2}{3}$$

(b) $\frac{-1}{8}$ by $\frac{3}{4}$

$$= \frac{-1}{8} \div \frac{3}{4}$$

$$= \frac{-1}{8} \times \frac{4}{3}$$

$$= \frac{-1\times 4}{8\times 3} = \frac{-1\times 1}{2\times 3} = \frac{-1}{6}$$

(c) $\frac{15}{7}$ by $\frac{-5}{7}$

$$= \frac{15}{7} \div \left(\frac{-5}{7}\right)$$

$$= \frac{15}{7} \times \left(\frac{-7}{5}\right)$$

$$= \frac{-15\times 7}{7\times 5}$$

$$= \frac{-3\times 1}{1\times 1} = -3$$

(d) $\frac{2}{3}$ by $\frac{-4}{5}$

$$= \frac{2}{3} \div \left(\frac{-4}{5}\right)$$

$$= \frac{2}{3} \times \left(\frac{-5}{4}\right)$$

$$= \frac{-2\times 5}{3\times 4}$$

$$= \frac{-1\times 5}{3\times 2} = \frac{-5}{6}$$

(e) $\frac{-3}{13}$ by $\frac{-4}{65}$

$$= \frac{-3}{13} \div \left(\frac{-4}{65}\right)$$

$$= \frac{-3}{13} \times \left(\frac{-65}{4}\right)$$

$$= \frac{+3\times 65}{13\times 4}$$

$$= \frac{3\times 5}{1\times 4} = \frac{15}{4} = 3\frac{3}{4}$$

(f) $\frac{-6}{7}$ by -15

$$= \frac{-6}{7} \div (-15)$$

$$= \frac{-6}{7} \times \frac{-1}{15}$$

$$= \frac{+6}{7\times 15}$$

$$= \frac{2}{7\times 5} = \frac{2}{35}$$

7. Find the absolute value of the following :

(a) $\left|\frac{-13}{15}\right| = \frac{13}{15}$

(b) $-\left|\frac{-12}{27}\right| = \frac{-12}{27} = \frac{-4}{9}$

(c) $\left|\frac{5}{3} + \frac{-7}{6}\right| = \left|\frac{5}{3} - \frac{7}{6}\right| = \left|\frac{5\times 2 - 7\times 1}{6}\right| = \left|\frac{10-7}{6}\right| = \left|\frac{3}{6}\right| = \frac{1}{2}$

(d) $\left|\frac{2}{3}-\frac{3}{4}\right| = \left|\frac{2\times4-3\times3}{12}\right| = \left|\frac{8-9}{12}\right| = \left|\frac{-1}{12}\right| = \frac{1}{12}$

8. Verify $|x\times y| = |x|\times|y|$ for $x=\frac{3}{4}$ and $y=\frac{-1}{3}$.

$$|x\times y| = \left|\frac{3}{4}\times\left(\frac{-1}{3}\right)\right|$$

$$= \left|\frac{3\times(-1)}{4\times3}\right| = \left|\frac{-1}{4}\right| = \frac{1}{4}$$

$$|x|\times|y| = \left|\frac{3}{4}\right|\times\left|\frac{-1}{3}\right|$$

$$= \frac{3}{4}\times\frac{1}{3} = \frac{3\times1}{4\times3} = \frac{1}{4}$$

So, $|x\times y| = |x|\times|y|$

L.H.S. = R.H.S. (verified)

9. The sum of two rational numbers is $\frac{1}{2}$. If one of them is $\frac{3}{4}$, find the other rational numbers.

Let, the other number be *x*.

Then, $$x+\frac{3}{4} = \frac{1}{2}$$

$$x = \frac{1}{2}-\frac{3}{4}$$

$$x = \frac{2-3}{4} = \frac{-1}{4}$$

Hence, the required number is $\frac{-1}{4}$.

10. The product of two rational numbers is $\left(-\frac{15}{7}\right)$. If one of them is $\left(-\frac{10}{21}\right)$, find the other number.

Let, the other rational number be *x*.

Then, $$x\times\left(\frac{-10}{21}\right) = \frac{-15}{7}$$

$$x = \left(\frac{-15}{7}\right)\div\left(\frac{-10}{21}\right)$$

$$= \left(\frac{-15}{7}\right)\times\left(\frac{-21}{10}\right)$$

$$= \frac{-15\times-21}{7\times10}$$

$$= \frac{-3\times -3}{1\times 2} = \frac{+9}{2}$$

Hence, $\frac{9}{2}$ is the required number.

Exercise 1.2

1. Write the additive inverse of each of the following :

(a) The additive inverse of $\frac{5}{8}$ is $\frac{-5}{8}$.

(b) The additive inverse of $-\frac{5}{9}$ is $-\left(\frac{-5}{9}\right) = \frac{5}{9}$.

(c) The additive inverse of $\frac{19}{-20}$ is $-\left(\frac{19}{-20}\right) = \frac{19}{20}$.

(d) The additive inverse of $\frac{15}{-37}$ is $-\left(\frac{15}{-37}\right) = \frac{15}{37}$.

2. Name the property used in each of the following :

(a) Existence of additive inverse. (b) Existence of additive identity.

(c) Commutative property of addition.

(d) Closure property of addition. (e) Associative property of addition.

3. Verify that $[-(-x)] = x$, for each of the following :

(a) $x = \frac{11}{3}$

$$-x = \frac{-11}{3}$$

$$-(-x) = -\left(-\frac{11}{3}\right) = +\frac{11}{3} = x$$

So, $[-(-x)] = x$

L.H.S. = R.H.S. (verified)

(b) $x = \frac{-7}{11}$

$$-x = -\left(\frac{-7}{11}\right) = +\frac{7}{11}$$

$$-(-x) = \frac{-7}{11} = x$$

So, $[-(-x)] = x$

L.H.S. = R.H.S. (verified)

4. Verify the closure property of addition for the following integers :

(a) $\frac{-5}{9}$ and $\frac{8}{9}$

Let, $a = \frac{-5}{9}$ and $b = \frac{8}{9}$ be two integers.

Then, $a + b = \frac{-5}{9} + \frac{8}{9} = \frac{-5+8}{9} = \frac{3}{9} = \frac{1}{3}$ be also an integer.

(b) $\frac{-19}{18}$ and $\frac{-11}{12}$

Let, $a = \frac{-19}{18}$ and $b = \frac{-11}{12}$ be two integers.

Then, $a + b = \frac{-19}{18} + \left(\frac{-11}{12}\right)$

$$= \frac{-19}{18} - \frac{11}{12} = \frac{-19 \times 2 - 11 \times 3}{36}$$

$= \frac{-38-33}{36} = \frac{-71}{36}$ be also an integer.

5. Verify that $x + y = y + x$, for each of the following :

(a) $x = \frac{-3}{5}$ and $y = \frac{-7}{10}$

$$x + y = \frac{-3}{5} + \left(\frac{-7}{10}\right)$$

$$= \frac{-3}{5} - \frac{7}{10}$$

$$= \frac{-3 \times 2 - 7}{10} = \frac{-6-7}{10} = \frac{-13}{10} = -1\frac{3}{10}$$

$$y + x = \frac{-7}{10} + \left(\frac{-3}{5}\right)$$

$$= \frac{-7}{10} - \frac{3}{5}$$

$$= \frac{-7 - 3 \times 2}{10} = \frac{-7-6}{10} = \frac{-13}{10} = -1\frac{3}{10}$$

Hence, $x + y = y + x$

L.H.S. = R.H.S. (verified)

(b) $x = \frac{6}{7}$ and $y = \frac{-11}{14}$

$$x + y = \frac{6}{7} + \left(\frac{-11}{14}\right)$$

$$= \frac{6}{7} - \frac{11}{14} = \frac{6 \times 2 - 11}{14} = \frac{12-11}{14} = \frac{1}{14}$$

$$y + x = \frac{-11}{14} + \frac{6}{7} = \frac{-11 + 6 \times 2}{14} = \frac{-11+12}{14} = \frac{1}{14}$$

Hence, $x + y = y + x$

L.H.S. = R.H.S. (verified)

6. For each of the following, check that $x - y \neq y - x$:

(a) $x = \frac{-3}{2}$ and $y = \frac{4}{5}$

$$x - y = \frac{-3}{2} - \frac{4}{5}$$

$$= \frac{-3 \times 5 - 4 \times 2}{10} = \frac{-15-8}{10}$$

$$= \frac{-23}{10}$$

$$y-x=\frac{4}{5}-\left(\frac{-3}{2}\right)$$

$$=\frac{4}{5}+\frac{3}{2}=\frac{4\times2+3\times5}{10}=\frac{8+15}{10}=\frac{23}{10}$$

$\because \quad \frac{-23}{10}\neq\frac{23}{10}$

$\therefore \quad x-y\neq y-x$ (verified)

(b) $x=\frac{5}{7}$ and $y=\frac{-8}{21}$

$$x-y=\frac{5}{7}-\left(\frac{-8}{21}\right)$$

$$=\frac{5}{7}+\frac{8}{21}=\frac{5\times3+8}{21}=\frac{15+8}{21}=\frac{23}{21}$$

$$y-x=\frac{-8}{21}-\frac{5}{7}$$

$$=\frac{-8-5\times3}{21}=\frac{-8-15}{21}=\frac{-23}{21}$$

$\because \quad \frac{23}{21}\neq\frac{-23}{21}$

$\therefore \quad x-y\neq y-x$ (verified)

7. Verify the associative property of addition for the following rational numbers :

(a) $\frac{-2}{3},\frac{5}{4},\frac{7}{12}$

Let, $a=\frac{-2}{3}, b=\frac{5}{4}$ and $c=\frac{7}{12}$

$$(a+b)+c=\left(\frac{-2}{3}+\frac{5}{4}\right)+\frac{7}{12}$$

$$=\left(\frac{-8+15}{12}\right)+\frac{7}{12}$$

$$=\frac{7}{12}+\frac{7}{12}=\frac{7+7}{12}=\frac{14}{12}=\frac{7}{6}$$

$$a+(b+c)=\frac{-2}{3}+\left(\frac{5}{4}+\frac{7}{12}\right)$$

$$=\frac{-2}{3}+\left(\frac{5\times3+7}{12}\right)$$

$$=\frac{-2}{3}+\left(\frac{15+7}{12}\right)$$

$$=\frac{-2}{3}+\frac{22}{12}=\frac{-2}{3}+\frac{11}{6}=\frac{-2\times2+11}{6}=\frac{-4+11}{6}=\frac{7}{6}$$

Hence, $(a+b)+c=a+(b+c)$

L.H.S. = R.H.S. (verified)

(b) $\frac{3}{5}, \frac{3}{10}, \frac{7}{15}$

Let, $a = \frac{3}{5}, b = \frac{3}{10}$ and $c = \frac{7}{15}$

$$(a+b)+c = \left(\frac{3}{5}+\frac{3}{10}\right)+\frac{7}{15}$$

$$= \left(\frac{6+3}{10}\right)+\frac{7}{15}$$

$$= \frac{9}{10}+\frac{7}{15} = \frac{9\times 3+7\times 2}{30}$$

$$= \frac{27+14}{30} = \frac{41}{30}$$

$$a+(b+c) = \frac{3}{5}+\left(\frac{3}{10}+\frac{7}{15}\right)$$

$$= \frac{3}{5}+\left(\frac{3\times 3+7\times 2}{30}\right)$$

$$= \frac{3}{5}+\left(\frac{9+14}{30}\right)$$

$$= \frac{3}{5}+\frac{23}{30} = \frac{3\times 6+23}{30}$$

$$= \frac{18+23}{30} = \frac{41}{30}$$

Hence, $a+(b+c) = (a+b)+c$

L.H.S. = R.H.S. (verified)

8. For $x = \frac{-9}{11}$ and $y = \frac{5}{7}$, verify that $(-x)+(-y) = -(x+y)$.

$$x = \frac{-9}{11} \text{ and } y = \frac{5}{7}$$

$$(-x) = -\left(\frac{-9}{11}\right) = \frac{+9}{11}$$

$$(-y) = -\frac{5}{7}$$

$$(-x)+(-y) = \frac{9}{11}+\left(-\frac{5}{7}\right)$$

$$= \frac{9}{11}-\frac{5}{7}$$

$$= \frac{9\times 7-11\times 5}{77}$$

$$= \frac{63-55}{77} = \frac{8}{77}$$

$$x+y = \frac{-9}{11}+\frac{5}{7}$$
$$= \frac{-9\times 7+11\times 5}{77}$$
$$= \frac{-63+55}{77} = \frac{-8}{77}$$
$$= -(x+y) = -\left(\frac{-8}{77}\right) = \frac{+8}{77}$$
$$(-x)+(-y) = -(x+y)$$

L.H.S. = R.H.S. (verified)

9. Rearrange suitably and find the sum :

(a) $\frac{3}{7}+\frac{-5}{11}+\frac{-5}{14}+\frac{3}{11}$

$$= \frac{3}{7}-\frac{5}{14}-\frac{5}{11}+\frac{3}{11}$$
$$= \frac{6-5}{14}+\frac{-5+3}{11} = \frac{1}{14}+\frac{-2}{11} = \frac{1}{14}-\frac{2}{11} = \frac{11-28}{154} = \frac{-17}{154}$$

(b) $-5+\frac{3}{10}+\frac{3}{7}+(-3)+\frac{5}{14}+\frac{7}{10}$

$$= -5+(-3)+\frac{3}{10}+\frac{7}{10}+\frac{3}{7}+\frac{5}{14}$$
$$= -5-3+\frac{3+7}{10}+\frac{6+5}{14}$$
$$= -8+\frac{10}{10}+\frac{11}{14}$$
$$= -8+1+\frac{11}{14}$$
$$= -7+\frac{11}{14} = \frac{-7\times 14+11}{14} = \frac{-98+11}{14} = \frac{-87}{14} = -6\frac{3}{14}$$

10. If $x = \frac{2}{3}$, $y = \frac{13}{21}$ and $z = \frac{5}{7}$ check that $(x-y)-z \neq x-(y-z)$.

$x = \frac{2}{3}$, $y = \frac{13}{21}$ and $z = \frac{5}{7}$

$$(x-y)-z = \left(\frac{2}{3}-\frac{13}{21}\right)-\frac{5}{7}$$
$$= \left(\frac{2\times 7-13}{21}\right)-\frac{5}{7}$$
$$= \left(\frac{14-13}{21}\right)-\frac{5}{7}$$
$$= \frac{1}{21}-\frac{5}{7} = \frac{1-5\times 3}{21} = \frac{1-15}{21} = \frac{-14}{21} = \frac{-2}{3}$$

$$x-(y-z)=\frac{2}{3}-\left(\frac{13}{21}-\frac{5}{7}\right)$$
$$=\frac{2}{3}-\left(\frac{13-5\times3}{21}\right)$$
$$=\frac{2}{3}-\left(\frac{13-15}{21}\right)$$
$$=\frac{2}{3}-\left(\frac{-2}{21}\right)=\frac{2}{3}+\frac{2}{21}$$
$$=\frac{2\times7+2\times1}{21}=\frac{14+2}{21}=\frac{16}{21}$$

$\because \quad -\frac{2}{3}\neq\frac{16}{21}$

$\therefore \quad (x-y)-z\neq x-(y-z)$ (verified)

Exercise 1.3

1. Find the multiplicative inverse of each of the following :

(a) The multiplicative inverse of -1 is -1.

(b) The multiplicative inverse of 5 is $\frac{1}{5}$.

(c) The multiplicative inverse of $-2\times\frac{-3}{5}$ is $\frac{5}{-2\times-3}=\frac{5}{6}$.

(d) The multiplicative inverse of $\frac{-5}{8}\times\frac{16}{15}$ is $\frac{-8\times15}{5\times16}$

2. Write the name of the property used in each of the following :

(a) Distributive property of multiplication over Addition.

(b) Existence of multiplicative Inverse.

(c) Commutative property of multiplication.

(d) Associative property of multiplication.

(e) Existence of multiplicative Identity.

3. Find the product and verify the commutative property for multiplication of rational numbers :

(a) $\frac{1}{9}\times\frac{5}{11}$

$=\frac{1\times5}{9\times11}=\frac{5}{99}$ and $\frac{5}{11}\times\frac{1}{9}=\frac{5\times1}{11\times9}=\frac{5}{99}$

Hence, L.H.S. = R.H.S.

So, community property holds good.

(b) $\left(\frac{-11}{19}\right)\times\frac{5}{7}$ and $\frac{5}{7}\times\left(\frac{-11}{19}\right)$

$$=\frac{-11\times5}{19\times7}=\frac{5\times(-11)}{7\times19}=\frac{-55}{133}=\frac{-55}{133}$$

Hence, L.H.S. = R.H.S.

So, commutative property holds good.

(c) $\frac{3}{5}\times\left(\frac{-7}{8}\right)$ and $\left(\frac{-7}{8}\right)\times\frac{3}{5}$

$$=\frac{3\times(-7)}{5\times 8}=\frac{(-7)\times 3}{8\times 5}$$

$$=\frac{-21}{40}=\frac{-21}{40}$$

Hence, L.H.S. = R.H.S.

So, commutative property holds good.

(d) $\frac{-5}{9}\times\left(\frac{-11}{32}\right)$ and $\left(\frac{-11}{32}\right)\times\left(\frac{-5}{9}\right)$

$$=\frac{(-5)\times(-11)}{9\times 32}=\frac{(-11)\times(-5)}{32\times 9}=\frac{+55}{288}=\frac{+55}{288}$$

Hence, L.H.S. = R.H.S.

So, commutative property holds good.

(e) $\frac{24}{35}\times\left(\frac{-14}{15}\right)$ and $\left(\frac{-14}{15}\right)\times\frac{24}{35}$

$$=\frac{24\times(-14)}{35\times 15}$$

$$=\frac{(-14)\times 24}{15\times 35}=\frac{-8\times 2}{5\times 5}=\frac{-2\times 8}{5\times 5}=\frac{-16}{25}=\frac{-16}{25}$$

Hence, L.H.S. = R.H.S.

So, commutative property holds good.

(f) $\frac{-21}{16}\times\left(\frac{-18}{23}\right)$ and $\left(\frac{-18}{23}\right)\times\left(\frac{-21}{16}\right)$

$$=\frac{-21\times(-18)}{16\times 23}$$

$$=\frac{(-18)\times(-21)}{23\times 16}$$

$$=\frac{-21\times(-9)}{8\times 23}$$

$$=\frac{(-9)\times(-21)}{23\times 8}=\frac{+189}{184}=\frac{+189}{184}$$

Hence, L.H.S. = R.H.S.

So, commutative property holds good.

4. Find the product and verify the associative property for multiplication of rational numbers.

(a) $\frac{1}{5}\times\left(\frac{-7}{1}\times\frac{6}{11}\right)$ and $\left(\frac{1}{5}\times\frac{-7}{1}\right)\times\frac{6}{11}$

$$= \frac{1}{5} \times \left(\frac{-42}{11}\right)$$

$$= \frac{-7}{5} \times \frac{6}{11}$$

$$= \frac{-42}{55} = \frac{-42}{55}$$

Hence, L.H.S. = R.H.S.

So, Associative property holds good.

(b) $\left(\frac{7}{23} \times \frac{5}{19}\right) \times \frac{1}{2}$ and $\frac{7}{23} \times \left(\frac{5}{19} \times \frac{1}{2}\right)$

$$= \frac{35}{437} \times \frac{1}{2}$$

$$= \frac{7}{23} \times \left(\frac{5}{28}\right)$$

$$= \frac{35}{874} = \frac{35}{874}$$

Hence, L.H.S. = R.H.S.

So, Associative property holds good.

(c) $\left(\frac{-9}{14} \times \frac{-1}{7}\right) \times \left(\frac{-2}{3}\right)$ and $\frac{-9}{14} \times \left(\frac{-1}{7} \times \frac{-2}{3}\right)$

$$= \frac{+9}{98} \times \frac{-2}{3}$$

$$= \frac{-9}{14} \times \left(\frac{+2}{21}\right)$$

$$= \frac{-3}{49} = \frac{-3 \times 1}{7 \times 7} = \frac{-3}{49}$$

Hence, L.H.S. = R.H.S.

So, Associative property holds good.

5. Simplify the following and verify the distributive property of multiplication over addition :

(a) $\frac{3}{2} \times \left(\frac{-6}{7} + \frac{1}{5}\right)$ and $\frac{3}{2} \times \left(\frac{-6}{7}\right) + \frac{3}{2} \times \frac{1}{5}$

$$= \frac{3}{2} \times \left(\frac{-6 \times 5 + 7 \times 1}{35}\right)$$

$$= \frac{3 \times (-3)}{7} + \frac{3}{10}$$

$$= \frac{3}{2} \times \left(\frac{-30 + 7}{35}\right)$$

$$= \frac{-9}{7} + \frac{3}{10}$$

$$= \frac{3}{2} \times \frac{-23}{35}$$

$$= \frac{-9\times 10+7\times 3}{70} = \frac{-69}{70} = \frac{-90+21}{70} = \frac{-69}{70}$$

Hence, L.H.S. = R.H.S.

So, Distributive property of multiplication holds good.

(b) $2\times\left[\frac{1}{9}+\left(\frac{-6}{11}\right)\right]$ and $2\times\frac{1}{9}+2\times\left(\frac{-6}{11}\right)$

$$= 2\times\left[\frac{11-54}{99}\right] = \frac{2}{9}+\left(\frac{-12}{11}\right)$$

$$= 2\times\left(\frac{43}{99}\right) = \frac{86}{99} = \frac{22-108}{99} = \frac{86}{99}$$

Hence, L.H.S. = R.H.S.

So, Distributive property of multiplication holds good.

(c) $0\times\left(\frac{0}{1}+\frac{3}{5}\right)$ and $0\times\frac{0}{1}+0\times\frac{3}{5}$

$$= 0\times\left(0+\frac{3}{5}\right) = 0+0$$

$$= 0\times\frac{3}{5} = 0 = 0$$

Hence, L.H.S. = R.H.S.

So, Distributive property holds good.

6. Find $(x+y)\div(x-y)$, for each of the following :

(a) $x=\frac{2}{7}$ and $y=\frac{4}{3}$

$x+y=\frac{2}{7}+\frac{4}{3}$ and $x-y=\frac{2}{7}-\frac{4}{3}$

$$= \frac{6+28}{21} = \frac{6-28}{21}$$

$$= \frac{34}{21} = \frac{-24}{21}$$

$\therefore \quad (x+y)\div(x-y) = \frac{34}{21}\div\left(\frac{-24}{21}\right)$

$$= \frac{\frac{34}{21}}{\frac{-24}{21}} = \frac{34}{-24} = \frac{-17}{12} = -1\frac{5}{12}$$

(b) $x=\frac{5}{4}$ and $y=\frac{3}{2}$

$$x+y=\frac{5}{4}+\frac{3}{2}=\frac{5+6}{4}=\frac{11}{4}$$

and $(x-y)=\frac{5}{4}-\frac{3}{2}=\frac{5-6}{4}=\frac{-1}{4}$

$\therefore \quad (x+y)-(x-y)=\frac{11}{4}\div\left(\frac{-1}{4}\right)=\frac{\frac{11}{4}}{\left(\frac{-1}{4}\right)}=\frac{11}{-1}=-11$

7. Fil in the blanks :

(a) $\left(\frac{-23}{17}\right)\times\left(\frac{18}{35}\right)=\left(\frac{18}{25}\right)\times\left(\frac{-23}{17}\right)$

(b) $-38\times\left(\frac{-7}{19}\right)\left(\frac{-7}{19}\right)\times(-38)$

(c) $\left(\frac{15}{7}\times\frac{-21}{10}\right)\times\left(\frac{-5}{6}\right)=\left(\frac{15}{7}\right)\times\left[\left(\frac{-21}{10}\right)\times\left(\frac{-5}{6}\right)\right]$

(d) $\frac{-12}{15}\times\left(\frac{4}{15}\times\frac{25}{-16}\right)=\left(\frac{-12}{15}\times\frac{25}{-16}\right)\times\left(\frac{4}{15}\right)$

(e) $\frac{-4}{5}\times\left(\frac{5}{7}\times\frac{-8}{9}\right)=\left(\frac{-4}{5}\times\frac{5}{7}\right)\times\frac{-8}{9}$

(f) $\frac{2}{5}\div\frac{2}{5}=(1)$

(g) $\frac{4}{11}\div\left(\frac{-4}{11}\right)=-1$

(h) $\frac{-11}{15}\div\left(\frac{11}{15}\right)=-1$

8. Verify the property $x\times y=y\times x$ by taking :

(a) $x=\frac{-2}{5},\ y=\frac{3}{7}$

$x\times y=\left(\frac{-2}{5}\right)\times\frac{3}{7}$ and $y\times x=\frac{3}{7}\times\left(\frac{-2}{5}\right)$

$$=\frac{(-2)\times 3}{5\times 7}=\frac{3\times(-2)}{7\times 5}=\frac{-6}{35}=\frac{-6}{35}$$

Hence, L.H.S. = R.H.S.

So, $(x\times y)=(y\times x)$ (verify)

(b) $x=\frac{12}{25},\ y=\frac{-15}{4}$

$x\times y=\frac{12}{25}\times\left(\frac{-15}{4}\right)$ and $y\times x=\left(\frac{-15}{4}\right)\times\frac{12}{25}$

$$=\frac{12\times(-15)}{25\times 4}$$

$$= \frac{(-15) \times 12}{4 \times 25}$$
$$= \frac{3 \times (-3)}{5 \times 1}$$
$$= \frac{(-3) \times 3}{1 \times 5}$$
$$= \frac{-9}{5} = \frac{-9}{5}$$

Hence, L.H.S. = R.H.S.

So, $x \times y = y \times x$ (verify)

9. Verify the property $(x \times y) \times z = x \times (y \times z)$ by taking :

(a) $x = \frac{9}{5}, y = \frac{-11}{5}, z = \frac{1}{3}$

$$(x \times y) \times z = \left(\frac{9}{5} \times \frac{-11}{5}\right) \times \frac{1}{3} = \frac{-99}{25} \times \frac{1}{3} = \frac{-33}{25}$$

and, $x \times (y \times z) = \frac{9}{5} \times \left(\frac{-11}{5} \times \frac{1}{3}\right) = \frac{9}{5} \times \left(\frac{-11}{15}\right) = \frac{-99}{75} = \frac{-33}{25}$

Hence, L.H.S. = R.H.S.

So, $(x \times y) \times z = x \times (y \times z)$ (verify)

(b) $x = \frac{-3}{7}, y = \frac{7}{12}, z = -9$

$$(x \times y) \times z = \left(\frac{-3}{7} \times \frac{7}{12}\right) \times (-9)$$
$$= \left(\frac{-3 \times 7}{7 \times 12}\right) \times (-9) = \frac{-3}{12} \times (-9) = \frac{+9}{4}$$

and, $x \times (y \times z) = \frac{-3}{7} \times \left(\frac{7}{12} \times -9\right)$

$$= \frac{-3}{7} \times \left(\frac{7 \times -3}{4}\right)$$
$$= \frac{-3 \times -21}{7 \times 4} = \frac{+9}{4}$$

Hence, L.H.S. = R.H.S.

So, $x \times (y \times z) = (x \times y) \times z$ (verify)

10. Verify the property $x \times (y + z) = (x \times y) + (x \times z)$ by taking :

(a) $x = \frac{-3}{5}, y = \frac{7}{12}, z = \frac{-5}{18}$

$$x \times (y + z) = \frac{-3}{5} \times \left(\frac{7}{12} + \frac{-5}{8}\right)$$

$$= \frac{-3}{5} \times \left(\frac{7}{12} - \frac{5}{8}\right)$$

$$= \frac{-3}{5} \times \left(\frac{14-15}{24}\right)$$

$$= \frac{-3}{5} \times \left(\frac{-1}{24}\right)$$

$$= \frac{-1\times -1}{5\times 8} = \frac{+1}{40}$$

and $(x \times y) + (x \times z) = \left(\frac{-3}{5} \times \frac{7}{12}\right) + \left(\frac{-3}{5} \times \frac{-5}{8}\right)$

$$= \left(\frac{-1\times 7}{5\times 4}\right) + \left(\frac{-3\times -1}{1\times 8}\right)$$

$$= \frac{-7}{20} + \frac{3}{8}$$

$$= \frac{-14+15}{40} = \frac{1}{40}$$

Hence, L.H.S. = R.H.S.

So, $x \times (y+z) = (x \times y) + (x \times z)$ (verify)

(b) $x = -2,\ y = \frac{-25}{8},\ z = \frac{-35}{12}$

$x \times (y+z) = -2 \times \left(\frac{-25}{8} + \frac{-35}{12}\right)$

$$= -2 \times \left(\frac{-25}{8} - \frac{35}{12}\right)$$

$$= -2 \times \left(\frac{-75-70}{24}\right)$$

$$= -2 \times \left(\frac{-145}{24}\right) = -1 \times \left(\frac{-145}{12}\right) = \frac{+145}{12}$$

and $(x \times y) + (x \times z) = \left(-2 \times \frac{-25}{8}\right) + \left(-2 \times \frac{-35}{12}\right)$

$$= \left(\frac{-1\times -25}{4}\right) + \left(\frac{-1\times -35}{6}\right)$$

$$= \frac{25}{4} + \frac{35}{6} = \frac{75+70}{12} = \frac{145}{12}$$

Hence, L.H.S. = R.H.S.

So, $x \times (y+z) = (x \times y) + (x \times z)$ (verify)

Exercise 1.4

1. Find a rational number between $(-1+1) \div 2$ lies between -1 and 1.

Now, $\dfrac{-1+1}{2}=\dfrac{0}{2}=0$

Thus, the required number is 0.

So, $-1<0<1$

Hence, 0 is a rational number between -1 and 1.

2. Find a rational number between $\left(\dfrac{1}{3}+\dfrac{1}{2}\right)\div 2$ lies between $\dfrac{1}{3}$ and $\dfrac{1}{2}$.

Now, $\left(\dfrac{1}{3}+\dfrac{1}{2}\right)\div 2=\left(\dfrac{2+3}{6}\right)\div 2$

$=\dfrac{5}{6}\times\dfrac{1}{2}=\dfrac{5}{12}$

Thus, the required number is $\dfrac{5}{12}$.

So, $\dfrac{1}{2}>\dfrac{5}{12}>\dfrac{1}{3}$.

Hence, $\dfrac{5}{12}$ is a rational number between $\dfrac{1}{2}$ and $\dfrac{1}{3}$.

3. Find two rational numbers between $\left(-\dfrac{1}{2}+\dfrac{-3}{4}\right)\div 2$ lies between $\dfrac{-1}{2}$ and $\dfrac{-3}{4}$.

Now, $\left(\dfrac{-1}{2}+\dfrac{-3}{4}\right)\div 2=\left(\dfrac{-1}{2}-\dfrac{3}{4}\right)\div 2$

$$=\left(\dfrac{-2-3}{4}\right)\div 2$$

$$=\dfrac{-5}{4}\times\dfrac{1}{2}=\dfrac{-5}{8}$$

$$\dfrac{-1}{2}=\dfrac{-1\times 4}{2\times 4}=\dfrac{-4}{8} \text{ and } \dfrac{-3}{4}=\dfrac{-3\times 2}{4\times 2}=\dfrac{-6}{8}$$

Now, a rational number between

$$\dfrac{-3}{4} \text{ and } \dfrac{-6}{8}=\left(\dfrac{-3}{4}-\dfrac{6}{8}\right)\div 2$$

$$=\left(\dfrac{-6-6}{8}\right)\div 2=\dfrac{-12}{8}\times\dfrac{1}{2}=\dfrac{-12}{16}$$

Equivalent number to $\dfrac{-3}{4}=\dfrac{-3\times 4}{4\times 4}=\dfrac{-12}{16}$

and $\dfrac{-1}{2}=\dfrac{1\times 2}{2\times 2}=\dfrac{-8}{16}$

So, $\dfrac{-12}{16}<\dfrac{-11}{16}<\dfrac{-10}{16}<\dfrac{-9}{16}<\dfrac{-8}{16}$

Hence, $\frac{-11}{16}, \frac{-10}{16}$ and $\frac{-9}{16}$ are rational numbers between $\frac{-1}{2}$ and $\frac{-3}{4}$.

4. Find three rational numbers between to -1 is $-1\times\frac{3}{3}=\frac{-3}{3}$

and $1=1\times\frac{3}{3}=\frac{3}{3}$

So, $\frac{-3}{3}<\frac{-2}{3}<\frac{-1}{3}<0<\frac{1}{3}<\frac{2}{3}<\frac{3}{3}$

Hence, $\frac{-2}{3}, \frac{1}{3}$, 0 and $\frac{2}{3}$ are lies between $-1$and 1.

5. Equivalent numbers to -1 and $\frac{-1}{2}$

$-1=-1\times\frac{8}{8}=\frac{-8}{8}$ and$\frac{-1}{2}=\frac{-1}{2}\times\frac{4}{4}=\frac{-4}{8}$

So, $\frac{-8}{8}<\frac{-7}{8}<\frac{-6}{8}<\frac{-5}{8}<\frac{-4}{8}$

Hence, $\frac{-7}{8}, \frac{-6}{8}, \frac{-5}{8}$ and $\frac{-11}{16}$ are lies between $-1$and $\frac{-1}{2}$.

6. Equivalent numbers to $\frac{3}{4}$ and $\frac{2}{3}$

$\frac{3}{4}=\frac{3\times9}{4\times9}=\frac{27}{36}$ and $\frac{2}{3}=\frac{2\times12}{3\times12}=\frac{24}{36}$

$\frac{27}{36}=\frac{27\times2}{36\times2}=\frac{54}{72}$ and $\frac{24}{36}=\frac{24\times2}{36\times2}=\frac{48}{72}$

So, $\frac{48}{72}<\frac{49}{72}<\frac{50}{72}<\frac{51}{72}<\frac{52}{72}<\frac{53}{72}<\frac{54}{72}$.

Hence, $\frac{49}{72}, \frac{50}{72}, \frac{51}{72}$ and $\frac{52}{72}$ are lies between $\frac{3}{4}$ and $\frac{2}{3}$.

7. Equivalent number to $\frac{3}{8}$ and $-\frac{1}{2}$

$\frac{3}{8}=\frac{3}{8}$ and $\frac{-1}{2}=\frac{-1\times4}{2\times4}=\frac{-4}{8}$

Hence, $\frac{-4}{8}<\frac{-3}{8}<\frac{-2}{8}<\frac{-1}{8}<0<\frac{1}{8}<\frac{2}{8}<\frac{3}{8}<\frac{4}{8}$

So, $\frac{-3}{8}, \frac{-2}{8}, \frac{-1}{8}$, 0, $\frac{1}{8}, \frac{2}{8}$ and $\frac{3}{8}$ are lies between $\frac{-1}{2}$ and $\frac{3}{8}$.

8. We know that : $\frac{-4}{11}<\frac{-3}{11}<\frac{-2}{11}<\frac{-1}{11}<0<\frac{1}{11}<\frac{2}{11}<\frac{3}{11}<\frac{4}{11}<\frac{5}{11}<\frac{6}{11}<\frac{7}{11}$

$\therefore$ ten rational number between $\frac{-1}{2}$ and $\frac{3}{8}$ are

$= \frac{-3}{11}, \frac{-2}{11}, \frac{-1}{11}, 0, \frac{1}{11}, \frac{2}{11}, \frac{3}{11}, \frac{4}{11}, \frac{5}{11}$ and $\frac{6}{11}$ are lies between $\frac{7}{11}$ and $\frac{-4}{11}$.

9. Here $x = \frac{-5}{11}$

and $|x| = \left|\frac{-5}{11}\right| = \frac{5}{11}$

We know that : $\frac{-5}{11} < \frac{-4}{11} < \frac{-3}{11} < \frac{-2}{11} < \frac{-1}{11} < 0 < \frac{1}{11} < \frac{2}{11} < \frac{3}{11} < \frac{4}{11} < \frac{5}{11}$.

So, $\frac{-4}{11}, \frac{-3}{11}, \frac{-2}{11}, \frac{-1}{11}, 0, \frac{1}{11}, \frac{2}{11}, \frac{3}{11}$ and $\frac{4}{11}$ are rational numbers lies between x and $(-x)$.

10. Here $x = \frac{-2}{3}$ and $y = \frac{-3}{4}$

$$(x+y) = \left(\frac{-2}{3}\right) + \left(\frac{-3}{4}\right) = \frac{-2}{3} - \frac{3}{4} = \frac{-8-9}{12} = \frac{-17}{12}$$

and, $(x+y)^{-1} = \left(\frac{-17}{12}\right)^{-1} = \frac{-12}{17}$

$x^{-1} = \left(\frac{-2}{3}\right)^{-1} = \frac{-3}{2}$ and $y^{-1} = \left(\frac{-3}{4}\right)^{-1} = \frac{-4}{3}$

So, $x^{-1} + y^{-1} = \frac{-3}{2} + \frac{-4}{3} = \frac{-9+(-8)}{6}$

$= \frac{-9-8}{6} = \frac{-17}{12}$

Hence, the rational number $\left(\frac{-12}{17} + \frac{-17}{12}\right) \div 2$ lies between $(x+y)^{-1}$ and $x^{-1} + y^{-1}$.

Now, $\left(\frac{-12}{17} + \frac{-17}{12}\right) \div 2 = \left(\frac{-12}{17} - \frac{17}{12}\right) \times \frac{1}{2}$

$= \left(\frac{-144-289}{204}\right) \times \frac{1}{2} = \frac{-433}{204 \times 2} = \frac{-433}{408}$

So, $\frac{-433}{408}$ is a rational number between $(x+y)^{-1}$ and $x^{-1} + y^{-1}$.

11. Here, $x = \frac{2}{3}$ and $y = \frac{3}{4}$

So, $(x-y) = \frac{2}{3} - \frac{3}{4} = \frac{8-9}{12} = \frac{-1}{12}$

and $(x-y)^{-1} = \left(\frac{-1}{12}\right)^{-1} = -12$

$$x^{-1} = \left(\frac{2}{3}\right)^{-1} = \frac{3}{2} \text{ and } y^{-1} = \left(\frac{3}{4}\right)^{-1} = \frac{4}{3}$$

So, $x^{-1} - y^{-1} = \frac{3}{2} - \frac{4}{3} = \frac{9-8}{6} = \frac{1}{6}$

Hence, the rational number $\left[\frac{1}{6} + (-12)\right] \div 2$ lies between $(x-y)^{-1}$ and $x^{-1} - y^{-1}$.

Now, $\left(\frac{1}{6} - 12\right) \div 2 = \left(\frac{1-12\times 6}{6}\right) \times \frac{1}{2} = \left(\frac{1-72}{6}\right) \times \frac{1}{2} = \frac{-71\times 1}{6\times 2} = \frac{-71}{12}$

So, $\frac{-71}{12}$ is a rational number between $(x-y)^{-1}$ and $x^{-1} - y^{-1}$.

Exercise 1.5

1. Let, the other number is x.

Then,
$$x + \left(\frac{-12}{5}\right) = -2$$
$$x - \frac{12}{5} = -2$$
$$x = -2 + \frac{12}{5} = \frac{-10+12}{5} = \frac{2}{5}$$

So, the required number is $\frac{2}{5}$.

2. Let, the other number is x.

Then,
$$x + \frac{7}{8} x + \frac{7}{8} = -\frac{1}{3}$$
$$x = \frac{-1}{3} - \frac{7}{8}$$
$$x = \frac{-8-21}{24} = \frac{-29}{24}$$

So, the required number is $\frac{-29}{24}$.

3. Let, the required number be x.

Then,
$$\frac{-6}{5} + x = \frac{2}{3}$$
$$x = \frac{2}{3} + \frac{6}{5} = \frac{10+18}{15} = \frac{28}{15}$$

So, $\frac{28}{15}$ added to $\frac{-6}{5}$ to get $\frac{2}{3}$.

4. According to question : $\left[\frac{33}{8} + \left(\frac{-19}{4}\right)\right] - \left[\left(\frac{-36}{11}\right) + \frac{49}{22}\right]$

$$= \left[\frac{33}{8} - \frac{19}{4}\right] - \left[\frac{-36}{11} + \frac{49}{22}\right]$$

$$= \left[\frac{33-38}{8}\right] - \left[\frac{-72+49}{22}\right]$$

$$= \left[\frac{-5}{8}\right] - \left[\frac{-23}{22}\right]$$

$$= \frac{-5}{8} + \frac{23}{22}$$

$$= \frac{-5 \times 11 + 23 \times 4}{88} = \frac{-55+92}{88} = \frac{37}{88}$$

5. Let, the required number be *x*.

Then, $\left(\frac{-13}{4} + \frac{-3}{8}\right) + x = 1$

$$= \left(\frac{-13 \times 2 + (-3)}{8}\right) + x = 1$$

$$= \left(\frac{-26-3}{8}\right) + x = 1 = \frac{-29}{8} + x = 1$$

$$x = 1 + \frac{29}{8}$$

$$x = \frac{8+29}{8} = \frac{37}{8} = 4\frac{5}{8}$$

So, $4\frac{5}{8}$ is the required number.

6. Cost of cloth = ` $36\frac{2}{3}$ per meter

$\therefore$ Cost of $3\frac{3}{4}$ metres of cloth = ` $36\frac{2}{3} \times 3\frac{3}{4}$

$$= \text{`}\ \frac{110}{3} \times \frac{15}{4} = \text{`}\ \frac{55 \times 5}{1 \times 2} = \text{`}\ \frac{275}{2} = \text{`}\ 137\frac{1}{2}$$

So, the cost of $3\frac{3}{4}$ metres of cloth is ` $137\frac{1}{2}$.

7. The cost of 1 m of cloth = ` $25\frac{1}{4}$

$\therefore$ the cost of $5\frac{3}{4}$ m of cloth = ` $25\frac{1}{4} \times 5\frac{3}{4}$

$$= \text{`}\ \frac{101}{4} \times \frac{23}{4} = \text{`}\ \frac{2323}{16} = \text{`}\ 145\frac{3}{16}$$

So, the cost of $5\frac{3}{4}$ metres of cloth is ` $145\frac{3}{16}$.

8. Suresh walk in a day = $4\frac{3}{5}$ km.

$\therefore$ Suresh walk in $5\frac{1}{2}$ days $= 4\frac{3}{5} \times 5\frac{1}{2}$ km $= \frac{23}{5} \times \frac{11}{2}$ km $= \frac{253}{10} = 25\frac{3}{10}$ km

So, Suresh covered $25\frac{3}{10}$ km distance in $5\frac{1}{2}$ days.

9. Distance covers by the cyclist $= 14\frac{2}{5}$ km

Time take by the cyclist $= 2\frac{1}{4}$ hours

$$\therefore \quad \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{14\frac{2}{5}\text{ km}}{2\frac{1}{4}\text{ hour}}$$

$$= \frac{\frac{72}{5}}{\frac{9}{4}}\text{ km/hr}$$

$$= \frac{72}{5} \times \frac{4}{9}\text{ km/hr}$$

$$= \frac{8 \times 4}{5 \times 1} = \frac{32}{5}\text{ km/hr} = 6\frac{2}{5}\text{ km/hr}$$

10. Let, the other number be *x*.

Then, $$x \times \left(\frac{-4}{15}\right) = \left(\frac{-28}{81}\right)$$

$$x = \frac{-28}{81} \times \frac{-15}{4}$$

$$= \frac{+28 \times 15}{81 \times 4} = \frac{7 \times 5}{27 \times 1} = \frac{35}{27} = 1\frac{8}{27}$$

So, the required number is $1\frac{8}{27}$.

11. $$\text{Sum} = \frac{65}{12} + \frac{8}{3} = \frac{65 + 32}{12} = \frac{97}{12}$$

$$\text{Difference} = \frac{65}{12} - \frac{8}{3} = \frac{65 - 32}{12} = \frac{33}{12}$$

$$\text{Sum} \div \text{difference} = \frac{97}{12} \div \frac{33}{12} = \frac{97}{12} \times \frac{12}{33} = \frac{97}{33} = 2\frac{31}{33}$$

12. Let, total number of students is *x*.

$$\text{Then, number of girls} = 300$$

$$\left(1-\frac{5}{7}\right)x = 300$$

$$\frac{2}{7}x = 300$$

$$x = 300\times\frac{7}{2} = 150\times 7 = 1050$$

Number of boys $= 1050 - 300 = 750$

So, 750 students are boys in the school.

13. Let, the whole journey of Aryan is x.

After tavelling 45 km distance left $= \frac{3}{8}$ of whole

Then,
$$x - 45\,\text{km} = \frac{3}{8}\times x$$

$$x - 45\,\text{km} = \frac{3x}{8}$$

$$x - \frac{3x}{8} = 45\,\text{km}$$

$$\frac{8x-3x}{8} = 45\,\text{km}$$

$$\frac{5x}{8} = 45\,\text{km}$$

$$x = 45\times\frac{8}{5}\,\text{km}$$

$$x = \frac{45\times 8}{5}\,\text{km}$$

$$x = 9\times 8\,\text{km}$$

$$= 72\,\text{km}$$

So, the whole journey of Aryan is 72 km.

14. Length of rectangle $= 45\frac{1}{2}$ m

and, Breadth of rectangle $= 34\frac{3}{4}$ m

$\therefore$ Perimeter of rectangle $= 2(l+b)$

$$= 2\left(45\frac{1}{2}+34\frac{3}{4}\right)\text{m}$$

$$= 2\left(\frac{91}{2}+\frac{139}{4}\right)\text{m}$$

$$= 2\left(\frac{182+139}{8}\right)\text{m} = \frac{321}{4}\,\text{m} = 8\frac{1}{4}\,\text{m}$$

$\therefore$ Area of rectangle $= l \times b$

$$= 45\frac{1}{2}\text{ m} \times 34\frac{3}{4}\text{ m}$$

$$= \frac{91}{2} \times \frac{139}{4}\text{ m}^2 = \frac{12649}{8}\text{ m}^2 = 1581\frac{1}{8}\text{ m}^2$$

15. Length of floor $= 2\frac{1}{4}\text{ m} = \frac{9}{4}\text{ m}$

Breadth of floor $= 1\frac{3}{4}\text{ m} = \frac{7}{4}\text{ m}$

$\therefore$ Area of floor $= \frac{9}{4}\text{ m} \times \frac{7}{4}\text{ m} = \frac{63}{16}\text{ m}^2$

and side of carpet $= 1\frac{1}{2}\text{ m} = \frac{3}{2}\text{ m}$

$\therefore$ Area of carpet $= \frac{3}{2}\text{ m} \times \frac{3}{2}\text{ m} = \frac{9}{4}\text{ m}^2$

Area of floor that is not carpeted $= \frac{63}{16}\text{ m}^2 - \frac{9}{4}\text{ m}^2$

$$= \left(\frac{63}{16} - \frac{9}{4}\right)\text{m}^2 = \left(\frac{63-36}{16}\right)\text{m}^2 = \frac{27}{16}\text{ m}^2$$

Hence, $1\frac{11}{16}\text{ m}^2$ of area of floor is not carpeted.

Multiple Choice Questions

Tick (✓) the correct option :

1. (a), 2. (b), 3. (a), 4. (b), 5. (d), 6. (c), 7. (c), 8. (b), 9. (a), 10. (d), 11. (d), 12. (c)

Sharp Your Knowledge

1. The value of $\frac{-3}{5} \div \frac{4}{11}$ is $\frac{-3}{5} \times \frac{11}{4} = \frac{-33}{20}$.
2. On the number line, $\frac{-13}{9}$ lies between $\frac{-14}{9}$ and $\frac{-12}{9}$.
3. The value of integer in $-2\frac{7}{11}$ is $\frac{-29}{11}$.
4. If we subtract $\frac{91}{25}$ from $\frac{-13}{25}$ we get $\frac{-13}{25} - \frac{91}{25} = \frac{-13-91}{25} = \frac{-104}{25} = -4\frac{4}{25}$.
5. $\frac{5}{4} \times \frac{-3}{7} + \frac{5}{4} \times \frac{9}{13} = \frac{5}{4}\left[\frac{-3}{7} + \frac{9}{13}\right] = \frac{5}{4}\left[\frac{-39+63}{91}\right] = \frac{5}{4} \times \frac{24}{91} = \frac{30}{91}$
6. A rational number with absolute value zero is 0 (zero).
7. A rational number that does not have a reciprocal is 0 (zero).
8. The rational numbers that are equal to their reciprocals are 1 and -1.

Exercise 2.1

1. Simplify and write the answer in power notation with positive exponents.

(a) $(2)^5 \times (-6)^{-5}$

$= (2)^5 \times \left(\frac{1}{-6}\right)^5$

$= \left(\frac{2}{-6}\right)^5 = \left(\frac{-1}{3}\right)^5 = \left(\frac{2}{3}\right)^8$

(b) $\left\{\left(\frac{3}{2}\right)^4\right\}^{-2}$

$= \left(\frac{3}{2}\right)^{4\times -2}$

$= \left(\frac{3}{2}\right)^{-8}$

(c) $(-5)^4 \times \left(\frac{3}{5}\right)^4$

$= \left(-5 \times \frac{3}{5}\right)^4$

$= (-3)^4$

(d) $(5^{-7} \div 5^{-10}) \times 5^{-3}$

$= \left\{\frac{5^{-7}}{5^{-10}}\right\} \times 5^{-3}$

$= \left\{\frac{1}{5^{-3}}\right\} \times 5^{-3} = (5^0)$

(e) $(-3)^7 \div (-3)^9$

$= (-3)^{7-9} = (-3)^{-2}$

$= \left(\frac{1}{-3}\right)^2$ or $\left(\frac{-1}{3}\right)^2$

(f) $\left(\frac{1}{4^3}\right)^2$

$= \frac{1}{4^{3\times 2}}$

$= \frac{1}{4^6}$

2. Simplify :

(a) $\{6^{-1} - 5^{-1}\} \div 3^{-1}$

$= \left\{\frac{1}{6} - \frac{1}{5}\right\} \div \frac{1}{3}$

$= \left\{\frac{5-6}{30}\right\} \div \frac{1}{3}$

$= \frac{-1}{30} \div \frac{1}{3} = \frac{-1}{30} \times \frac{3}{1}$

(b) $\{(3^{-1} \times 4^{-1})\}^{-1} \times 5^{-1}$

$= \left\{\frac{1}{3} \times \frac{1}{4}\right\}^{-1} \times 5^{-1}$

$= \left(\frac{1}{12}\right)^{-1} \times \frac{1}{5}$

$= \frac{12}{1} \times \frac{1}{5} = \frac{-1}{10} = \frac{12}{5}$

(c) $\left\{\left(\frac{1}{3}\right)^{-3} - \left(\frac{1}{2}\right)^{-3}\right\} \div \left(\frac{1}{4}\right)^{-3} = \left\{\left(\frac{3}{1}\right)^3 - \left(\frac{2}{1}\right)^3\right\} \div \left(\frac{4}{1}\right)^3$

$= \{27 - 8\} \div 64 = \frac{19}{64}$

(d) $\left\{\left(\frac{1}{3}\right)^{-1}\times(-9)^{-1}\right\}^{-1}$

$$=\left\{\left(\frac{3}{1}\right)^{1}\times\left(\frac{-1}{9}\right)\right\}^{-1}=\left(\frac{-1}{3}\right)^{-1}=(-3)^{1}=-3$$

3. Evaluate :

(a) $\{(2^{0}+3^{-1})\times 9^{2}\}=\left\{\left(1+\frac{1}{3}\right)\times 81\right\}=\left\{\frac{4}{3}\times 81\right\}=108$

(b) $(2^{-1}+3^{-1}+4^{-1})^{0}=\left(\frac{1}{2}+\frac{1}{3}+\frac{1}{4}\right)^{\circ}=\left(\frac{6+4+3}{12}\right)^{\circ}=\left(\frac{13}{12}\right)^{\circ}=1$

(c) $\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=3^{2}+2^{2}+4^{2}=9+4+16=29$

(d) $(3^{2}+4^{2})^{-1/2}=(9+16)^{-\frac{1}{2}}=(25)^{-\frac{1}{2}}$

$$=(5^{2})^{-\frac{1}{2}}$$

$$=(5)^{2\times\frac{-1}{2}}=(5^{-1})\text{ or }\left(\frac{1}{5}\right)$$

(e) $\dfrac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}=\dfrac{3^{-5}\times(2\times 5)^{-5}\times 5^{3}}{5^{-7}\times(2\times 3)^{-5}}$

$$=3^{-5+5}\times 2^{-5+5}\times 5^{-5+3+7}$$

$$=3^{\circ}\times 2^{\circ}\times 5^{5}$$

$$=5\times 5\times 5\times 5\times 5=3125$$

(f) $(1^{3}+2^{3}+3^{3})^{-5/2}=(1+8+27)^{-\frac{5}{2}}$

$$=(36)^{-\frac{5}{2}}$$

$$=(6^{2})^{-\frac{5}{2}}=6^{-5}$$

$$=\left(\frac{1}{6}\right)^{5}=\frac{1}{7776}$$

4. Let x should be multiplied by $(-5)^{-1}$ so that product is equal to $(11)^{-1}$

$$x\times(-5)^{-1}=(11)^{-1}$$

$$x=\frac{(11)^{-1}}{(-5)^{-1}}$$

$$x = \frac{-5}{11}$$

5. Let $(-12)^{-1}$ should be divided by x so that quotient is equal to $(-4)^{-1}$.

So, $$(-12)^{-1} \div x = (-4)^{-1}$$

$$(-12^{-1}) \div (-4)^{-1} = x$$

$$x = \frac{(-12)^{-1}}{(-4)^{-1}}$$

$$x = \frac{1}{-12} \times \frac{-4}{1} = \frac{1}{3}$$

6. Let x should be multiplied by $\left(\frac{2}{7}\right)^{-2}$ so that the product is equal to $\left(\frac{5}{7}\right)^{-1}$.

So, $$x \times \left(\frac{2}{7}\right)^{-2} = \left(\frac{5}{7}\right)^{-1}$$

$$x \times \left(\frac{7}{2}\right)^{2} = \left(\frac{7}{5}\right)^{1}$$

or $$x = \frac{7 \times 2 \times 2}{7 \times 7 \times 5}$$

$$x = \frac{4}{35}$$

7. Find the value of x in each of the following.

(a) $$\left(\frac{4}{5}\right)^{3x+1} \times \left(\frac{4}{5}\right)^{-15} = \left(\frac{4}{5}\right)^{x}$$

or $$\left(\frac{4}{5}\right)^{3x+1+(-15)} = \left(\frac{4}{5}\right)^{x}$$

$$\left(\frac{4}{5}\right)^{3x+1-15} = \left(\frac{4}{5}\right)^{x}$$

$$x = 3x + 1 - 15$$

$$x - 3x = 1 - 15$$

$$-2x = -14$$

$$x = \frac{14}{2}$$

$$x = 7$$

(b) $$\left(\frac{3}{5}\right)^{-3} \times \left(\frac{3}{5}\right)^{10} = \left(\frac{3}{5}\right)^{3x+1}$$

or $$\left(\frac{3}{5}\right)^{-3+10} = \left(\frac{3}{5}\right)^{3x+1}$$

or $$\left(\frac{3}{5}\right)^{7} = \left(\frac{3}{5}\right)^{3x+1}$$

$$3x+1 = 7$$
$$3x = 7-1$$
$$3x = 6$$
$$x = \frac{6}{3}$$
$$x = 2$$

(c) $$\left(\frac{2}{3}\right)^{-4} \times \left(\frac{2}{3}\right)^{-8} = \left(\frac{2}{3}\right)^{4x}$$

or $$\left(\frac{2}{3}\right)^{-4+(-8)} = \left(\frac{2}{3}\right)^{4x}$$

$$\left(\frac{2}{3}\right)^{-4-8} = \left(\frac{2}{3}\right)^{4x}$$

$$\left(\frac{2}{3}\right)^{-12} = \left(\frac{2}{3}\right)^{4x}$$

or $$4x = -12$$
$$x = \frac{-12}{4}$$
$$x = -3$$

(d) $$\left(\frac{2}{7}\right)^{-17} \div \left(\frac{2}{7}\right)^{8} = \left(\frac{2}{7}\right)^{2x+1}$$

$$\left(\frac{2}{7}\right)^{-17} \div \left(\frac{2}{7}\right)^{8} = \left(\frac{2}{7}\right)^{2x+1}$$

$$\left(\frac{2}{7}\right)^{-17-8} = \left(\frac{2}{7}\right)^{2x+1}$$

$$\left(\frac{2}{7}\right)^{-25} = \left(\frac{2}{7}\right)^{2x+1}$$

or $$2x+1 = -25$$

$$2x = -26$$

$$x = \frac{-26}{2}$$
$$x = -13$$

Exercise 2.2

1. (a) Speed of light = 300,000,000 m/sec

or 3.0×10^8 m/sec

(b) Thickness of normal paper = 0.007 cm

or 7.0×10^{-3} cm

(c) size of a bacteria = 0.0000005 m

or 5.0×10^{-7} m

(d) 1. micron is equal to = 0.000001 m

or 1×10^{-6} m

(e) The population of a certain country = 885396000

or 8.85396×10^8

(f) Diameter of a wire = 0.000003 m = 3.0×10^{-6} m

(g) The distance of the moon from the earth = 384,460,000 m

or 3.8446×10^8 m

(h) size of plant cell = 0.00000001275 km = 1.275×10^{-8} km

(i) Distance of the sun from the earth = 149,600,000 km

$= 1.496 \times 10^8$ km

(j) Radius of the earth = 63780000 m

$\Rightarrow$ 6.378×10^7 m

2. Express the following in the usual form.

(a) 1.732×10^8

or 173200000

(b) 9.7137×10^{13}

or 97137000000000

(c) 4.01853×10^7

or 40185300

(d) 1.31×10^{-9}

or 0.00000000131

(e) 5.3×10^{-13}

or 0.00000000000053

(f) 8.37×10^{-6}

or 0.000000837

3. Express the following numbers in standard form.

(a) 2,43,00,00,00,000

$= 2.43 \times 10^{11}$

(b) 89,00,00,00,000

$= 8.9 \times 10^{10}$

(c) 16,70,000

$= 1.67 \times 1000000$

or $= 1.67 \times 10^6$

(d) 0.0000000029

or $= 2.9 \times 10^{-9}$

(e) 0.00000000007

or 7.0×10^{-11}

(f) 0.00000037

or 3.7×10^{-7}

4. Diameter of sun = 1.4×10^9

Diameter of earth = 1.275×10^7

Sun : earth $= 1.4 \times 10^9 : 1.275 \times 10^7$

$= 1400000000 : 12750000 = 5600 : 5$

5. Thickness of each page $= 0.000075$ m

Thickness of 500 pages $= 500 \times 0.000075$ m

$= 0.0375$ m

So, thickness of stack $= 7 \times 0.0375$ m

$= 0.2625$ m

6. Size of plant cell $= 0.00001275$ m

Size of red blood cell $= 0.000007$ m

So, plant cell : red blood cell $= \dfrac{0.00001275M \times 1000000}{0.000007M \times 100000000} = \dfrac{1275}{700} = 51:28$

Multiple Choice Questions

1. (d) **2.** (d) **3.** (c) **4.** (c) **5.** (c)

Sharp Your Knowledge

1. $\dfrac{a^2}{b}$ **2.** 10 **3.** 1 **4.** 1 **5.** 0.0797355

Higher Order Thinking Skills

$a^{-1} + b^{-1} = 2^{-1}$ and $a + b = 10$, find $a \times b$

we have $a^{-1} + b^{-1} = 2^{-1}$

or $\dfrac{1}{a} + \dfrac{1}{b} = \dfrac{1}{2}$

or $\dfrac{a+b}{ab} = \dfrac{1}{2}$

or $ab = 2(a+b)$

or $ab = 2 \times 10 \quad \because \quad a + b = 10$

so $a \times b = 20$

$a^{x^2-y^2} \times a^{y^2-3^2} \times a^{3^2-x^2}$

or $a^{x^2-y^2+y^2-3^2+3^2-x^2}$

$= 1$ R.H.S. **Proved**

3 Square and Square Roots

Exercise 3.1

1. (a) false (b) false (c) false
(d) false (e) true (f) true

2. (a) $(8+7) = 15$

(b) $(19+18) = 37$

(c) $(35+34) = 69$

(d) $(136+135) = 271$

3. Is 1764 a perfect square?

2	1764
2	882
3	441
3	147
7	49
7	7
	1

$1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$

So, 1764 is a perfect square

4. Is 1228 a perfect square?

2	1228
2	614
307	307
	1

$1228 = 2 \times 2 \times 307$

So, it is not perfect square.

5. (a) (12, 5, 13)

Here, we have $a = 12$

$b = 5$

$c = 13$

or $c^2 = a^2 + b^2$

$13^2 = 12^2 + 5^2$

$13 \times 13 = 12 \times 12 + 5 \times 5$

$169 = 144 + 25$

$169 = 169$

So it is pythagorean triplet.

(b) (6, 7, 8)

Here, we have $a = 6$

$b = 7$

$c = 8$

or $c^2 = a^2 + b^2$

$8^2 = 6^2 + 7^2$

$64 = 36 + 49$

$64 \neq 85$

So, it is not pythagoreans triplet.

(c) (18, 80, 82)

Here, we have $a = 18, b = 80, c = 82$

or $c^2 = a^2 + b^2$

$= 82 \times 82 = 18 \times 18 + 80 \times 80$

$6724 = 324 + 6400$

$6724 = 6724$

So, it is pythagorean triplet.

6. (a) 4900

2	4900
2	2450
5	1225
5	245
7	49
7	7
	1

$4900 = 2 \times 2 \times 5 \times 5 \times 7 \times 7$

So, it is perfect square.

(b) 6400

2	6400
2	3200
2	1600
2	800
2	400
2	200

2	100
2	50
5	25
5	5
	1

So, 6400
$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5$
So, 6400 is perfect square

(c) 351

3	357
3	117
3	39
13	13
	1

$351 = 3 \times 3 \times 3 \times 13$
Here, no. 3 and is have no pair
so, 351 is not perfect square.

(d) 160000

2	160000
2	80000
2	40000
2	20000
2	10000
2	5000
2	2500

2	1250
5	625
5	125
5	25
5	5
	1

160000
$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$
$\times 5 \times 5 \times 5 \times 5$
So, 160000 is a perfect square.

7. Check out which of the following perfect squares are squares of even numbers?

(a) 676
It is last digit is even
So, 676 is the perfects
square of even no.

(b) 841
It is last digit is odd
So, 841 is not the perfect
square of an even no.

(c) 333
It's last digit is odd.
So, 333 is not the perfect
Square of an even no.

(d) 225
It is last digit is odd.
So, 225 is not the perfect
Square of an even no.

8. Check out which of the following perfect squares are square of odd numbers?

(a) 841
It's last digit is even
So, 841 is the perfect square of an odd no.

(b) 729
It's last digit is even
So, 729 is the perfect square of an odd no.

(c) 484
It's last digit is even
So, 484 is not the perfect square of an odd on.

(d) 6400
It's last digit is even
So, 6400 is not the perfect square of an odd no.

9. Check out which of the following numbers are not perfect squares?

(a) 169000

2	169000
2	84500
2	42250
5	21125
5	4225
5	845
13	169
13	13
	1

$169000 = 2\times2\times2\times5\times5\times5\times13\times13$

Here 2 and 5 have pair
So, it is not perfect square.

(b) 1000

2	1000
2	500
2	250
5	25
5	5
	1

$1000 = 2\times2\times2\times5\times5\times5$

Here 2 and 5 have no pair
So, it is not perfect square.

(c) 625

5	625
5	125
5	25
5	5
	1

$625 = 5\times5\times5\times5$

So, 625 is a perfect square.

(d) 1296

2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

$1296 = 2\times2\times2\times2\times3\times3\times3\times3$
So, 1296 is a perfect square.

10. (a) $1+3+5+7$
$4\times4=16$

(b) $1+3+5+7+9+11$
$6\times6=36$

(c) $1+3+5+7+9+11+13+15+17+19=10\times10=100$

11. (a) $(52)^2 = (5^2+2)$ hundred $+ (2)^2$
$= (25+2)$ hundred $+ 4$
$= 27\times100+4 = 2700+4 = 2704$

(b) $(57)^2 = (5^2+7)$ hundred $+ (7)^2$
$= (25+17)$ hundred $+ 49$
$= 32\times100+49 = 3200+49 = 3249$

(c) $(51)^2 = (5^2+1)$ hundred $+ (1)^2$
$= (25+1)$ hundred $+ 1$
$= 26\times100+1 = 2600+1 = 2601$

(d) $(58)^2 = (5^2+8)$ hundred $+ (8)^2$
$= (25+8)$ hundred $+ 64$
$= 33\times100+64 = 3300+64 = 3364$

HIGER ORDER THINKING SKILLS

49 $=$ $1+3+5+7+9+11+13$
81 $=$ $1+3+5+7+9+11+13+15+17$

Exercise 3.2

1. (a) $\sqrt{81}$

$81-1=80,$ $80-3=77,$ $77-5=72$
$72-7=65,$ $65-9=56,$ $56-11=45$
$45-13=32,$ $32-15=17,$ $17-17=0$

This subtracting process is done in 9 times
So, $\sqrt{81}=9$

(b) $\sqrt{121}$

$121-1=120,$ $120-3=117,$ $117-5=12$
$112-7=105,$ $105-9=96,$ $96-11=85$
$85-13=72,$ $72-15=57,$ $57-17=40$
$40-19=21,$ $21-21=0$

This subtracting process id done in 11 times.
So, $\sqrt{121}=11$

(c) $\sqrt{169}$

$169-1=168,$ $168-3=165,$ $165-5=160$
$160-7=153,$ $153-9=144,$ $144-11=133$
$133-13=120,$ $120-15=105,$ $105-17=88$
$88-19=69,$ $69-21=48,$ $48-23=25$
$25-25=0$

Here, this subtracting process is done in 13 times
So, $\sqrt{169}=13$

2. Find the square root of the following numbers by prime factorization method :

(a) $\sqrt{625}$

So, $\sqrt{625} = \sqrt{5\times5\times5\times5}$

$= 5\times5$

$= 25$

5	625
5	125
5	25
5	5
	1

(b) 729

So, $\sqrt{729} = \sqrt{3\times3\times3\times3\times3\times3}$

$= 3\times3\times3$

$= 27$

3	729
3	243
3	81
3	27

3	9
3	3
	1

(c) $\sqrt{1296}$

$\sqrt{1296}$

$= \sqrt{2\times2\times2\times2\times2\times3\times3\times3\times3}$

$= 2\times2\times3\times3$

$= 36$

2	7744
2	3872
2	1936
2	968
2	484

2	242
11	121
11	11
	1

(d) $\sqrt{4096}$

So, $\sqrt{4096} = \sqrt{\begin{array}{l}2\times2\times2\times2\times2\times2\\ \times 2\times2\times2\times2\times2\times2\end{array}}$

$= 2\times2\times2\times2\times2\times2$

$= 64$

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64

2	32
2	16
2	8
2	4
2	2
	1

(e) $\sqrt{7744}$

So, $\sqrt{7744}$

$= \sqrt{2\times2\times2\times2\times2\times2\times11\times11}$

$= 2\times2\times2\times11$

$= 88$

2	7744
2	3872
2	1936
2	968
2	484

2	242
11	121
11	11
	1

(f) $\sqrt{5929}$

So, $\sqrt{5929}$

$= \sqrt{7\times7\times11\times11}$

$= 7\times11$

$= 77$

7	5929
7	847
11	121
11	11
	1

3. (a) $\sqrt{\dfrac{529}{841}}$

So, $\sqrt{\dfrac{529}{841}}$

$= \sqrt{\dfrac{23\times23}{29\times29}} = \dfrac{23}{29}$

23	529
23	23
	1

29	841
29	29
	1

(b) $\sqrt{2\dfrac{14}{25}} = \sqrt{\dfrac{64}{25}}$

So, $\sqrt{\dfrac{64}{25}}$

$= \sqrt{\dfrac{2\times2\times2\times2\times2\times2}{5\times5}}$

$= \sqrt{\dfrac{2\times2\times2}{5}}$

$= \dfrac{8}{5} = 1\dfrac{3}{5}$

2	64
2	32
2	16
2	8
2	4
2	2
	1

5	25
5	5
	1

(c) $\sqrt{23\dfrac{26}{121}} = \sqrt{\dfrac{2809}{121}}$

$= \sqrt{\dfrac{53\times53}{11\times11}}$

$= \dfrac{53}{11}$

$= 4\dfrac{9}{11}$

53	2809
53	53
	1

11	121
11	11
	1

4. 1890

2	1890
3	945
3	315
3	105
5	35
7	7
	1

$1890 = 2\times3\times3\times3\times5\times7$

So, Here 2, 3, 5 and 7 have no pair

So, $2\times3\times5\times7 = 210$ should be multiplied

5. 9408

2	9408
2	4704
2	2352
2	1176
2	588
2	294
3	147
7	49
7	7
	1

$9408 = 2\times2\times2\times2\times2\times2\times3\times7\times7$
Here, 3 has no. pair
So, no. should be divided by 3.

6. 1200

2	1200
2	600
2	300
2	150
3	75
5	25
5	5
	1

$1200 = 2\times2\times2\times2\times3\times5\times5$

Here, 3 has no. pair
So, 1200 should be divided by 3
to become a perfect square.

7. 3645

3	3645
3	1215
3	405
3	135
3	45
3	15
5	5
	1

$3645 = 3\times3\times3\times3\times3\times3\times5$

Here 5 has no. pair
So, 3645 must be divided by 5 to
make perfect square.

8. Let students in class $= x$
Each student donate $= x$
So total rupees $= x\times x = 5184$

2	5184
2	2596
2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

or $\quad x^2 = 5184$

$$x = \sqrt{5184}$$
$$= \sqrt{2\times2\times2\times2\times2\times2\times3\times3\times3\times3}$$
$$= 2\times2\times2\times3\times3$$
$$= 72$$

So, there are 72 students in the class.

9. $8160 - 60 = \sqrt{8100}$

2	8100
2	4050
3	2025
3	675
3	625
3	75
5	25
5	5
	1

So, $\quad = \sqrt{8100}$
$$= \sqrt{2\times2\times3\times3\times3\times3\times5\times5}$$
$$= 2\times3\times3\times5$$
$$= 90$$

So, there are 90 soldiers in each row.

10. Let No. of rows $= x$

No. of trees in each row $= x$

So, total Mango trees $= x \times x = 2304$

$x^2 = 2304$

$x = \sqrt{2304}$

$= \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3}$

$= 2 \times 2 \times 2 \times 2 \times 3$

$= 48$

So, there are 48 rows in the garten.

2	2304
2	1152
2	576
2	288
2	144
2	72

2	36
2	18
3	9
3	3
	1

11. No. of team $= x$

No. of soldiers in each team $= x$

So, total soldiers

$x \times x = 6561$

$x^2 = 6561$

$x = \sqrt{6561}$

$= \sqrt{3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}$

$= 3 \times 3 \times 3 \times 3$

$= 81$

So, there are 81 soldiers in each team.

3	6561
3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

12. No. of rows in the garden $= x$

No. of trees in each row $= x$

So, total no. of trees in the garden

$x \times x = 1764$

or $x^2 = \sqrt{1764}$

or $x = \sqrt{1764}$

$x = \sqrt{2 \times 2 \times 3 \times 3 \times 7 \times 7}$

$= 2 \times 3 \times 7$

$= 42$

2	1746
2	882
3	441
3	147
7	49
7	7
	1

13. No. of soldiers in each row $= x$

No. of rows $= x$

So total soldiers $x \times x = 6400$

$x^2 = 6400$

$x = \sqrt{6400}$

$= \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5}$

$= 2 \times 2 \times 2 \times 2 \times 5$

$= 80$

So, there are 80 soldiers in each row.

2	6400
2	3200
2	1600
2	800
2	400
2	200

3	100
3	50
5	25
5	5
	1

Exercise 3.3

1. (a) $\sqrt{18225}$

	135
1	$\overline{1}\ \overline{82}\ \overline{25}$
	1
23	82
	69
265	1325
	1325
	×

So, $\sqrt{18225} = 135$

(b) $\sqrt{390625}$

	625
6	$\overline{39}\ \overline{06}\ \overline{25}$
	36
122	3 06
	2 44
1245	62 25
	62 25
	×

So, $\sqrt{390625} = 625$

(c) $\sqrt{291600}$

	540
5	$\overline{29}\,\overline{16}\,\overline{00}$
	25
104	4 16
	4 16
1080	00
	00
	×

So, $\sqrt{291600} = 540$

2. (a) $\sqrt{\dfrac{324}{841}}$

	18
1	$\overline{3}\,\overline{24}$
	1
28	224
	224
	×

	29
2	$\overline{8}\,\overline{41}$
	4
49	441
	441
	×

So, $\sqrt{\dfrac{324}{841}} = \dfrac{18}{29}$

(b) $\sqrt{75\dfrac{46}{49}} = \sqrt{\dfrac{3721}{49}}$

	6
6	$\overline{37}\,\overline{21}$
	36
121	121
	121
	×

	7
7	$\overline{49}$
	49
	×

So, $\sqrt{\dfrac{3721}{49}} = \dfrac{61}{7}$

$= 8\dfrac{5}{7}$

(c) $\sqrt{10\frac{151}{225}} = \sqrt{\frac{2401}{225}}$

So, $\sqrt{\frac{2401}{225}} = \frac{49}{15}$

$= 3\frac{4}{15}$

	49
4	$\overline{24}\ \overline{01}$
	16
89	8 01
	8 01
	×

	15
1	$\overline{2}\ \overline{25}$
	1
25	125
	125
	×

3. (a) $\sqrt{37.0881}$

	6.09
6	$\overline{37}.\overline{08}\ \overline{81}$
	36
120	1 08
	00
1209	1 0881
	1 0881
	×

$= \sqrt{37.0881} = 6.09$

(b) $\sqrt{0.00002025}$

	0.0045
0	$0.\overline{00}\ \overline{00}\ \overline{20}\ \overline{25}$
	0
0	00
	00
0	00
	00
4	20
	16
85	425
	425
	×

$= \sqrt{0.00002025} = 0.0045$

(c) $\sqrt{0.00038809}$

	0.0197
1	$0.\overline{00}\ \overline{03}\ \overline{88}\ \overline{09}$
	1
29	288
	261
387	2709
	2709
	×

So, $= \sqrt{0.00038809}$

$= 0.0197$

4. (a) $\sqrt{7}$

	2.645
2	$\overline{7}.\overline{00}\ \overline{00}\ \overline{00}$
	4
46	3 00
	2 76
524	2400
	2096
5285	30400
	26425
	3975

$= 2.645$

or $\quad 2.65$

(b) $\sqrt{1.7}$

	1.303
1	$\overline{1}.\overline{70}\ \overline{00}\ \overline{00}$
	1
23	70
	69
2603	10000
	7809
	2191

$= 1.303$

$= 1.30$

(c) $\sqrt{145.38}$

	12.057
1	$\overline{1}\ \overline{45}.\overline{38}\ \overline{00}\ \overline{00}$
	-1
22	45
	44
240	138
	000
2405	13800
	12025
24107	177500
	-168749
	8751

$= 12.057$

or $\quad 12.06$

5. Simplify :

(a) $\dfrac{\sqrt{59.29}-\sqrt{5.29}}{\sqrt{59.29}+\sqrt{5.29}}$

$= \dfrac{7.7-2.3}{7.7+2.3}$

$= \dfrac{5.4}{10.0} = 0.54$

	7.7
7	$\overline{59}.\overline{24}$
	49
147	10 29
	10 29
	×

	2.3
2	$\overline{5}.\overline{23}$
	4
43	1 29
	1 29
	×

(b) $\dfrac{\sqrt{0.2304}-\sqrt{0.1764}}{\sqrt{0.2304}+\sqrt{0.1764}}$

$= \dfrac{0.48-0.42}{0.48+0.42}$

$= \dfrac{0.06}{0.90}$

$= \dfrac{-6}{90} = \dfrac{1}{15}$

	0.48
4	$0.\overline{23}\,\overline{04}$
	16
88	704
	704
	×

	0.42
0	$0.\overline{17}\,\overline{64}$
4	17
	16
82	164
	164
	×

6. $\sqrt{70225} = 265$

	265
2	$\overline{7}\ \overline{02}\ \overline{25}$
	4
46	302
	276
525	2625
	2625
	×

So, $\sqrt{702.25}+\sqrt{7.0225}$

$= 26.5 + 2.65$

$= 29.15$

7. $\sqrt{18496} = 136$

	136
1	$\overline{1}\ \overline{84}\ \overline{96}$
	1
23	84
	69
266	1596
	1596
	×

So, $\sqrt{1.8496}\times\sqrt{184.96}$

$1.36 \times 13.6 = 18.496$

8. $\sqrt{18496} = 136$

So, $\sqrt{1.8496}\times\sqrt{184.96}$

$1.36 \times 13.6 = 18.496$

9. $\sqrt{19044} = 138$

$\sqrt{190.44}+\sqrt{1.9044}$

$= 13.8 \div 1.38$

$= \dfrac{13.8\times10}{1.38\times10}$

$= 10$

	138
1	$\overline{1}\ \overline{90}\ \overline{44}$
	1
23	90
	69
268	21 44
	21 44
	×

Multiple Choice Questions

1. (d) **2.** (c) **3.** (d) **4.** (a) **5.** (c) **6.** (b) **7.** (b) **8.** (d)

Higher Order thinking Skills

2220 $\square$

So, $\square = 1$

and no. is 22201

	149
1	$\overline{2}\ \overline{22}\ \overline{0\square}$
	1
24	1 22
	96
289	260 $\square$
	2601
	$\times$

$\Rightarrow$ 13, 31

169, 961

$\Rightarrow$ $1^2 + 2^2 + 2^2 = 3^2$

$2^2 + 3^2 + 6^2 = 7^2$

$3^2 + 4^2 + 12^2 = 13^2$

$4^2 + 5^2 + 20^2 = 21^2$

$5^2 + 6^2 + 30^2 = 31^2$

$6^2 + 7^2 + 42^2 + 43^2$

4 Cube and Cube Roots

Exercise 4.1

1. Find the cubes of the following numbers :

(a) 12^3

$= 12 \times 12 \times 12$

$= 144 \times 12$

$= 1728$

(b) 40^3

$= 40 \times 40 \times 40$

$= 1600 \times 40$

$= 64000$

(c) 52^3

$= 52 \times 52 \times 52$

$= (+169) \times (-13)$

$= 140608$

(d) $(-13)^3$

$= (-13) \times (-13) \times (-13)$

$= 2704 \times 52$

$= -2197$

(e) -27

$= (-27) \times (-27) \times (-27)$

$= (+729) \times (-27)$

$= -19683$

(f) 0.9

$= 0.9 \times 0.9 \times 0.9$

$= 0.81 \times 0.9$

$= 0.729$

(g) 3.5

$3.5 \times 3.5 \times 3.5$

$= 12.25 \times 3.5$

$= 42.875$

(h) 0.06

$0.06 \times 0.06 \times 0.06$

$= 0.0036 \times 0.06$

$= 0.000216$

(i) $\frac{4}{5}$

$= \left(\frac{4}{5}\right) \times \left(\frac{4}{5}\right) \times \left(\frac{4}{5}\right)$

(j) $\frac{11}{12}$

$= \left(\frac{11}{12}\right) \times \left(\frac{11}{12}\right) \times \left(\frac{11}{12}\right)$

$= \dfrac{4\times4\times4}{5\times5\times5}$

$= \dfrac{16\times4}{25\times5}$

$= \dfrac{64}{125}$

$= \dfrac{11\times11\times11}{12\times12\times12}$

$= \dfrac{121\times11}{144\times12}$

$= \dfrac{1331}{1728}$

(k) $\dfrac{-2}{7}$

$= \left(\dfrac{-2}{7}\right)\times\left(\dfrac{-2}{7}\right)\times\left(\dfrac{-2}{7}\right)$

$= \dfrac{-2\times-2\times-2}{7\times7\times7}$

$= \dfrac{+4\times-2}{49\times7}$

$= \dfrac{-8}{343}$

(l) $\dfrac{-5}{9}$

$= \left(\dfrac{-5}{9}\right)\times\left(\dfrac{-5}{9}\right)\times\left(\dfrac{-5}{9}\right)$

$= \dfrac{-5\times-5\times-5}{9\times9\times9}$

$= \dfrac{25\times-5}{81\times9}$

$= \dfrac{-125}{729}$

2. Which of the following numbers are perfect cube?

(a) 16

$16 = 2\times2\times2\times2$

3	27
3	9
3	3
	1

Here the prime factors are not grouped in triplets

∴ 16 is not perfect cube.

(b) 27

$27 = 3\times3\times3$

2	16
2	8
2	4
2	2
	1

Here the prime factors are grouped in triplets

∴ 27 is a perfect cube.

(c) 81

3	81
3	27
3	9
3	3
	1

$81 = 3\times3\times3\times3$

Here the prime factors are not grouped in triplets

∴ 81 is not perfect cube.

(d) 216

2	216
2	108
2	54
3	27
3	9
3	3
	1

$= 2\times2\times2\times3\times3\times3$216

Here the prime factors are grouped in triplets.

∴ 216 is a perfect cube.

(e) 212

2	212
2	106
53	53
	1

$212 = 2 \times 2 \times 53$

Here the prime factors are not grouped in triplets

∴ 212 is not perfect cube.

(f) 729

3	729
3	243
3	81
3	27
3	9
3	3
	1

$729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$

Here the prime factors are grouped in triplets.

∴ 729 is a perfect cube

(g) 1000

2	1000
2	500
2	250
5	125
5	25
5	5
	1

$1000 = 2 \times 2 \times 2 \times 5 \times 5 \times 5$

Here the prime factors are grouped in triplets.

So, 1000 is a perfect cube.

(h) 4608

2	4608
2	2304
2	1152
2	576
2	288

2	144
2	72
2	36
2	18
3	9

$4608 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$
$\times 2 \times 2 \times 3 \times 3 \times 3$

Here the prime factor are not grouped in triplets

So, 4608 is not a perfect cube.

3. Which of the following are the cubes of even integers?

(a) 216
It's last digit is even
So, it is the cube of an even no.

(b) 125
It's last digit is odd
so, it is not the cube of an even no.

(c) 512
It's last digit is even
So, it is the cube of an even no.

(d) 343
It's last digit is odd
So, it is not the cube of an even no.

(e) 1000
It's last digit is even
So, it is the cube of an even no.

(f) 13824
It's last digit is even
So, it is the cube of an even no.

4. Which of the following numbers are the cubes of odd integers?

(a) 8

(b) 27

It's last digit is even
So, it is not the cube of an odd no.

It's last digit is odd
So, it is the cube of an odd no.

(c) 729
It's last digit is odd
So, it is the cube of an odd no.

(d) 1000
It's last digit is even
So, it is not cube of an odd no.

(e) 6859
It's last digit is odd
So, It is the cube of an odd no.

(f) 531441
It's last digit is odd
So, it is the cube of an odd no.

5. **43200**

2	43200
2	21600
2	10800
2	5400
2	2700
2	1350

3	675
3	225
3	75
5	25
5	5
	1

43200
$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 5$
Thus, it is clear that to make it a perfect cube it must be multiplied by 5.

6. 13122

2	13122
3	6561
3	2187
3	729
3	243
3	81

3	27
3	9
3	3
	1

$13122 = 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$
Thus, it is clear that to make it a perfect cube it must be divided by $2 \times 3 \times 3 = 18$

7. Edge of cuboid tank $= 1.8$ m

$\therefore$ volume of cuboid $= (\text{edge})^3$
$= \text{edge} \times \text{edge} \times \text{edge}$
$= 1.8 \text{ m} \times 1.8 \text{ m} \times 1.8 \text{ m}$
$= 3.24 \times 1.8 \text{ m}^3$
$= 5.832 \text{ m}^3$

So, volume of cuboid $= 5.832 \text{ m}^3$

8. (a) $42^3 = (40+2)^3$
$= (40)^3 + 3 \times (40)^2 \times 2 + 3 \times (2)^2 \times 40 + (2)^3$
$= 64000 + 3 \times 1600 \times 2 + 3 \times 4 \times 40 + 8$
$= 64000 + 9600 + 480 + 8$
$= 74088$

(b) $87^3 = (80+7)^3$

$= (80)^3 + 3\times(80)^2 \times 2 + 3\times(7)^2 \times 80 + (7)^3$

$= 512000 + 3\times 6400\times 2 + 3\times 49\times 80 + 343$

$= 512000 + 38400 + 11760 + 343$

$= 858503$

(c) $56^3 = (50+6)^3$

$= (50)^3 + 3\times(50)^2 \times 6 + 3\times(6)^2 \times 50 + (6)^3$

$= 125000 + 3\times 2500\times 6 + 3\times 36\times 50 + 216$

$= 125000 + 45000 + 5400 + 216$

$= 175616$

(d) $92^3 = (90+2)^3$

$= (90)^3 + 3\times(90)^2 \times 2 + 3\times(2)^2 \times 90 + (2)^3$

$= 729000 + 3\times 8100\times 2 + 3\times 4\times 90 + 8$

$= 729000 + 48600 + 1080 + 8$

$= 778688$

Sharp Your Knowledge

1. T **2.** T **3.** F **4.** T **5.** F

Exercise 4.2

1. (a) $\sqrt[3]{91125}$

$\sqrt[3]{91125}$

$= \sqrt[3]{3\times 3\times 3\times 3\times 3\times 3\times 5\times 5\times 5}$

$= 3\times 3\times 5$

$= 45$

3	91125
3	30375
3	10125
3	3375
3	1125

3	375
5	125
5	25
5	5

(b) $\sqrt[3]{531441}$

$= \sqrt[3]{531441}$

$= \sqrt[3]{3\times 3\times 3\times 3\times 3\times 3 \times 3\times 3\times 3\times 3\times 3\times 3}$

$= 3\times 3\times 3\times 3$

$= 81$

3	531441
3	177147
3	59049
3	19683
3	6561
3	2187
3	729

3	243
3	81
3	27
3	9
3	3
	1

(c) $\sqrt[3]{250047}$

$\sqrt[3]{250047}$

$= \sqrt[3]{3\times 3\times 3\times 3\times 3\times 3\times 7\times 7\times 7}$

$= 3\times 3\times 7$

$= 63$

3	250047
3	83349
3	27783
3	9261
3	3087

3	1029
7	343
7	49
7	7
	1

(d) $\sqrt[3]{551368}$

$\sqrt[3]{551368}$

$= \sqrt[3]{2\times 2\times 2\times 41\times 41\times 41}$

$= 3\times 41$

$= 82$

2	551368
2	275684
2	137842
41	68921
41	1681
41	41
	1

(e) $\sqrt[3]{-74088}$

$= -\sqrt[3]{74088}$

$= -\sqrt[3]{2\times 2\times 2\times 3\times 3\times 3\times 7\times 7\times 7}$

$= -(2\times 3\times 7)$

$= -42$

2	74088
2	37044
2	18522
3	9261
3	3087

3	1029
7	343
7	41
7	7
	1

(f) $\sqrt[3]{-175616}$

$-\sqrt[3]{175616}$

$= -\sqrt[3]{\begin{array}{l}2\times 2\times 2\times 2\times 2\times 2\\ \quad\times 2\times 2\times 2\times 7\times 7\times 7\end{array}}$

$= -(2\times 2\times 2\times 7)$

$= -56$

2	175616
2	87808
2	43904
2	21952
2	10976
2	5488
2	2744

2	1372
2	686
7	343
7	49
7	7
	1

2. (a) $\sqrt[3]{\dfrac{3375}{4913}}$

$$= \frac{\sqrt[3]{3375}}{\sqrt[3]{4913}}$$

$$= \frac{\sqrt[3]{3\times3\times3\times5\times5\times5}}{\sqrt[3]{17\times17\times17}}$$

$$= \frac{3\times5}{17} = \frac{15}{17}$$

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

17	4913
17	289
17	17
	1

(b) $\sqrt[3]{\dfrac{2197}{1331}}$

$$= \frac{\sqrt[3]{2197}}{\sqrt[3]{1331}}$$

$$= \frac{\sqrt[3]{13\times13\times13}}{\sqrt[3]{11\times11\times11}}$$

$$= \frac{13}{11} = 1\frac{2}{11}$$

13	2197
13	169
13	13
	1

11	1331
11	121
11	11
	1

(c) $\sqrt[3]{\dfrac{-343}{166375}}$

$$= \frac{-\sqrt[3]{343}}{\sqrt[3]{166375}}$$

$$= \frac{\sqrt[3]{7\times7\times7}}{\sqrt[3]{5\times5\times5\times11\times11\times11}}$$

$$= \frac{-(7)}{(5\times11)}$$

$$= \frac{-7}{55}$$

7	343
7	49
7	7
	1

5	166375
5	33275
5	6655
11	1331
11	121
11	11
	1

(d) $\sqrt[3]{\dfrac{-9261}{42875}}$

$$= \frac{-\sqrt[3]{9261}}{\sqrt[3]{42875}}$$

$$= \frac{-\sqrt[3]{3\times3\times3\times7\times7\times7}}{\sqrt{5\times5\times5\times7\times7\times7}}$$

$$= \frac{-(3\times7)}{(5\times11)}$$

$$= \frac{-21}{55}$$

3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

5	42875
5	8575
5	1715
7	343
7	49
7	7
	1

3. Find the cube root of the following numbers :

(a) $\sqrt[3]{0.000729}$

$$= \sqrt[3]{\frac{0.000729}{1000000}}$$

$$= \frac{\sqrt[3]{729}}{\sqrt[3]{1000000}}$$

$$= \frac{\sqrt[3]{3\times3\times3\times3\times3\times3}}{\sqrt[3]{2\times2\times2\times2\times2\times2\times5\times5\times5\times5\times5\times5}}$$

$$= \frac{(3\times3)}{2\times2\times5\times5} = \frac{9}{100} = 0.09$$

3	729
3	243
3	81
3	27
3	9
3	3
	1

2	1000000
2	500000
2	250000
2	125000
2	62500
2	31250
5	15625
5	3125
5	625
5	125
5	25
5	5
	1

(b) $\sqrt[3]{0.085184}$

$$= \sqrt[3]{\frac{0.85184}{1000000}}$$

$$= \frac{\sqrt[3]{85184}}{\sqrt[3]{1000000}}$$

$$= \frac{\sqrt[3]{2\times2\times2\times2\times2\times2\times11\times11\times11}}{\sqrt[3]{10\times10\times10\times10\times10\times10}}$$

$$= \frac{(2\times2\times11)}{10\times10}$$

$$= \frac{44}{100} = 0.44$$

2	85184
2	42592
2	21296
2	10648
2	5324
2	2662
11	1331
11	121
11	11
	1

10	1000000
10	100000
10	10000
10	1000
10	100
10	10
	1

(c) $\sqrt[3]{373.248}$ $= \sqrt[3]{\frac{373.248}{1000}} = \frac{\sqrt[3]{373248}}{\sqrt[3]{1000}}$

2	373248
2	186624
2	93312
2	46656
2	23328
2	11664
2	5832
2	2916

2	1458
3	729
3	242
3	81
3	27
3	9
3	3
	1

10	1000000
10	100000
10	10000
10	1000
10	100
10	10
	1

$$= \frac{\sqrt[3]{2\times2\times2\times2\times2\times2\times2\times2\times2\times3\times3\times3\times3\times3\times3}}{\sqrt[3]{2\times2\times2\times5\times5\times5}}$$

$$= \frac{(2\times2\times2\times3\times3)}{(2\times5)} = \frac{72}{10} = 7.2$$

(d) $\sqrt[3]{0.003375}$

$$= \frac{\sqrt[3]{0.003375}}{\sqrt[3]{1000000}}$$

$$= \frac{\sqrt[3]{3\times3\times3\times5\times5\times5}}{\sqrt[3]{10\times10\times10\times10\times10\times10}}$$

$$= \frac{(3\times5)}{(10\times10)}$$

$$= \frac{15}{100} = 0.15$$

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

10	1000000
10	100000
10	10000
10	1000
10	100
10	10
	1

4. (a) 43200

43200

$= 2\times2\times2\times2\times2\times2\times3\times3\times3\times5\times5$

Grouping the factors in triplets of equal factors and 5×5 become left.

Thus if we multiplied by 5 in the given no. the no. will become perfect cube.

So, the no. to be multiplied by 5.

Thus, the perfect cube no. = $43200\times5 = 216000$

Now, $\sqrt[3]{216000}$

$= \sqrt[3]{2\times2\times2\times2\times2\times2\times3\times3\times3\times5\times5\times5}$

$= 2\times2\times3\times5$

$= 60$

2	43200
2	21600
2	10800
2	5400
2	2700
2	1350
3	675
3	225
3	75
5	25
5	5
	1

(b) 33275

$= 5\times5\times11\times11\times11$

Grouping the factors in triplets of equal factors, and 5×5 become left.

Thus, if we multiplied by 5 in the given no. the no. will become perfect cube.

So, the no. to be multiplied by 5

thus, the perfect cube no. = 33275×5

5	33275
5	6655
11	1331
11	121
11	11
	1

$= 166375$

Now, $\sqrt[3]{166375} = \sqrt[3]{5\times5\times5\times11\times11\times11}$

$= 5\times11 = 55$

(c) 6750

2	6750
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

$= 2\times3\times3\times3\times5\times5\times5$

Grouping the factors in triplets of equal factors, and 2 become left.

Thus, if we multiplied by 2×2 in given no., the no. will become perfect cube.

So, the no. to be multiplied by $2\times2 = 4$

Thus, the perfect cube no.

$= 6750\times4 = 27000$

Now, $\sqrt[3]{27000}$

$= \sqrt[3]{2\times2\times2\times3\times3\times3\times5\times5\times5}$

$= 2\times3\times5 = 30$

(d) 3087

3	3087
3	1029
7	343
7	49
7	7
	1

$= 3\times3\times7\times7\times7$

Grouping the factors in triplets of equal Factors, and 3×3 become left.

Thus, if we multiplied by 3 in the given no. the no. will become perfect cube.

So, the no. to be multiplied by 3

Thus, the perfect cube no.

$= 3087\times3$

$= 9261$

Now, $\sqrt[3]{9261} = 3\times3\times3\times7\times7\times7$

$= 3\times7 = 21$

5. (a) 15552

2	15552
2	7776
2	3888
2	1944
2	972
2	486
3	243
3	81
3	27
3	9
3	3
	1

$= 2\times2\times2\times2\times2\times2\times3\times3\times3\times3\times3$

Grouping the factors in triplets of equal factors, and 3×3 become left.

Thus, if we divided by 3×3 in the given no., the non will become perfect cube.

So, the no. to be divided by $3\times3 = 9$.

Thus, the perfect cube no.

$= 1552\div9$

$= 1728$

Now, $\sqrt[3]{1728}$

$= \sqrt[3]{\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{3\times3\times3}}$

$= 2\times2\times3$

$= 12$

(b) 3087

$= 3\times3\times7\times7\times7$

Grouping the factors in triplets of equals, and 3×3 become left.

Thus, if we divided by 3×3 in the given no., the no. will become perfect cube.

So, the no. to be divided by $3\times3=9$

Thus, the perfect cube no.

$= 3087\div9=343$

Now, $\sqrt[3]{343}=\sqrt[3]{7\times7\times7}=7$

3	3087
3	1029
7	343
7	49
7	7
	1

(c) 31250

$= 2\times5\times5\times5\times5\times5\times5$

Grouping the factors is triplets of equals, and 2 become left.

Thus, if we divided by 2 in the given no., the no. will become perfect cube.

So, the no. tube divided by 2.

Thus, the perfect cube no. = $31250\div2$

$=15625$

Now, $\sqrt[3]{15625}=\sqrt[3]{5\times5\times5\times5\times5\times5}$

$=5\times5$

$=25$

2	31250
5	15625
5	3125
5	625
5	125
5	25
5	5
	1

(d) 120393

$= 3\times3\times3\times7\times7\times7\times13$

Grouping the factors in triplets of equals, and 13 become left.

thus, if we divided by 13 is the given no., the no will become perfect cube.

So, the no. tube divided by 13.

Thus, the perfect cube no.

$=120393\div13$

$=9261$

Now, $\sqrt[3]{9261}=\sqrt[3]{3\times3\times3\times7\times7\times7}$

$=3\times7=21$

3	120393
3	40131
3	13377
7	4459
7	637
7	91
13	13
	1

Multiple Choice Questions

1. (a) **2.** (b) **3.** (b) **4.** (c) **5.** (c) **6.** (d) **7.** (a) **8.** (b) **9.** (b) **10.** (a)

Hots

$(10^3)^3$ is , 6m, No bigger

Mental Maths

How many triangles are there in the following figure.

Ans.

Exercise 5.1

1. Find out the values of a, b and c for which the following are true :

(a) Here we have $8-a=5$

	C	3	8
–	2	9	9
	3	b	5

so $a=3$
and $3-9$ not possible
so $13-9=b$
Hence, $b=4$
Now, $c-1-2=3$
so $c=6$
So, $a=3, b=4, c=6$
and sum =

	6	3	8
–	2	9	3
	3	4	5

(b) $5-6$ not possible

	8	a	5
–	b	8	6
	1	0	c

so $15-6=c$
or $c=9$
Now, $a-1-8=0$
So, $a=9$
Now, $8-b=1$
So, $b=7$
So, $a=9, b=7, c=9$
and sum

	8	9	5
–	6	8	6
	1	0	9

(c) Here $6+a=4$

	4	7	6
–	9	7	8
1	4	5	4

So, $a=-2$ not possible
or $a=10-2=8$
Now, $b+1+7=5$
$b+8=5$
$b=-3$ Not possible
or $b=10-3=7$
Now, $1+4+c=14$
or $5+c=14$
$c=9$
So, $a=8, b=7, c, 9$
and sum will be

	4	b	6
–	c	7	a
1	4	5	c

2. Let the no be $=x$

According to question

$$(x+18)\times 7=182$$
$$x+18=\frac{182}{7}$$
$$x+18=26$$
$$x=26-18$$
$$x=8$$

So, the no = 8.

3. (a) We have to find a number which When multiplied by 9 gives 6 at ones place. It may be 4 there for a should be = 4

$$\begin{array}{cccc} & & 2 & a \\ & \times & b & 9 \\ \hline & 2 & 1 & 6 \\ 1 & 2 & 0 & \times \\ \hline 1 & 4 & 1 & 6 \end{array}$$

Now, $24 \times b = 120$

so, $b = \dfrac{120}{24}$

Hence value of $a = 4$ and $b = 5$

or
$$\begin{array}{cccc} & & 2 & 4 \\ & \times & 5 & 9 \\ \hline & 2 & 1 & 6 \\ 1 & 2 & 0 & \times \\ \hline 1 & 4 & 1 & 6 \end{array}$$

(b)
$$\begin{array}{cccc} & & a & b \\ & \times & 7 & 6 \\ \hline & 5 & 1 & 0 \\ 5 & 9 & 5 & \times \\ \hline 6 & 4 & 6 & 0 \end{array}$$

We have to find a no. which, when multiplied by 6 gives 0 at ones place. It may be either 0 or 5.98 we take as 0, the $6 \times 0 = 0$ and did not carry anything. Then it is not possible to copes 51 in the table of 76. so, b should be 5.

Now, $b = 5$

$b \times 5 = 30$

or carried over = 3

Now, $b \times a = 51 - 3$

or $6 \times a = 48$

$a = \dfrac{48}{6}$

$a = 8$

$$\begin{array}{cccc} & & 8 & 5 \\ & \times & 7 & 6 \\ \hline & 5 & 1 & 0 \\ 5 & 9 & 5 & \times \\ \hline 6 & 4 & 6 & 0 \end{array}$$

So, $a = 8, b = 5$

or sum will be

(c)
$$\begin{array}{cccccc} & & & 8 & 8 & 8 \\ & & \times & 4 & 7 & 9 \\ \hline & & 7 & 9 & 9 & 2 \\ & 6 & 2 & 1 & 6 & \times \\ 3 & 5 & 5 & 2 & \times & \times \\ \hline 4 & 2 & 5 & 3 & 5 & 2 \end{array}$$

We have to find a no. which when multiplied by 8 gives 2 at one place. It may be either 4 or 9. If we take c as 4, the $8 \times 4 = 32$ but it is not possible for $8 \times 4 = 79$

So, $c = 9$

so, $b = 8$

and $888 \times a = 3552$

$a = \dfrac{3552}{888}$

$a = 4$

so, sum will be

$$\begin{array}{cccccc} & & & 8 & b & 8 \\ & & \times & a & 7 & c \\ \hline & & 7 & 9 & 9 & 2 \\ & 6 & 2 & 1 & 6 & \times \\ 3 & 5 & 5 & 2 & \times & \times \\ \hline 4 & 2 & 5 & 3 & 5 & 2 \end{array}$$

4. according to questions

$$a+\cancel{b}=820 \qquad \ldots \text{I}$$
$$a-\cancel{b}=80 \qquad \ldots \text{II}$$
$$\overline{2a=900}$$
$$a=\frac{900}{2}=450$$

Putting the value of a

$$450+b=820$$
$$b=820-450$$
$$b=370$$

5. According to questions

$$a+b=480 \qquad \ldots \text{I}$$
$$a=b+40 \qquad \ldots \text{II}$$

or
$$a-\cancel{b}=40 \qquad \ldots \text{II}$$
$$a+\cancel{b}=480 \qquad \ldots \text{I}$$
$$\overline{2a=520}$$
$$a=\frac{520}{2}\,260$$
$$a=260$$

Putting the value of a in eq. (1)

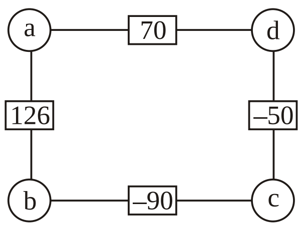
$$260+b=480$$
$$b=480-260$$
$$b=220$$

6. According to questions

$$(p+7)\times 9=216$$

or
$$p+7=\frac{216}{9}$$
$$p+7=24$$
$$p=24-7$$
$$p=17$$

7. (a)



$$a\times b=126$$

so, $a=14,\ b=9$ satisfied it

Now, $14\times d=70$

so
$$d=\frac{70}{14}$$
$$d=5$$
$$9\times c=-90$$
$$c=\frac{-90}{9}$$
$$c=-10$$
$$-10\times d=-50$$

$$d = \frac{50}{10}$$

$$d = 5$$

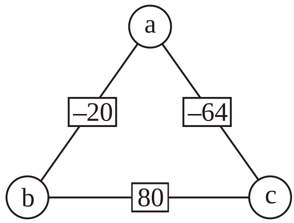
(b) $a \times b = -20$

$a = -4, b = 5$

or $5 \times c = 80$

$$c = \frac{80}{5}$$

$$c = 16$$



8. Complete the following magic square

(a)

6	1	8
7	5	3
2	9	4

(b)

6	12	7	9
1	15	4	14
11	5	10	8
16	2	13	3

Sharp Your Knowledge

(a) 570, 750 (b) 507, 570, 705, 750 (c) 570, 750, 705

(d) No. number is possible (e) 570, 750

Exercise 5.2

1. 8 consecutive numbers between 501 and 550, which are exactly divisible by 2.
= 502, 504, 506, 508, 510, 512, 514, 516

2. Numbers between 1001 to 1050 which are exactly divisible by 3.
= 1002, 1005, 1008, 1011, 1014, 1017, 1020, 1023, 1026, 1029, 1032, 1035, 1038, 1041, 1044, 1047

3. No. divisible by 2 under given conditions
= 2930, 2390, 9320, 9230, 3290, 3920, 3902, 3092, 9032, 9302

4. 7 No. divisible by 3 under given conditions.
= 4590, 4059, 4509, 4905, 4095, 5049, 5940

5. 8 four digit numbers which are exactly divisible by 5 under given conditions
= 5370, 3570, 7530, 7350, 5730, 3750, 3705, 7305

6. 6 three-digit numbers, which are exactly divisible by 10 under given conditions.
= 580, 590, 890, 850, 950, 980

7. Using the tests of divisibility, determine which of the following numbers are divisible by 9:

(a) 1258
$= 1 + 2 + 5 + 8$
$= 16$
16 is not divisible by 9
So, 1258 is not divisible by 9.

(b) 4338
$= 4 + 3 + 3 + 8$
$= 18$
18 is divisible by 9
So, 4338 is divisible by 9.

(c) 7905

(d) 63909

$= 7+9+0+5$
$= 21$
21, is not divisible by 9
So, 7905 is not divisible by 9.

$= 6+3+9+0+9$
$= 27$
27, is divisible by 9
So, 63909 is divisible by 9.

8. Write the smallest and the greatest values of a in each of the following numbers so that the number formed is divisible by 3:

(a) $a6724 = a+6+7+2+4 = a+19$
No. is divisible by 3
So $a+19$ is also divisible by 3
So that value of a May be 2, 5 or 8
So lowest value = 2
Highest value = 8

(b) $4765a2 = 4+7+6+5+a+2 = 24+a$
No. is divisible by 3
So, $24+a$ also divisible by 3.
So that value of a may be 0, 3, 6, 9
So lowest value of $a = 0$
Highest value of $a = 9$

9. Write the values of x and y in the following odd numbers so that the numbers formed are divisible by 3 and 5 :

(a) $7x25 = 7+x+2+5 = 14+x$
No. should be divisible by 3
So, $14+x$ is also divisible by 3
So that value of x may be = 1, 4, or 7

(b) $8xy4y$
No. should be divided by = 5
So, $y = 5$
Now, $8+x+5+4+5$
$22+x$
No. is divisible by 3
So, that $22+x$ is also divisible by 3.
So, that value of x may be = 2, 5, 8
$x = 2, 5$ or 8 $y = 5$

10. Find x, such that the number is exactly divisible by 3. $(0 <= x < 5)$

(a) $450x$
$4+5+0+x$
$9+x$
No. is divisible by 3
So, $9+x$ is also divisible by 3.
So, $x = 3$
$\because$ $0 < x < 5$

(b) $3x58$

$3+x+5+8$

$x+16$

No. is divisible by 3

So, $x+16$ is divisible by 3

so $x=2$

$\because$ $0<x<5$

So $x=2$

(c) $40x9$

$=4+0+x+9$

$=13+x$

No. is divisible by 3

So, $13+x$ is divisible by 3

so $x=2$ and $\because 0<x<5$

(d) $95x0$

$=9+5+x+0$

$=14+x$

No. is divisible by 3

So, $14+x$ is divisible by 3

$\because$ $0<x<5$

So, $x=1$

(e) $x397$

$x+3+9+7$

$=x+19$

No. is divisible by 3

So, $19+x$ is also divisible by 3.

$\because$ $0<x<5$

So $x=2$

Multiple Choice Questions

1. (d) **2.** (a) **3.** (b) **4.** (a) **5.** (a) **6.** (b) **7.** (b)

HOTS

(a) 64, –128, 256 (b) 21, 34, 55

$\Rightarrow$ $7 \boxed{+} 7 \boxed{-} (7 \boxed{\div} 7) = 13$

6 Algebraic Expression

Exercise 6.1

1. Identify which of the following expressions are polynomials. If the expression is not a polynomial. say why.

Ans. (a) Polynomial

(b) Not polynomial, because the degree of variable is in a fraction.

(b) Polynomial

(c) Not polynomial, because the degree of variable is tina fraction.
(d) Not polynomial, because the degree of variable is in a fraction.
(e) Polynomial

2. Write the degree of each of the following polynomials.

(a) $x^3 - 3x^2 + 1 - x$
degree = 3

(b) $xy^2 - y^3 + y^4 + 6$
degree = 4

(c) $\frac{6a^3b}{7} + \frac{4a^2b^3}{5} - \frac{3ab^2}{4}$
so, degree = 2+3 = 5

(d) $2x^5 - 6x^3 + 7x - 9$
degree = 5

(e) $p^6q - p^5q^2 + 6p^4q^3 - 8pq^2 + pq$
so, degree = 6+1 = 7

3. Arrange each of the polynomials in : (a) ascending order of the first variable, and (b) in descending order of the second variable.

(a) $x^3y^2 - x^4y + 3x^2y^3 - 2xy$
ascending order of first variable
$$-2xy + 3x^2y^3 + x^3y^2 - x^4y$$
descending order of the second variable.
$$3x^2y^3 + x^3y^2 - 2xy - x^4y$$

(b) $ab^5 - 6ab^3 + 5a^2b^4$
ascending order of first variable
$$ab^5 - 6ab^3 + 5a^2b^4$$
descending orders of second variable
$$ab^5 + 5a^2b^4 - 6ab^3$$

(c) $1 - pq^3 + p^2q^4 - pq$
ascending order of first variable
$$1 - pq^3 - pq + p^2q^4$$
descending order of second variable
$$+p^2q^4 - pq^3 - pq + 1$$

(d) $xy^3 + x^3y$
ascending order of first variable
$$xy^3 + x^3y$$
descending order of second variable
$$xy^3 + x^3y$$

(e) $x^6y^2 - 7x^5y + 8xy^4 - 9x^2y^3$
ascending order of first variable
$$8xy^4 - 9x^2y^3 - 7x^5y + x^6y^2$$

descending order of second variable
$$8xy^4 - 9x^2y^3 + x^6y^2 - 7x^5y$$

4. Add the polynomials.

(a) $3x^2 - 4x + 6x^3 - 5$ and $8x^3 - 4x^2 + 5x + 5$

$3x^2 - 4x + 6x^3 - 5 + 8x^3 - 4x^2 + 5x + 5$

$3x^2 - 4x^2 - 4x + 5x + 6x^3 + 8x^3 - 5 + 5$

$-x^2 + x + 14x^3 + 0$

or $14x^3 - x^2 + x$

(b) $7a^3b - 8a^2b^2 + 9ab$ and $1 - 6ab$

$= 7a^3b - 8a^2b^2 + 9ab + 1 - 6ab$

$= 7a^3b - 8a^2b^2 + 9ab - 6ab + 1$

$= 7a^3b - 8a^2b^2 + 3ab + 1$

(c) $5pq^2 + 6p^2q - 9pq$ and $9pq - 6p^2q - 5pq^2$

$= 5pq^2 + 6p^2q - 9pq + 9pq - 6psp2q - 5pq^2$

$= 5pq^2 - 5pq^2 + 6p^2q - 6p^2q - 9pq + 9pq$

$= 0 + 0 + 0 = 0$

(d) $3 - abc + abc^2$ and $-2abc^2 + abc$

$= 3 - abc + abc + abc^2 - 2abc^2 = 3 + 0 - abc^2 = 3 - abc^2$

(e) $\dfrac{-2xy}{3} + \dfrac{3x^2y}{4} + \dfrac{4xy^2}{5}$ and $\dfrac{xy}{3} + \dfrac{-2x^2y}{5} + \dfrac{3xy^2}{5}$

$= \dfrac{-2xy}{3} + \dfrac{xy}{3} + \dfrac{3x^2y}{4} - \dfrac{2x^2y}{5} + \dfrac{4xy^2}{5} + \dfrac{3xy^2}{5}$

$= \dfrac{-xy}{3} + \left(\dfrac{15x^2y - 8x^2y}{20}\right) + \dfrac{7xy^2}{5} = \dfrac{-xy}{3} + \dfrac{7x^2y}{20} + \dfrac{7xy^2}{5}$

5. Subtract the first polynomial from the second.

(a) $(6x^2 + 5x - 1)$ from $(-5x + 7x^2 + 9)$

$= (-5x + 7x^2 + 9) - (6x^2 + 5x - 1)$

$= -5x + 7x^2 + 9 - 6x^2 - 5x + 1$

$= -5x - 5x + 7x^2 - 6x^2 + 9 + 1$

$= -10x + x^2 + 10$ or $x^2 - 10x + 10$

(b) $(6x^2 - 15x + 4)$ from $(12 - x^2)$

$= (12 - x^2) - (6x^2 - 15x + 4)$

$= (12 - x^2) - 6x^2 + 15x - 4$

$= 12 - 4 - x^2 - 6x^2 + 15x = 8 - 7x^2 + 15x$ or $-7x^2 + 15x + 8$

(c) $(a^2 - 5a + 6)$ from $(a^3 - 4a^2 + 5 - a)$

$(a^3 - 4a^2 + 5 - a) - (a^2 - 5a + 6)$

$= a^3 - 4a^2 + 5 - a - a^2 + 5a - 6$

$= a^3 - 4a^2 - a^2 + 5 - 6 - a + 5a$

$= a^3 - 5a^2 - 1 + 4a = a^3 - 5a^2 + 4a - 1$

6. Multiply :

(a) $-5a^2b^2$ by $-6ab$

$= (-5a^2b^2) \times (-6ab) = +30a^3b^3$

(b) xyz by $-3x^3y^2z$

$= (xyz) \times (-3x^3y^2z) = -3x^4y^3z^2$

(c) $\frac{-2}{3}xy$ by $\frac{3}{2}x^2y^2z$

$= \left(\frac{-2}{3}xy\right) \times \left(\frac{3}{2}x^2y^2z\right)$

$= \frac{-2}{3} \times \frac{3}{2}x^3y^3z = -x^3y^3z$

(d) $(2x^2 - 4x + 1)$ by $(3x - 1)$

$= (2x^2 - 4x + 1) \times (3x - 1)$

$= 3x(2x^2 - 4x + 1) \times -1(2x^2 - 4x + 1)$

$= 6x^3 - 12x^2 + 3x - 2x^2 + 4x - 1$

$= 6x^3 - 12x^2 - 2x^2 + 3x + 4x - 1 = 6x^3 - 14x^2 + 7x - 1$

(e) $(3x^3 - 6x^2y + xy^2 + 2)$ by $(3 - x)$

$= (3x^3 - 6x^2y + xy^2 + 2) \times (3 - x)$

$= 3(3x^3 - 6x^2y + xy^2 + 2) - x(3x^3 - 6x^2y + xy^2 + 2)$

$= 9x^3 - 18x^{2y} + 3xy^2 + 6 - 3x^4 + 6x^3y - x^{2y^2} - 2x$

$= -3x^4 + 9x^3 + 6x^3y - x^2y^2 + 18x^2y + 3xy^2 - 2x + 6$

(f) $(x^3 - y^3)$ by $(x - y)$

$= (x^3 - y^3) \times (x - y)$

$= x(x^3 - y^3) - y(x^3 - y^3)$

$= x^4 - xy^3 - yx^3 - y^4 = x^4 - x^3y - xy^3 - y^4$

(g) $(x^2 - 7x + 6)$ by $(2x - y)$

$= (x^2 - 7x + 6)(2x - y)$

$= 2x(x^2 - 7x + 6) - y(x^2 - 7x + 6)$

$= 2x^3 - 14x^2 + 12x - yx^2 7xy - 6y$

$= 2x^3 - x^2y - 14x^2 + 7xy + 12x - 6y$

(h) $(x + y - xy)$ by $(1 - xy)$

$= (x + y - xy) \times (1 - xy)$

$= 1(x + y - xy) - xy(x + y - xy)$

$= x + y - xy - x^2 - xy^2 + x^2y^2$

$= x^2y^2 - x^2y - xy^2 - xy + x + y$

(i) $(3a^3 - 7b^3)$ by $(2a^2b + ab^2)$

$= (3a^3 - 7b^3) \times (2a^2b + ab^2)$

$= 2a^2b(3a^3 - 7b^3) + ab^2(3a^3 - 7b^3)$

$= 6a^5b - 14a^2b^4 3a^4b^2 - 7ab^5$

$= 6a^5b + 3a^4b^2 - 14a^2b^4 - 7ab^5$

(j) $(y^2 + 2y + 3)$ by $(y^2 + 2y - 3)$

$= y^2(y^2 + 2y + 3) + 2y(y^2 + 2y + 3) - 3(y^2 + 2y + 3)$

$= y^4 + 2y^3 + 3y^2 + 2y^3 + 4y^2 + 6y - 3y^2 - 6y - 9$

$= y^4 + 2y^3 + 2y^3 + 3y^2 + 4y^2 - 3y^2 + 6y - 6y - 9$

$= y^4 + 4y^3 + 4y^2 - 9$

7. Indicate whether true or false. Correct the mistakes.

(a) $2 + a = 2a$ (in correct) **False**

It will be $(2 + a)$

(b) $3a + b = 3ab$ (in correct)

It will be $(3a + b)$ **False**

(c) $4a \times 3b = 12ab$ (correct) **True**

(d) $a \times a = 2a$ (in correct) False

It will be $a \times a = a^2$

Exercise 6.2

1. Divide :

(a) $26a^2$ by $13a$

$= \dfrac{26a^2}{13a} = 2a$

(b) $4x$ by $\dfrac{4x}{3}$

$= \dfrac{4x}{4x/3} = \dfrac{4x \times 3}{4x} = 3$

2. Divide :

(a) $6a^2b + 3ab^2 + 12ab$ by $2a$

$$= \frac{6a^2b + 3ab^2 + 12ab}{2a}$$

$$= \frac{6a^2b}{2a} + \frac{3ab^2}{2a} + \frac{12ab}{2a} = 3ab + \frac{3b^2}{2} + 6b$$

(b) $18a^3 - 12a^2c + 9ac^2$ by 3 ac

$$= \frac{18a^3 - 12a^2c + 9ac^2}{3ac}$$

or $$\frac{18a^3}{3ac} - \frac{12a^2c}{3ac} + \frac{9ac^2}{3ac}$$

$$= \frac{6a^2}{c} - 4a + 3c$$

3. Use the given information, to find the dividend.

(a) divisor = $x+1$; quotient = $x-1$;

remainder = 3 ; dividend = ?

Dividend $= \text{Divisor} \times \text{quotient} + \text{remainder}$

$= (x+1)\times(x-1)+3$

$= x(x-1)+1(x-1)+3 = x^2 - x + x - 1 + 3 = x^2 + 2$

(b) divisor = x^2+1, quotient = $2x$;

remainder = $7x+5$; dividend = ?

Dividend $= \text{Divisor} \times \text{quotient} + \text{remainder}$

$= (x^2+1)\times 2x + 7x + 5$

$= 2x^3 + 2x + 7x + 5 = 2x^3 + 9x + 5$

4. Divide :

(a) $x^5 + 3x^4 - 5x^3 + 4x^2 + 39x - 11$ by $4x + x^2 - 2$

or $x^5 + 3x^4 - 5x^3 + 4x^2 + 39x - 11$ by $x^2 + 4x - 2$

$$\begin{array}{r}
x^3 - x^2 + x - 2 \\
x^2+4x-2 \overline{\smash{)}\, x^5 + 3x^4 - 5x^3 + 4x^2 + 39x - 11} \\
x^5 + 4x^4 - 2x^3 \qquad\qquad\qquad \\
- \quad - \quad + \qquad\qquad\qquad\quad \\
\hline
-x^4 - 3x^3 + 4x^2 + 39x - 11 \\
-x^4 - 4x^3 + 2x^2 \qquad\qquad \\
+ \quad + \quad - \qquad\qquad\quad \\
\hline
x^3 + 2x^2 + 39x - 11 \\
x^3 + 4x^2 - 2x \qquad \\
- \quad - \quad + \qquad\quad \\
\hline
-2x^2 + 41x - 11 \\
-2x^2 - 8x + 4 \\
+ \quad + \quad - \\
\hline
49x - 15
\end{array}$$

So, Quotient = $(x^3 - x^2 + x - 2)$

Remainder = $(49x - 15)$

(b) $2y^4 + y^3 + 10y^2 + 8y - 4$ by $y^2 - y + 6$

$$\begin{array}{r}
2y^2 + 3y + 1 \\
y^2 - y + 6 \overline{\smash{)}\, 2y^{4+} y^3 + 10y^2 + 8y - 4} \\
2y^4 - 2y^3 + 12y^2 \qquad\qquad \\
- \quad + \quad - \qquad\qquad\quad \\
\hline
3y^3 - 2y^2 + 8y - 4 \\
3y^3 - 3y^2 + 18y \qquad
\end{array}$$

$$\begin{array}{r}
\underline{-\quad + \quad -\qquad} \\
y^2 - 10y - 4 \\
y^2 - y + 6 \\
\underline{-\quad + \quad -} \\
-9y - 10
\end{array}$$

Quotient = $(2y^2 + 3y + 1)$; Remainder = $(-9y - 10)$

5. Divide and show that the divisor is a factor of the dividend.

(a) $x^4 - x^3 + 3x^2 - 2x + 2$ by $x^2 + 2$

$$\begin{array}{r|l}
 & x^2 - x + 1 \\ \hline
x^2 + 2 & x^4 - x^3 + 3x^2 - 2x + 2 \\
 & x^4 + 2x^2 \\
 & \underline{-\quad -\qquad} \\
 & -x^3 + x^2 - 2x + 2 \\
 & -x^3 - 2x \\
 & \underline{+\quad +\qquad} \\
 & x^2 + 2 \\
 & x^2 + 2 \\
 & \underline{-\quad -} \\
 & 0
\end{array}$$

Since the remainder is 0, both the divisor, as will as the quotient are factors of the divided. we can therefore write

$(x^4 - x^3 + 3x^2 - 2x + 2) = (x^2 + 2)(x^2 - x + 1)$

(b) $12x^3 - 2x^2 + x + 1$ by $3x + 1$

$$\begin{array}{r|l}
 & 4x^2 - 2x \\ \hline
3x + 1 & 12x^3 - 2x^2 + x + 1 \\
 & 12x^3 + 4x^2 \\
 & \underline{-\quad -\qquad} \\
 & 6x^2 + x + 1 \\
 & 6x^2 - 2x \\
 & \underline{+\quad +\qquad} \\
 & -x + 1
\end{array}$$

Quotient = $4x^2 - 2x$ Remainder = $1 - x$

Since the remainder is not 0,

So, both quotient and divisor is not the factors of dividend.

6. Find the value of k, if the divisor is a factor of the dividend.

(a) $2x^3 - 14 + k$ by $(x + 3)$

$$\begin{array}{r|l}
 & 2x^2 - 6x + 18 \\ \hline
x + 3 & 2x^3 - 14 + k
\end{array}$$

$$
\begin{array}{r}
2x^3+6x^2 \\
-\quad - \\
\hline
-6x^2-14+k \\
-6x^2-18x \\
+\quad + \\
\hline
18x-14+k \\
18x+54 \\
- \\
\hline
\times
\end{array}
$$

For the remainder be zero

$$14+k=54$$
$$k=54+14$$
$$k=68$$

(b) $4x^3-12x^2-37x+k$ by $2x+1$

$4x^3-12x^2-37x+k\div(2x+1)$

$$
\begin{array}{r|l}
 & 2x^2-7x-15 \\
\hline
2x+1 & 4x^3-12x^2-37x+k \\
 & 4x^3+2x^2 \\
 & -\quad - \\
\hline
 & -14x^2-37x+k \\
 & -14x^2-7x+12 \\
 & +\quad + \\
\hline
 & -30x+k \\
 & -30x-15 \\
\hline
 & 0 \\
\hline
\end{array}
$$

For the remainder to be zero.

$$k=-15$$

7. Volume of rectangular solid $=2x^3+7x^2+2x-3$

length $=(2x-1)$

width $=(x+3)$

$\therefore$ length $\times$ width $=(2x-1)(x+3)$

$$=2x(x+3)-1(x+3)$$
$$=2x^2+6x-x-3$$
$$=(2x^2+5x-3)$$

So, Height $=$ Volume $\div$ (length $\times$ width)

$$=(2x^3+7x^2+2x-3)\div(2x^2+5x-3)$$

$$
\begin{array}{r|l}
 & x+1 \\
\hline
2x^2+5x-3 & 2x^3+7x^2+2x-3
\end{array}
$$

$$\begin{array}{r} 2x^3 + 5x^2 - 3x \\ - \quad - \quad + \\ \hline 2x^2 + 5x - 3 \\ 2x^2 + 5x - 3 \\ \hline \times \end{array}$$

So, height $= (x+1)$.

8. Volume of cube $= x^3 + 3x^2 + 3x + k$

length of side $= (x+1)$

$\therefore$ Volume $= (\text{length})^3$

$= (x+1)^3$

$= (x+1)(x+1)(x+1)$

$= (x^2 + 2x + 1)(x+1)$

$= x^3 + 2x^2 + x + x^2 + 2x + 1$

$= x^3 + 3x^2 + 3x + 1$

on comparing by volume

we get $k = 1$.

9. Divide and write down the quotient and remainder for each. Also check to see if your division is correct using the rule: dividend = (divisor × quotient) + remainder.

(a) $(x^2 + 5x + 6)$ by $(x+2)$

$$\begin{array}{r} x+3 \\ x+2 \overline{) x^2 + 5x + 6 (} \\ x^2 + 2x \\ - \quad - \\ \hline 3x + 6 \\ 3x + 6 \\ - \quad - \\ \hline 0 \end{array}$$

So, $Q = (x+3)$, divisor $= (x+2)$, $R = 0$

Checking :

Dividend $= (\text{divisor}) \times \text{quotient} + \text{Remainder}$

$= (x+2)(x+3) + 0$

$= x(x+3) + 2(x+3) + 0$

$= x^2 + 3x + 2x + 6 + 0$

$= x^2 + 5x + 6$ **Hence Proved**

(b) $y^2 - 2y + 5$ by $y + 1$

$y - 3$

$$
\begin{array}{r|l}
y+1 & y^2 - 2y + 5 \\
 & y^2 + y \\
 & -\quad - \\ \hline
 & -3y + 5 \\
 & -3y - 3 \\
 & +\quad + \\ \hline
 & +8
\end{array}
$$

Quotient $= y-3$; Divisor $= y+1$

Remainder $= 18$

Checking :

Dividend $=$ (divisor) $\times$ quotient $+$ Remainder

$= (y+1)\times(y-3)+8$

$= (y+1)\times(y-3)+8$

$= y(y-3)+1(y-3)+8$

$= y^2 - 3y + y - 3 + 8$

$= y^2 - 2y + 5$ **Hence proved**

(c) $m^2 - 3m + 7$ by $(m-2)$

$$
\begin{array}{r|l}
 & m-1 \\ \hline
m-2 & m^2 - 3m + 7 \\
 & m^2 - 2m \\
 & -\quad + \\ \hline
 & -m + 7 \\
 & -m + 2 \\
 & +\quad - \\ \hline
 & 5 \quad \text{Remainder}
\end{array}
$$

$Q = (m-1)$

Divisor $= m-2$,

Remainder $= 5$

Checking :

Dividend $=$ divisor $\times$ quotient $+$ Remainder

$= (m-2)(m-1)+5$

$= m(m-1)-2(m-1)+5$

$= m^2 - m - 2m + 2 + 5$

$= m^2 - 3m + 7$ **Hence proved.**

(d) $x^2 - 8x - 12$ by $(x+4)$

$(x^2 - 8x - 12) \div (x+4)$

$x - 12$

$$
\begin{array}{r|l}
x+4 & x^2-8x-12 \\
& x^2+4x \\
& -\quad - \\
\hline
& -12x-12 \\
& -12x-48 \\
& +\quad + \\
\hline
& +36 \quad \text{Remainder}
\end{array}
$$

Quotient $= (x-12)$; Remainder $= 36$ Divisor $= (x+4)$

Checking :

Dividend = divisor × quotient + Remainder

$= (x+4)(x-12)+36$

$= x(x-12)+4(x-12)+36$

$= x^2-12x+4x-48+36 = x^2-8x-12$ **Hence proved**

(c) $3y^2+10y-9$ by $(3y-2)$

$(3y^2+10y-9) \div (3y-2)$

$$
\begin{array}{r|l}
 & y+4 \\
\hline
(3y-2) & 3y^2+10y-9 \\
& 3y^2-2y \\
& -\quad + \\
\hline
& 12y-9 \\
& 12y-8 \\
& -\quad + \\
\hline
& -1 \ \text{Remainder}
\end{array}
$$

Divisor $= (3y-2)$, R $= -1$, Quotient $= (y+4)$

Checking :

Dividend = divider × quotient + Remainder

$= (3y-2) \times (y+4) - 1$

$= 3y(y+4) - 2(y+4) - 1$

$= 3y^2+12y-2y-8-1 = 3y^2+10y-9$ **Hence proved**

10. Rewrite the terms in proper order and then divide.

(a) $112y+10y^3+8y^4+15$ by $5+4y$

$8y^4+10y^3+12y+15$ by $(4y+5)$

$$
\begin{array}{r|l}
 & 2y^3+3 \\
\hline
(4y+5) & 8y^4+10y^3+12y+15 \\
& 8y^4+10y^3 \\
& -\quad - \\
\hline
& +12y+15 \\
& -12y-15 \\
& -\quad - \\
\hline
& \times
\end{array}
$$

$\therefore$ Quotient = $(2y^3 + 3)$ and Remainder = 0

(b) $-12 + 3x^2 - 4x + x^3$ by $5x + x^2$

$= x^3 + 3x^2 - 4x - 12$ by $(x^2 + 5x)$

$$
\begin{array}{r|l}
 & x - 2 \\ \hline
x^2 + 5x & x^3 + 3x^2 - 4x - 12 \\
 & x^3 + 5x^2 \\
 & - \quad - \\ \hline
 & -2x^2 - 4x - 12 \\
 & -2x^2 - 10x \\
 & + \quad + \\ \hline
 & 6x - 12
\end{array}
$$

$\therefore$ Quotient = $(x - 2)$ and Reminder = $(6x - 12)$

Exercise 6.3

1. Expand :

(a) $(2x+3)^2 = (2x)^2 + (3)^2 + 2\times(2x)\times 3$

$= 4x^2 + 9 + 12x = 4x^2 + 12x + 9$

(b) $(5a - 3b)^2 = (5a)^2 + (3b)^2 - 2\times(5a)\times(3b)$

$= 25a^2 + 9b^2 - 30ab = 25a^2 - 30ab + 9b^2$

(c) $(-3x + 5x)^2 = (-3x)^2 + (5y)^2 + 2\times(-3x)\times 5y$

$= 9x^2 + 25y^2 - 30xy = 9x^2 - 30xy + 25y^2$

(d) $[5x + (-3y)]^2 = (5x)^2 + (-3y)^2 + 2\times(5x)\times(-3)$

$= 25x^2 + 9y^2 - 30xy = 25x^2 - 30xy + 9y^2$

(e) $[(-4a) - (-2b)]^2$

$= (-4a)^2 + (-2b)^2 - 2\times(-4a)\times(-2b)$

$= -16a^2 + 4b^2 - 16ab = 16a^2 - 16ab + 4b^2$

(f) $[9a + (-2b)]^2 = (19)^2 + (2b)^2 + 2\times 19\times(-2b)$

$= 361 + 4b^2 - 76b = 4b^2 - 76b + 361$

(g) $(\sqrt{2}x - 5y)^2 = (\sqrt{2}x)^2 + (5y)^2 - 2\sqrt{2}x\times 5y$

$= 2x^2 + 25y^2 - 10\sqrt{2}xy = 2x^2 - 10\sqrt{2}xy + 25y^2$

(h) $(\sqrt{3}a + \sqrt{2}b)^2$

$= (\sqrt{a})^2 + (\sqrt{2}b)^2 + 2\times\sqrt{3}\times\sqrt{2}ab = 3a^2 + 2b^2 + 6\sqrt{6}ab$

2. Find the product.

(a) $(2x-1)(2x+1) = (2x)^2 - (1)^2 = 4x^2 - 1$

(b) $(-2x + y)(2x + y) = (y - 2x)(y + 2x) = (y)^2 - (-2x)^2$

$= y^2 - 4x^2$

3. Using identities, find the values.

(a) $(105)^2 = (100+5)^2$

$= (100)^2 + (5)^2 + 2\times 100\times 5 = 10000 + 25 + 1000 = 11025$

(b) $(298)^2 = (300-2)^2$

$= (300)^2 + (2)^2 - 2\times 300\times 2$

$= 90000 + 4 - 1200 = 90004 - 1200 = 88804$

(c) $(1.05)^2 = (1+0.05)^2$

$= (1)^2 + (0.05)^2 + 2\times 1\times (0.05) = 1 + 0.0025 + 0.10 = 1.1025$

(d) $(2.98)^2 = (3.00 - 0.02)^2$

$= (3)^2 + (0.02)^2 - 2\times 3\times (0.02) = 9 + 0.04 - 0.12 = 8.92$

(e) $102 \times 98 = (100+2)\times(100-2)$

$= (100)^2 - (2)^2 = 10000 - 4 = 9996$

(f) $210 \times 190 = (200+10)\times(200-10)$

$= (200)^2 - (10)^2 = 40000 - 100 = 39900$

(g) $151 \times 151 - 51 \times 51 = (151)^2 - (51)^2$

$= (151+51)(151-51) = 202\times 100 = 20200$

(h) $182 \times 182 - 2 \times 182 \times 62 + 62 \times 62$

$= (182)^2 - 2\times 182\times 62 + (62)^2$

$= (182-62)^2 = (120)^2 = 120\times 120 = 14400$

4. If $x + \frac{1}{x} = 4$, find the value of :

(a) $x^2 + \frac{1}{x^2}$

we have $\left(x+\frac{1}{x}\right) = 4$

squaring on both sides $= \left(x+\frac{1}{x}\right)^2 = (4)^2$

$$= x^2 + \left(\frac{1}{x}\right)^2 + 2\times x\times\frac{1}{x} = 16$$

$$= x^2 + \frac{1}{x^2} + 2 = 16$$

$$= x^2 + \frac{1}{x^2} = 16 - 2$$

$$= x^2 + \frac{1}{x^2} = 14$$

(b) $x^4 + \frac{1}{x^4}$

Now, we have $= \left(x + \frac{1}{x^2}\right) = 4$

Squaring on both sides $= \left(x + \frac{1}{x}\right)^2 = (4)^2$

$$= x^2 + \frac{1}{x^2} + 2 \times x \times \frac{1}{x} = 16$$

$$= x^2 + \frac{1}{x^2} + 2 = 16$$

$$= x^2 + \frac{1}{x^2} = 14$$

Again squaring on both sides

$$= \left(x^2 + \frac{1}{x^2}\right)^2 = (14)^2$$

$$= (x^2)^2 + \left(\frac{1}{x^2}\right)^2 + \times x^2 \times \frac{1}{x^2} = 196$$

$$= x^4 + \frac{1}{x^4} + 2 = 196$$

or $x^4 + \frac{1}{x^4} = 194$

5. If $x^2 + \frac{1}{x^2}$ = 62, find the value of $\left(x + \frac{1}{x}\right)$.

Now, $= x^2 + \frac{1}{x^2} = 62$

on adding 2 both sides $= x^2 + \frac{1}{x^2} + 2 = 62 + 2$

$$= x^2 + \frac{1}{x^2} + 2 = 64$$

$$= \left(x + \frac{1}{x}\right)^2 = (64)$$

$$= \left(x + \frac{1}{x}\right)^2 = (8)^2$$

$$= x + \frac{1}{x} = 8$$

6. If $x^2 + \frac{1}{x^2}$ = 102, find the values of $x - \frac{1}{x}$.

We have, $$x^2 + \frac{1}{x^2} = 102$$

subtracting 2 on both sides

$$x^2 + \frac{1}{x^2} - 2 = 102 - 2$$

$$x^2 + \frac{1}{x^2} - 2 = 100$$

or $$\left(x - \frac{1}{x}\right)^2 = (100)$$

or $$\left(x - \frac{1}{x}\right)^2 = (10)^2$$

$$\left(x - \frac{1}{x}\right) = 10$$

7. If $x - \frac{1}{x} = 8$, find the values of

(a) $x^2 + \frac{1}{x^2}$

we have,

$$x - \frac{1}{x} = 8$$

squaring on both sides

$$\left(x - \frac{1}{x}\right)^2 = (8)^2$$

$$= x^2 + \frac{1}{x^2} = 64 + 2$$

$$= x^2 + \frac{1}{x^2} = 66$$

(b) $x^4 + \frac{1}{x^4}$

we have,

$$\left(x - \frac{1}{x}\right) = 8$$

squaring on both sides

$$\left(x + \frac{1}{x}\right)^2 = (8)^2$$

$$x^2 + \frac{1}{x^2} - 2 \times x \times \frac{1}{x} = 64$$

$$x^2 + \frac{1}{x^2} = 64 + 2$$

$$x^2 + \frac{1}{x^2} = 66$$

again squarring on both sides

$$\left(x^2 + \frac{1}{x^2}\right)^2 = (66)^2$$

$$(x^2)^2 + \left(\frac{1}{x^2}\right)^2 + 2 \times x^2 \times \frac{1}{x^2} = 4356$$

$$x^4 + \frac{1}{x^4} + 2 = 4356$$

$$x^4 + \frac{1}{x^4} = 4356 - 2$$

$$x^4 + \frac{1}{x^4} = 4354$$

8. If $x + \frac{1}{x} = \sqrt{3}$, find the values of

(a) $x^2 + \frac{1}{x^2} = ?$

we have,

$$x + \frac{1}{x} = \sqrt{3}$$

squarring on both sides

$$\left(x + \frac{1}{x}\right)^2 = (\sqrt{3})^2$$

$$x^2 + \frac{1}{x^2} + 2 \times x \times \frac{1}{x} = 3$$

$$x^2 + \frac{1}{x^2} + 2 = 3$$

$$x^2 + \frac{1}{x^2} = 3 - 2$$

$$x^2 + \frac{1}{x^2} = 1$$

(b) $x^4 + \frac{1}{x^4}$

We have,

$$x + \frac{1}{x} = \sqrt{3}$$

Squarring on both sides

$$\left(x + \frac{1}{x}\right)^2 = (\sqrt{3})^2$$

$$x^2+\frac{1}{x^2}+2\times x\times\frac{1}{x}=3$$

$$x^2+\frac{1}{x^2}+2=3$$

$$x^2+\frac{1}{x^2}=3-2$$

$$x^2+\frac{1}{x^2}=1$$

again squarring on both sides

$$\left(x^2+\frac{1}{x^2}\right)^2=(1)^2$$

$$x^4+\frac{1}{x^4}+2\times x^2\times\frac{1}{x^2}=1$$

$$x^4+\frac{1}{x^4}+2=1$$

or $$x^4+\frac{1}{x^4}=1-2$$

$$x^4+\frac{1}{x^4}=-1$$

9. If $a + 2b = 5$, and $ab = 2$, find a^2+4b^2.

We have

$$a+2b=5$$

on squarring both sides

$$(a+2b)^2=(5)^2$$

$$(a)^2+(2b)^2+2\times a\times 2b=(5)^2$$

$$a^2+4b^2+4ab=25$$

or $$a^2+4b^2+4\times 2=25$$

$$a^2+4b^2+8=25$$

$$a^2+4b^2=25-8$$

$$a^2+4b^2=17$$

10. If $x^2+9y^2=9$ and $xy=1$, find $(2x+6y)^2$.

Now, $(2x+6y)^2=(2x)^2+(6y)^2+2\times 2x\times 6y$

$$=4x^2+36y^2+24xy$$

$$=4(x^2+9y^2)+24xy$$

or $4\times 9+24+24\times 1=36+24$

$$=60$$

11. If $x-y=12$ and $xy=6\frac{1}{4}$, find $x+y$.

We have, $x - y = 12$

on squarring both sides

$$(x-y)^2 = (12)^2$$

$$x^2 + y^2 - 2 \times x \times y = 144$$

$$x^2 + y^2 - 2 \times 6\frac{1}{4} = 144$$

$$x^2 + y^2 - 2 \times \frac{25}{4} = 144$$

or $$x^2 + y^2 = 144 + \frac{25}{2}$$

$$x^2 + y^2 = \left(\frac{313}{2}\right)$$

on adding $2xy$ both sides

$$x^2 + y^2 + 2xy = \frac{313}{2} + 2xy$$

or $$x^2 + y^2 + 2xy = \frac{313}{2} + 2 \times \frac{25}{4}$$

$$x^2 + y^2 + 2xy = \frac{338}{2}$$

$$(x+y)^2 = 169$$

or $$x + y = \sqrt{169}$$

$$(x+y) = 13$$

12. If $64x^2 + y^2 = 72$ and $xy = 2$, find $\left(4x + \frac{y}{2}\right)^2$.

we have,

$$\left(4x + \frac{y}{2}\right)^2$$

or $$\frac{1}{4} \times (8x + y)^2$$

or $$\frac{1}{4}((8x)^2 + (y)^2 + 2 \times 8x \times y) = \frac{1}{4}(64x^2 + y^2 + 16xy)$$

$$= \frac{1}{4}(64x^2 + y^2 + 16 \times 2)$$

$$= \frac{1}{4}(72 + 32) = \frac{1}{4} \times (104) = 26$$

13. Expand and simplify :

(a) $(a+b)(a-b)(a^2+b^2)$

$$= (a^2 - b^2)(a^2 + b^2)$$

$$= (a^2)^2 - (b^2)^2 = a^4 - b^4$$

(b) $(a+b)^2 - (a-b)^2$

$= (a^2 + b^2 + 2ab) - (a^2 + b^2 - 2ab)$

$= a^2 + b^2 + 2ab - a^2 - b^2 + 2ab = 4ab$

(c) $(a+b)^2 - (a+b)(a-b)$

$= (a^2 + b^2 + 2ab) - (a^2 - b^2)$

$= a^2 + b^2 + 2ab - a^2 + b^2 = 2b^2 + 2ab$

Exercise 6.4

1. Find the highest common factor of the following monomials.

(a) x^4y^3, x^2y Highest common factor $= x^2y$

(b) $14p^2qr^4, 49p^2q^2r, 35pqr$ Highest common factor $= 7pqr$

(c) $-a^5, ab^3$ Highest common factor $= a$

(d) $6a^2, -18a^6, -12a^2$ Highest common factor $= 6a^2$

(e) $3y^3z^2, 15y^4z^2, 18y^6z^3$ Highest common factor $= 3y^3z^2$

2. Factorise the following expressions, taking out the highest common factor :

(a) $2x + 8$
$= 2(x+4)$

(b) $3a - 9$
$= 3(a-3)$

(c) $5a^2 + 15$
$= 5(a^2 + 3)$

(d) $10p^2qr + 15pq^2r$
$= 5pqr(2p + 3q)$

(e) $14x - 28x^2$
$= 14x(1 - 2x)$

(f) $6ab - a$
$= a(6b - 1)$

(g) $3x^2 + 9x + 12$
$= 3(x^2 + 3x + 4)$

(h) $8a^3 - 16a^2 + 4a$
$= 4a(2a^2 - 4a + 1)$

(i) $4x^2 - 12x^2y^2 - 8x$
$= 4x(x - 3xy^2 - 2)$

3. Factorise completely

(a) $a(b-c) + d(b-c) = (b-c)(a+d)$

(b) $2x(x-1) + 3y(x-1) = (x-1)(2x+3y)$

(c) $(x-a) + 3b(x-a) = (x-a)(1+3b)$

(d) $3x^2(y-1) + 2x(y-1) = (y-1)(3x^2 + 2x) = x(y-1)(3x+2)$

(e) $3q(p-q) + 2r(p-q) + s(p-q) = (p-q)(3q + 2r + s)$

(f) $y(x-1) - x(x-1) = (x-1)(y-x)$

(g) $x(x-y)^2 + y(x-y)^2 = (x-y)^2(x+y)$

(h) $(a-b)^3 + (a-b)^2 = (a-b)^2(a-b+1)$

(i) $ax^2 + ay^2 + bx^2 + by^2 = a(x^2 + y^2) + b(x^2 + y^2)$

$= (x^2 + y^2)(a+b)$

(j) $ax^2 + ay^2 - bx^2 - by^2 = a(x^2 + y^2) - b(x^2 + y^2)$

$$= (x^2 + y^2)(a - b)$$

(k) $ax - bx + ay - by = x(a - b) + y(a - b) = (a - b)(x + y)$

(l) $ax - ay + bx - by = a(x - y) + b(x - y) = (x - y)(a + b)$

(m) $x^2 - y^2 + x^3 - xy^2 = x^2 + x^3 - y^2 - xy^2$

$$= x^2(1 + x) - y^2(1 + x) = (1 + x)(x^2 - y^2)$$

(n) $xy^2 - yx^2 - xy + x^2 = x(y^2 - y - yx + x)$

$$= x(-xy + y^2 + x - y)$$

$$= x[-y(x - y) + 1(x - y)] = x(x - y)(1 - y)$$

Exercise 6.5

1. By inspection find which identity each one of the following represents and factorise accordingly.

(a) $25a^2 + 10a + 1 = (5a)^2 + 2 \times 5a \times 1 + (1)^2 = (5a + 1)^2$

(b) $a^2 - 4ab + 4b^2 = (a)^2 - 2 \times a \times 2b + (2b)^2 = (a - 2b)^2$

(c) $36x^2 + 84x + 49 = (6x)^2 + 2 \times 6x \times 7 + (7)^2 = (6x + 7)^2$

(d) $25x^2 - 81y^2 = (5x)^2 - (9y)^2 = (5x + 9y)(5x - 9y)$

(e) $121x^2 - 1 = (11x)^2 - (1)^2 = (11x + 1)(11x - 1)$

(f) $x^4 - 18x^2y^2 + 81y^4 = (x^2) - 2 \times x^2 \times 9y^2 + (9y^2)^2$

$$= (x^2 - 9y^2)^2 = (x^2 - (3y)^2)^2$$

$$= [(x + 3y)(x - 3y)]^2$$

(g) $49a^6 - 28a^3b^3 + 4b^6 = (7a^3)^2 - 2 \times 7a^3 \times 2b^3 + (2b^3)^2$

$$= (7a^3 - 2b^3)^2$$

(h) $4 - 9x^4 = (2)^2 - (3x^2)^2 = (2 + 3x^2)(2 - 3x^2)$

2. The following expressions are supposed to be perfect squares. However, one term has been incorrectly written in each. Write the correct expression to make each a perfect square.

(a) $4x^2 + 10x + 25 = (2x)^2 + 2x \times 5 + (5)^2$

here, we have

$$(a)^2 + ab + (b)^2$$

to make this perfect square equation should be

$$a^2 + 2ab + b^2$$

so, $(2x)^2 + 2 \times 2x \times 5 + (5)^2$

or $(4x^2 + 20x + 25)$

(b) $9x^2 - 6x - 1 = (3x)^2 - 2 \times 3x \times 1 - (1)^2$

Here we have

$$= a^2 - 2ab - (1)^2$$

to make this perfect square
equation should be $a^2 - 2ab + b^2$

so $\quad (3x)^2 - 2\times 3x\times 1 + (1)^2$

or $\quad (9x^2 - 6x + 1)$

(c) $4x^2 + 4x + \frac{1}{4}$

$4x^2 + 4x + \frac{1}{4}$

$(2x)^2 + 4\times 2x\times \frac{1}{2} + \left(\frac{1}{2}\right)^2$

Here we have $(2x)^2 + 4x + \left(\frac{1}{2}\right)^2$

to make this perfect square equation should be

$$= a^2 + 2ab + (b)^2$$

$$= (2x)^2 + 2\times 2x\times \frac{1}{2} + \left(\frac{1}{2}\right)^2 = 4x^2 + 2x + \frac{1}{4}$$

(d) $4 - 2x + \frac{x^2}{2}$

$$= (2)^2 - 2\times 2\times \frac{x}{2} + \frac{(x)^2}{2}$$

Here, we have $= (2)^2 - 2\times 2\times \frac{x}{2} + \frac{x^2}{2} = a^2 - 2ab + \frac{b^2}{2}$

To make this perfect square equation should be

$$a^2 - 2ab + b^2 = (2)^2 - 2ab + \left(\frac{b}{2}\right)^2$$

$$= (2)^2 - 2x + \left(\frac{x}{2}\right)^2 = \frac{x^2}{4} - 2x + 4$$

3. Factorise.

(a) $a^2 + 14a + 49 = (a)^2 + 2\times a\times 7 + (7)^2 = (a+7)^2$

(b) $4q^2 + 8q + 4 \quad = 4(1^2 + 2q + 1) = 4[(q)^2 + 2\times 1\times 1 + (1)^2] = 4(2+1)^2$

(c) $a^4 - 1 \quad = (a^2)^2 - (1)^2$

$$= (a^2 + 1)(a^2 - 1)$$

$$= (a^2 + 1)(a^2 - (1)^2) = (a^2 + 1)(a+1)(a-1)$$

(d) $a^4 - (a+b)^4$

$$= (a^2)^2 - ((a+b)^2)^2$$

$$= [a^2 + (a+b)^2][a^2 - (a+b)^2]$$

$$= [a^2 + (a+b)^2](a+a+b)(a-a-b)$$
$$= [a^2 + (a+b)^2][(2a+b)(-b)]$$

(e) $p^2 - 256 = (p)^2 - (16)^2$
$$= (p+16)(p-16)$$

(f) $9x^2 - 24x + 16 = 9x^2 - 24x + 16$
$$= (3x)^2 - 2\times 3x\times 4 + (4)^2 = (3x-4)^2$$

(g) $[(x^2 - 4x + 4) - 81]$
$$= (x^2 - 4x + 4) - 81$$
$$= [x^2 - 2\times x\times 2 + (2)^2] - (9)^2$$
$$= (x-2)^2 - (9)^2 = (x-2+9)(x-2-9) = (x+7)(x-11)$$

(h) $(a+b)^4 - b^4$
$$= (a+b)^4 - (b)^4$$
$$= [(a+b)^2]^2 - (b^2)^2$$
$$= ((a+b)^2 + b^2)((a+b)^2 - b^2)$$
$$= ((a+b)^2 + b^2)[(a+b+b)(a+b-b)]$$
$$= [(a+b)^2 + b^2][(a+2b)(a)]$$

(i) $25 - (4a^2 + 12a + 9)$
$$= (25) - (4a^2 + 12a + 9)$$
$$= (5)^2 - [(2a)^2 + 2\times 2a\times 3 + (3)^2]$$
$$= 5^2 - (2a+3)^2$$
$$= (5 + 2a + 3)(5 - 2a - 3)$$
$$= (2a+8)(2-2a) = 2(a+4)2(1-a) = 4(a+4)(1-a)$$

(j) $p^4 - 8p^2q^2 + 16q^4 - 121$
$$= (p^2)^2 - 2\times p^2\times 4q^2 + (4q^2)^2 - (11)^2$$
$$= (p^2 - 4q^2)^2 - (11)^2 = (p^2 - 4q^2 + 11)(p^2 - 4q^2 - 11)$$

(k) $9x^2 - 49 = (3x)^2 - (7)^2 = (3x+7)(3x-7)$

(l) $25 - 4y^2 = (5)^2 - (2y)^2 = (5+2y)(5-2y)$

(m) $4a^2 - b^2 = (2a)^2 - (b)^2 = (2a+b)(2a-b)$

(n) $x^2 - \dfrac{1}{36} = x^2 - \left(\dfrac{1}{6}\right)^2 = \left(x + \dfrac{1}{6}\right)\left(x - \dfrac{1}{6}\right)$

(o) $\dfrac{x^2}{36} - \dfrac{y^2}{25} = \left(\dfrac{x}{6}\right)^2 - \left(\dfrac{y}{5}\right)^2 = \left(\dfrac{x}{6} + \dfrac{y}{5}\right)\left(\dfrac{x}{6} - \dfrac{y}{5}\right)$

(p) $25a^2b^2 - 49x^2y^2 = (5ab)^2 - (7xy)^2 = (5ab + 7xy)(5ab - 7xy)$

(q) $(2p - 3q)^2 - (3p + 2q)^2 = (2p - 3q + 3p + 2q)(2p - 3q - 3p - 2q)$
$$= (5p - q)(-p - 5q) = (p + 5q)(q - 5p)$$

(r) $a^2b^4c^6 - 1 = (ab^2c^3)^2(1)^2 = (ab^2c^3+1)(ab^2c^3-1)$

4. Factorise, after removing the HCF.

(a) $4a^2 + 24a + 36$

$$= 4(a^2+6a+9) = 4[(a)^2+2\times a\times 3+(3)^2] = 4(a+3)^2$$

(b) $a^4 - 4a^3 + 4a^2$

$$= a^2(a^2-4a+4) = a^2[(a)^2-2\times a\times 2+(2)^2] = a^2(a-2)^2$$

(c) $3y^4 - 36y^2 + 108$

$$= 3(y^4-12y^2+36)$$
$$= 3[(y^2)^2-2\times y^2\times 6+(6)^2] = 3(y^2-6)^2$$

(d) $10a^2 - 20ab + 10b^2$

$$= 10a^2-20ab+10b^2 = 10(a^2-2ab+b^2) = 10(a-b)^2$$

(e) $2x^2 + 12x + 18$

$$= 2(x^2+6x+9) = 2(x^2+2\times x\times 3+(3)^2] = 2(x+3)^2$$

(f) $5a^3 - 30a^2 + 45a$

$$= 5a(a^2-6a+9) = 5a[(a)^2-2\times a\times 3+(3)^2] = 5a(a-3)^2$$

Multiple Choice Questions

1. (c) **2.** (a) **3.** (d) **4.** (b) **5.** (b) **6.** (c) **7.** (c) **8.** (c) **9.** (a) **10.** (b)

Sharp Your Knowledge

1. $\frac{1}{2}\times(4a^2bc^3)\times\frac{1}{8}ab^2c = \frac{1}{2}\times 4a^2bc^3\times\frac{1}{8}ab^2c = \frac{1}{4}a^3b^3c^4$

2. Divide $4x^2y^2z^2$ by xyz

$$= 4x^2y^2z^2 \div xyz = \frac{4x^2y^2z^2}{xyz} = 4xyz$$

3. Let should be added to $4x^2+8x+16$ to get $-2x^2+6x-3$.

so, $A+4x^2+8x+16 = -2x^2+6x-3$

so, $A = -2x^2+6x-3-4x^2-8x-16$

or $A = -6x^2-2x-19$

4. Let A should be subtracted from $4x^2-7x-8$ to get $-3x^2+8$.

$$= 4x^2-7x-8-A = -3x^2+8$$
$$= 4x^2-7x-8+3x^2+8 = A$$
$$= 7x^2-7x = A$$
$$A = 7x(x-1)$$

5. $3x^2y\times(6x^2+4y^2) = 3x^2y(6x^2+4y^2)$

$$= 18x^4y+12x^2y^3$$

6. $4x^3y^2$, when $x = 1$, and $y = 1$?

$$= 4x^3y^3 = 4\times(1)^3\times(1)^3 = 4\times1\times1 = 4$$

7. $3x^2 + 7xy + 8y^2$, when $x = 1$, and $y = 2$

$$= 3x^2 + 7xy + 8y^2$$
$$= 3\times(1)^2 + 7\times(1)\times(2) + 8\times(2)^2$$
$$= 3\times1 + 7\times1\times2 + 8\times4 = 3 + 14 + 32 = 49$$

8. $\left(a^2 - \frac{1}{a^2}\right)^2 = (a^2)^2 + \left(\frac{1}{a^2}\right)^2 - 2\times a^2\times\frac{1}{a^2} = a^4 + \frac{1}{a^4} - 2$

9. Side $= (a - 2)$

$\therefore$ Area $= (\text{side})\times\text{side}$

$$= (a-2)(a-2) = a^2 - 2a - 2a + 4 = a^2 - 4a + 4$$

10. $(x^6 - 1)$ by $(x^3 + 1) = \frac{(x^6 - 1)}{(x^3 + 1)} = \frac{(x^3)^2 - (1)^2}{(x^3 + 1)}$

$$= \frac{(x^3 + 1)(x^3 - 1)}{(x^3 + 1)} = x^3 - 1$$

HIGER ORDER THINKING SKILLS

Cost of $5pq$ note books $=$ ` $(35p^2q + 10pq^2)$

$$= 5pq(7p + 2q)$$

Cost of note book $= \frac{5pq(7p + 2q)}{5pq} = (7p + 2q)$

So, last of 2 note books $= 2\times(7p + 2q) = (14p + 4q)$

distance covered by car $= (9a^2 + 27ab + 15b^3)$

time $= 3$ hr

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{9a^2 + 27ab + 15b^3}{3} = \frac{3(3a^2 + 9ab + 5b^3)}{3}$$

7 Linear Equations in One Variable

Exercise 7.1

1. Solve, and check by substitution if your answer is correct.

(a) $2x - 9 = 11$

$$2x = 11 + 9$$
$$2x = 20$$
$$x = \frac{20}{2}$$
$$x = 10$$

(b) $4x + 3 = 2x - 5$

$$4x - 2x = -5 - 3$$
$$2x = -8$$
$$x = \frac{-8}{2}$$
$$x = -4$$

Check :

$$2x-9=11$$
$$2\times10-9=11$$
$$20-9=11$$
$$11=11$$

LHS = RHS correct

Check :

$$4x+3=2x-5$$
$$4x-4+3=2x-4-5$$
$$-16+3=-8-5$$
$$-13=-13$$

LHS = RHS

(c) $-x+24=-3x-20$

$$-x+3x=-20-24$$
$$2x=-4$$
$$x=\frac{-44}{2}$$
$$x=-22$$

Check :

$$-x+24=-3x-20$$
$$-(-22)+24=-3\times(-22)-20$$
$$22+24=66-20$$
$$46=46$$

LHS = RHS

Correct

(d) $\frac{x}{2}+5=x$

$$\frac{x}{2}-x=-5$$
$$\frac{-x}{2}=-5$$
$$x=5\times2$$
$$x=10$$

Check :

$$\frac{x}{2}+5=x$$
$$\frac{10}{2}+5=10$$
$$5+5=10$$
$$10=10$$

LHS = RHS

Correct

(e) $3x+4-2x=6x-8-3$

$$3x-2x-6x-8-3-4$$
$$-5x=-15$$
$$x=\frac{15}{3}$$
$$x=3$$

Check :

$$3x+4-2x=6x-8-3$$
$$3\times3+4-2\times3=6\times3-8-3$$
$$9+4-6=18-8-3$$
$$13-6=10-3$$
$$7=7$$

LHS = RHS

(f) $4x-3=2x-1$

$$4x-2x=-1+3$$
$$2x=2$$
$$x=1$$

Check :

$$4x-3=2x-1$$
$$4\times1-3=2\times1-1$$
$$4-3=2-1$$
$$1=1$$

LHS = RHS

(g) $\frac{x}{3}+6=\frac{1}{9}$

$$\frac{x}{3}=\frac{1}{9}-6$$
$$\frac{x}{3}=\frac{1-54}{9}$$

(h) $a=8-\frac{3}{2}$

$$a=\frac{16-3}{2}$$
$$a=\frac{13}{2}$$

$$\frac{x}{3} = \frac{-53}{9}$$
$$x = \frac{-53 \times 3}{9}$$
$$x = \frac{-53}{3}$$

Check :

$$\frac{x}{3} + 6 = \frac{1}{9}$$
$$\frac{-53}{3 \times 3} + 6 = \frac{1}{9}$$
$$\frac{-53}{9} + 6 = \frac{1}{9}$$
$$\frac{-53+54}{9} = \frac{1}{9}$$
$$\frac{1}{9} = \frac{1}{9}$$

LHS = RHS correct

Check :

$$a = 8 - \frac{3}{2}$$
$$\frac{13}{2} = 8 - \frac{3}{2}$$
$$\frac{13}{2} = \frac{16-3}{2}$$
$$\frac{13}{2} = \frac{13}{2}$$

LHS = RHS correct

(i) $\frac{1}{3}x - \frac{2}{3} = \frac{5}{6}$

$$\frac{x}{3} = \frac{5}{6} + \frac{2}{3}$$
$$\frac{x}{3} = \frac{5+4}{6}$$
$$\frac{x}{3} = \frac{9}{6}$$
$$x = \frac{9 \times 3}{6}$$
$$x = \frac{9}{2}$$

Check :

$$\frac{1}{3}x - \frac{2}{3} = \frac{5}{6}$$
$$\frac{1}{3} \times \frac{9}{2} - \frac{2}{3} = \frac{5}{6}$$
$$\frac{9}{6} - \frac{2}{3} = \frac{5}{6}$$
$$\frac{9-4}{6} = \frac{5}{6}$$
$$\frac{5}{6} = \frac{5}{6}$$

LHS = RHS correct

(j) $4(1-p) = 3(p-2)$

$$4 - 4p = 3p - 6$$
$$-4p - 3p = -6 - 4$$
$$-7p = -10$$
$$p = \frac{10}{7}$$

Check :

$$4(1-p) = 3(p-2)$$
$$4\left(1 - \frac{10}{7}\right) = 3\left(\frac{10}{7} - 2\right)$$
$$4\left(\frac{7-10}{7}\right) = 3\left(\frac{10-14}{7}\right)$$
$$4 \times \frac{-3}{7} = 3 \times \frac{-4}{7}$$
$$\frac{-12}{7} = \frac{-12}{7}$$

LHS = RHS correct

2. Solve :

(a) $4x - 2(3x-5) + \frac{2}{3}(4x-7) = 0$

$$4x - 6x + 10 + \frac{8}{3}x - \frac{14}{3} = 0$$

$$\frac{4x}{1} - \frac{6x}{1} + \frac{8}{3}x = \frac{14}{3} - 10$$

$$\frac{12x - 18x + 8x}{3} = \frac{14-30}{3}$$

$$\frac{2x}{3} = \frac{-16}{3}$$

$$x = \frac{-16}{2}$$

$$x = -8$$

(b) $\frac{a-4}{7} - a = \frac{5-a}{3} + 1$

$$\frac{a-4-7a}{7} = \frac{5-a+3}{3}$$

$$\frac{-6a-4}{7} = \frac{8-a}{3}$$

$$3(-6a-4) = 7(8-a)$$

$$-18a - 12 = 16 - 7a$$

$$-18a + 7a = 56 + 12$$

$$-11a = 68$$

$$a = \frac{-68}{11}$$

(c) $7p - 13 = 3(5p-4)$

$$7p - 13 = 15p - 12$$

$$7p - 15p = -12 + 13$$

$$-8p = +1$$

$$p = \frac{1}{-8}$$

$$p = \frac{-1}{8}$$

(d) $q - \frac{q+1}{3} = \frac{q-1}{5} + q$

$$q - \frac{(q+1)}{3} = \frac{q-1}{5} + q$$

$$\frac{3q - q - 1}{3} = \frac{q - 1 + 5q}{5}$$

$$\frac{2q-1}{3} = \frac{6q-1}{5}$$

$$5(2q-1)=3(6q-1)$$
$$10q-5=18q-3$$
$$10q-18q=-3+5$$
$$-8q=2$$
$$q=\frac{2}{-8}$$
$$q=\frac{-1}{4}$$

(e) $$\frac{3y-\frac{6}{7}}{4}+1=\frac{2y-\frac{1}{3}}{3}+5$$
$$\frac{21y-\frac{6}{7}}{4}+1=\frac{6y-\frac{1}{3}}{3}+5$$
$$\frac{21y-6}{7\times4}+1=\frac{6y-1}{9}+5$$
$$\frac{21y-6}{28}+1=\frac{6y-1+45}{9}$$
$$\frac{21y-6+28}{28}=\frac{6y+44}{9}$$
$$\frac{21y+22}{28}=\frac{6y+44}{9}$$
$$9(21y+22)=28(6y+44)$$
$$9(21y+22)=168y+1232$$
$$189y+198=168y+1232$$
$$189y-168y=1232-198$$
$$21y=1034$$
$$y=\frac{1034}{21}$$

3. Translate the following into mathematical sentences and solve them.

(a) Let no. be $= x$
$$3x-8=1$$
$$3x=1+8$$
$$3x=9$$
$$x=\frac{9}{3}$$
$$x=3$$
So, equation $3x-8=1$; where $x=3$

(b) Let no. be $= x$

So, according to questions.
$$2x+5=x+10$$
$$2x-x=10-5$$
$$x=5$$

so, equation $= 2x+5 = x+10$;
where $x = 5$

(c) Let no. be $= x$
So, according to questions

$$\frac{x}{4}+11 = \frac{3x}{4}$$

or $$\frac{x}{4}-\frac{3x}{4} = -11$$

$$\frac{x-3x}{4} = \frac{-11}{1}$$

$$\frac{-2x}{4} = \frac{-11}{1}$$

$$-2x = -44$$

$$x = \frac{44}{2}$$

$$x = 22$$

So, equation $= \frac{x}{4}+11 = \frac{3x}{4}$; where $x = 22$

(d) Let no. be $= x$
So, according to questions

$$x+\left(\frac{2x}{3}-4\right) = 1$$

or $$x+\frac{2x}{3}-4 = 1$$

$$x+\frac{2x}{3} = 1+4$$

$$\frac{3x+2x}{3} = 5$$

$$\frac{5x}{3} = 5$$

$$x = 3\times 1$$

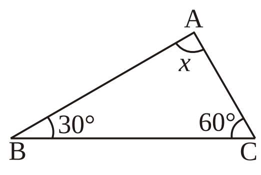
$$x = 3$$

So, equation $= x+\left(\frac{2x}{3}-4\right)$; where $x = 3$

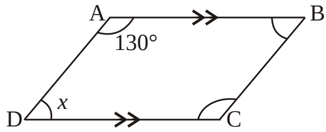
4. Look ath these geometrical figures : Find x in each of them

(a) In $\Delta\, ABC$

$$\angle A+\angle B+\angle C = 180^\circ$$
$$x+30^\circ+60^\circ = 180^\circ$$
$$x+90^\circ = 180^\circ$$
$$x = 180^\circ-90^\circ$$
$$x = 90^\circ$$



(b) In parallelogram $ABCD$



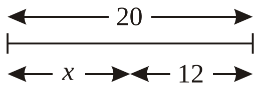
$$\angle A = \angle C = 130°$$

and $\angle B = \angle D = x$

So, In $ABCD$

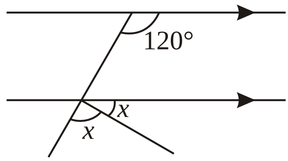
$$\angle A + \angle B + \angle C + \angle D = 360°$$
$$130° + x° + 130° + x° = 360°$$
$$260° + 2x° = 360°$$
$$2x° = 360° - 260°$$
$$2x° = 100°$$
$$x° = \frac{100°}{2}$$
$$x = 50°$$

(c) In the given line



$$x + 12 = 20$$
$$x = 20 - 12$$
$$x = 8$$

(d) In the given figure



$x + x = 120°$ (corresponding)

$$2x = 120°$$
$$x = \frac{120°}{2}$$
$$x = 60°$$

Exercise 7.2

1. Let one no. be $= x$

So other no. be $= x + 10$

A.C.Q. $= x + x + 10 = 40$

$$2x + 10 = 40$$
$$2x = 40 - 10$$
$$2x = 30$$
$$x = \frac{30}{2}$$
$$x = 15$$

So, one no. be $= 15$

Other no. $= 15 + 10 = 25$

2. Let no. be $= x$

A.C.Q. $$x - 8 = \frac{x}{3}$$

or $$x - \frac{x}{3} = 8$$

$$\frac{3x - x}{3} = 8$$

$$\frac{2x}{3} = 8$$

$$x = \frac{8 \times 3}{2}$$

$$x = 12$$

So no. = 12

3. Le other no. be = x

A.C.Q. $\quad x + 8 = 45$

$$x = 45 - 8$$

$$x = 37$$

so other no. is = 37

4. Let the no. be = x

A.C.Q. $\quad 3x + 12 = -6$

$$3x = -6 - 12$$

$$3x = -18$$

$$x = \frac{-18}{3}$$

$$x = -6$$

so the no. = -6

5. Let no. be = x

A.C.Q. $\quad \frac{7}{11} - \frac{x}{3} = \frac{24}{55}$

$$\frac{21 - 11x}{33} = \frac{24}{55}$$

$$\frac{21 - 11x}{33} = \frac{24}{55}$$

$$55(21 - 11x) = 24 \times 33$$

$$1155 - 605x = 792$$

$$605x = 1155 - 792$$

$$x = \frac{363}{605}$$

$$x = \frac{3}{5}$$

6. So the no. = $\frac{3}{5}$

Let no. be = x

A.C.Q. $\quad 29 - 7x = 43$

$$29 - 7x = 43$$

$$29 - 43 = 7x$$

$$7x = -14$$

$$x = \frac{-14}{7}$$

$$x = -2$$

So, the no. $= -2$

7. Let no. be $= x$

So, A.C.Q. $$x - 9 = \frac{21}{5}$$

$$x = \frac{21}{5} + 9$$

$$x = \frac{21 + 45}{5}$$

$$x = \frac{66}{5}$$

So, No. $= \frac{66}{5}$

8. Let no. be $= x$

$$x - \frac{2}{3} \times 9 = \frac{1}{4}(x + 45)$$

$$x - 6 = \frac{1}{4}(x + 45)$$

$$4x - 24 = x + 45$$

$$4x - x = 45 + 24$$

$$3x = 69$$

$$x = \frac{69}{3}$$

$$x = 23$$

9. Let no. be $= x$

So, A.C.Q. $$\frac{2}{3}(2x + 19) - 11 = 95$$

$$\frac{4x}{3} + \frac{38}{3} - 11 = 95$$

$$\frac{4x}{3} = \frac{95}{1} + \frac{11}{1} - \frac{38}{3}$$

or $$\frac{4x}{3} = \frac{285 + 33 - 38}{3}$$

$$\frac{4x}{3} = \frac{280}{3}$$

$$x = \frac{280 \times 3}{4 \times 3}$$

$$x = 70$$

So. No. $= 70$

10. Let no. be $= x$

So, A.C.Q. $$\frac{x}{4} + \frac{x}{9} + \frac{x}{3} = 25$$

or $$\frac{9x+4x+12x}{36}=25$$

$$\frac{25x}{36}=\frac{25}{1}$$

or $$x=\frac{25\times 36}{25}$$

$$x=36$$

So, No $=36$

11. Let fraction $=\frac{x-1}{x}$

So, A.C.Q. $$\frac{x-1+4}{x+5}=\frac{4}{5}$$

$$\frac{x+3}{x+5}=\frac{4}{5}$$

$$5(x+3)=4(x+5)$$

$$5x+15=4x+20$$

$$5x-4x=20-15$$

$$x=5$$

so, fraction $=\frac{4}{5}$

12. Let no. be $=x$

So, A.C.Q. $$\left[x+\frac{1}{3}\right]\times 2=\frac{8}{3}$$

$$2x+\frac{2}{3}=\frac{8}{3}$$

$$2x=\frac{8}{3}-\frac{2}{3}$$

$$2x=\frac{6}{3}$$

$$x=\frac{2}{2}$$

$$x=1$$

So, No. $=1$

13. Let the no. of sweet $=x$

A.C.Q. $$x-\frac{x}{2}=7$$

or $$\frac{x}{2}=7$$

$$x=7\times 2$$

$$x=14$$

so, no. of sweets $=14$.

14. Let the weight of the block of wood $= x$

A.C.Q. $\quad \dfrac{x}{2} + 6 = x$

or $\quad x - \dfrac{x}{2} = 6$

$$\frac{x}{2} = 6$$

$$x = 6 \times 2$$

$$x = 12$$

So, the weight of the block of wood $= 12$ kg.

15. Female population of a town $= x$

$\therefore$ Male population of a town $= \dfrac{2}{3}x$

So, A.C.Q. $\quad x + \dfrac{2}{3}x = 90000$

$$\frac{3x + 2x}{3} = 90000$$

$$\frac{5x}{3} = 90000$$

or $\quad x = \dfrac{90000 \times 3}{5}$

$$x = 54000$$

So. no. of female $= 54000$

and no. of male $= 54000 \times \dfrac{2}{3} = 36000.$

16. Let fraction $= \dfrac{x-4}{x}$

A.C.Q. $\quad \dfrac{x-4-1}{x} = \dfrac{2}{3}$

$$\frac{x-5}{x} = \frac{2}{3}$$

$$3x - 15 = 2x$$

$$3x - 2x = 15$$

$$x = 15$$

So, fraction will be $= \dfrac{15-4}{15} = \dfrac{11}{15}.$

17. Let the fraction be $= \dfrac{x-2}{x}$

A.C.Q. $\quad \dfrac{x-2+1}{x+1} = \dfrac{3}{4}$

or $\quad \dfrac{x-1}{x+1} = \dfrac{3}{4}$

$$4(x-1) = 3(x+1)$$

$$4x-4=3x+3$$
$$4x-3x=3+4$$
$$x=7$$

so, fraction will be $= \frac{7-2}{7} = \frac{5}{7}$.

18. Let tony is father age $= 2x$

So, tony is age $= x$

A.C.Q. $\quad 2x-10 = x-10+20$
$$2x-10 = x+10$$
or $\quad 2x - x = 10+10$
$$x = 20$$

so, age of tony $= 20$ years

and age of tony's father $= 20 \times 2 = 40$ years.

19. Let the age of tuffy $= x$

and age of terry cat $= \frac{2}{3}x$

A.C.Q. $\quad x - \frac{2}{3}x = 4$
$$\frac{3x-2x}{3} = 4$$
$$\frac{x}{3} = 4$$
$$x = 4 \times 3$$
$$x = 12$$

So, age of tuffy $= 12$ years

and age of teffy cat $= 12 \times \frac{2}{3} = 8$ years.

20. Let the age of son $= x$

and age of father $= 2x$

A.C.Q. $\quad x + 2x = 99$
$$3x = 99$$
$$x = \frac{99}{33}$$
$$x = 33$$

So, age of son $= 33$ years

and age of father $= 33 \times 2 = 66$ years.

21. Let the age of father be $= 4x$

so, age of a boy $= \frac{1}{4} \times 4x = x$

A.C.Q. $\quad \frac{1}{2}(4x+24) = (x+24)$

or $\quad 2x+12 = x+24$
$$2x - x = 24 - 12$$

$$x = 12$$

So, age of boy $= 12$ years

and age of father $= 12 \times 4 = 48$ years.

22. Let ticket of ` 2.50 $= x$

so, tickets of ` 5.00 $= 300 - x$

A.CQ.

$$x \times 2.50 + 5 \times (300 - x) = 1250$$
$$2.50x + 1500 - 5x = 1250$$
$$-2.50x = 1250 - 1500$$
$$-2.50x = -250$$
$$x = \frac{250 \times 100}{250}$$
$$x = 100$$

So, tickets of ` 2.50 $= 100$

and tickets of ` 5.00 $= 300 - 100 = 200$

23. Let No. of 50 paise coin $= x$

so, no. of 25 paise coin $= 76 - x$

Total money = ` 29 or 2900 paise

A.C.Q.

$$50 \times x + 25(76 - x) = 2900$$
$$50x + 1900 - 25x = 2900$$
$$25x = 2900 - 1900$$
$$25x = 1000$$
$$x = \frac{1000}{25}$$

so, 50 paise coin $= 40$

so, 25 pase coin $= 76 - 40 = 36$.

24. 50 paise coin added up to value = ` 3.50

so no. of 50 paise coin $= \frac{3.50}{50}$ paise

$$= \frac{3.50}{100 \times 50} \times 100 \text{ paise}$$
$$= 7 \text{ coin}$$

Let no. of 10 paise coin $= x$

so no. of 25 paise coin $= 2x$

total money = ` 15.50 or 1550 paise

So, A.C.Q.

$$10 \times x + 25 \times 2x + 50 \times 7 = 1550$$
$$10x + 50x + 350 = 1550$$
$$60x = 1550 - 350$$
$$60x = 1200$$
$$x = \frac{1200}{60}$$

$x = 20$

So, the coin of 10 paise = 20

the coin of 25 paise $= 2 \times 20 = 40$

and the coin of 50 paise = 7.

25. Let the no. of 20 paise coin = x

so the no. of 5 paise coin = $2x$

and the no. of 50 paise coin = $\frac{x}{5}$

total money = ` 2.00 or 200 paise

So, A.C.Q.

$$20 \times x + 5 \times 2x + 50 \times \frac{x}{5} = 200$$

$$20x + 10x + 10x = 200$$

$$40x = 200$$

$$x = \frac{200}{40}$$

$$x = 5$$

So, 20 paise coin = 5

and 5 paise coin $= 2 \times 5 \Rightarrow 10$

and 50 paise coin $= \frac{5}{5} = 1.$

Sharp Your Knowledge

1. T **2.** T **3.** F **4.** F **5.** T

Multiple Choice Questions

1. (c) **2.** (d) **3.** (c) **4.** (b) **5.** (b) **6.** (b) **7.** (c) **8**. (c)

Higher Order Thinking Skills

$\Rightarrow$ Solution = 12 litre

Alcohol in it $= 33\frac{1}{3}\% = 4$ litre

Let after mixing water solution = x litre

Now $\quad x \times 20\% = 4$

$$x \times \frac{20}{100} = 4$$

$$x = \frac{400}{20} = 20 \text{ litre}$$

So, water is mixed $= 20 - 12 = 8$ litre.

$\Rightarrow$ Let x kg of tea will be mixed.

So, A.C.Q

$$x \times 50 + 35 \times 60 = 57(35 + x)$$

$$50x + 2100 = 1995 + 57x$$

$$57x - 50x = 2100 - 1995$$

$$7x = 105$$
$$x = \frac{105}{7}$$
$$x = 15$$

So, 15 kg tea of ` 50 per kg should be mixed.

8 Comparing Quantities

Exercise 8.1

1. (a) Express 42% as a decimal.

$$42\% = \frac{42}{100} = 0.42$$

(b) Express $6\frac{1}{9}$ as a per cent.

$$6\frac{1}{9} = \frac{55}{9} = \frac{55\times100}{9\times100} = \frac{5500}{9}\% \text{ or } 611\frac{1}{9}\%$$

(c) Express 81 : 9 as a per cent.

$$81 : 9 = \frac{81}{9} = \frac{81}{9}\times\frac{100}{100} \text{ or } 900\%$$

2. Find x if :

(a) 40% of $x = 50$

$$x\times 40\% = 50$$
$$\frac{x\times40}{100} = 50$$
$$x = \frac{50\times100}{40}$$
$$x = 125$$

(b) 10% of x is 4

$$x\times10\% = 4$$
$$x\times\frac{10}{100} = 4$$
$$x = \frac{4\times100}{10}$$
$$x = 40$$

3. (a) What percent of 45 is 20?

Let x% of 45 is 20

So, $$45\times x\% = 20$$
$$45\times\frac{x}{100} = 20$$
$$x = \frac{100\times20}{45}$$

$$= \frac{400}{9}\% \text{ or } 44\frac{4}{9}\%$$

(b) What percent of ` 7.50 is ` 6

Let x percent of ` 7.50 = 6

$$7.50 \times x\% = 6$$

$$\frac{7.50 \times x}{100} = 6$$

$$x = \frac{6 \times 100}{7.50} \times 100$$

$$x = \frac{6 \times 100 \times 100}{750}$$

$$x = 80\%$$

4. men $= 40\%$

women $= 35\%$

so children $= 100 - (40 + 35)\%$

$= 100 - 75 = 25\%$

5. Let value of land $= x$

so, A.C.Q.

$$x + x \text{ of is } 20\% = 18000$$

$$x + \frac{x \times 20}{100} = 18000$$

$$\frac{5x + x}{5} = 18000$$

$$\frac{6x}{5} = 18000$$

$$\frac{6x}{5} = \frac{18000 \times 5}{6}$$

$$x = 15000$$

6. girls $= 55\%$

So, boys $= (100 - 55)\% = 45\%$

total students $= 1800$

So. No. of boys $= 1800 \times 45\%$

$$= \frac{1800 \times 45}{100} = 810$$

7. Let C.P. $= x$

lost % $= 10\%$

A.C.Q.

$$x - x \times 10\% = \text{` } 1200$$

$$x - \frac{x \times 10}{100} = 1200$$

$$\frac{10x - x}{10} = 1200$$

$$\frac{9x}{10} = 1200$$

$$x = \frac{1200 \times 10}{9}$$

$$x = 1333\frac{1}{3}$$

Now, $\text{gain} = 10\%$

$$= 1333\frac{1}{3} + \frac{12000}{9} \times 10\%$$

$$= 1333\frac{1}{3} + \frac{12000}{9} \times \frac{10}{100}$$

$$= 1333\frac{1}{3} + \frac{1200}{9}$$

$$= 1333\frac{1}{3} + 133\frac{1}{3}$$

$$= \text{` } 1466\frac{2}{3}$$

8. Total trees $= 320$

apple trees $= 25\%$

so, apple trees $= 320 \times 25\%$

$$= 320 \times \frac{25}{100} = 80$$

lemon trees $= 62.5\%$

so, apple trees $= 320 \times 62.5\%$

$$= 320 \times \frac{62.5}{100 \times 10}$$

$$= \frac{32 \times 625}{100} = 200$$

so, mango trees $= 320 - 80 - 200 = 40$

9. Winner got vote $= 53\%$

loser got vote $= 100 - 53 = 47\%$

so, margin $= 53\% - 47\% = 6\%$

Let total no. of voters $= x$

Now, x of $6\% = 9600$

$$x \times \frac{6}{100} = 9600$$

$$x = \frac{9600 \times 100}{6}$$

$$x = 160000$$

10. Let sushil's is income $= 100$

so, Ravi's income $= 100 + 60 = 160$

margin $= 160 - 100 = 60$

so, sushil's income loss than Ravi's income in percentage

$$= \frac{60}{160} \times 100$$

$$= \frac{600}{16} = \frac{150}{4} = \frac{75}{2} = 37\frac{1}{2}\% \text{ or } 37.5\%.$$

11. Let population $= 100$

It increase 15% every year

so population after 1 year $= 100 + 15 = 115$

If population is 115 then population a year ago $= 100$

If population is 1 then population a year ago $= \frac{100}{115}$

If population is 20700 then population a year ago

$$= \frac{100}{115} \times 20700 = 18000.$$

12. Let man's monthly income = ₹ 100

he saves 10% of his monthly incomes = ₹ 10

saving in a year $= 10 \times 12 =$ ₹ 120

If saving is ₹ 120, then monthly income $= 100$

If saving is ₹ 1 then monthly income $= \frac{100}{120}$

If saving is ₹ 16200, then monthly income

$$= ₹\ \frac{100}{120} \times 16200$$

$$= ₹\ 13500.$$

Exercise 8.2

1. M.P. = ₹ 1880

S.P. = ₹ 1504

Discount $= 1880 - 1504 =$ ₹ 376

$$\text{Discount\%} = \frac{\text{Discount}}{\text{M.P.}} \times 100$$

$$= \frac{376}{1880} \times 100 = 20\%.$$

2. M.P. = ₹ 35000

discount $= 12\%$

Discount = ₹ 35000 × 12%

$$= \frac{35000 \times 12}{100} = ₹\ 4200$$

S.P. = ₹ 35000 – ₹ 4200 = ₹ 30800.

3. Let M.P. $= 100$

discount $= 8\% = 8$

S.P. $= 100 - 8 = 92$

If S.P. 92, then M.P. $= 100$

If S.P. 1, then M.P. $= \frac{100}{92}$

If S.P. ` 4416, then M.P. $= \frac{100}{92} \times 4416 =$ ` 4800.

4. Marks price = ` 1120

discount = 10%

so, discount $= 1120 \times 10\%$

$= \frac{1120 \times 10}{100} =$ ` 112

so, S.P. $= 1120 - 112 =$ ` 1008

Now, S.P. $= 1008$

profit $= 26\%$

C.P. = ?

$$\text{C.P.} = \frac{100 \times \text{S.P.}}{(100 + \text{profit }\%)}$$

$= \frac{100 \times 1008}{126} =$ ` 800.

5. C.P. = ` 1480

Profit = 10%

So, Profit $= \frac{1480 \times 10}{100} =$ ` 148

So, S.P. $= 1480 + 148 =$ ` 1628

Now, Let M.P. $= 100$

discount = 12.5% = 12.5

S.P. = 100 – 12.5 = 87.50

Now, if S.P. = 87.50 then M.P. = 100

Now, if S.P. = 1 then M.P. $= \frac{100}{87.50}$

Now, if S.P. = 1628

then M.P. $= \frac{100 \times 1628 \times 101}{87.50}$

$= \frac{13024}{7} = 1860.57$

6. Cost price of saree = ` 2200

gain = 12%

so, gain = ` $2200 \times 12\%$

$= \frac{2200 \times 12}{100} = 264$

S.P. = ` 2200 + ` 264 = ` 2464

Now, Let M.P. = 100

discount = 26% = 26

S.P. = 100 – 26 = 74

Now, if S.P. = 74 then M.P. = 100

Now, if S.P. 1 then M.P. = $\frac{100}{74}$

Now, if S.P. 2464

then M.P. = $\frac{100}{74} \times 2464 =$ ` 3329.73

7. M.P. = ` 3500

discount = 10%

so, discount = ` $\frac{3500 \times 10}{100} =$ ` 350

So, S.P. = ` 3500 – ` 350 = ` 3150

sale tax = 10%

sale tax = $\frac{3510 \times 10}{100} =$ ` 315

so, customer had to pay = ` 3150 + ` 315 = ` 3465.

8. Let Marked price = x

discount = 20%

$$\text{discount} = \frac{x \times 20}{100} = \frac{x}{5}$$

$$\text{S.P.} = x - \frac{x}{5} = \frac{5x - x}{5} = \frac{4x}{5}$$

$$\text{C.P.} = \frac{100 \times \text{S.P.}}{100 + 25\%}$$

$$= \frac{100}{125} \times \frac{4x}{5} = \frac{16x}{25}$$

Profit S.P. – C.P.

$$150 = \frac{4x}{5} - \frac{16x}{25}$$

$$150 = \frac{20x - 16x}{25}$$

$$150 = \frac{4x}{25}$$

$x = \frac{150 \times 25}{4} =$ ` 937.50

Exercise 8.3

1. Complete the following table :

Ans. (a) Principal = ` 3520

Interest = ` 250

Amount = ` 3520 + ` 250 = ` 3770.

(b) Principal = ` 5780

Amount = ` 6240

Interest = Amount – Principal

= ` 6240 – ` 5780 = ` 460.

(c) Principal = ` 2750

Rate % = ` 10%

Time = 2 years

$$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$= \frac{2750 \times 10 \times 2}{100} = \text{\`}\ 550$$

Amount = P + S.I.

= ` 2750 + ` 550 = ` 3300.

(d) Principal = ` 9600

Rate = 8%

time = 3 months = $\frac{3}{12}$ years

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{9600 \times 8 \times 3}{100 \times 12} = \text{\`}\ 192$$

Amount = P + S.I.

= ` 9600 + ` 192 = ` 9792.

(e) $R = 5\%, T = 3$ years

S.I. = ` 1500

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$1500 = \frac{P \times 5 \times 3}{100}$$

$$P = \frac{1500 \times 100}{5 \times 3}$$

P = ` 10000

Amount = P + S.I.

= 10000 + 1500 = ` 11500

(f) P = ` 4750

$R = 12\frac{1}{2}\% \Rightarrow \frac{25}{2}\%$

$T = 2$ years

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{4750 \times 25 \times 2}{100 \times 2} = 1187.50$$

Amount = P + S.I.

= 4750 + 1187.50 = 5937.50

(g) $R = 10\%$

$T = 73$ days or $\frac{73}{365}$ years

S.I. = ` 500

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$500 = \frac{P \times 10 \times 73}{100 \times 365}$$

$$P = \frac{500 \times 100 \times 5}{10}$$

P = ` 25000

$$A = P + \text{S.I.}$$

$$= 25000 + 500$$

= ` 25500.

(h) Principal = ` 5000

$R = 9\%$

S.I. = ` 2700

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$2700 = \frac{5000 \times 9 \times T}{100}$$

$$T = \frac{2700}{50 \times 9}$$

$T = 6$ year

Amount $= P + \text{S.I.}$

$= 5000 + 2700 =$ ` 7700.

2. P = ` 30000 , $R = 9\%$ per annum , $T = 4$ years

(a) $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$= \dfrac{30000 \times 9 \times 4}{100} =$ ` 10800

(b) Amount = P + S.I.

$= 30000 + 10800 =$ ` 40800

(c) Monthly payment = ` $\dfrac{40800}{4 \times 12} =$ ` 850.

3. P = ` 4000 , $T = 5$ years , $A$ = ` 5400

$$\text{S.I.} = A - P$$

$= 5400 - 4000 =$ ` 1400

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$1400 = \frac{4000 \times R \times 5}{100}$$

$$R = \frac{1400}{40 \times 5}$$

$R = 7\%$

Now, $R = 7\%$, $P =$ ` 5600, $T = 3$ years

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{5600 \times 7 \times 3}{100} = \text{` } 1176$$

$$\text{Amount} = \text{P} + \text{S.I.}$$

$$= 5600 + 1176 = \text{` } 6776.$$

4. $P =$ ` 3650, $R = 10\%$

$T = 3$ Jan, 2006 to 17 March, 2006 $= 73$ days or $\frac{73}{365}$ years

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{3650 \times 10 \times 73}{100 \times 365} = \text{` } 73.$$

5. $P = ?$, S.I. = ` 840

$R = 2\frac{1}{2}\% = \frac{5}{2}\%$, $T = 3$ years

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$840 = \frac{P \times 5 \times 3}{100 \times 2}$$

$$P = \frac{840 \times 100 \times 2}{5 \times 3}$$

$$P = \text{` } 11200.$$

6. $P =$ ` 10000, $R = 10\%$, $T = 3$ years

For compound interest

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$A = 1000\left[1 + \frac{10}{100}\right]^3$$

$$A = 1000\left(\frac{11}{10}\right)^3$$

$$= \frac{10000 \times 11 \times 11 \times 11}{10 \times 10 \times 10} = \text{` } 13310$$

$$\text{C.I.} = A - P$$

$$= 13310 - 10000 = \text{` } 3310.$$

7. $P =$ ` 8000

$R = 12\frac{1}{2}\% \Rightarrow \frac{25}{2}\%$

$T = 2$ years

For compound interest

$$A = P\left[1+\frac{R}{100}\right]^T = 8000\left[1+\frac{25}{2\times 100}\right]^2$$

$$= 8000\left[1+\frac{1}{8}\right]^2 = 8000\left[\frac{9}{8}\right]^2$$

$$= \frac{8000\times 9}{8}\times\frac{9}{8} = ` \ 10125$$

$$\text{C.I.} = A - P$$

$$= ` \ 10125 - 8000 = ` \ 2125.$$

8. $P = `\ 2000,\ R = 10\%,\ T = 3$ years

For compound interest

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 2000\left[1+\frac{10}{100}\right]^3 = 2000\left[\frac{11}{10}\right]^3$$

$$= 2000\times\frac{11}{10}\times\frac{11}{10}\times\frac{11}{10} = `2662$$

$$\text{C.I.} = A - P$$

$$= `\ 662 - 2000 = `\ 662.$$

9. $P = 2500,\ R = 20\%,\ T = 3$ years

$$\text{S.I.} = \frac{P\times R\times T}{100}$$

$$= \frac{2500\times 20\times 3}{100} = `\ 1500$$

For compound interest

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 2500\left[1+\frac{20}{100}\right]^3 = 2500\left[\frac{6}{5}\right]^3$$

$$= \frac{2500\times 6\times 6\times 6}{5\times 5\times 5} = `\ 4320$$

$$\text{C.I.} = A - P$$

$$= 4320 - 2500$$

$$= `\ 1820$$

$$\text{difference} = \text{C.I.} - \text{S.I.}$$

$$= 1820 - 1500$$

$$= `\ 320.$$

10. $P = `\ 3500,\ R = 8\%,\ T = 2$ years

For compound interest?

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$= 3500\left(1+\frac{8}{100}\right)^2 = 500\times\left(\frac{27}{25}\right)^2$$

$$= \frac{3500\times 27}{25}\times\frac{27}{25}$$

$$= ` \ 4082.4$$

11. (a) $P = 93750$, $R = 9.6\%$, $T = 2$ years

For compound interest

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 93750\left[1+\frac{9.6}{1000}\right]^2$$

$$A = 93750\left[\frac{1096}{1000}\right]^2$$

$$= \frac{93750\times 1096\times 1096}{1000\times 1000} = ` \ 112614$$

(b) Now, $P = ` \ 112614$, $R = 9.6\%$, $T = 1$years

$$\text{S.I.} = \frac{P\times R\times T}{100}$$

$$= \frac{112614\times 9.6\times 1}{100\times 10} = ` \ 10810.94$$

12. $P = ` \ 1000$

$R = 8\%$ per annum or $\frac{8\%}{2} = 4\%$ half yearly

$T = 1\frac{1}{2}$ years $= \frac{3}{2}$ years or $\frac{3}{2}\times 2 = 3$ half years

For compound Interest

$$A = P\left[1+\frac{R}{100}\right]^T = 1000\left[1+\frac{4}{100}\right]^3$$

$$A = 1000\left[\frac{26}{25}\right]^3 = \frac{1000\times 26\times 26\times 26}{25\times 25\times 25}$$

$$= \frac{140608}{125} = 1124.864$$

C.I. $= A - P$

$= 1124.864 - 1000$

$= ` \ 124.864$

13. $P = ` \ 9600$, $R = 5\frac{1}{2}\% = \frac{11}{2}\%$, $T = 3$ years

For compound interest

$$A = P\left[1+\frac{R}{100}\right]^T = 9600\left[1+\frac{11}{200}\right]^3$$

$$= 9600\times\left(\frac{211}{200}\right)^3$$

$$= \frac{9600\times 211\times 211}{200\times 200}\times\frac{211}{200}$$

$= \text{`}\ 11272.72$

C.I. $= A - P$

$= \text{`}\ 11272.72 - \text{`}\ 9600$

$= \text{`}\ 1672.72$

Exercise 8.4

1. $P = \text{`}\ 6250$, $R = 4\%$, $T = 2$ years

For compound interest

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 6250\left[1+\frac{4}{100}\right]^2 = 6250\times\left(\frac{26}{25}\right)^2$$

$$= 6250\times\frac{26}{25}\times\frac{26}{25} = \text{`}\ 6760$$

C.I. $= A - P$

$= \text{`}\ 6760 - \text{`}\ 6250 = \text{`}\ 510.$

2. $P = \text{`}\ 20000$, $R = 7.5\%$, $T = 3$ years

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 2000\left[1+\frac{7.5}{1000}\right]^3$$

$$= 20000\times\left(\frac{1075}{1000}\right)^3$$

$$= \frac{20000\times 1075\times 1075\times 1075}{1000\times 1000\times 1000}$$

$$= \frac{397535}{16} = \text{`}\ 24845.94$$

3. Let $P = \text{`}\ x$, $T = 2$ years, $R = 10\%$

$$\text{S.I.} = \frac{P\times R\times T}{100}$$

$$= \frac{x\times 2\times 10}{100} = \text{`}\ \frac{x}{5}$$

For compound interest

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= x\left(x+\frac{10}{100}\right)^2 = x\left(\frac{11}{10}\right)^2$$

$$= x\times\frac{11}{10}\times\frac{11}{10} = \frac{121}{100}x$$

$$\text{C.I.} = A-P$$

$$= \frac{121x}{100} - x = \frac{121x-100x}{100}$$

$$= \frac{21x}{100}$$

$$\text{difference} = \frac{21x}{100} - \frac{x}{5}$$

$$= \frac{21x-20x}{100} = \frac{x}{100}$$

so difference $\frac{x}{100} = 300$

or $x = 300\times 100$

$x = 30000$

so, principal $= 30000$.

4. $P =$ ` 1000

$R = 10\%$ per annum or $\frac{10}{2} = 5\%$ half yearly

$T = 18$ months $= \frac{18}{12}$ year $= \frac{3}{2}$ years or $\frac{3}{2}\times 2 = 3$ half years

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$A = P\left[1+\frac{5}{100}\right]^3$$

$$A = 1000\left[1+\frac{1}{20}\right]^3$$

$$= 1000\times\left(\frac{21}{20}\right)^3$$

$$= 1000\times\frac{21}{20}\times\frac{21}{20}\times\frac{21}{20} = \frac{9261}{8} = 1157.625$$

C.I. $= A - P =$ ` 1157.625 – ` 1000 = ` 157.625

5. $P =$ ` 1600

$R = 10\%$ per annum or $\frac{10}{4}\%$ per quarterly

$T = 6$ months or $\frac{6}{12}$ years or $\frac{6}{12} \times 4$ quarter $= 2$ quarter

For compound interest

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$A = 1600\left[1+\frac{10}{4\times 100}\right]^T$$

$$= 1600\left(1+\frac{1}{40}\right)^T = 1600 \times \left(\frac{41}{40}\right)^2$$

$$= 1600 \times \left(\frac{41}{40}\times\frac{41}{40}\right) = 1681$$

C.I. $= A - P$

$= 1681 - 1600 =$ ` 81.

6. $R = 5\%$ per annum $= \frac{5}{2}$ half yearly

$P =$ ` 1000

$T = 1$ years = or 2 half years

For compound interest

$$A = P\left[1+\frac{R}{100}\right]^T = 1000\left[1+\frac{5}{2\times 100}\right]^2$$

$$= 1000\left[1+\frac{1}{40}\right]^2 = 1000\left[\frac{41}{40}\right]^2$$

$$= 1000\times\frac{41}{40}\times\frac{41}{40} = \frac{16810}{16}$$

$= 1050.625$

C.I. $= A - P$

$= 1050.625 - 1000$

$=$ ` 50.625

7. $A =$ ` 10830, $P = ?$, $R = -5\%$

$T = 2$ years

$$A = P\left[1+\frac{(R)}{100}\right]^T$$

$$10830 = P\left[1+\frac{(-5)}{100}\right]^2$$

$$\Rightarrow \quad 10830 = P\left(1-\frac{1}{20}\right)^2$$

$$10830 = P\times\left(\frac{19}{20}\right)^2$$

$$10830 = P \times \frac{19}{20} \times \frac{19}{20}$$

$$P = \frac{10830 \times 20 \times 20}{19 \times 19} = \text{`}\ 12000$$

So, cost of motor cycle was = ` 12000.

8. $A =$ ` 5832, $T = 2$ years, $R = 8\%$, $P = ?$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$5832 = P\left[1 + \frac{8}{100}\right]^2$$

$$5832 = P \times \left(\frac{27}{25}\right)^2$$

$$5832 = P \times \frac{27}{25} \times \frac{27}{25}$$

$$P = \frac{5832 \times 25 \times 25}{27 \times 27}$$

$P =$ ` 5000.

9. $P =$ ` $1000$, $A =$ ` 1102.50, $T = 2$ years, $R = ?$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$1102.50 = 1000\left[1 + \frac{R}{100}\right]^2$$

or $$\frac{1102.50}{1000 \times 100} = \left[1 + \frac{R}{100}\right]^2$$

$$\frac{110250}{100000} = \left[1 + \frac{R}{100}\right]^2$$

$$\frac{441}{400} = \left[1 + \frac{R}{100}\right]^2$$

$$\left(\frac{21}{20}\right)^2 = \left(1 + \frac{R}{100}\right)^2$$

or $$1 + \frac{R}{100} = \frac{21}{20}$$

$$\frac{R}{100} = \frac{21}{20} - 1$$

$$\frac{R}{100} = \frac{21 - 20}{20}$$

$$\frac{R}{100} = \frac{1}{20}$$

$$R = \frac{100}{20}$$
$$R = 5\%.$$

10. $P = ₹\ 1800, R = 10\%,$
C.I. = ₹ 378, $T = ?$

$$A = P + \text{C.I.}$$
$$= 1800 + 378 = ₹\ 2178$$
$$A = P\left[1 + \frac{R}{100}\right]^T$$
$$2178 = 1800\left[1 + \frac{10}{100}\right]^T$$
$$\frac{2178}{1800} = \left(\frac{11}{10}\right)^T$$
$$\frac{2178}{1800} = \left(\frac{11}{10}\right)^T$$
$$\frac{121}{100} = \left(\frac{11}{10}\right)^T$$

or $$\left(\frac{11}{10}\right)^2 = \left(\frac{11}{10}\right)^T$$

or $$T = 2 \text{ years.}$$

11. $P = 1000000, A = 1225043, T = 3$ years, $R = ?$

$$A = P\left[1 + \frac{R}{100}\right]^T$$
$$1225043 = 1000000\left[1 + \frac{R}{100}\right]^3$$
$$\frac{1225043}{1000000} = \left[1 + \frac{R}{100}\right]^3$$
$$\left(\frac{107}{100}\right)^3 = \left[1 + \frac{R}{100}\right]^3$$

or $$\left(1 + \frac{R}{100}\right) = \frac{107}{100}$$

$$\frac{R}{100} = \frac{107}{100} - 1$$
$$\frac{R}{100} = \frac{107 - 100}{100}$$
$$\frac{R}{100} = \frac{7}{100}$$
$$R = 7\%.$$

12. $R = 10\%$, $P = 60000$, $R = 79860$, $T = ?$

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$79860 = 60000\left[1+\frac{10}{100}\right]^T$$

$$\frac{79860}{60000} = \left[\frac{11}{10}\right]^T$$

or $$\frac{1331}{1000} = \left(\frac{11}{10}\right)^T$$

or $$\frac{11\times 11\times 11}{10\times 10\times 10} = \left(\frac{11}{10}\right)^T$$

$$\left(\frac{11}{10}\right)^3 = \left(\frac{11}{10}\right)^T$$

or $$T = 3 \text{ years.}$$

13. $P =$ ` 800, $A = 926.10$

$R = 10\%$ per annum or $\frac{10}{2} = 5\%$ per half yearly

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$926.10 = 800\left[1+\frac{5}{100}\right]^T$$

$$\frac{92610}{800\times 100} = \left[1+\frac{5}{100}\right]$$

$$\frac{92610}{80000} = \left(\frac{21}{20}\right)^T$$

or $$\frac{21\times 21\times 21}{20\times 20\times 20} = \left(\frac{21}{20}\right)^T$$

$$\left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^T$$

$T = 3$ or $T = 3$ half years

or $$T = \frac{3}{2} \text{ years.}$$

14. $P =$ ` $31250$, $A =$ ` 35152

$T = 1\frac{1}{2}$ years or $\frac{3}{2}$ years or 3 half years

$R = ?$

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$35152 = 31250\left[1+\frac{R}{100}\right]^3$$

$$\frac{35152}{31250} = \left[1+\frac{R}{100}\right]^3$$

$$\frac{26\times26\times26}{25\times25\times25} = \left[1+\frac{R}{100}\right]^3$$

$$\left(\frac{26}{25}\right)^3 = \left[1+\frac{R}{100}\right]^3$$

or $$1+\frac{R}{100} = \frac{26}{25}$$

$$\frac{R}{100} = \frac{26}{25}-1$$

$$\frac{R}{100} = \frac{26-25}{25}$$

$$\frac{R}{100} = \frac{1}{25}$$

$$R = \frac{100}{25}$$

$$R = 4\%$$

$R = 4\%$ per half years

or $4\times2 = 8\%$ per annum.

Exercise 8.5

1. $P = ?$, $A =$ ` 7290, $T = 2$ years, $R = 8\%$

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$7290 = P\left[1+\frac{8}{100}\right]^2$$

$$7290 = P\left(\frac{27}{25}\right)^2$$

$$P = 7290\times\left(\frac{25}{27}\right)^2$$

$$P = \frac{7290\times25\times25}{27\times27}$$

$P =$ ` 6250.

2. Find the amount, if :

(a) $P =$ ₹ 2500, $T = 4$ years, $R = 5\%$

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 2500\left[1+\frac{5}{100}\right]^4$$

$$= 2500\times\left(\frac{21}{20}\right)^4$$

$$= \frac{2500\times 21\times 21\times 21\times 21}{20\times 20\times 20\times 20} = \frac{194481}{64} = \text{₹ } 3038.77$$

(b) $P =$ ₹ 9450, $T = 2$ years, $R = 4\%$

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$A = 9450\left[1+\frac{4}{100}\right]^2$$

$$= 9450\left[\frac{26}{25}\right]^2 = \frac{9450\times 26\times 26}{25} = \frac{255528}{25} = \text{₹ } 10221.12$$

(c) $P =$ ₹ 9360, $R = 6\%$, $T = 3$ years

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 9360\left[1+\frac{6}{100}\right]^3$$

$$= 9360\left[\frac{53}{50}\right]^3 = \frac{9360\times 53\times 53\times 53}{50\times 50\times 50} = \text{₹ } 11147.91$$

3. Find the compound interest on :

(a) $P =$ ₹ 2500, $R = 8\%$, $T = 2$ years

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$A = 2500\left[1+\frac{8}{100}\right]^2$$

$$A = 2500\left[\frac{27}{25}\right]^2 = \frac{2500\times 27}{25}\times\frac{27}{25} = \text{₹ } 2916$$

C.I. $= A - P = 2916 - 2500 =$ ₹ 416

(b) $P =$ ₹ 4000, $R = 5\%$ per annum, $T = 3$ years

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 4000\left[1+\frac{5}{100}\right]^3 = 4000\left[\frac{21}{20}\right]^3$$

$$= 4000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = \frac{9261}{2} = ` \ 4630.5$$

C.I. $= A - P = 4630.50 - 4000 = ` \ 630.50$

(c) $P = ` \ 10000, T = 3$ years, $R = 10\%$

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 10000\left[1+\frac{10}{100}\right]^3$$

$$= 10000\left(\frac{11}{10}\right)^3 = 10000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} = ` \ 13310$$

C.I. $= A - P = 13310 - 10000 = ` \ 3310$

(d) $P = ` \ 8000, R = 12\%$ per annum, $T = 2$ years

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$= 8000\left[1+\frac{12}{100}\right]^2$$

$$= 8000\left[\frac{28}{25}\right]^2 = \frac{800 \times 28 \times 28}{25 \times 25} = ` \ 10035.20$$

C.I. $= A - P$

$= 10035.20 - 8000 = ` \ 2035.20$

4. $P = ` \ 10000, R = 5\%, T = 2\frac{1}{2}$ years

We will calculate it for 2 years only and then other 6 months later.

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$A = 10000\left[1+\frac{5}{100}\right]^2$$

$$= 10000\left(\frac{21}{20}\right)^2 = \frac{10000 \times 21 \times 21}{20 \times 20} = ` \ 11025$$

C.I. $= A - P = 11025 - 10000 = ` \ 1025$

Now, for 6 months $P = 11025$

$R = 5\%, T = 6$ months $= \frac{6}{12}$ years

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{11025 \times 5 \times 6}{100 \times 12} = 275.625$$

total C.I. $=$ ₹ $1025 + 275.625 =$ ₹ 1300.625

5. $P =$ ₹ 50000, $R = 8\%$, $T = 3$ years

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$= 50000\left[1 + \frac{8}{100}\right]^3$$

$$= 50000 \times \left(\frac{108}{100}\right)^3$$

$$= \frac{50000 \times 108 \times 108 \times 108}{100 \times 100 \times 100} = \frac{314928}{5} = 62985.60$$

$$\text{C.I.} = A - P$$

$$= 62985.60 - 50000 = \text{₹ } 12985.60$$

6. $R = 18\%$, $A =$ ₹ 4177.20, $T = 2$ years, $P = ?$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$4177.20 = P\left[1 + \frac{18}{100}\right]^2$$

$$4177.20 = P\left[\frac{118}{100}\right]^2$$

$$4177.20 = P \times \frac{118}{100} \times \frac{118}{100}$$

$$P = \frac{4177.20 \times 100 \times 100}{118 \times 118}$$

$$P = \text{₹ } 3000.$$

7. $P =$ ₹ 40000, $A =$ ₹ 44100, $R = 5\%$, $T = ?$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$44100 = 40000\left[1 + \frac{5}{100}\right]^T$$

$$\frac{44100}{40000} = \left(\frac{21}{20}\right)^T$$

$$\frac{21 \times 21}{20 \times 20} = \left(\frac{21}{20}\right)^T$$

$$\left(\frac{21}{20}\right)^2 = \left(\frac{21}{20}\right)^T$$

$$T = 2 \text{ years.}$$

8. $P =$ ` 16000, $R = 5\%$, $T = 3$ years

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$A = 16000\left[1+\frac{5}{100}\right]^3 = 16000\left[\frac{21}{20}\right]^3$$

$$= \frac{16000\times 21\times 21\times 21}{20\times 20\times 20} = \text{` } 18522$$

$$\text{C.I.} = A - P$$

$$= 18522 - 16000 = \text{` } 2522.$$

9. $P =$ ` 6750, $A =$ ` 8192, $R = 6\frac{2}{3}\% = \frac{20}{3}\%$

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$8192 = 6750\left[1+\frac{20}{3\times 100}\right]^T$$

$$\frac{8192}{6750} = \left[\frac{16}{15}\right]^T$$

$$\frac{16\times 16\times 16}{15\times 15\times 15} = \left(\frac{16}{15}\right)^T$$

$$\left(\frac{16}{15}\right)^3 = \left(\frac{16}{15}\right)^T$$

or $\quad T = 3$ years.

10. $T = 2$ years, $R = 10\%$

S.I. = ` 1000, $P = ?$

$$\text{S.I.} = \frac{P\times R\times T}{100}$$

$$1000 = \frac{P\times 10\times 2}{100}$$

$$P = \frac{1000\times 10}{2}$$

$$P = \text{` } 5000$$

Now, $P =$ ` 5000, $R = 8\%$, $T = 2$ years

$$A = P\left[1+\frac{R}{100}\right]^T$$

$$A = 5000\left[1+\frac{8}{100}\right]^2$$

$$= 5000 \times \left(\frac{27}{25}\right)^2$$

$$= \frac{5000 \times 27 \times 27}{25 \times 25} = 5832$$

C.I. $= A - P = 5832 - 5000 =$ ` 832.

11. $P =$ ` 12000

$R = 8\%$ per annum or $\frac{8}{2} = 4\%$ half year

$T = 1$ years or 2 half years

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$= 12000\left[1 + \frac{4}{100}\right]^2 = 12000\left(\frac{26}{25}\right)$$

$$= \frac{12000 \times 26 \times 26}{25 \times 25} = 12979.20$$

So, C.I. $= A - P$

$= 12979.20 - 12000 =$ ` 979.20

12. $P =$ ` 15000

$R = 6\%$ per annum or $\frac{6}{2} = 3\%$ per half yearly

$T = 1\frac{1}{2}$ years or $\frac{3}{2}$ years or 3 half years

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$= 15000\left[1 + \frac{3}{100}\right]^3 = 15000 \times \left[\frac{103}{100}\right]^3$$

$$= \frac{15000 \times 103 \times 103 \times 103}{100 \times 100 \times 100} = 16390.91$$

C.I. $= A - P = 16390.91 - 15000 = 1390.91$

13. $A =$ ` 12167, $R = 15\%$, $T = 3$ years

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$12167 = P\left[1 + \frac{15}{100}\right]^3$$

$$12167 = P\left[\frac{23}{20}\right]$$

$$12167 = \frac{P \times 23 \times 23 \times 23}{20 \times 20 \times 20}$$

$$P=\frac{12167\times20\times20\times20}{23\times23\times23}$$

$$P=\text{\`}\ 8000.$$

14. $P=6400, T=2$ years

$R=6\frac{1}{4}\%=\frac{25}{4}\%$

$$A=P\left[1+\frac{R}{100}\right]$$

$$A=6400\left[1+\frac{25}{4\times100}\right]^2$$

$$=6400\left[1+\frac{1}{16}\right]^2=6400\left[\frac{17}{16}\right]^2=\frac{6400\times17\times17}{16\times16}=\text{\`}\ 7225$$

$$\text{C.I.}=A-P=7225-6400=\text{\`}\ 825$$

$$\text{S.I.}=\frac{P\times R\times T}{100}=\frac{6400\times25\times2}{100\times4}=800$$

$$\text{difference}=825-800=\text{\`}\ 25.$$

15. Let $P=x, R=5\%, T=3$ years

$$\text{S.I.}=\frac{P\times R\times T}{100}$$

$$\text{S.I.}=\frac{x\times5\times3}{100}=\frac{3x}{20}$$

Now, for C.I. $P=x, R=5\%, T=3$ years

$$A=P\left[1+\frac{R}{100}\right]^T$$

$$A=x\left[1+\frac{5}{100}\right]^3=x\left(\frac{21}{20}\right)^3=\frac{x\times21\times21\times21}{20\times21\times20}=\frac{9261}{8000}x$$

$$\text{C.I.}=A-P$$

$$=-\frac{9261x}{8000}-x=\frac{9261x-8000x}{8000}=\frac{1261x}{8000}$$

$$\text{difference}=\frac{1261x}{8000}-\frac{3x}{20}$$

or $$\frac{1261x}{8000}-\frac{3x}{20}=183$$

$$\frac{1261x0-1200x}{8000}=183$$

$$\frac{61x}{8000}=183$$

$$x=\frac{183\times8000}{61}$$

$$x=24000$$

so, $P =$ ₹ 24000

16. $P = 7396$ in two years

$A = 7950.70$ in three

So, $\text{S.I.} = 7950.70 - 7396.00$

$= 554.70$ for 1 years

Now, $P = 7396$, S.I. $= 554.70$

$T = 1$ years, $R = ?$

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$554.70 = \frac{7396 \times R \times 1}{100}$$

$$R = \frac{554.70 \times 100}{1 \times 7396 \times 100} = \frac{55470}{7396} = 7.5\%.$$

17. $P =$ ₹ 15625

$T = 9$ months or $\frac{9}{12}$ years or $\frac{9}{12} \times 4 = 3$ quarters

$R = 16\%$ per annum $= \frac{16}{4}\% = 4\%$ quarterly

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$= 15625\left[1 + \frac{4}{100}\right]^3$$

$$= 15625\left[-\frac{26}{25}\right]^3 = \frac{15625 \times 26 \times 26 \times 26}{25 \times 25 \times 25} = \text{₹ } 17576.$$

Exercise 8.6

1. Look at the following tables and point out in which cases do a and b vary directly ?

(a)

a	9	10	15	30	40	80	100
b	18	20	30	60	80	160	200

Here $\frac{{}^{1}9}{{}_{2}18} = \frac{10^1}{20_2} = \frac{15^1}{30_2} = \frac{{}^{1}30}{{}_{2}60} = \frac{40^1}{80_2} = \frac{80^1}{160_2} = \frac{100^1}{200_2} = \frac{1}{2} = k.$

so, this table vary directly.

(b)

a	3	6	12	24	50	60	100
b	10	20	40	100	150	200	300

Here $\frac{3}{10} = \frac{^{1}6}{_{10}20} = \frac{12^{3}}{40_{10}} = \frac{24^{6}}{100_{25}} = \frac{50^{1}}{150_{3}} = \frac{^{3}60}{_{10}200} = \frac{100^{1}}{300_{3}}$.

Here k = not same

So, this table not vary directly.

2. If a and b vary directly in each of the following, then complete the table :

(a)

a	2	6	7	8
b	5	15	17.5	20

(b)

a	2	3	7	25	120
b	24	36	84	300	1440

3. $x = ?,\ y = 400,\ k = 40$

We have,

$$\frac{x}{y} = k$$

$$\frac{x}{400} = 40$$

or $$x = 40 \times 400 = 16000.$$

4. $y \propto x$

if $x = 2,\ y = 8$ then $k = ?$

Here, $$\frac{y}{x} = k$$

$$\frac{8}{2} = k$$

$$k = 4.$$

5. If $x \propto 5y$

$x_1 = 10,\ y_1 = 2$, find x_2 when $y_2 = 7$

or $$\frac{x_1}{y_1} = \frac{x_2}{y_2}$$

$$\frac{10}{2} = \frac{x_2}{7}$$

$$x_2 = \frac{10 \times 7}{2}$$

$$x_2 = 5 \times 7$$

$$x_2 = 35.$$

6. $p \propto q$

Here $p_1 = 282,\quad q_1 = 5.1$

$p_2 = ?,\quad q_2 = 6.8$

so, $$\frac{p_1}{q_1} = \frac{p_2}{q_2}$$

$$\frac{282}{5.1} = \frac{p_2}{q_2}$$

$$p_2 \times 5.1 = 282 \times 6.8$$

$$p_2 = \frac{282 \times 6.8 \times 10}{5.1 \times 10}$$

$$p_2 = 376.$$

7.

Pencil	2	3	4	5	6	7	8
Cost	6	9	12	15	18	21	24

cost of 8 pencils = ₹ 24

cost of 1 pencil $= \frac{24}{8} = 3$

cost of 2 pencils $= 3 \times 2 =$ ₹ 6

cost of 3 pencils $= 3 \times 3 =$ ₹ 9

cost of 4 pencils $= 4 \times 3 =$ ₹ 12

cost of 5 pencils $= 5 \times 3 =$ ₹ 15

cost of 6 pencils $= 6 \times 3 =$ ₹ 18

cost of 7 pencils $= 7 \times 3 =$ ₹ 21

8.

books	cartons
72 ↓	4 ↓
540	x

$$\frac{x}{4} = \frac{540}{72}$$

$$x = \frac{540 \times x}{72}$$

$$x = 30$$

9.

Cloths in metres	cost
8 ↓	₹ 250 ↓
5.8	x

Here, $$\frac{x}{250} = \frac{5.8}{8}$$

$$x = \frac{5.8 \times 250}{8 \times 10}$$

$$x = \frac{1450}{8} = ₹\ 181.25$$

10.

Money paid	Days
₹ 1200 ↓	5 ↓
x	24

$$\frac{x}{1200} = \frac{24}{5}$$

$$x = \frac{1200^{240} \times 24}{5_1}$$

$$x = ₹\ 5760$$

11. fare — distance

` 675 — 150 km

` 1512 — x

Here, $\frac{x}{150} = \frac{1512}{675}$

$$x = \frac{{}^{6}150 \times 1512^{6}}{675_{27\,1}}$$

$$x = 336\,\text{km}$$

12. food — person

95 kg — 5

x — 23

Here, $\frac{x}{95} = \frac{23}{5}$

$$x = \frac{23 \times 95}{5}$$

$$x = 437$$

13. chairs — days

36 — 8

27 — x

Here, $\frac{x}{8} = \frac{27}{36}$

$$x = \frac{27 \times 8}{36}$$

$$x = 6\,\text{days}$$

14. Runs — Overs

100 — 25

180 — x

$$\frac{x}{25} = \frac{180}{100}$$

$$x = \frac{180 \times 25}{100}$$

$$x = 45\,\text{runs}$$

15. wages — days

` 1209 — 13

` 1953 — x

Here, $\frac{x}{13} = \frac{1953}{1209}$

$$x = \frac{1953 \times 13}{1209}$$

$$x = 21\,\text{days}$$

Exercise 8.7

1. In which of the following cases do the two quantities a and b vary inversely?

(a)

a	4	8	16	32	64
b	16	8	4	2	1

Here

$$a \times b = 4 \times 16 = 64 = k$$
$$8 \times 8 = 64 = k$$
$$16 \times 4 = 64 = k$$
$$32 \times 2 = 64 = k$$
$$64 \times 1 = 64 = k$$

Here $a \times b =$ constant (k)

so, a vary inversely to b.

(b)

a	2	5	10	20	50
b	20	50	100	200	500

Here

$$\frac{2}{20} = \frac{1}{10}$$
$$\frac{{}^{1}\cancel{5}}{{}_{10}\cancel{50}} = \frac{1}{10}$$
$$\frac{{}^{1}\cancel{10}}{{}_{10}\cancel{100}} = \frac{1}{10}$$
$$\frac{{}^{1}\cancel{20}}{{}_{10}\cancel{200}} = \frac{1}{10}$$
$$\frac{{}^{1}\cancel{50}}{{}_{10}\cancel{500}} = \frac{1}{10}$$

so, $a \times b =$ not constant

so, a is not vary inversely b.

2.

a	8	**10**	4	2
b	15	12	**30**	60

a	**2**	3	4	**6**
b	18	12	**9**	6

3. Men $\quad$ days

15 ↑ $\quad$ 24 ↓

9 $\quad$ x

Here, $$\frac{x}{24} = \frac{15}{9}$$
$$x = \frac{{}^{5}15 \times 24^{8}}{9_{3}}$$
$$x = 40 \text{ days}$$

4. If 50 persons more come to join the camp then no. of persons will become $300 + 50 = 350$

person	days
300	42
350	x

$$\frac{x}{42} = \frac{300}{350}$$
$$x \times 350 = 300 \times 42$$
$$x = \frac{300 \times 42}{350}$$
$$x = 36 \text{ days}$$

5.

men	weeks
800	10
500	x

$$\frac{x}{10} = \frac{800}{500}$$
$$x = \frac{800 \times 10}{500}$$
$$x = 16 \text{ weeks}$$

6.

men	days
16	30
x	24

$$\frac{x}{16} = \frac{30}{24}$$
$$x = \frac{{}^{10}30 \times 16^{2}}{24_{3}}$$
$$x = 20 \text{ men}$$

7.

cows	days
33	12
x	9

$$\frac{x}{33} = \frac{12}{9}$$
$$x = \frac{12 \times 33}{9}$$
$$x = 44 \text{ cows}$$

8. Let x readers were transferee to another camp, so

soldiers	days
1200 $\downarrow$	28 $\uparrow$
$(1200-x)$	32

$$\frac{1200-x}{1200}=\frac{28}{32}$$
$$(1200-x)\times 32=1200\times 28$$
$$38400-32x=33600$$
$$32x=38400-33600$$
$$32x=4800$$
$$x=\frac{4800^{150}}{32_1}$$
$$x=150$$

So, 150 soldiers were transferred to another camp.

9. According to questions

left soldiers $=105-42=63$

soldiers	days
105 $\uparrow$	21 $\downarrow$
63	x

$$\frac{x}{21}=\frac{105}{63}$$
$$x=\frac{105\times 21}{63}$$
$$x=35\text{ days}$$

10.

time	speed
45 min $\uparrow$	40 km/hr $\downarrow$
25 min	x

$$\frac{x}{40}=\frac{45}{25}$$
$$x=\frac{45\times 40}{25}$$
$$x=72\text{ km/hr.}$$

Exercise 8.8

1. Riya completes $\frac{1}{20}$ part of a work $=1$ day

Riya completes 1 part of a work $=1\times 20$ days

$=20$ days

so, she will take 20 days to complete work.

2. Javed finishes a piece of work is $=8$ days

Javed's one day work $=\frac{1}{8}$ parts

Rajan finishes the same work in $=10$ days

Rajan's one day work $= \frac{1}{10}$ parts

Together's one day work $= \frac{1}{8} + \frac{1}{10} = \frac{5+4}{40} = \frac{9}{40}$

So, they will work together in $\frac{40}{9}$ days $= 4\frac{4}{9}$ days.

3. Rekha can reap a field in $= 20$ days

Rekha can reap field in one day $= \frac{1}{20}$ part

Pawan car reap a field in $= 30$ days

Pawan can reap a field in one day $= \frac{1}{30}$ part

Together they can reap in one day $= \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{5}{60}$

So, they will reap a field together in $= \frac{60}{5}$ days

$= 12$ days.

4. Rubi and Rinki together can do a work in $= 6$ days

Their one day's work $= \frac{1}{6}$

Rinki can do the same work in $= 9$ days

Rinki's one day work $= \frac{1}{9}$

so Rubi's one day work $= \frac{1}{6} - \frac{1}{9} = \frac{3-2}{18} = \frac{1}{18}$

So, Rubi can do work in $= 18$ days.

5. Tom and peter together can do a piece of work $= 7\frac{1}{2}$ days $= \frac{15}{2}$ days

Tom and peter's one day work $= \frac{2}{15}$ part of while work

Tom alone can do the same work in $= 20$ days

Tom's one day work $= \frac{1}{20}$ part of whole work.

Peter's one day work $= \frac{2}{15} - \frac{1}{20} = \frac{8-3}{60} = \frac{5}{60}$

So, peter alone car do a work in $= \frac{60}{5} = 12$ days

6.

laborer	amount	days
12 ↓	3600 ↓	5 ↓
9	x	8

So, $\frac{x}{3600} = \frac{9}{12} \times \frac{8}{5}$

$$x = \frac{9 \times 8 \times 3600}{12 \times 5}$$

$$x = ` \ 4320$$

So, 9 labours earn ` 4320 in 8 days.

7. A alone can do a piece of in $= 12$ days

A's one day work $= \frac{1}{12}$ part

B car do same work in $= 15$ days

B's one day work $= \frac{1}{15}$ part

$(A \text{ and } B)$'s one day work $= \frac{1}{12} + \frac{1}{15} = \frac{5+4}{60} = \frac{9}{60}$

They work together for 4 days

So, their 4 days work $= \frac{9 \times 4}{60} = \frac{3}{5}$ part

Left work $= 1 - \frac{3}{5} = \frac{5-3}{5} = \frac{2}{5}$ part

A cant do 1 piece of work $= 12$

A cant do $\frac{2}{5}$ piece of work $= 12 \times \frac{2}{5} = \frac{24}{5} = 4\frac{4}{5}$ days

So, A alone completes the remaining work in $4\frac{4}{5}$ days.

8. A, B and C together do a piece of work in $= 6$ days

$(A, B \text{ anc } C)$'s one day work $= \frac{1}{6}$ work

A and B together to the same work in $= 10$ days

$(A \text{ and } B)$ is one day work $= \frac{1}{10}$ parts

so C's one day work $= \frac{1}{6} - \frac{1}{10} = \frac{5-3}{30} = \frac{2}{30}$

So, C can do alone same piece of work $= \frac{30}{2}$ days $= 15$ days.

9. Pipe A can fill a tank in $= 24$ minutes

A can fill tank in one minutes $= \frac{1}{24}$ part

pipe B can fill a tank in $= 32$ minutes

pipe B can fill tank in one minute $= \frac{1}{32}$ part

(A and B) together can fill tank in one minute $= \frac{1}{24} + \frac{1}{32} = \frac{4+3}{96} = \frac{7}{96}$

pipe C can empty tank in $= 16$ minutes pipe C can empty tank in one min $= \frac{1}{16}$ part

if all pipes are open, then tank field in one minutes $= \frac{7}{96} - \frac{1}{16} = \frac{7-6}{96} = \frac{1}{96}$

or whale tank will be filled in $= 96$ minutes.

10. Let x more people come to family.

$$\begin{array}{ll} \text{people} & \text{days} \\ 8 \;\downarrow & 30 \;\uparrow \\ 8+x & 20 \end{array}$$

$$\frac{x+8}{8} = \frac{30}{20}$$

$$(x+8)\times 20 = 30\times 8$$

$$20x+160 = 240$$

$$20x = 240-160$$

$$20x = 80$$

$$x = \frac{80}{20}$$

$$x = 4$$

So, 4 more quests come to family.

11.

$$\begin{array}{lll} \text{men} & \text{hours} & \text{days} \\ 120 \;\downarrow & 9 \;\downarrow & 40 \;\downarrow \\ 150 & 6 & x \end{array}$$

so, $$\frac{x}{40} = \frac{120}{150}\times\frac{9}{6}$$

$$x = \frac{120\times 9\times 40}{150\times 6}$$

$$x = 6\times 8$$

$$x = 48 \text{ days.}$$

12. 3 boys = 5 girls 1 boy $= \frac{5}{3}$ girl

Now, 2 boys + 2 girls $= 2\times\frac{5}{3}$ girls + 2 girls

$$= \frac{10}{3} \text{ girls} + 2 \text{ girls} = \frac{10\text{girls} + 6 \text{ girls}}{3} = \frac{16}{3} \text{ girls}$$

$$\begin{array}{ll} \text{girls} & \text{hours} \\ 5 \;\uparrow & 8 \;\downarrow \\ \frac{16}{3} & x \end{array}$$

$$\frac{x}{8} = \frac{5\times 3}{16}$$

$$x = \frac{5\times 3\times 8}{16}$$

$$x = \frac{15}{2}$$

$$x = 7\frac{1}{2} \text{ days}$$

So, 2 boys and 2 girls together can clean the same compound in $7\frac{1}{2}$ days.

Exercise 8.9

1. Change the following :

(a) 30 m/s into km/h

$$^{6}30 \times \frac{18}{5_1} \text{ km/hr} = 108 \text{ km/hr}$$

(b) 27 km/hr to m/s

$$^{3}27 \times \frac{5}{18_2} \text{ m/s} = \frac{15}{2} \text{ m/s} = 7.5 \text{ m/s}$$

2. $36 \text{ km/hr} = {}^{2}36 \times \frac{5}{18_1} \text{ m/s} = 10 \text{ m/sec}$

3. $\text{Speed } = 15 \text{ m/sec} = 15 \text{ m/sec} = 15^3 \times \frac{18}{5_1} \text{ km/hr} = 54 \text{ km/hr}$

4. $\text{Speed } = 18 \text{ km/hr} = 18 \text{ km/hr} = 18^1 \times \frac{5}{18_1} \text{ m/sec} = 5 \text{ m/sec}$

5. $\text{Speed } = \frac{18}{5} \text{ km/hr} = \frac{18}{5} \text{ km/hr} = \frac{{}^{1}18}{5_1} \times \frac{5^1}{18_1} \text{ m/sec} = 1 \text{ m/sec}$

6. $\text{speed } = 35 \text{ m/sec} = 35 \text{ m/sec} = 35 \times \frac{18}{5} \text{ m/sec} = 126 \text{ m/sec}$

7. $\text{Speed } = 320 \text{ km/hr}$ $\qquad$ $\text{time} = 3 \text{ hrs}$

$\text{distance} = \text{speed} \times \text{time}$

$= 320 \times 3 = 960 \text{ km or } 960 \times 1000 \text{ m} = 960000 \text{ matres.}$

8. $\text{Time} = 7 \text{ sec}$

$\text{distance} = \text{length of train} = 210 \text{ m}$

$$\text{Speed } = \frac{\text{distance}}{\text{time}} = \frac{210^{30}}{7_1} = 30 \text{ m/sec.}$$

9. $\text{Speed } = 36 \text{ km/hr} = 36^2 \times \frac{5}{18_1} \text{ m/sec} = 10 \text{ m/sec.}$

$\text{time} = 18 \text{ sec}$

$\text{distance} = \text{speed} \times \text{time} = 10 \times 18 = 180 \text{ m.}$

10.

time	speed
10 hr	40 km/hr
x	50 km/hr

$$\frac{x}{10} = \frac{40}{50}$$

$$x = \frac{40 \times 10}{50}$$

$$x = 8 \text{ hours}$$

11. time $= 12$ hours $+ 20$ minutes

$= 12 \times 60$ min $+ 20$ min.

$= 720$ min $+ 20$ min $= 740$ min or 740×60 sec $= 44400$ sec

Speed $= 25$ m/sec

distance $=$ speed $\times$ time $= 44400 \times 25 = 1110000$ or 1110 km

12. distance $=$ length of train $= 225$ m

time $= 10$ sec

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{225}{10} = 22.5 \text{ m/sec}$$

so, the speed of train $= 22.5$ m/sec

and distance $=$ length of platform $+$ length of train

$405 + 225$

$= 630$ m

$$\text{time taken} = \frac{\text{distance}}{\text{speed}} = \frac{630}{22.5} \times 10 = \frac{6300}{225} = 28 \text{ sec.}$$

Multiple Choice Questions

1. (c) **2.** (b) **3.** (c) **4.** (d) **5.** (a) **6.** (b)

Sharp Your Knowledge

1. 10% of x is 20

or $x \times 10\% = 20$

$$\frac{x \times 10}{100} = 20$$

$x = 20 \times 10$

$x = 200$

2. 60% of 180 $= \dfrac{180 \times 60}{100} = 108$

So, no. $= 180 + 108 = 288$

3. 50% of 130 $= 130 \times 50\% = \dfrac{130 \times 50}{100} = 65$

So, No. $= 130 - 65 = 65$

4. 5% of $y = 4$

$y \times 5\% = 4$

$$\frac{y \times 5}{100} = 4$$

$$y = \frac{4 \times 100}{5}$$

$y = 80$

5. Let the total no. of students $= x$

So, 30% of $x = 120$ boys

$$\frac{x \times 30}{100} = 120$$

$$x = \frac{120 \times 100}{30} \qquad \Rightarrow \qquad x = 400$$

6. C.P. = $`$ 10 per dozen S.P. = $`$ 15 per dozen

so, $\text{profit} = 15 - 10 = ` \; 5$

$$\text{profit } \% = \frac{\text{profit}}{\text{C. P.}} \times 100 = \frac{5}{10} \times 100 = 50\%$$

Higher Order Thinking Skills

$\Rightarrow$ A's cost price $= x$

$$\text{Profit} = 20\% = \frac{x \times 20}{100} = \frac{x}{5}$$

$$\text{so, S.P. of } A = \frac{x + x}{5} = \frac{6x}{5}$$

So S.P. of A = C.P. of B

$$B\text{'s C.P.} = \frac{6x}{5}$$

$$\text{loss} = 15\% = \frac{6x}{5} \times \frac{15}{100} = \frac{18x}{100}$$

$$\text{S.P. of } B = \frac{6x}{5} - \frac{18x}{100} = \frac{120x - 18x}{100} = \frac{102x}{100}$$

$$\text{So, C.P. of } C = \text{S.P. of } B = \frac{102x}{100}.$$

$\Rightarrow$ Let, C.P. of article $= x$

gain = 5%

$$\text{so,} \quad \text{gain} = \frac{x \times 5}{100} = \frac{x}{20} \qquad \Rightarrow \text{S.P.} = \frac{x}{20} + x = \frac{x + 20x}{20} = \frac{21x}{20}$$

Loss = 5%

$$\text{so,} \quad \text{loss} = \frac{x \times 5}{100} = \frac{x}{20}$$

$$\text{So,} \quad \text{S.P.} = x - \frac{x}{20} = \frac{20x - x}{20} = \frac{19x}{20}$$

$$\text{A.C.Q.} \quad \frac{21x}{20} - 50 = \frac{19x}{20}$$

$$\frac{21x}{20} - \frac{19x}{20} = 50$$

$$\frac{21x - 19x}{20} = 50$$

$$\frac{2x}{20} = 50 \qquad \Rightarrow \qquad x = \frac{50 \times 20}{2}$$

$$x = ` \; 500$$

$$\text{gain} = \frac{x}{20} \Rightarrow \frac{500}{20}$$

So, original selling price = $500 + 25 = ` \; 525$.

9 Visualising Solid Shapes

Exercise 9.1

1. For each of the given solid, the three views are given. Mark them

Ans. (a) (i) Top view (ii) Front view (iii) Side view
(b) (i) Front view (ii) Side view (iii) Top view
(c) (i) Top view (ii) Front view (iii) Side view
(d) (i) Front view (ii) Tow view (iii) Side view
(e) (i) Front view (ii) Side view (iii) Top view
(f) (i) Top view (ii) Side view (iii) in front view

2. A solid obtained by joined 4 cubes.

Ans. (a) (i) Side view (ii) Front view (iii) Top view
(b) (i) Front view (ii) Side view (iii) Top view
(c) (i) Side view (ii) Front view (iii) Top view
(d) (i) Top view (ii) Side view (iii) Front view
(e) (i) Front view (ii) Top view (iii) Side view

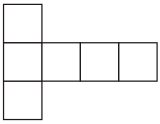
Exercise 9.2

1. Name the 3-D figures that can be obtained by folding the following nets.

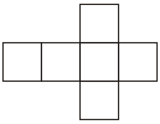
Ans. (a) Triangular prism (b) Cube
(c) Triangular prism (d) Square pyramid
(e) Hexagonal prism (f) Cuboid

2. Draw two different nets for a cube.

(a)

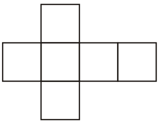


(b)

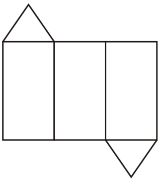


3. Draw nets for each of the following polyhedrons.

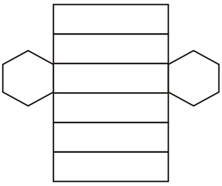
(a)



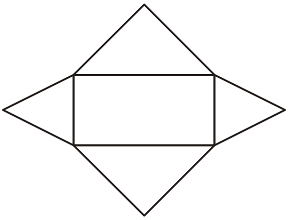
(b)



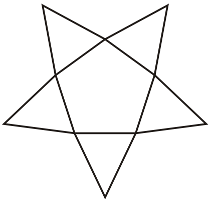
(c)



(d)



(e)



4. **A die is a cube where the sum of the numbers on the opposite faces must total 7. Which of the following are dice?**

Ans. b, c

Multiple Choice Questions

1. (b) **2.** (d) **3.** (a) **4.** (d) **5.** (b)

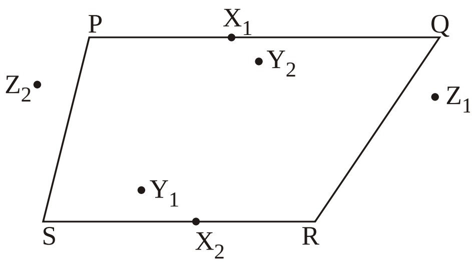
Sharp Your Knowldege

1.	square pyramid	**2.**	cylinder	**3.**	core
4.	8	**5.**	one, two		

10 Quadrilaterals

Exercise 10.1

1. a, b, d are concave; Not all two points when joined lie wholly in the interior of the quadrilateral.
2. Here is a quadrilateral WXYZ, Name the following :
   (a) two pairs of opposite sides
   XY and *WZ*; *XW* and *YZ*
   (b) Two pairs of opposite angles
   $\angle X$ and $\angle Z$; $\angle W$ and $\angle Y$
   (c) Two pairs of adjacent sides
   XW and *XY* ; *ZY* and *ZW*
   (d) Two pairs of adjacent angles
   $\angle Y$ and Z ; $\angle X$ and $\angle W$.
3.



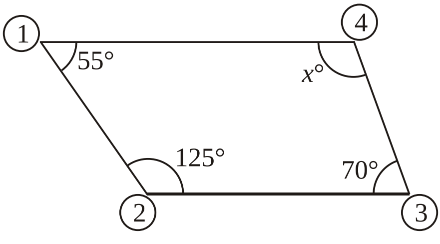
4. (a) False, three vertices of a quadrilateral never be collinear.
   (b) False, A quadrilateral can have an obtuse angle.
   (c) False, A quadrilateral can have more than one right angle.
   (d) False, A sum of the four angles of a concave quadrilateral is 360°.
   (e) False, A diagonal of a quadrilateral is a line segment Joining any two opposite vertices of the quadrilateral.
   (f) True
5. In a quadrilateral

   $\angle 1 = 55°$

   $\angle 2 = 125°$

   $\angle 3 = 70°$

   $\angle 4 = ?$



We know that the
sum of angles in
quadrilateral = 360°

So, $\angle 1 + \angle 2 + \angle 3 + \angle 4 = 360°$

$55° + 125° + 70° + \angle 4 = 360°$

$250° + \angle y = 360°$

$\angle 4 = 360° - 250° = 110°$

6. The angles of a quadrilateral are in the following ratio. Find the measure of the four angles.

(a) Let $\angle 1 = x, \angle 2 = 2x, \angle 3 = 3x, \angle 4 = 4x$

We know that the sum of angles in quadrilateral = 360°

So, $\angle 1 + \angle 2 + \angle 3 + \angle 4 = 360°$

$$x + 2x + 3x + 4x = 360°$$
$$10x = 360°$$
$$x = \frac{360}{10}$$
$$x = 36°$$

So, $\angle 1 = 36°$

$\angle 2 = 2 \times 36° = 72°$

$\angle 3 = 3 \times 36° = 108°$

$\angle 4 = 4 \times 36° = 144°$

(b) Let $\angle 1 = 2x, \angle 2 = 2x, \angle 3 = 3x, \angle 4 = 5x$

We know that the sum of angles in quadrilateral = 360°

so, $\angle 1 + \angle 2 + \angle 3 + \angle 4 = 360°$

$$2x + 2x + 3x + 5x = 360°$$
$$12x = 360°$$
$$x = \frac{360°}{12}$$
$$x = 30°$$

So, $\angle 1 = 2 \times 30° = 60°, \angle 2 = 2 \times 30° = 60°$

$\angle 3 = 3 \times 30° = 90°, \angle 4 = 5 \times 30° = 150°$

(c) Let $\angle 1 = 3x, \angle 2 = 5x, \angle 3 = 7x, \angle 4 = 9x$

We know that the sum of angles in quadrilateral = 360°

So, $\angle 1 + \angle 2 + \angle 3 + \angle 4 = 360°$

$$3x + 5x + 7x + 9x = 360°$$
$$24x = 360°$$
$$x = \frac{360}{24}$$
$$x = 15$$

So, $\angle 1 = 3 \times 15° = 45°,$

$\angle 2 = 5 \times 15° = 75°$

$\angle 3 = 7 \times 15° = 105°,$

$\angle 4 = 9 \times 15° \Rightarrow 135°$

7. Let, $\angle 1 = x$, $\angle 2 = x$, $\angle 3 = x$, $\angle 4 = 2x$

We know that the sum of angles in quadrilateral = 360°

So,
$$\angle 1 + \angle 2 + \angle 3 + \angle 4 = 360°$$
$$x + x + x + 2x = 360°$$
$$5x = 360°$$
$$x = \frac{360°}{5}$$

So,
$$\angle 1 = 72°,$$
$$\angle 2 = 72°$$
$$\angle 3 = 72°,$$
$$\angle 4 = 2 \times 72° = 144°$$

8. Let $\angle B = x$, $\angle D = x$, $\angle A = 2x$, $\angle C = 2x$

We know that the sum of angles in quadrilateral = 360°

So, = 360°
$$\angle A + \angle B + \angle C + \angle D = 360°$$
$$2x + x + 2x + x = 360°$$
$$6x = 360°$$
$$x = \frac{360°}{6}$$
$$x = 60°$$

So,
$$\angle A = 2 \times 60° = 120°$$
$$\angle B = 60° = 60°$$
$$\angle C = 2 \times 60° = 120°$$
$$\angle D = 60° = 60°$$

9. Let each angle of a quadrilateral = x

So,
$$\angle 1 + \angle 2 + \angle 3 + \angle 4 = 360°$$
$$x + x + x + x = 360°$$
$$4x = 360°$$
$$x = \frac{360}{4}$$
$$x = 90°$$

So, each angle of a quadrilateral = 90°.

10. Let $\angle 1 = x$, $\angle 2 = x$, $\angle 3 = x$, $\angle 4 = 120°$

We know that the sum of angles in quadrilateral = 360°

So,
$$\angle 1 + \angle 2 + \angle 3 + \angle 4 = 360°$$
$$x + x + x + 120° = 360°$$
$$3x + 120° = 360°$$
$$3x = 360° - 120°$$
$$3x = 240°$$
$$x = \frac{240}{3}$$
$$x = 80$$

So, $\angle 1 = 80°$, $\angle 2 = 80°$, $\angle 3 = 80°$ and $\angle 4 = 120°$

11. Sum of two angles of a quadrilateral $= 180°$

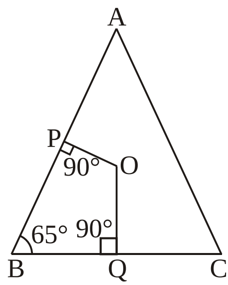
Let sum of another two angles of a quadrilateral $= x$

We know that sum of all four angles in quadrilateral $= 360°$

So, sum of two angles + sum of another two angles $= 360°$

$$180° + x = 360°$$
$$x = 360° - 180°$$
$$x = 180°$$

12. In quadrilateral $POQB$



$\angle P = 90°$

$\angle B = 65°$

$\angle Q = 90°$

$\angle O = ?$

We know that the sum of all four angles in quadrilateral

$= 360°$

$$\angle P + \angle B + \angle Q + \angle O = 360°$$
$$90° + 65° + 90° + \angle O = 360°$$
$$\angle O = 360° - 90° - 65° - 90°$$
$$\angle O = 360° - 245$$
$$\angle O = 115°.$$

Exercise 10.2

1. length $= 8$ cm

breadth $= 6$ cm

Perimeter of parallelogram $= 2[l + b]$ cm

$= 2[8 + 6]$ cm

$= 2 \times 14 = 28$ cm.

2. Let, length $= x$

and breadth $= 2x$

perimeter $= 24$ cm

perimeter of parallelogram $= 2[l + b]$

$$24 = 2[x + 2x]$$
$$24 = 2 \times 3x$$
$$6x = 24$$
$$x = \frac{24}{6} = 4 \text{ cm}$$

So, length $= 4$ cm

breadth $= 2 \times 4 = 8$ cm.

3. Let $BC = x$ cm

and $AB = (x + 8)$ cm

perimeter $= 40$ cm

$$\text{perimeter} = 2(l + b)$$
$$40 = 2(x + x + 8)$$
$$40 = 2(2x + 8)$$

$$4x + 16 = 40$$
$$4x = 40 - 16$$
$$4x = 24$$
$$x = \frac{24}{4}$$
$$x = 6$$

So, $BC = 6\,\text{cm}$

or $AB = 6 + 8 = 14$ cm.

4. Let $\angle 1 = 40°, \angle 2 = x°, \angle 3 = 40°, \angle 4 = x$

Because in parallelogram opposite angles are equal.

In parallelogram

$$\angle 1 + \angle 2 + \angle 3 + \angle 4 = 360°$$
$$40 + x + 40 + x = 360°$$
$$80 + 2x = 360°$$
$$2x = 360 - 80$$
$$2x = 280°$$
$$x = \frac{280°}{2}$$
$$x = 140°$$

So, angles are 40°, 140°, 40° and 140°.

5. Let $\angle 1 = x°, \angle 2 = x + 30°, \angle 3 = x, \angle 4 = x + 30°$

Because in parallelogram opposite angles are equal

In paralleogram

$$\angle 1 + \angle 2 + \angle 3 + \angle 4 = 360°$$
$$x + x + 30° + x + x + 30° = 360°$$
$$4x + 60° = 360°$$
$$4x = 360 - 60°$$
$$4x = 300°$$
$$x = \frac{300}{4}$$
$$x = 75°$$

So, $\angle 1 = 75°, \quad \angle 2 = 75 + 30° = 105°$

$\angle 3 = 75°, \quad \angle 4 = 75° + 30° = 105°$

6. A table for parallelograms *ABCD* is given here. Study it carefully. Correct the mistakes and say why the information given is wrong.

(a) $AB = 5.5$ cm, $BC = 8\,\text{cm}$, $\angle ABC = 45°$

$\angle BCD = 145°, \angle CDA = 45°, \angle DAB = 145°$

Here sum of adjacent angles

$$= \angle ABC + \angle ACD$$
$$= 45° + 145° = 190°$$

It is not possible

So, $\angle BCD = 145 - 10° = 135°$

So, $\angle BCD = 135°$ and $\angle DAB = 135°$

(b) $AB = 6\,\text{cm},\ BC = 7.5\ \text{cm}$

$\angle ABC = 25°,\ \ \angle BCD = 155°$

$\angle CDA = 35°,\ \ \angle DAB = 155°$

Here vertical opposite angles

$$\angle ABC = \angle CDA$$

$$25° \neq 35°$$

So, It is not possible

In parallelogram vertical opposite angles are equal

So, both are = 25°

Which suits the angle of parallelogram because it adjacent angle is 155°

So, $\qquad \angle CDA = 25°$

(c) $AB = 5\,\text{cm},\ BC = 5\,\text{cm},.\ \angle ABC = 90°$

$\angle BCD = 100°, \angle CDA = 90°, \angle DAB = 100°$

Here,

sum of all angles of parallelogram

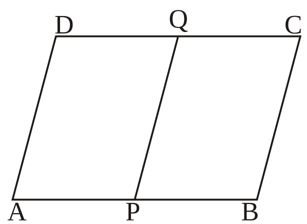
$$\angle ABC + \angle BCD + \angle CDA + \angle DAB = 360°$$

$$90° + 100° + 90° + 100° = 360°$$

$$380° \neq 360°$$

It is not possible because in a prallelogram sum of all the angles = 360°.

7. $ABCD$ is a parallelogram



Now, In $APQD$

$$AP = \frac{1}{2} AB$$

$$DQ = \frac{1}{2} DC$$

we have $AB = DC$

so $\qquad \frac{1}{2} AB = \frac{1}{2} DC$

or $\qquad AP = DQ$

and $\quad \angle DAP = \angle QPB \qquad$ (corresponding angle)

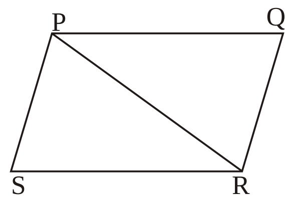
and $\quad \angle DCB = \angle PQD \qquad$ (corresponding angle)

so, $\quad \angle QPB = \angle PQD$

or $\quad \angle DAP = \angle PQD \qquad$ (opposite angles)

so $APQD$ is a parallelogram (proved).

8. In $\Delta\, PSR$ and PQR



$PS = QR$

(opposite sides of $P\ \pi$ gm)

$SR = PQ$

(opposite sides of π gm)

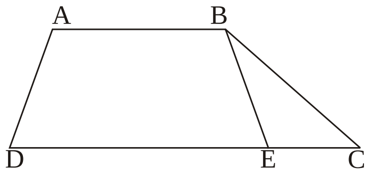
$PR = PR$

(common)

so, by SSS property

$\Delta\, PSR \cong PQR$ **Proved**

9. In trapezium $ABED$



$\angle ADE = \angle BED$

(corresponding atzacent angles)

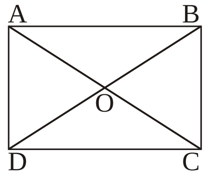
In $\Delta\, BEC$

$\angle BED = \angle EBC + \angle BCE$

($\because$ sum of two interior opposite angles is equal to third opposite exterior angle)

so we can say $\angle ADE = \angle EBC + \angle BCE$.

10. In $\Delta\, ABC$ and $\Delta\, BAD$



$AD = BC$ (opposite sides of rectangle)

$AC = BD$ (diagonal of the rectangle)

$AB = AB$ (common)

So, $\Delta\, ABC \cong \Delta\, BAD.$ **Proved**

11. Let length of rectangle $= 3x$

and breadth of rectangle $= 2x$

perimeter $= 80\,\text{cm}$

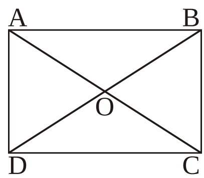
So, perimeter of rectangle $= 2[l+b]$

$$80 = 2[3x+2x]$$
$$80 = 2\times 5x$$
$$10x = 80$$
$$x = \frac{80}{10}$$
$$x = 8$$

So, length of rectangle $= 3\times 8 \Rightarrow 24$ cm

breadth of rectangle $= 2\times 8 = 16\,\text{cm}.$

12. In $\Delta\, AOB$ and $\Delta\, COD$



$AB = CD$ (opposite sides of rectangle)

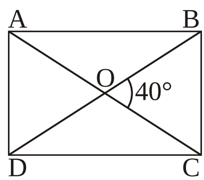
$AO = OC$

$BO = OD$

because diagonal in a rectangle bisect each other

So, $\Delta\, AOB \cong \Delta\, COD.$ **Proved**

13. In $\Delta\, OBC$



$\Delta\, OBC$ is isoscles, triangle

So, let $\angle OBC = x = \angle OCB$

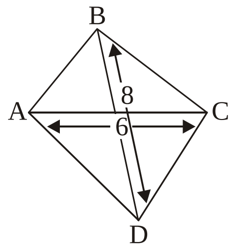
now in $\Delta\, OBC$

$$\angle BOC + \angle OCB + OBC = 180^\circ$$
$$40^\circ + x^\circ + x = 180^\circ$$
$$2x + 40 = 180^\circ$$
$$2x = 180 - 40$$
$$2x = 140^\circ$$
$$x = \frac{140}{2}$$

So, $\angle OBC = 70^\circ$ and $\angle OCB = 70^\circ$.

14. Let each side of rhombus

So, In $\Delta\, ABO$



$$OB = \frac{8}{2} = 4\text{ cm}$$

$$OA = \frac{6}{2} = 3\text{ cm}$$

$$AB = x$$

So, by pythagorus theorem

$$AB^2 = AO^2 + OB^2$$

$$x^2 = 3^2 + 4^2$$

$$= 9 + 16$$

$$x^2 = 25$$

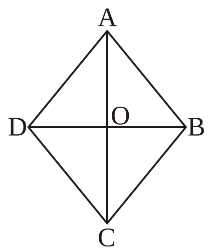
$$x = \sqrt{25}$$

$$x = 5\text{ cm}$$

So, length of each side = 5 cm.

15. In $\Delta\, AOD$ and COD

$AO = OC$ [because diagonal bisect each other in rhombus]



$AD = CD$ (side of rhombus)

$OD = OD$ (common)

So, $\Delta\, AOD \cong \Delta\, COD$

and $\angle ADO = \angle CDO$

similarly we can prove

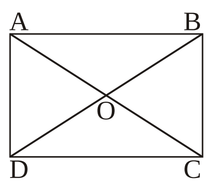
$$\angle DAO = \angle BAO$$

$$\angle ABO = \angle CBO$$

$$\angle BCO = \angle DCO$$

So, it previous that each diagonal bisects the vertex angle.

16. $\Delta\, AOD$ and $\Delta\, BOC$



$AD = BC$ (side of square)

$AO = OC$

[because diagonal bisect each other]

$$DO = OB$$

So, $\Delta\, AOD \cong \Delta\, BOC$

Now, In $\Delta\, AOD$ and COD

$AD = DC$ (sides of square)

$AO = OC$ (because diagonal bisect each other)

$OD = OD$ (common)

So, $\Delta\, AOD \cong \Delta\, BOC$

similarly, we can prove $AOD \cong AOB$

So, we can say that diagonals of square divide the square into four congruent triangles. **proved**

17. Write whether True or False.

(a) T (b) F (c) T (d) T (e) F (f) T (g) T

Multiple Choice Questions

1. (b) **2.** (b) **3.** (d) **4.** (d) **5.** (b) **6.** (a) **7.** (a) **8.** (a) **9.** (c)

Sharp Your Knowledge

1. T **2.** T **3.** F **4.** T **5.** T

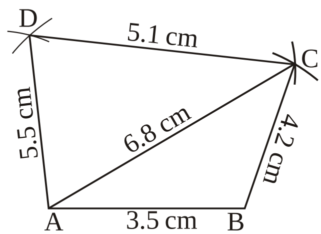
Higher Order Thinking Skills

Kite

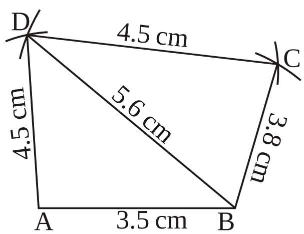
11 Construction of Quadrilaterals

Exercise 11.1

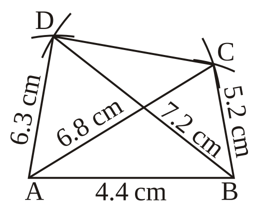
1. (a) $AB = 3.5$ cm, $BC = 4.2$ cm, $CD = 5.1$, $DA = 5.5$ cm, $AC = 6.8$ cm



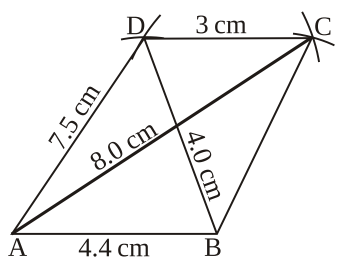
(b) $AB = 3.5$ cm, $BC = 3.8$ cm, $CD = 4.5$ cm, $DA = 4.5$ cm, $BD = 5.6$ cm



(c) $AB = 4.4$ cm, $BC = 5.2$ cm, $DA = 6.3$ cm, $AC = 6.8$ cm $BD = 7.2$ cm

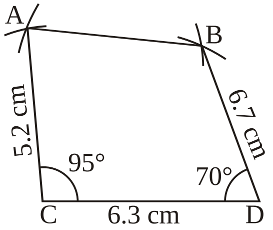


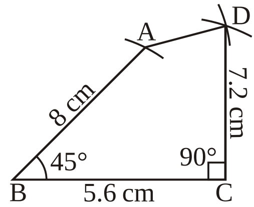
(d) $AB = 3.4$ cm, $CD = 3.0$ cm, $DA = 7.5$ cm, $AC = 8.0$ cm, $BD = 4$ cm



(e) $AB = 5.2$ cm, $BC = 6.3$ cm, $CD = 6.7$ cm, $\angle B = 95°$, $\angle C = 70°$

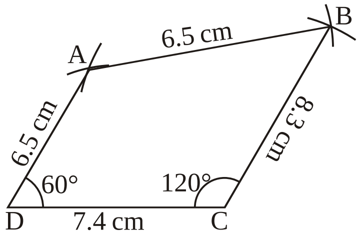
(f) $AB = 8$ cm, $BC = 5.6$ cm, $CD = 7.2$ cm, $\angle B = 45°$, $\angle C = 90°$

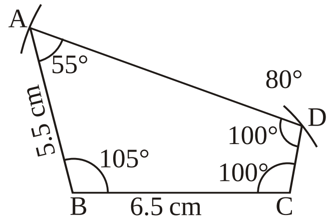




(g) $AB = 6.5$ cm, $BC = 7.4$ cm, $CD = 8.3$ cm, $= 120^\circ$ $\angle C = 60^\circ$

(h) $AB = 5.5$ cm, $BC = 6.5$ cm, $\angle B = 105^\circ$, $\angle C = 100^\circ$, $\angle D = 100^\circ$



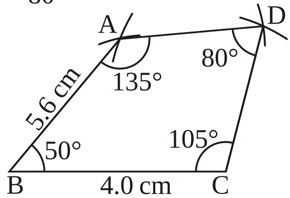


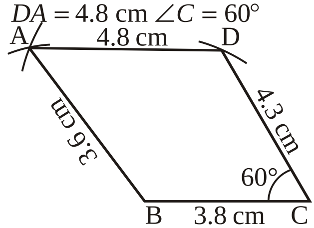
(i) $AB = 5.6$ cm, $BC = 4$ cm, $\angle B = 50^\circ$, $\angle C = 105^\circ$,

(j) $AB = 3.6$ cm, $BC = 3.8$ cm, $CD = 4.3$ cm,

$\angle D = 80^\circ$

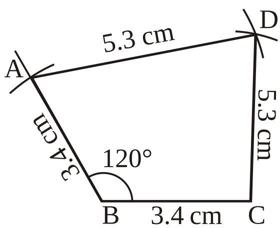
$DA = 4.8$ cm $\angle C = 60^\circ$

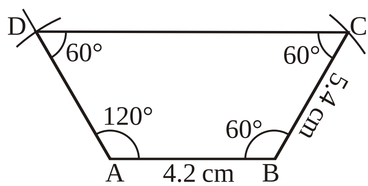




(k) $AB = 3.4$ cm, $BC = 3.4$ cm, $CD = 5.3$ cm, $DA = 5.3$ cm $\angle B = 120^\circ$

(l) $AB = 4.2$ cm $BC = 5.4$ cm, $\angle A = 120^\circ$, $\angle B = 120^\circ$, $\angle D = 60^\circ$

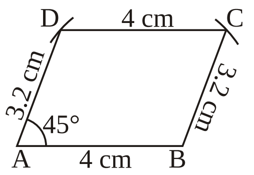




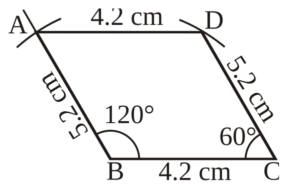
Exercise 11.2

1. Construct parallelograms $ABCD$ with the following data.

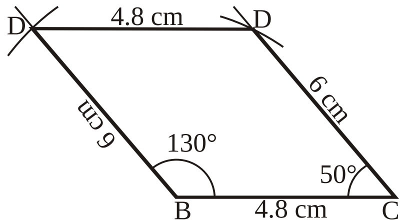
(a) $AB = 4$ cm, $BC = 3.2$ cm, $CD = 4$ cm, $DA = 3.2$ cm, $\angle A = 45°$



(b) $DC = 5.2$ cm, $CB = 4.2$ cm, $\angle B = 120°$

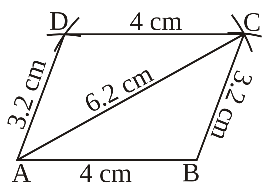


(c) $BC = 4.8$ cm, $CD = 6$ cm, $\angle C = 50°$

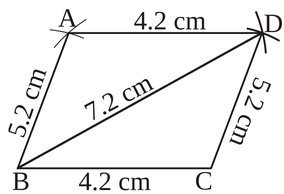


2. Construct parallelograms $ABCD$ with the following data.

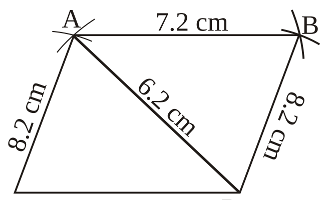
(a) $AB = 4$ cm, $BC = 3.2$ cm, $AC = 6.2$ cm



(b) $DC = 5.2$ cm, $CB = 4.2$ cm, $BD = 7.2$ cm

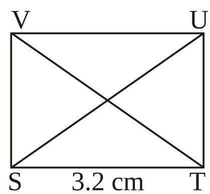


(c) $DA = 6.2$ cm, $DC = 7.2$ cm, $AC = 8.2$ cm

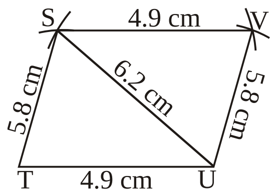


3. Construct parallelograms $STUV$ with the following data.

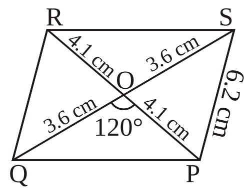
(a) $SU = 5$ cm, $ST = 3.2$ cm, $TV = 6.2$ cm



(b) $TS = 5.8$ cm, $TU = 4.9$ cm, $SU = 6.2$ cm



(c) $QS = 7.2$ cm, $\angle POQ = 120°$, $PR = 8.2$ cm

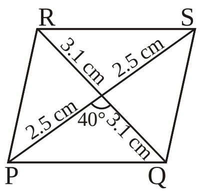


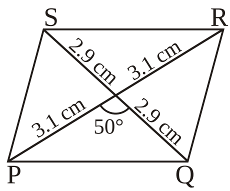
4. Construct parallelograms $PQRS$ with the following data.

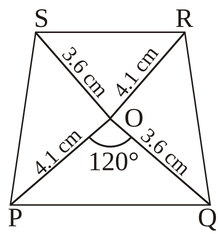
(a) $PR = 5$ cm, $\angle ROQ = 40°$ $QS = 6.2$ cm

(b) $QS = 5.8$ cm, $\angle POS = 50°$, $PR = 6.2$ cm

(c) $QS = 7.2$ cm, $\angle POQ = 120°$, $PR = 8.2$ cm

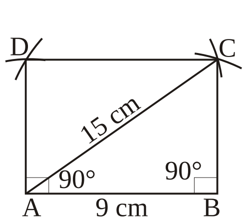




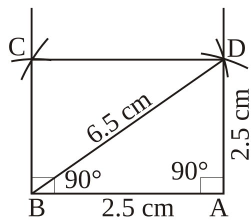


5. Construct rectangle $ABCD$ with the following data.

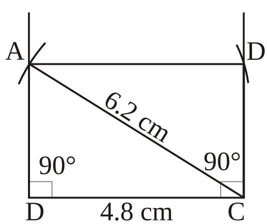
(a) $AB = 9$ cm, $AC = 15$ cm



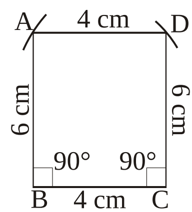
(b) $BC = 2.5$ cm, $BD = 6.5$ cm



(c) $DC = 4.8$ cm, $CA = 76.2$ cm

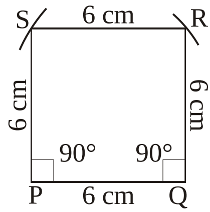


(d) $AB = 6$ cm, $BC = 4$ cm



6. Construct squares $PQRS$ with the following data.

(a) $PQ = 6\,\text{cm}$

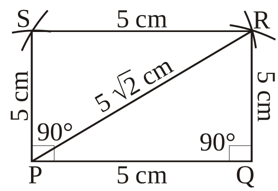


(b) $PR = 5\sqrt{2}$

by pythagoras

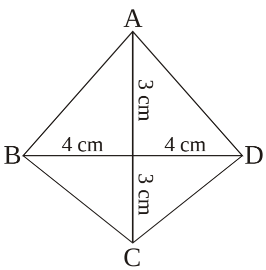
$$PQ^2 + QR^2 = PR^2$$
$$x^2 + x^2 = (5\sqrt{2})^2$$
$$x^2 + x^2 = 50$$
$$2x^2 = 50$$
$$x^2 = \frac{50}{2}$$
$$x^2 = 25$$
$$x = 5\,\text{cm}$$

So, each side of square is 5 cm.

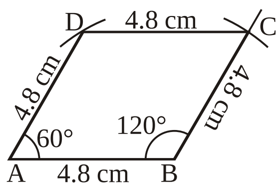


7. Construct rhombuses $ABCD$ with the following data.

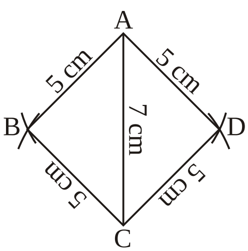
(a) $AC = 6\,\text{cm}$, $BD = 8\,\text{cm}$



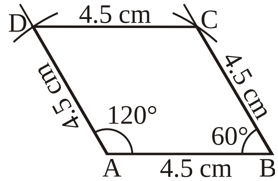
(b) $AB = 4.8$ cm, $\angle B = 120°$



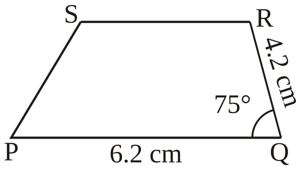
(c) $AB = 5\,\text{cm}$, $AC = 7\,\text{cm}$



(d) $AB = 4.5$ cm, $\angle B = 60$



8. Construct a trapezium PQRS in which $PQ = 6.2$ cm, $QR = 4.2$ cm, $RS = 3.2$ cm, $\angle Q = 75°$ and $PQ \parallel SR$



12 Mensuration

Exercise 12.1

1. diagonal = 40 cm $\quad h_1 = 12$ cm $\quad h_2 = 9$ cm

$$\text{Area of quadrilateral} = \frac{1}{2} \times \text{diagonal}\,[h_1 + h_2]$$

$$= \frac{1}{2} \times 40 \times (12+9) = \frac{1}{2} \times 40 \times 21 = 420\ \text{cm}^2.$$

2. Area of quadrilateral = $325\ \text{cm}^2$

diagonal = 25 cm $\quad h_1 = 14$ cm $\quad h_2 = ?$

$$\text{Area of quadrilateral} = \frac{1}{2} \times \text{diagonal} \times [h_1 + h_2]$$

$$325 = \frac{1}{2} \times 25[14 + h_2]$$

$$14 + h_2 = \frac{325 \times 2}{25} = 14 + h_2 = 26$$

$$h_2 = 26 - 14$$

$$h_2 = 12\ \text{cm}.$$

3. Area of rhombus = $560\ \text{cm}^2$ $\quad d_1 = 28$ cm $\quad d_2 = ?$

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$560 = \frac{1}{2} \times 28 \times d_2$$

$$d_2 = \frac{560^{40}}{14_1}$$

$$d_2 = 40\ \text{cm}.$$

4. Side of rhombus = 20 cm

$d_1 = 32$ cm

In $\Delta\, ABO$

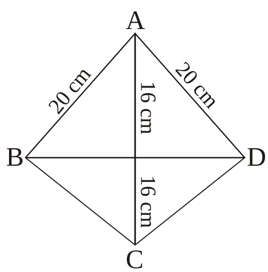
$$AO = \frac{32}{2} = 16\ \text{cm}$$

$$AB = 20\ \text{cm}$$

$BO = ?$

By pythageras theorem

$$AB^2 = AO^2 + BO^2$$



$$(20)^2 = (16)^2 + (BO)^2$$
$$400 = 256 + BO^2$$
$$BO^2 = 400 - 256$$
$$BO^2 = 144$$
$$BO = \sqrt{144}$$
$$BO = 12\,\text{cm}$$

So, other diagonal $BD = 12 \times 2 = 24$ cm

Now, Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$$= \frac{1}{2} \times 32 \times 24 = 384\ \text{cm}^2.$$

5. Area of rhombus $= 48\,\text{cm}^2$

$d_1 = 12\,\text{cm}$

$d_2 = ?$

Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$$48 = \frac{1}{2_1} \times 12^6 \times d_2$$
$$d_2 = \frac{48^8}{6}$$
$$d_2 = 8\,\text{cm}$$

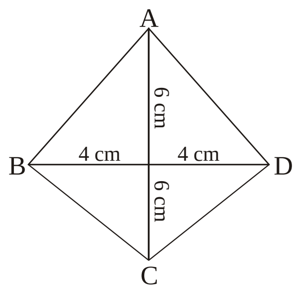
Now, to get the side of rhombus

In $\Delta\, ABO$

$AO = 6\,\text{cm}$

$BO = 4$ cm

$AB = ?$



by pythagoras theorem

$$AB^2 = AO^2 + BO^2$$
$$AB^2 = 6^2 + 4^2$$
$$AB^2 = 36 + 16$$
$$AB^2 = 52$$
$$AB = \sqrt{52}$$
$$AB = 7.2\ \text{cm}.$$

6. $a = 3\,\text{cm}$

$b = 4$ m $2d$ m $\Rightarrow 4.2$ m

$h = 2$m

Area of trapezium $= \frac{1}{2} \times h\,(a+b) = \frac{1}{2} \times 2 \times (3 + 4.2) = 7.2$ m

7. $a = 172.5$ cm $\qquad b = 91.5$ cm $\qquad h = 26$ cm

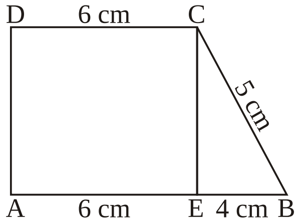
Area of trapezium $= \frac{1}{2} \times h\,(a+b)$

$$= \frac{1}{2} \times 26 (172.5 + 91.5)$$
$$= 13 \times 264 = 3432 \text{ cm}^2.$$

8. In ΔCEB

$BC = 5 \text{ cm}$ $\quad BE = 4 \text{ cm}$ $\quad CE = ?$

by pythageras theorem



$$BC^2 = CE^2 + BE^2$$
$$5^2 = CE^2 + 4^2$$
$$25 = CE^2 + 16$$
$$CE^2 = 25 - 16$$
$$CE^2 = 9$$
$$CE = \sqrt{9}$$
$$CE = 3 \text{ cm}$$

So, $a = 6 \text{ cm}$

$b = 6 + 4 = 10 \text{ cm}$

$h = 3 \text{ cm}$

Area of trapezium $ABCD = \frac{1}{2} \times h[a + b]$

$$= \frac{1}{2} \times 3(6 + 10)$$
$$= \frac{1}{2} \times 3 \times 16 = 24 \text{ cm}^2$$

Exercise 12.2

1. diagonal $= 8.2$ cm

offset from $A = 3.4$ cm

offset from $C = 2.6$ cm

Area of quadrilateral

$$= \frac{1}{2} \times \text{diagonal} \times [\text{sum of its offsets}]$$
$$= \frac{1}{2} \times 8.2\, [3.4 + 2.6] = 4.1 \times 6 = 24.6 \text{ cm}^2.$$

2. diagonal $AC = 18 \text{ m}$

offset from $B = 11 \text{ m}$

offset from $D = 9 \text{ m}$

Area of quadrilateral

$$= \frac{1}{2} \times \text{diagonal}\, [\text{sum of its offsets}]$$
$$= \frac{1}{2} \times 18[11 + 9] = 9 \times 20 = 180 \text{ m}^2.$$

3. Here, diagonal $AC = 12 \text{ cm}$

offset from $B = 8 \text{ cm}$

offset from $D = 4$ cm

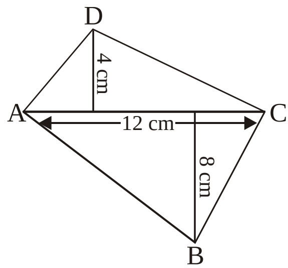
Area of quadrilateral

$= \frac{1}{2} \times$ diagonal

[sum of its offsects]

$= \frac{1}{2} \times 12[8+4]$

$= 6 \times 12 = 72 \text{ cm}^2.$



4. Area of EGD $= \frac{1}{2} \times GD \times ED$

$= \frac{1}{2} \times 20 \times 30$

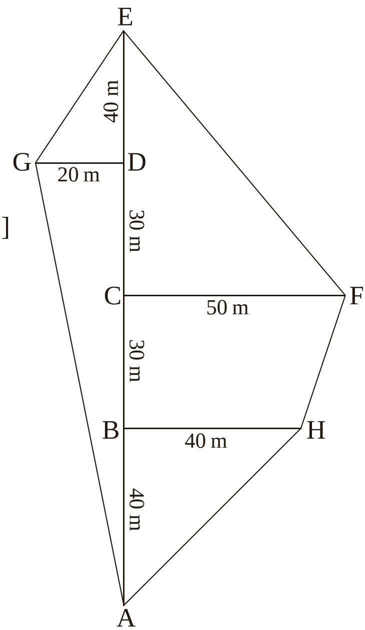
$= 300 \text{ m}^2$

Area of AGD $= \frac{1}{2} \times GD \times AD$

$= \frac{1}{2} \times GD \times [AB + BC + CD]$

$= \frac{1}{2} \times 20 \times [40 + 30 + 30]$

$= \frac{1}{2} \times 20 \times 100 = 1000 \text{ m}^2$



Area of AHB

$= \frac{1}{2} \times BH \times AB$

$= \frac{1}{2} \times 40 \times 40 = 800 \text{ m}^2$

Area of $BCHF$

$= \frac{1}{2} \times BC \times [CF + BH]$

$= \frac{1}{2} \times 30[40 + 50] = \frac{1}{2} \times 30 \times 90 = 1350 \text{ m}^2$

Area of EFC

$= \frac{1}{2} \times CF \times EC$

$= \frac{1}{2} \times CF\,[ED + DC]$

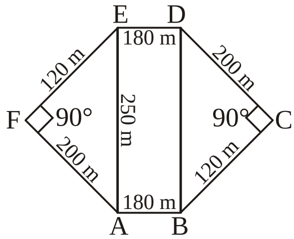
$= \frac{1}{2} \times 50[30 + 30] = \frac{1}{2} \times 50 \times 60 = 1500 \text{ m}^2$

So, Area of field $= 300 + 1000 + 800 + 1350 + 1500$

$= 4950 \text{ m}^2.$

5. Area of $\Delta\, AFE$

$= \frac{1}{2} \times EF \times AF$



$$= \frac{1}{2} \times 120 \times 200$$

$$= 12000\,\text{m}^2$$

Area of $ABDE = AB \times AE$
$= 180 \times 280$
$= 50400\,\text{m}^2$

Area of $\Delta\, BCD = \frac{1}{2} \times BC \times CD$
$= \frac{1}{2} \times 120 \times 200$
$= 12000\ \text{m}^2$

So, area of field $= 12000 + 50400 + 12000 = 74400\,\text{m}^2$

Higher Order Thinking Skills

$a = 25\,\text{cm},\ b = 13\,\text{cm},\ h = 10\,\text{cm}$

Area of trapezium $= \frac{1}{2} \times h[a+b]$

$$= \frac{1}{2} \times 10 \times [25+13] = \frac{1}{2} \times 10 \times 38 = 190\,\text{cm}^2.$$

Exercise 12.3

1. What is the volume of each of these cuboids?

(a) $l = 6\,\text{m},\ b = 2\,\text{m},\ h = 7\,\text{m}$

volume of cuboid $= l \times b \times h = 6 \times 2 \times 7 = 84\ \text{m}^3$

(b) $l = 8\,\text{m},\ b = 3\,\text{m},\ h = 7\,\text{m}$

volume of cuboid $= l \times b \times h = 8 \times 3 \times 7 = 168\ \text{m}^3$

(c) $l = 5\,\text{m},\ b = 3\,\text{m},\ h = 4\,\text{m}$

volume of cuboid $= l \times b \times h = 5 \times 3 \times 4 = 60\,\text{m}^3$

2. Find the volume of a cube whose side is :

(a) side = 7.5 cm

volume of cube $= (\text{side})^3 = 7.5 \times 7.5 \times 7.5 = 421.875\ \text{cm}^3$

(b) side = 3.8 cm

volume of cube $= (\text{side})^3$
$= \text{side} \times \text{side} \times \text{side} = 3.8 \times 3.8 \times 3.8 = 54.872\ \text{cm}^3$

(c) side = 43 mm

volume of cube $= (\text{side})^3$
$= \text{side} \times \text{side} \times \text{side}$
$= 43 \times 43 \times 43 = 1849 \times 43$
$= 79507\ \text{mm}^3$ or $79{,}507\ \text{cm}^3$

3. $l = 3.8\ \text{m},\ b = 2.3\ \text{m},\ h = 2\ \text{m}$

volume of cuboid $= l \times b \times h$
$= 3.8 \times 2.3 \times 2$

$$= 8.74 \times 2 = 17.48 \text{ m}^3$$

So, there are 17.48 cubic metre wood is the stalk.

4. Volume $= 1440 \text{ cm}^3$

$l = 36 \text{ cm}$, $b = 8 \text{ cm}$, $h = ?$

volume of cuboid $= l \times b \times h$

$$1440 = 36 \times 8 \times h$$

$$h = \frac{1440}{36 \times 8}$$

$$h = 5 \text{ cm.}$$

So, its height $= 5 \text{ cm}$

5. length of tea box $= 12 \text{ m}$

$$= 12 \times 100 \text{ cm} = 1200 \text{ cm}$$

breadth of tea-box $= 9 \text{ cm}$

height of tea-box $= 4 \text{ cm}$

volume of tea-box $= l \times b \times h$

$$= 1200 \times 9 \times 4$$

$$= 43200 \text{ cm}^3$$

length of card board $= 0.6 \text{ m}$

$$= 6 \times 100 = 60 \text{ cm}$$

breadth of card board $= 0.45 \text{ m}$

$$= 0.45 \times 100 = 45 \text{ cm}$$

height of card board $= 0.8 \text{ m}$

$$= 0.8 \times 100 = 80 \text{ cm}$$

volume of cardboard $= l \times b \times h$

$$= 60 \times 45 \times 80$$

$$= 216000 \text{ cm}^3$$

So, no. of tea-boards $= \dfrac{\text{volume of cardboard}}{\text{volume of tea-box}}$

$$= \frac{216000}{43200} = 5 \text{ box.}$$

6. volume of metal black $= 60 \text{ cm} \times 48 \text{ cm} \times 36 \text{ cm} = 103680 \text{ cm}^3$

weight of $1 \text{ cm}^3 = 9 \text{ gm}$

weight of $103680 \text{ cm}^3 = 103680 \times 9$

$$= 933120 \text{ gm} = \frac{933120}{1000} \text{ kg} = 933.12 \text{ kg.}$$

7. Volume of car board $= l \times b \times h$

$$= 60 \text{ cm} \times 30 \text{ cm} \times 30 \text{ cm}$$

$$= 54000 \text{ cm}^3$$

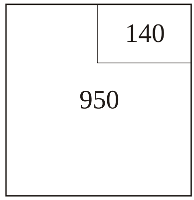
volume of cube $= (\text{side})^3$

$$= \text{side} \times \text{side} \times \text{side} = 5 \times 5 \times 5 = 125 \text{ cm}^3$$

No. of cube can be placed inside card board

$$= \frac{\text{volume of card board}}{\text{volume of a cube}} = \frac{54000}{125} = 432 \text{ cubes.}$$

8. Area of plot $= 950\,\text{m}^2$



Area of house $= 140\,\text{m}^2$

remaining area of plot $= 950 - 140$

$= 810\ \text{m}^2$

thicken of soil $= 20\,\text{cm} = 0.2\ \text{m}$

So, volume of soil = Area $\times$ thickness

$= 810 \times 0.2 = 162\ \text{m}^3$

9. volume of bath-tube $= 65\,\text{cm} \times 30\ \text{cm} \times 40\ \text{cm}$

$= 78000\,\text{cm}^3$

$$= \frac{78000}{1000} = 78\,\text{litre}$$

volume of water car $= 2l$

So, No. of water can be emptied to fill the bath tub

$$= \frac{78\,l}{2\,l} = 39\,\text{times.}$$

Exercise 12.4

1. $r = 4.2$ cm

$h = 12\,\text{cm}$

Volume of cylinder $= \pi r^2 h$

$$= \frac{22}{7} \times \frac{42}{10} \times \frac{42}{10} \times 12\,\text{cm}^3$$

$$= \frac{132 \times 504}{10 \times 10} = \frac{66528}{100}\ \text{cm}^3$$

$= 665.28\ \text{cm}^3$.

2. Diameter $= 2.8$ m

$$r = \frac{2.8}{2}\ 1.4\ \text{m}$$

$h = 8\,\text{m}$

Volume of cylinder $= \pi r^2 h$

$$= \frac{22}{7} \times \frac{14}{10} \times \frac{14}{10} \times 8\,\text{m}^3$$

$$= \frac{44 \times 112}{100} = \frac{4928}{100}\ \text{m}^3 = 49.28\ \text{m}^3.$$

3. Circumference $= 44$ cm

$2\pi r = 44$

$$2 \times \frac{22}{7} \times r = 44$$

$$r = \frac{44 \times 7}{2 \times 22}$$

$$r = 7\,\text{m}$$

$h = 10\,\text{m}$

Volume of cylinder $= \pi r^2 h$

$$= \frac{22}{7} \times 7 \times 7 \times 10 = 1540\,\text{m}^3.$$

4. $h = 30\,\text{cm}$

$r = 2.8$ cm

Volume of talcum powder its $= \pi r^2 h$

$$= \frac{22}{7} \times \frac{28}{10} \times \frac{28}{10} \times 30$$

$$= \frac{88 \times 84}{10} = \frac{7392}{10}$$

$$= 739.2 \text{ cm}^3.$$

So, it can hold 739.2 cm^3 powder

5. $h = 24.5$ m

$r = 3\,\text{m}$

Volume of will $= \pi r^2 h$

$$= \frac{22}{7} \times 3 \times 3 \times \frac{24.5}{10} = 693\,\text{m}^3.$$

6. Area of base $= 9.63 \text{ m}^2$

$h = 4$ m

Volume of tank $=$ Area of base $\times$ height

$= 9.63 \times 4$

$= 38.52 \text{ m}^3$ $\qquad$ $1 \text{ kl} = 1 \text{ m}^3$

or $\qquad = 38.52$ kl

So, It car hold 38.52 kl of water.

7. Dimension of paper $= 22\,\text{cm} \times 10$ cm

It can be capped exactly once around the curved surface of a cylinder of height 10 cm

So, circumference $= 22\,\text{cm}$

or $\qquad 2\pi r = 22$

$$2 \times \frac{22}{7} \times r = 22$$

or $\qquad r = \dfrac{22 \times 7}{22 \times 2} = 3.5$ cm

$$r = 3.5 \text{ cm}$$

$h = 10\,\text{cm}$

Volume of cylinder $= \pi r^2 h$

$$= \frac{22}{7} \times \frac{35}{10} \times \frac{35}{10} \times 10$$

$$= \frac{22 \times 5 \times 35}{10} = 385 \text{ cm}^3.$$

8. Side of cube = 14 cm

Volume of cube $= (\text{side})^3$

$= \text{side} \times \text{side} \times \text{side}$

$= 14 \times 14 \times 14 \text{ cm}^2 = 196 \times 14 \text{ cm}^2 = 2744 \text{ cm}^3$

A metal cube of 14 cm is melted and drawn in the shape of a cylindrical wire of diameter 0.84 cm

$d = 0.84$ cm $\quad\quad r = 0.42$ cm

Now, volume of wire = volume of cube

$$\pi r^2 h = 2744$$

$$\frac{22}{7} \times 0.42 \times 0.42 \times h = 2744$$

or $$h = \frac{2744 \times 7}{22 \times 0.42 \times 0.42}$$

$$= \frac{2744 \times 7 \times 100 \times 100}{22 \times 42 \times 42} = \frac{490000}{99} = 4949.49 \text{ cm.}$$

So, length of wire = 49.49 cm

9. $d_1 = 7 \text{ cm}, r_1 = \frac{7}{2} \text{ cm} \Rightarrow 3.5 \text{ cm}$ $\quad\quad d_2 = 6 \text{ cm}, r_2 = \frac{6}{2} \text{ cm} \Rightarrow 3 \text{ cm}$

$h = 63$ cm

Volume of pipe $= r(r_1^2 - r_1^2)h$

$$= \frac{22}{7} \times ((3.5)^2 - (3)^2) \times 63$$

$$= \frac{22}{7}(3.5+3)(3.5-3) \times 63 = 643.5 \text{ cm}^3$$

Weight of pipe $= 643.5 \times 7.5$ g $= 4826.25$ g.

Exercise 12.5

1. $l = 18$ cm, $b = 8$ cm, $h = 1.8$ cm

Surface area of geometric box

$= 2[lb + bh + hl]$

$= 2 \times [18 \times 8 + 8 \times 1.8 + 1.8 \times 18]$

$= 2 \times [144 + 14.4 + 32.4] = 2 \times [190.8] = 381.6 \text{ cm}^2.$

2. $l = 10$ cm, $b = 8$ cm, $h = 6$ cm

surface area of card board

$= 2[lb + bh + hl]$

$= 2[10 \times 8 + 8 \times 6 + 6 \times 10]$

$= 2[80 + 48 + 60] = 2 \times [188] = 376 \text{ cm}^2$

3. Find the surface area of a cube whose edge is :

(a) side (a) = 6 cm

Surface area of cube $= 6a^2 = 6\times6\times6 = 36\times6 = 216\,\text{cm}^2$

(b) side (a) = 3.4 cm

Surface area of cube $= 6a^2$

$= 6\times3.4\times3.4 = 20.4\times3.4 = 69.36\ \text{cm}^2$

(c) side (a) = 1.2 m

surface area of cube $= 6a^2$

$= 6\times1.2\times1.2 = 7.2\times1.2 = 8.64\ \text{m}^2$

(d) side (a) = 23 cm

surface area of cube $= 6a^2$

$= 6\times23\times23 = 3174\ \text{cm}^2$

4. $l = 45\,\text{cm}$, $b = 30\,\text{cm}$, $h = 30\,\text{cm}$

surface area of fin box

$= 2[lb + bh + hl]$

$= 2[45\times30 + 30\times30 + 30\times45]$

$= 2[1350 + 900 + 1350]$

$= 2\times[3600] = 7200\,\text{cm}^2$

To make 25 such boxes $= 7200\times25 = 180000\,\text{cm}^2 = \dfrac{180000}{10000} = 18\,\text{m}^2$

So, 18 m^2 tin sheet is required to make 25 such boxes.

5. $l = 3.8$ m, $b = 4.5$ m, $h = 3.5$ m

Area of four falls $= 2[l\times b]\times h$

$= 2[3.8 + 4.5]\times3.5$

$= 2\times8.3\times3.5 = 16.6\times3.5 = 58.10\ \text{m}^2$

cost of paneling $= 58.10\times$ ` 285 = `16558.50

6. Surface area of a cube $= 486\,\text{cm}^2$

Let side of cube $= a$

So, surface area $= 6a^2$

$48b = 6a^2$

$a^2 = \dfrac{486}{6}$

$a^2 = 81$

$a = \sqrt{81}$

$a = 9\,\text{cm}$

So, length of an edge of this box = 9 cm.

7. $l = 90\,\text{cm}$, $b = 60\,\text{cm}$, $h = 45\,\text{cm}$

Surface area $= 2[lb + bh + hl]$

$= 2\times[90\times60 + 60\times45 + 45\times90]$

$= 2\times[5400 + 2700 + 4050]$

$= 2\times12150 = 24300\,\text{cm}^2$

or $= \dfrac{24300}{10000}\,\text{m}^2$

cost of painting $= 2.43 \times 200 =$ ` 486.

8. Perimeter of the floor $= 66\,\text{m}$

height of room $= 5.2$ m

Area of four walls $=$ perimeter $\times$ height

$$= 66 \times 5.2 = 343.2\ \text{m}^2$$

9. Area of square $= 49\,\text{cm}^2$

$$(a)^2 = 49$$

$$a = \sqrt{49}$$

$$a = 7\,\text{cm}$$

So, length $= 7\,\text{cm}$

breadth $= 7\,\text{cm}$

height $= 10\,\text{cm}$

Surface area $= 2[lb + bh + hl]$

$$= 2 \times [7 \times 7 + 7 \times 10 + 10 \times 7]$$

$$= 2 \times [49 + 70 + 70]$$

$$= 2 \times [189]$$

$$= 378\,\text{cm}^2.$$

10. $l = 22\,\text{m},\ b = 16\,\text{m},\ h = 10\,\text{m}$

Area of four walls $= 2[l + b] \times h$

$$= 2 \times [22 + 16] \times 10$$

$$= 2 \times 38 \times 10 = 760\ \text{m}^2$$

Area of floor $= l \times b = 22 \times 16 = 352\,\text{m}^2$

total area to be cemented $= 760 + 352 = 1112\,\text{m}^2$

cost of cementing $=$ ` $1112 \times 19 =$ ` 21128

Exercise 12.6

1. Area of base $= 140\,\text{cm}^2$

height of cylinder $= 17\,\text{cm}$

volume of cylinder $=$ Area of base $\times$ height

$$= 140 \times 17 = 2380\,\text{cm}^3.$$

2. $r = 10\,\text{cm}$

$h = 10.5$ cm

lateral surface area $= 2\pi rh = 2 \times \dfrac{22}{7} \times 10 \times \dfrac{10.5}{10} = 44 \times 15 = 660\,\text{cm}^2.$

3. Circumference of cylinder $= 154$ cm

height $(h) = 1.5$ m or $1.5 \times 100\,\text{cm} = 15\,\text{cm}$

lateral surface area $=$ circumference $\times$ height

$$= 154 \times 150\,\text{cm}^2$$

$$= 23100\,\text{cm}^2$$

or $$= \frac{23100}{10000}\,\text{m}^2 = 2.31\ \text{m}^2.$$

4. $r = 3.5$ cm

$h = 6$ cm

lateral surface area of cylinder $= 2\pi rh$

$$= 2\times\frac{22}{7}\times\frac{3.5}{10}\times 6 = 132 \text{ cm}^2.$$

5. diameter $= 77$ cm $\qquad r = \frac{77}{2}$ cm $= 38.5$ cm $\qquad h = 105$ cm

Lateral surface area of roller $= 2\pi rh$

$$= 2\times\frac{22}{7}\times\frac{38.5}{10}\times 105$$

$$= 25410 \text{ cm}^2$$

or $$= \frac{25410}{10000} \text{ m}^2 = 2.541 \text{ m}^2$$

total area covered in 7600 revolutions $= 2.541\times 60 = 1524.60 \text{ m}^2$.

6. inner radius $(r) = 9$ m

height $= 21$ m

inner lateral surface area $= 2\pi rh$

$$= 2\times\frac{22}{7}\times 9\times 21 = 44\times 27 = 1188 \text{ m}^2$$

$\therefore$ Cost of painting = ` $1188\times 8$ = ` 9504.

7. $h = 80$ cm

$r = 63$ cm

Total surface area of cylindrical box

$$= 2\pi r[h+r]$$

$$= 2\times\frac{22}{7}\times 63[80+63] = 396\times 143 = 56628 \text{ cm}^2$$

or $$= \frac{56628}{10000} \text{ m}^2 = 5.6628 \text{ m}^2$$

So, cost of tin required $= 5.6628\times 5$ = ` 28.314.

8. Diameter $= 70$ cm

So, radius $= \frac{70}{2} = 35$ cm

$h = 4$ m or 400 cm

curved surface $= 2\pi rh = 2\times\frac{22}{7}\times 35\times 400 = 88000 \text{ cm}^2$

or $$= \frac{88000}{10000} \text{ m}^2 = 8.8 \text{ m}^2$$

So, cost of cementing $= 8.8\times 32$ = ` 281.60.

9. $h = 14$ m

inner radius $(r) = 2$ m

Inner surface area $= 2\pi rh$

$$= 2\times\frac{22}{7}\times 2\times 14 = 176 \text{ m}^2.$$

So, cost of plastering its inner surface $= 176 \times 15 =$ ₹ 2640.

10. diameter $= 140$ cm

$\therefore \quad r = \dfrac{140}{2}$ 70 cm $= \dfrac{70}{100}$ m $= 0.7$ m

$h = 1.2$ m

Lateral surface area of drum $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times \frac{0.7}{10} \times \frac{1.2}{10}$$

$$= \frac{44 \times 12}{100} = \frac{528}{10} = 5.28 \text{ m}^2$$

Area of base $= \pi r^2$

$$= \frac{22}{7} \times \frac{0.7}{10} \times \frac{0.7}{10} = \frac{154}{100} = 1.54 \text{ m}^2$$

total area tube electroplating $= 5.28 + 1.54 = 6.82 \text{ m}^2$

So, cost of electroplating $=$ ₹ $6.82 \times 7.50 =$ ₹ 51.15.

Multiple Choice Questions

1. (b) **2.** (d) **3.** (a) **4.** (b) **5.** (a) **6.** (a) **7.** (b) **8.** (c) **9.** (c) **10.** (b) **11.** (b)

13 Introduction to Graph

Exercise 13.1

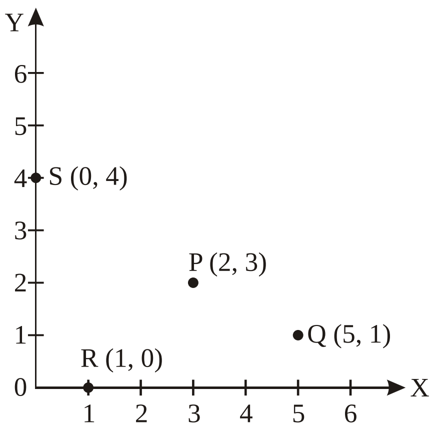
1. Co-ordinates of $A = (2, 2)$

Co-ordinates of $B = (1, -2)$

Co-ordinates of $C = (-3, -2)$

Co-ordinates of $D = (-3, 1)$

2.

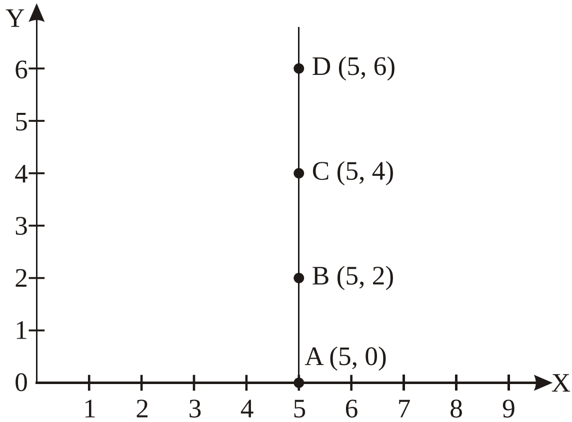


3. Co-ordinates of $A = (0, 1)$

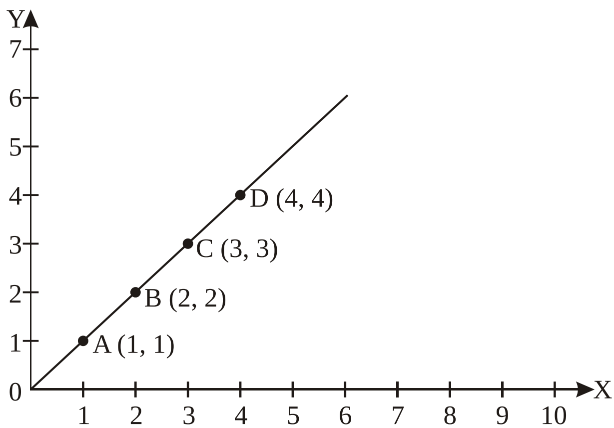
Co-ordinates of $B = (1, 2)$

Co-ordinates of $C = (3, 1)$
Co-ordinates of $D = (4, 4)$
Co-ordinates of $E = (2, 0)$

4. Plot the following on a graph sheet verify if they lie on a line.
(a) A (5, 0), B (5, 2), C (5, 4), D (5, 6)



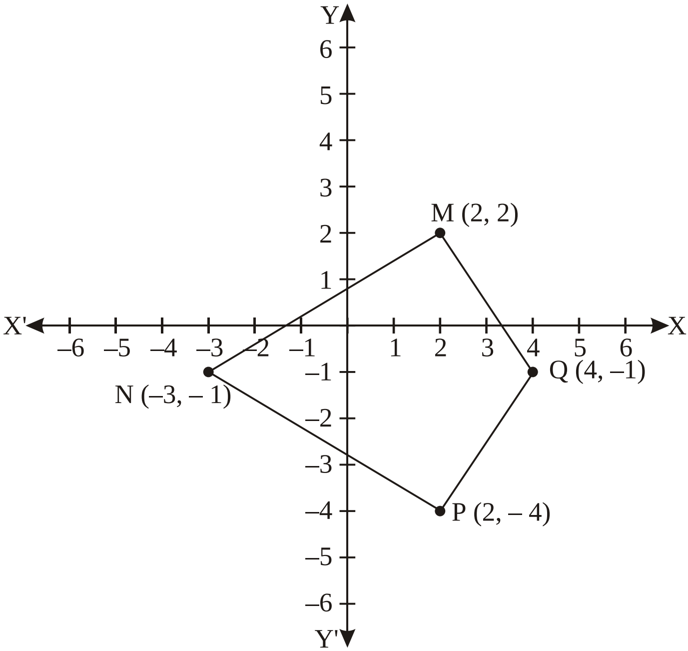
Yes, it is a line all points lie on a line.
(b) P (1, 1), Q (2, 2), R (3, 3), S (4, 4)



Yes, It is a line. All points lie on a line.

5. Co-ordinates of $A = (2, 3)$
Co-ordinates of $B = (4, 4)$
Co-ordinates of $C = (4, 2)$
Co-ordinates of $D = (2, 1)$.

6.



We get quadrilateral *MNPQ* by joining these points

where *M* lies in I quadrant

N lies in III quadrant

P lies in IV quadrant

Q lies in IV quadrant.

7. points (– 5, 4) and (3, 2)

here $x_1 = -5, \quad x_2 = 3, \quad y_1 = 4, \quad y_2 = 2$

co-ordinates of mid-point $= \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

$$= \left(\frac{-5+3}{2}, \frac{4+2}{2}\right)$$

$$= \frac{-2}{2}, \frac{6}{2} = (-1, 3).$$

8. (a) $G(-3, -10)$ — point G, (–3, –10) lies in III quadrant.

(b) $L(-3, -10)$ — point $L(-3, -10)$ lies in III quadrant.

(c) $R(3, 0)$ — point R (3, 0) lies on X-axis.

(d) $Z(0, -11)$ — point Z (0, – 11) lies on Y-axis.

Exercise 13.2

1. The graph given below shows the number of Android mobiles sold by a shopkeeper from the month of July to December.

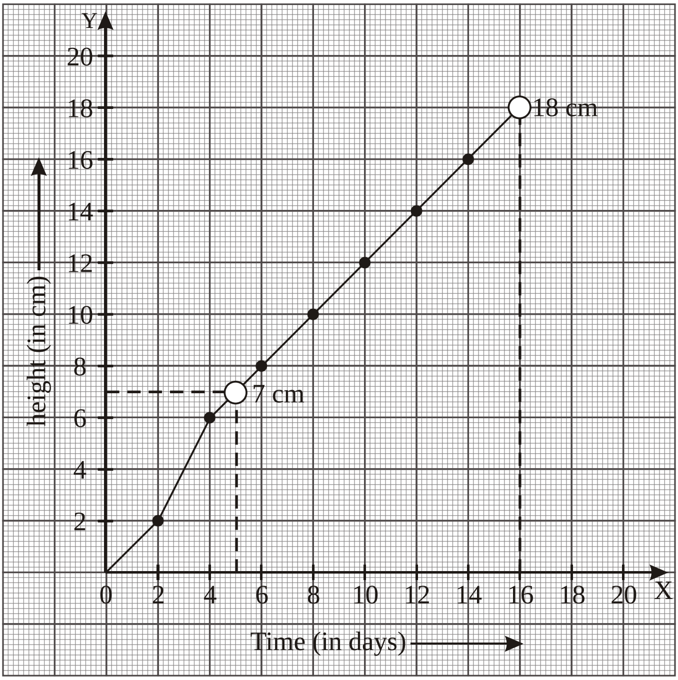
(a) The sale of Android mobiles was highest in month of October.

(b) The sale of Android mobiles was minimum in the month of December.
(c) 500 Android mobiles were sold in the month of September.

2. Following is a time temperature graph of a patient in a hospital recorded every hour.
(a) The patients temperature was 101° F at 10 : 00 am.
(b) The patient's temperature was 102°F at 12 : 00 noon and 2 : 00 pm.
(c) The temperature of patient dropped from 101° F to 100°F between 10 : 00 am to 11 : 00 am.

3. The height, in centimeters, measured every 2 days over a period of 2 weeks (14 days) of a plant grown from a seed is shown in the table.

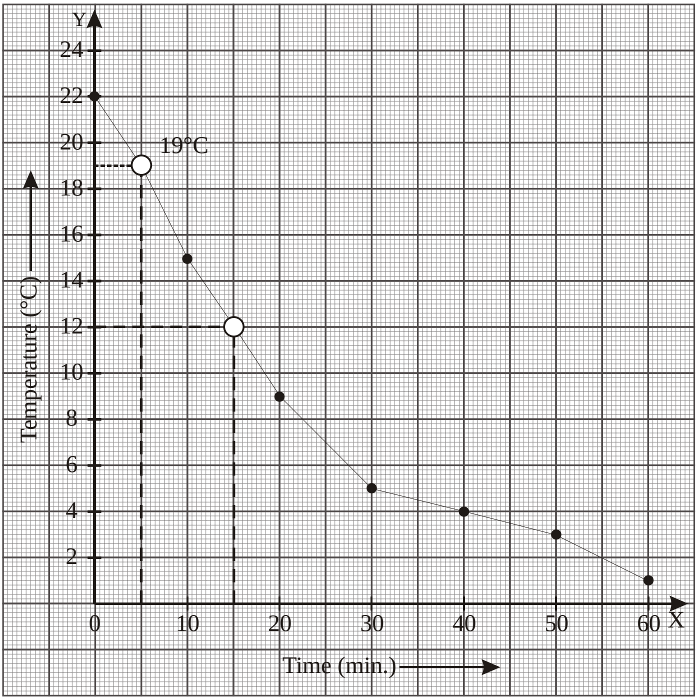
Time (in days)	0	2	4	6	8	10	12	14
Height (cm)	0	2	6	8	10	12	14	16



(a) height of plant is 7 cm after 5 days.
(b) height of plant is 18 cm after 16 days.

4. A bowl of water was placed in the freezer of a refrigerator. During the next hour its temperature in °C was measured every ten minutes. Draw a graph.

Time (min)	0	10	20	30	40	50	60
Temperature (°C)	22	15	9	5	4	3	1



(a) It is a curve.

(b) temperature after 5 minutes was 19°C.

(c) After 15 min the temperature was 12°C.

5. Mrs. Verma drove from Shimla at 9 a.m. and reached Chandigarh by 1 p.m. She stayed there for 2 hours and then drove back. The graph shows the relation between the distance covered and time taken by her :

(a) Mrs. Verma started back from Chandigarh at 3 : 00 pm.

(b) She stayed in Chandigarh between 1 : 00 pm to 3 : 00 pm.

(c) She travelle (180 + 180 = 360 km during her entire tripe.

Multiple Choice Questions

1. (c) **2.** (a) **3.** (a) **4.** (a) **5.** (b) **6.** (b) **7.** (b) **8.** (a)

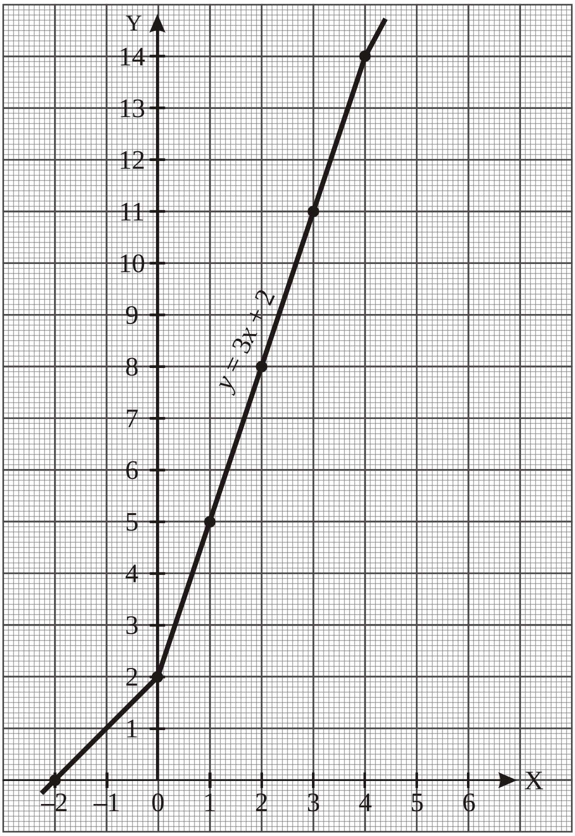
Sharp Your Knowldege

1. four **2.** same **3.** ordered pair **4.** (0, 0) **5.** line

Higher Order Thinking Skills

1. $y = 3x + 2$

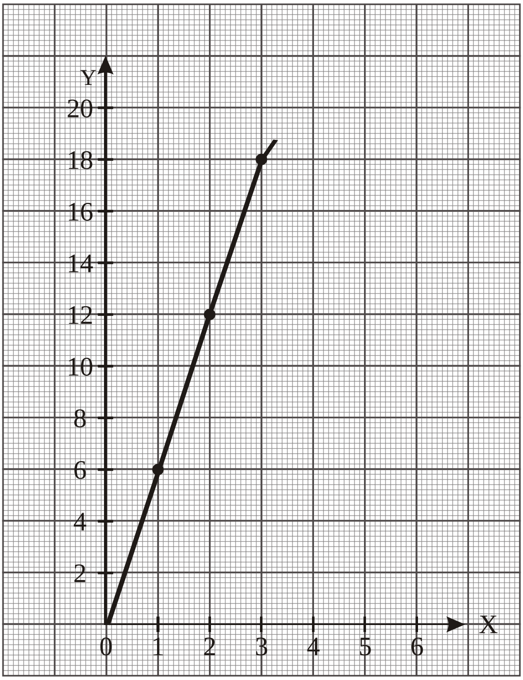
x	0	1	2	3	4	–2
y	2	5	8	11	14	–4



When $x = -2$ then $y = -4$

2. $y = 6x$

x	0	1	2	3
y	0	6	12	18



14 Data Handling

Exercise 14.1

1. Read the bar graph and answer the following questions :

(a) The bar graph show the production of watches of a factory from 2001 to 2005.

(b) 30 million watches tonnes were manufactured in 2003.

(c) In 2005

(d) Equal number of watches were manufactured in both years and it is equal to watches manufactured is 2005

So, In 2001 = 20 millions watches

In 2002 = 20 millions watches

40 millions watches

and In 2005 = 40 millions watches

(e) increasing every years.

2. Read the bar shown in figure and answer the following questions :

(a) The bar graph in general gives information about the number of students and subject preferred by them.

(b) Hindi is linkes by maximum number of students.

(c) English is liked by least number of students.

(d) $60 - 20 = 40$ students.

3. The bar graph below shows the six nations having population over 100 millions.

(a) India has the highest population.

(b) Japan has the least population.

(c) Extinate $1100 + 700 + 300 + 250 + 150 = 2500$ millions.

4. Read the following bar graph and answer the questions that follow :

(a) The bar graph shows the result percentage of a certain school in 5 different years.

(b) In 2012, the result of school was 95%

(c) In 2013, the result of school was below 80%

(d) Average $= \dfrac{80+95+70+85+90}{5}$

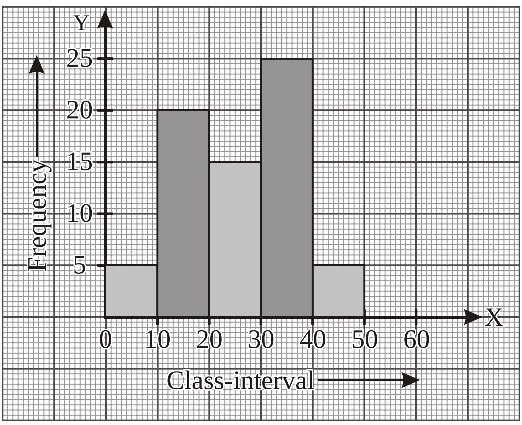
$= \dfrac{420}{5}$

$= 84\%$

5. Draw histogram for the following :

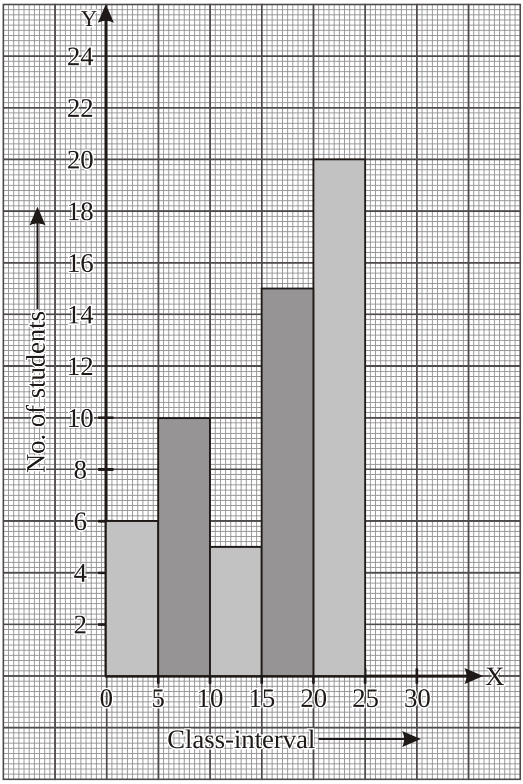
(a)

Class interval	0-10	10-20	20-30	30-40	40-50
Frequency	5	20	15	25	5



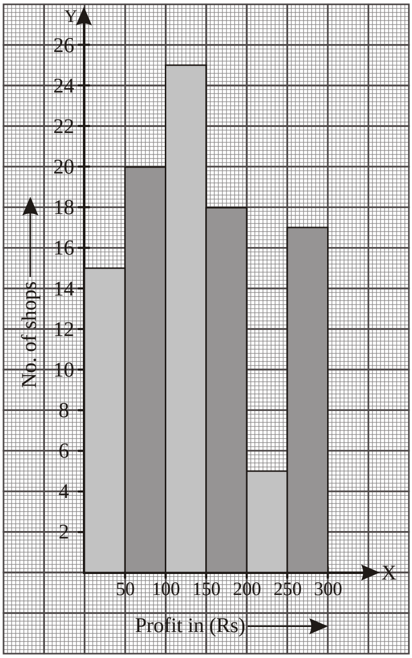
(b)

Class Interval	0-5	5-10	10-15	15-20	20-25
No. of students	6	10	5	15	20

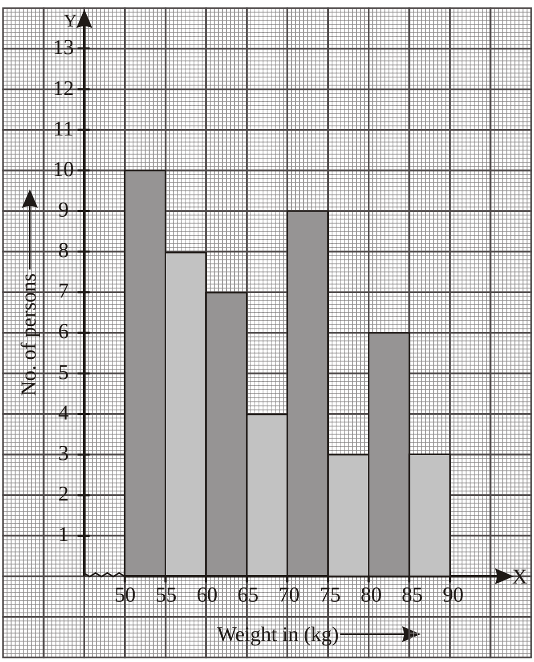


6. Draw a histogram to represent the following data of the salaries of teachers.

Monthly-earning	No. of teachers
5000-10000	15
10,000-15,000	8
15000-20,000	25
20,000-25,000	5
25,000-30,000	10



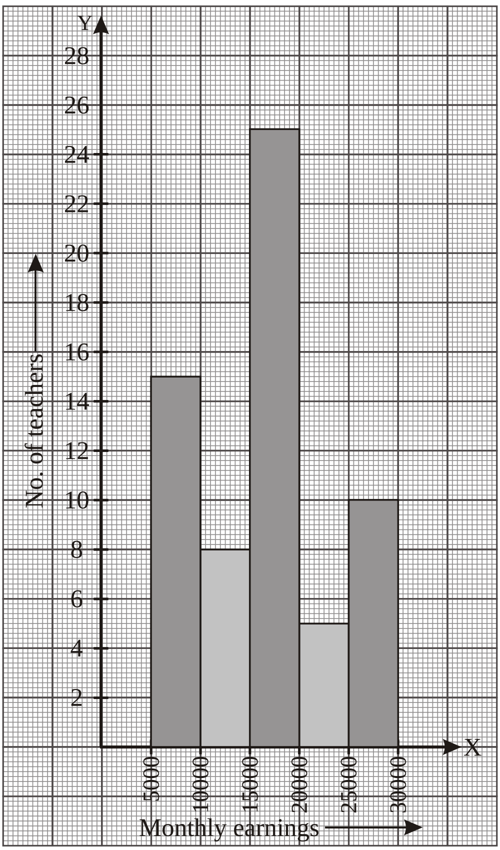
7. The following is the distribution of weights (in kg) of 50 persons.



weight (in kg)	Number of persons
50-55	10
55-60	8
60-65	7
65-70	4
70-75	9
75-80	3
80-85	6
85-90	3

8. The monthly profits (in `) of 100 shops are distributed as follows :

Profit of shop	0-50	50-100	100-150	150-200	200-250	250-300
No. of shops	15	20	25	18	5	17



9. Study the histogram and answer the following questions.

(a) $300+1000+800+700+400$

$\Rightarrow 3200$ families

(b) (15-20) has maximum number of illiterate family.

(c) (10-15) has minimum number of illiterate family.

Exercise 14.2

1. A teacher gave a test of 50 marks to the students of her class. Following marks are obtained by the students :

Marks	Tally sign	No. of students (frequency)
10-15	|	1
15-20	||	2
20-25	||	2
25-30	||	2
30-35	|||	3
35-40	~~||||~~ |	6
40-45	||	2
45-50	~~||||~~ ||	7

2. The number of runs scored by a cricket player in 25 innings are as follows :

Class-interval	Tally marks	Frequency
40-50	~~||||~~ |	6
50-60	~~||||~~	5
60-70	||	2
70-80	|||	3
80-90	||	2
90-100	|	1
100-110	||	2
110-120	|	1
120-130	|	1
130-140	|	1
140-150	|	1

3. The monthly wages of 30 workers in a factory are given below :

Class-interval	Tally-marks	Frequency
900-910	|||	3
910-920	|	1
920-930	|	1
930-940	$\cancel{||||}$	5
940-950	$\cancel{||||}$ ||	7
950-960	|	1
960-970	|||	3
970-980	|	1
980-990	||	2
990-1000	$\cancel{||||}$ |	6

4. The following table represents :

(a) Lower limit of class 31– 33 = 31

(b) upper limit of class 35 – 37 = 37

(c) frequency of class 29 - 31 = 6

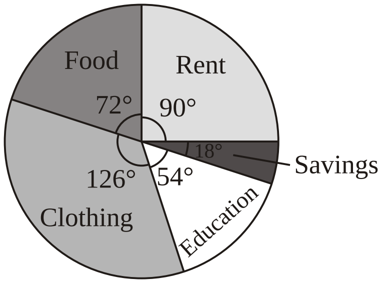
(d) class mark of class 27 - 29 = $\frac{27+29}{2} = \frac{56}{2} = 28$

Exercise 14.3

1. A teacher's monthly expenditure is given in the following table. Draw a pie graph to represent the data :

Items	Expenditure (in per cent)	Central angle
Rent	25%	$\frac{25}{100} \times 360° = 90°$
Food	20%	$\frac{20}{100} \times 360° = 72°$
Clothing	35%	$\frac{35}{100} \times 360° = 126°$
Educating	15%	$\frac{15}{100} \times 360° = 54°$
Savings	5%	$\frac{5}{100} \times 360° = 18°$

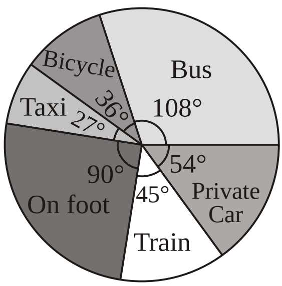
So, pic chart



2. Draw a pie graph for the following data :

Mode of commuting	Number of children	center angle
Bus	60	$\frac{60}{200} \times 360° = 108°$
Bicycle	20	$\frac{20}{200} \times 360° = 36°$
Taxi	15	$\frac{15}{200} \times 360° = 27°$
On foot	50	$\frac{50}{200} \times 360° = 90°$
Train	25	$\frac{25}{200} \times 360° = 45°$
Private car	30	$\frac{30}{200} \times 360° = 54°$

So, pic chart

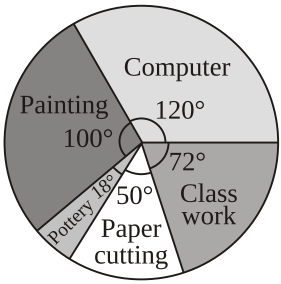


3. The table below shows the hobbies of students in a certain school :

Hobbies	No. of students	Center angle
Computer	180	$\frac{180}{540} \times 360° = 120°$

Painting	150	$\frac{150}{540} \times 360° = 100°$
Pottery	27	$\frac{27}{540} \times 360° = 18°$
Paper-cutting	75	$\frac{75}{540} \times 360° = 50°$
Class-work	108	$\frac{108}{540} \times 360° = 72°$

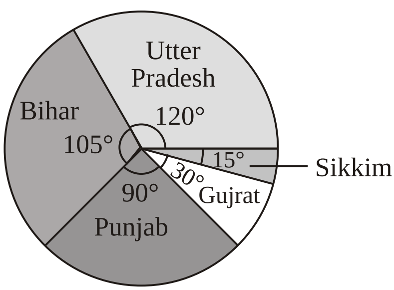
So, pie chart



4. The number of people speaking Hindi in different states is given below :

States	No. of people	center angle
Uttar Pradesh	8000	$\frac{8000}{2400} \times 360° = 120°$
Bihar	7000	$\frac{7000}{2400} \times 360°$ d= $105°$
Punjab	6000	$\frac{6000}{2400} \times 360° = 90°$
Gujarat	2000	$\frac{2000}{2400} \times 360° = 30°$
Sikkim	1000	$\frac{1000}{2400} \times 360° = 15°$

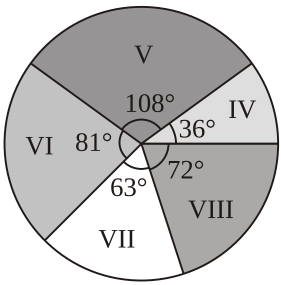
So, pic chart



5. The data given below shows the number of students of a certain school reading Herry-Potter in different classes. Represent it by a pie-graph.

Class	**No. of students**	**Central angle**
IV	40	$\frac{40}{400} \times 360° = 36°$
V	120	$\frac{120}{400} \times 360° = 108°$
VI	90	$\frac{90}{400} \times 360° = 81°$
VII	70	$\frac{70}{400} \times 360° = 63°$
VIII	80	$\frac{80}{400} \times 360° = 72°$

So, pic chart is



6. There are 1000 workers who travel from home to a factory they work. The pie graph shows the proportion of workers using various modes for travelling to work.

(a) (i) by bus $= \frac{90°}{360°_{4}} \times 1000^{250} = 250$ workers

(ii) by train $= \frac{144°^{4}}{360°_{1}} \times 1000 = 400$ workers

(iii) by cycle $\frac{72°^{2}}{360°_{1}} \times 1000 = 200$ workers

(iv) on foot $\frac{54°^{3}}{360°_{2}} \times 1000^{50} = 150$ workers

(b) workers go by bus = 250

or $\frac{250}{1000_{4}} \times 100^{25} = 25\%$

(c) workers travel by train = 400

or $\frac{400}{1000} \times 100 = 40\%$

Now, workers travel by cycle = 200

or $\frac{200}{1000} \times 100 = 20\%$

So, Train : cycle = 40% : 20%

= 2 : 1

7. On the basis of information, answer the following question :

(a) Bihar has the highest rate of illiterate.

(b) No. of illiterate people in Uttar Pradhes = $\frac{110°}{360°} \times 108000$

$\Rightarrow$ 33,000 peoples

(c) No. of illiterate people in Gujarat = $\frac{80°}{360°} \times 108000$

= 24,000 peoples

(d) Punjab has minimum illiterate population

No. of illiterate people in Punjab = $\frac{50°}{360°} \times 108000$

= 15,000 people

8. Read the pie graph and answer the following questions :

(a) No. of healthy people = $\frac{130°}{360°} \times 216000$

= 78000

(b) No. of physically handicapped people

= $\frac{90°}{360°} \times 216000$

= 54000

(c) No. of Mentally handicapped people

= $\frac{30°}{360°} \times 216000 = 18000$

(d) No. of drug addicts people = $\frac{110°}{360°} \times 216000$ = 66000

Multiple Choice Questions

1. (a) (i) (b) (ii) (c) (iv) (d) (iii) (e) (ii)

2. (a) (ii) (b) (i) (c) (i)

Sharjp Your Knowledge

1. 7 **2.** class size **3.** class mark

Higher Order Thinking Skills

35, 47

Exercise 15

1. HHHH, HHHT, HHTT, HTTT, HHTH, HTHH, HTTH, HTHT, THHH, THHT, THTH, THTT, TTHH, TTHT, TTTH, TTTT
2. probability of getting a vowel from the word
$$\text{English} = \frac{2}{7}$$
3. 1, 2, 3, 4, 5, 6, 7, 8, 9
Probability of choosing a prime number $= \frac{4}{9}$
4. Probability of getting white balls $= \frac{\text{No. of white balls}}{\text{No. of total balls}} = \frac{4}{23}$
5. A box contains some balls, which are marked with numbers from 1 to 10. If a ball is drawn randomly, find the probability of getting :
   (a) Probability a prime no. ball
   $\Rightarrow \quad \frac{4}{10} = \frac{2}{5}$
   (b) probability a odd no. ball $= \frac{5}{10} = \frac{1}{2}$
   (c) probability of ball no. multiple of 3 $= \frac{3}{10}$
6. A die is thrown once, find the probability of getting :
   (a) probability of getting an odd no. $= \frac{3}{6} = \frac{1}{2}$
   (b) probability of a no. less than 4 $= \frac{3}{6} = \frac{1}{2}$
   (c) probability of getting a composite no. $= \frac{2}{6} = \frac{1}{3}$
   (d) probability of a no. divisible by 2 $= \frac{3}{6} = \frac{1}{2}$
7. Two coins are tossed simultaneously, find the probability of getting :
   (a) Probability of getting exactly one head $= \frac{3}{4}$
   (b) Probability of two heads $= \frac{1}{4}$ (c) Probability of No. head $= \frac{1}{4}$
8. Two die are rolled simultaneoulsy. Find the probability of getting :
   (a) Probability of getting a sum of 5 $= \frac{\text{favourable at comes}}{\text{total out comes}} = \frac{4}{36} = \frac{1}{9}$

(b) Probability of two 5's $\frac{1}{36}$

(c) Probability of sum of 10 $= \frac{3}{36} = \frac{1}{12}$

9. A bag contains 6 red balls, 3 black balls and 5 white balls. A ball is drawn out of the bag at random. What is the probability that the ball is :

(a) Probability of getting a red ball $= \frac{6}{14} = \frac{3}{7}$

(b) Probability of getting a white ball $\frac{5}{14} \Rightarrow \frac{5}{14}$

(c) Probability of getting a black ball $\frac{3}{14}$

(d) Probability of getting a green ball $= \frac{0}{1} = 0$

Multiple Choice Questions

1. (b) **2.** (a) **3.** (c) **4.** (a) **5.** (d)

Sharp Your Knowledge

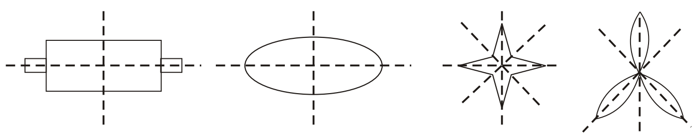
1. 2^n **2.** 1 **3.** greater than 1 **4.** sample space **5.** HH, HT, TH, TT

16 Symmetry, Reflection and Rotation

Exercise 16.1

1. For each of the given figure.

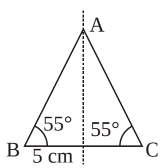
(a) Draw the line (or lines) of symmetry (if any).



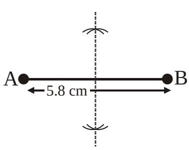
(i) (ii) (iv) (v)

(b) (i) Two, (ii) Two, (iii) None, (iv) Four, (v) Three

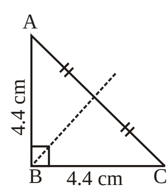
2.



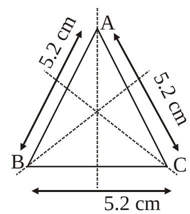
3.



4.



5.



6. (F, G, J, L, P, R) has
No line of symmetry.

Exercise 16.2

1. Find the coordinates of the images of the following points under reflection in the x-axis :

(a) $(-3, 2)$

The reflection of the point $(-3, 2)$ in the x axis is : $(-3, -2)$

(b) $(5, -4)$

The reflection of the point $(5, -4)$ in the x axis is : $(5, 4)$

(c) $(3, 8)$

The reflection of the point $(3, 8)$ in the x–axis is : $(3, -8)$

(d) $(0, 2.5)$

The reflection of the point $(0, 2.5)$ in the x-axis is : $(0, -2.5)$

(e) $(3.5, 0)$

The reflection of the point $(3.5, 0)$ in the x-axis is : $(3.5, 0)$

2. Find the coordinates of the images of the following points under reflection in the y-axis.

(a) $(0, -5)$

The reflection of the point $(0, -5)$ in the y-axis is : $(0, -5)$

(b) $(4, -3)$

The reflection of the point $(4, -3)$ in the y-axis is : $(-4, -3)$

(c) $(-3, 6)$

The reflection of the point $(-3, 6)$ in the y-axis is : $(3, 6)$

(d) $(-5, 0)$

The reflection of the point $(-5, 0)$ in the y-axis is : $(5, 0)$

(e) $(-4, -7)$

The reflection of the point $(-4, -7)$ in the y-axis is : $(4, -7)$

3. Find the coordinates of the images of the following points under reflection about the origin :

(a) $(4, -3)$

The reflection of the point $(4, -3)$ about the origin is : $(-4, 3)$

(b) $(-2, 4)$

The reflection of the point $(-2, 4)$ about the origin is : $(2, -4)$

(c) $(-5, -7)$

The reflection of the point $(-5, -7)$ about the origin is : $(5, 7)$

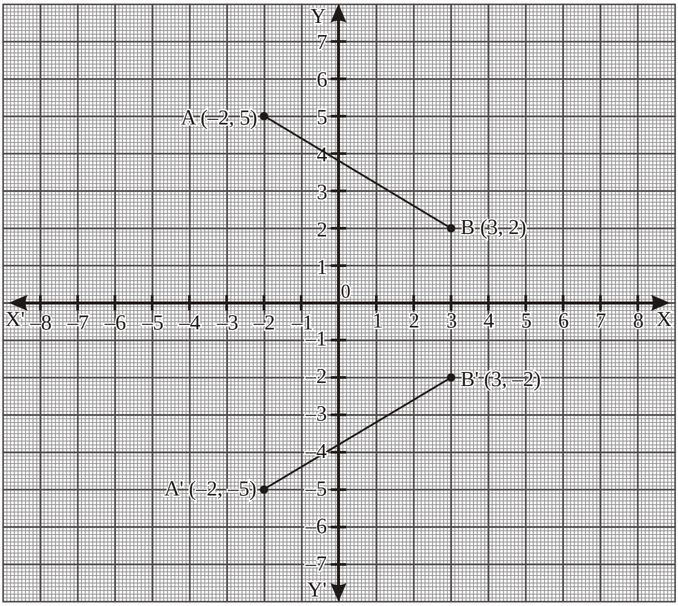
(d) $(8, 9)$

The reflection of the point $(8, 9)$ about the origin is : $(-8, -9)$

(e) $(7, 3)$

The reflection of the point $(7, 3)$ about the origin is : $(-7, -3)$

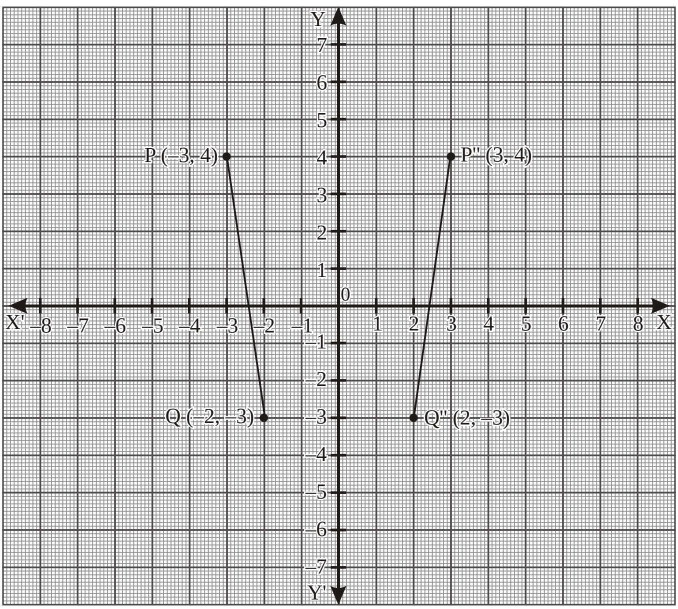
4. (a) $A = (-2, 5), B = (3, 2)$



$A' = (-2, -5), B' = (3, -2)$

Yes, AB and $A'B'$ are equal.

(b) $P = (-3, 4)$ and $Q = (-2, -3)$

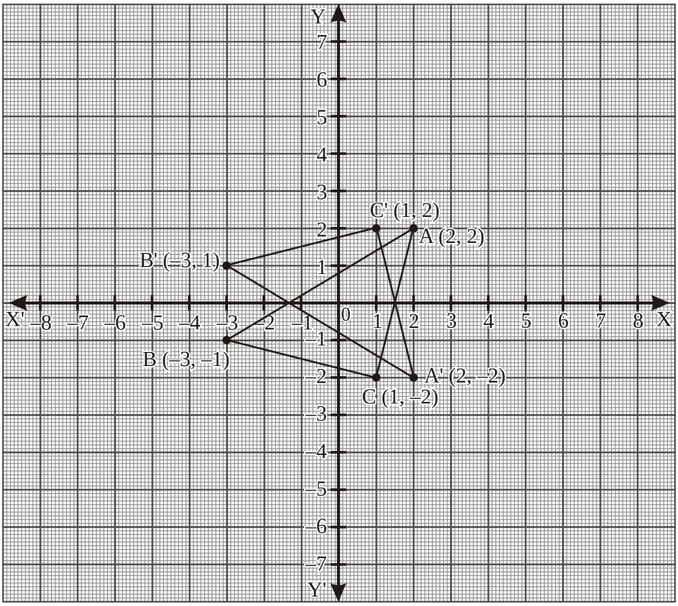


$P'' = (3, 4)$, $Q'' = (2, -3)$

Yes, PQ and $P''Q''$ are equal.

5. Plot the $\Delta\ ABC$ whose vertices are $A(2, 2)$, $B(-3, -1)$ and $C(1, -2)$.

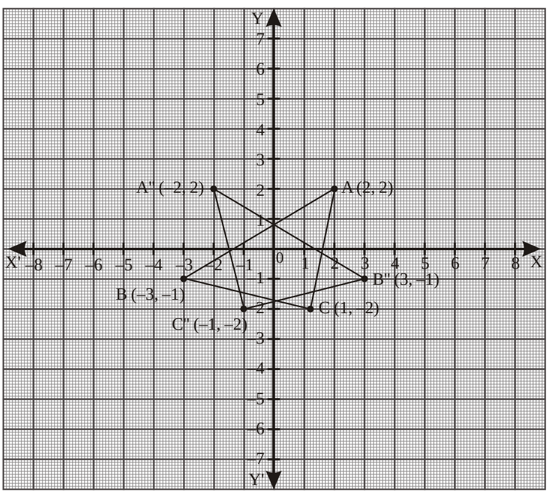
(a) $A\ (2, 2)$, $B\ (-3, -1)$ and $C\ (1, -2)$



$A' = (2, -2)$, $B' = (-3, 1)$, $C' = (1, 2)$

Yes, the two triangles are congruent.

(b) $A = (2, 2)$ $B = (-3, -1)$ and $C = (1, -2)$



$A'' = (-2, 2), B'' = (3, -1), C'' = (-1, -2)$
Yes, the two triangle are congruent.

Exercise 16.3

1. The following points are rotated through 90° anti-clockwise about the origin. Write the coordinates of their corresponding points.

(a) (5, 2)

We know if $P(x, y)$ is rotated through 90° anticlockwise about the origin to the point P', then $P'(-y, x)$

$\therefore$ corresponding to P (5, 2) we get $P'(-2, 5)$.

(b) (– 4, 6)

We know if $P(x, y)$ is rotated through 90° anticlockwise about the origin to the point P', then $P'(-y, x)$

$\therefore$ corresponding to $P(-4, 6)$ we get $P'(-6, -4)$.

(c) (3, – 6)

We know if $P(x, y)$ is rotated through 90° anti-clockwise about the origin to get point P', then $P'(-y, x)$

$\therefore$ corresponding to $P(3, -6)$, we get $P'(6, 3)$.

(d) (– 4, – 3)

We know if $P(x, y)$ is rotated through 90° anti-clockwise about the origin to the point P', then $P'(-y, x)$

$\therefore$ corresponding to $p(-4, -3)$, we get $p'(3, -4)$.

(e) (0, 4)

We know if $P(x, y)$ is rotated through 90° anti-clockwise about the origin to the point P', then $P'(-y, x)$

$\therefore$ corresponding to P (0, 4), we get $P'(-4, 0)$.

(f) (– 5, 0)

We know if $P(x, y)$ is rotated through 90° anti-clockwise about the origin to get point P', then $P'(-y, x)$

$\therefore$ corresponding to $P(-5, 0)$, we get $P'(0, -5)$

2. The following points are rotated through 90° clockwise about the origin. Write the coordinates of their corresponding points.

(a) (4, 5)

We know if $P(x, y)$ is rotated through 90° clockwise about the origin to the point P', then $P'(y, -x)$

$\therefore$ corresponding to $p(4, 5)$, we get $P'(5, -4)$.

(b) (– 3, 1)

We know if $P(x, y)$ is rotated through 90° clockwise about the origin to the point P', then $P'(y, -x)$

$\therefore$ corresponding to $P(-3, 1)$ we get $P'(1, 3)$.

(c) (2, – 5)

We know if $P(x, y)$ is rotated through 90° clockwise about the origin to get point P', then $P'(y, -x)$

$\therefore$ corresponding to $P(2, -5)$, we get $P'(-5, -2)$.

(d) $(-3, -4)$

We know if $P\ (x,\ y)$ is rotated through 90° clockwise about the origin to the point P', then $P'(y, -x)$

$\therefore$ corresponding to $P\ (-3, -4)$ we get $P'(-4, 3)$.

(e) (0, 3)

We know if $P\ (x,\ y)$ is rotated through 90° clockwise about the origin to the point P', then $P'(y - x)$

$\therefore$ corresponding top (0, 3), we get $P'(3, 0)$.

(f) $(-4, 0)$

We know if $P\ (x,\ y)$ is rotated through 90° clockwise about the origin to the point P', then $P'(y - x)$

$\therefore$ corresponding top $P\ (-4, 0)$, we get $P'(0, 4)$.

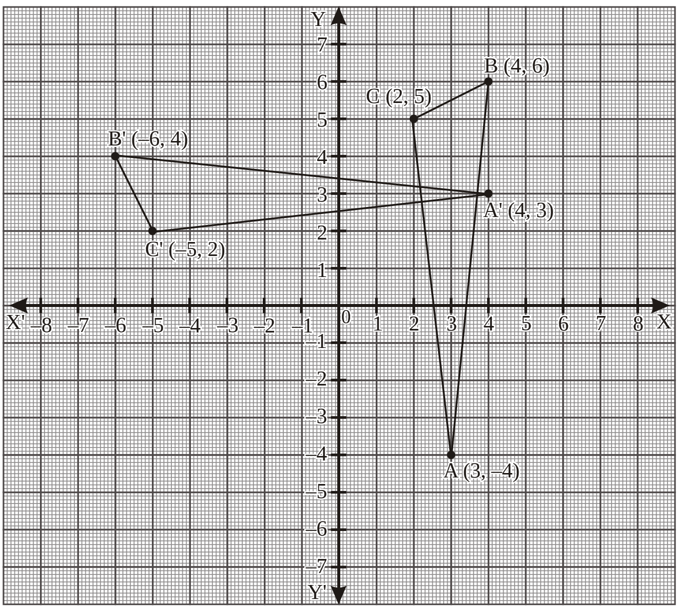
3. A triangle ABC with vertices $A(3, -4)$, $B(4, 6)$ and $C(2, 5)$ is rotated through 90° about the origin to the points A', B' and C' in the direction,

(a) when $P\ (x,\ y)$ is rotated through 90° anti-clockwise about the origin to the point P', then coordinates of P' are $(-y, x)$

$\therefore$ When A, B, C are rotated through 90° anti-clockwise about the origin to the points $A'B'C'$, then

coordinates are $A'(4, 3)$, $B'(-6, 4)$, $C'(-5, 2)$

plottting these points on the graph paper, we get the $\Delta\ A'B'C'$ as shown on the graph.



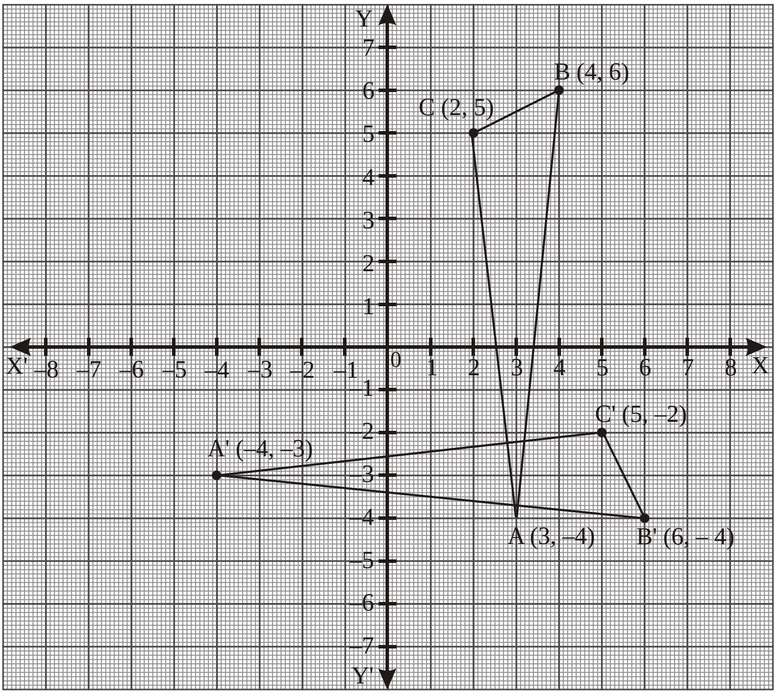
(b) $A\,(3,-4)$, $B,(4,\,6)$, $C\,(2,\,5)$

When $P\,(x,\,y)$ is rotated through 90° clockwise about the origin to the point P', then co-ordinates fo P' are $(y,-x)$

$\therefore$ When A, B, C are rotated through 90° clockwise about the origin to the points A', B', C' then coordinates are

$A'(-4,-3)$, $B'(6,-4)$, $C'(5-2)$

plotting these points on the graph paper, we get the $\Delta\, A'\,B'\,C'$ as shown on the graph.

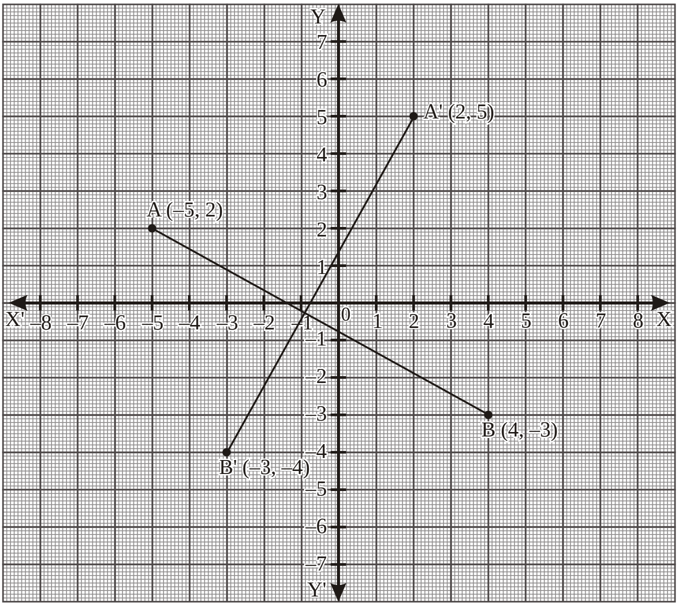


4. Plot the points $A(-5, 2)$ and $B(4,-3)$ on the graph. Rotate these points through 90° about the origin.

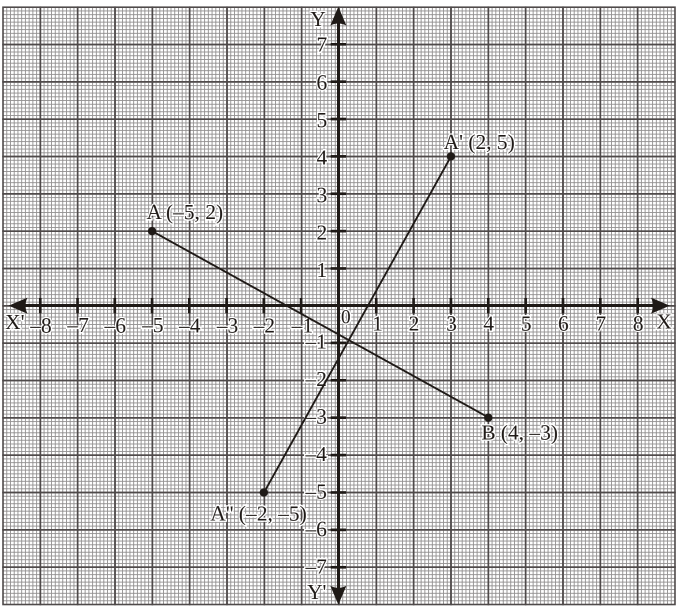
(a) When A, B are rotated through 90° clockwise about the origin to the point A', B' then coordinates are

$A'(2,\,5)$, $B'(-3,-4)$

plotting these points on the graph paper, we get the point A', B' as shown on the graph.

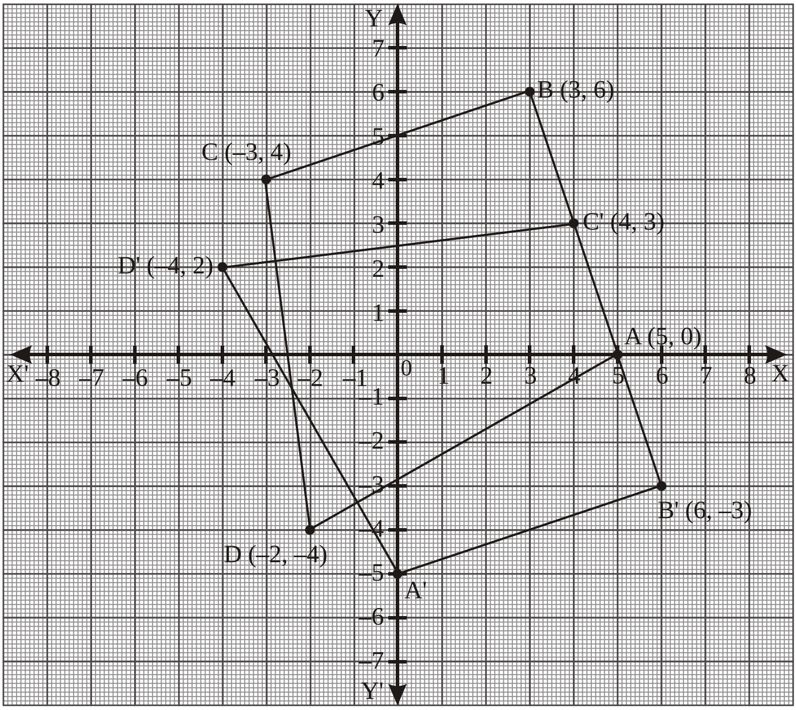


(b) When A, B are rotated through 90° anti-clockwise about the origin to the point A', B', then coordinates are $A''(-2,-5)$, $B''(3, 4)$
plotting these points on the graph paper, we get the point A'', B'' as shown on the graph.



5. A quadrilateral *ABCD* with its vertices $A(5, 0)$, $B(3, 6)$, $C(-3, 4)$ and $D(-2, -4)$ is rotated through 90°

(a) When $P(x, y)$ is rotated through 90° clockwise about the origin to the point P', then coordinates of P' are $(y - x)$



∴ when A, B, C, D are rotated through 90° clockwise about the origin to the points A', B', C', D' then coordinates are $A'(0, -5)$, $B'(6-3)$, $C'(4, 3)$, $D(-4, 2)$

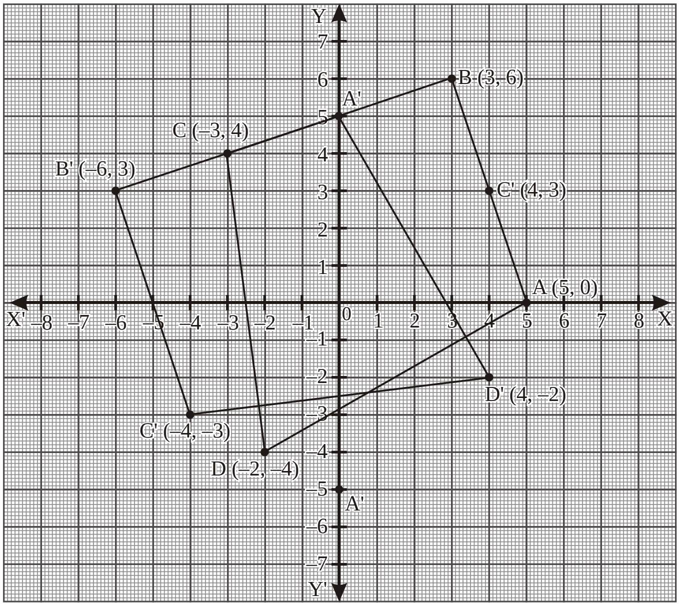
Plotting these points on the graph paper, we get the point $A', B'C', D'$ ash shown on the graph.

(b) $A(5, 0)$, $B(3, 6)$, $C(-3, 4)$, and $D(-2, -4)$

When $P(x, y)$ is rotated through 90° anti-clockwise about the origin to the point P', then coordinates of P' are $(-y, x)$

∴ When A, B, C, D are rotated through 90° anti-clockwise about the origin to the point $A', B'C', D'$, then coordinates are $A'(0, 5)$, $B'(-6, 3)$, $C'(-4, -3)$, and $D'(4, -2)$

Plotting these points on the graph paper, we get the point A', B', C', D' as shown on the graph.



Muliple Choice Questions

Tick (3) the correct option :

1. (d), **2.** (a), **3.** (b), **4.** (c)

Sharp Your Knowledge

1. True, **2.** False **3.** True, **4.** True, **5.** False

Higher Order Thinking Skills

Do it Yourself.

Note