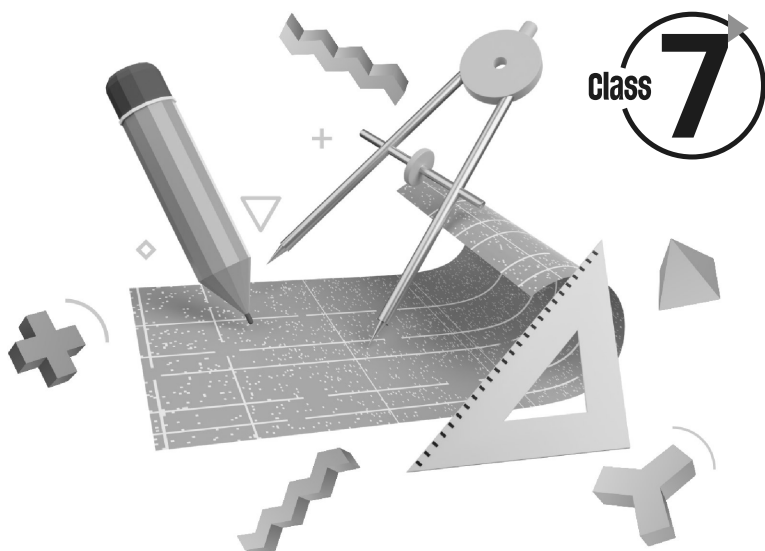




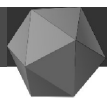
FOCUS Maths

A Complete Course in Mathematics

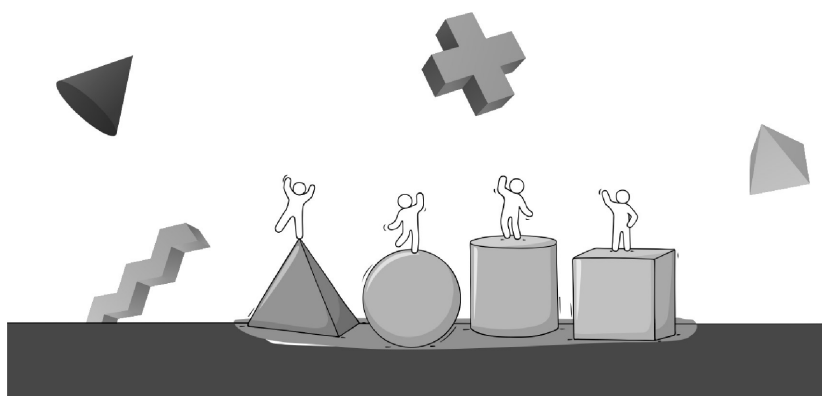
Solution Manual



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Integers



EXERCISE- 1A

1. Fill in the blanks:

(i) $(-25) + (5) = (5) + (-25)$

(ii) $(-49) + 49 = 0$

(iii) $15 - (-15) = 30$

(iv) $(-5) + (-14) = (-14) + (-5)$

(v) $(-51) - (-9) = -(42)$

(vi) $(-45) \div 0$ is not defined.

Division by zero is undefined in mathematics, which means there is no answer to the expression $(-45) \div 0$. **Ans.**

(vii) $(-30) \div (1) = -30$

(viii) $(0) \div (-80) = 0$, Because zero is divided by any non-zero integer, the result will be always zero. **Ans.**

2. Evaluate the following:

(i) $(-1) \times (-2) \times (-3) \times (-4) \times (-5)$

$\Rightarrow (-1 \times -2) \times (-3 \times -4) \times (-5)$ $[(-) \times (-) = +]$

$\Rightarrow 2 \times 12 \times (-5) = 24 \times (-5) = -120$ **Ans.** $[(+) \times (-) = -]$

(ii) $4 \times (-9) \times 10 = (4 \times -9) \times 10 = -36 \times 10 = -360$ **Ans.** $[(+) \times (-) = -]$

(iii) $8 \times (-2) \times (-5)$

$\Rightarrow 8 \times 10$ $[(-) \times (-) = +]$

$\Rightarrow 80$ **Ans.**

(iv) $(-3) \times (25) \times (-6)$

$\Rightarrow (-3 \times 25) \times (-6)$ $[(-) \times (+) = -]$

$\Rightarrow -75 \times -6 = 450$ **Ans.** $[(-) \times (-) = +]$

(v) $15 \times (-24) \times 10$

$\Rightarrow 15 \times -240 = -3600$ **Ans.**

(vi) $(-47) \times 66 \times (-20)$

$\Rightarrow (-47) \times (66 \times -20) = -47 \times -1320 = 62040$ **Ans.** $[(-) \times (-) = +]$

(vii) $(-4) \times (-6) \times (-8) \times (-10)$ $[(-) \times (-) = +]$

$\Rightarrow 24 \times 80 = 1920$ **Ans.**

3. Find the value of :

(i) $1625 \times 820 + (-625) \times 820$

$$\Rightarrow 820 \times \{(1625) + (-625)\} \quad [\text{Using } a \times b + a \times c = a(b + c)]$$

$$\Rightarrow 820 \times (1625 - 625) \\ = 820 \times 1000$$

$$= \mathbf{820000}$$

Ans.

(ii) $54321 \times 999 - (-54321)$

[If there is a negative sign outside a small bracket, then when the small bracket is opened, the sign inside the small bracket changes.]

$$\Rightarrow 54321 \times 999 + 54321 \quad [\text{Using } a \times b + a \times c = a(b + c)]$$

$$\Rightarrow 54321(999 + 1) = 54321 \times 1000$$

$$= \mathbf{54321000}$$

Ans.

4. Evaluate the following :

(i) $12 \div [(13) + (-13)]$

$$\Rightarrow 12 \div [(13 - 13)] \text{ or } 12 \div (13 - 13)$$

$$\Rightarrow 12 \div 0 \text{ is undefined or "not defined."}$$

Ans.

(ii) $[56 \div (-21)] \div (-4)$

$$\Rightarrow \left[\frac{56}{-21} \right] \div (-4) \text{ Division of integers or } -\frac{56}{21} \times \frac{1}{-4} = \frac{56 \times 1}{21 \times 4} = \frac{56}{84}$$

$$= \frac{14}{21} = \frac{2}{3} \quad \mathbf{Ans.}$$

(iii) $(-6) \div [(36) \div (-12)]$

$$[(-) \div (-) = +]$$

$$= (-6) \div \left[\left(-\frac{36}{12} \right) \right] \text{ or } (6) \div 3 \Rightarrow \frac{6}{3}$$

$$\Rightarrow \mathbf{2 \text{ Ans.}}$$

(iv) $[(-100) + (60)] \div [(29) - (9)]$

$$= [(-100) + (60)] \div [(29 - 9)]$$

$$= [(-100 + 60)] \div [(29 - 9)]$$

$$= [-40] \div [(20)] = \frac{-40}{20} = -2 = \mathbf{-2}$$

$$[(-) \div (+) = -]$$

5. (i) Complete the puzzle and, (ii) Find the value of A, B, C, D, E, F, G and H .

(ii) Values of $A = -9, B = (=), C = -3, D = (X), E = (=), F = 0, G = 5$
and $H = (=)$.

6. The product of two integers is -51 .

One integer is -17 .

Let the other integer to be x .

So, according to the given question

$$-17 \times x = -51$$

$$\Rightarrow x = \frac{-51}{-17} = 3 \quad [(-) \div (-) = +]$$

Hence, the other integer is $(x) = 3$.

Ans

7. $m \times (-5) = (-40)$

$$\Rightarrow m = \frac{(-40)}{(-5)} \text{ or } m = \frac{40}{5} = 8 \quad [(-) \div - = (+)]$$

Hence, the value of m is 8.

8. The sum of -1878 and 878 is $[(-1878) + 878]$.

According to the question, subtract the sum from 2000.

$$\text{Now, } 2000 - [(-1878) + 878]$$

$$\Rightarrow 2000 - (-1878 + 878)$$

$$\Rightarrow 2000 - (-1000) \text{ or } 2000 + 1000 = 3000$$

Ans.

	a	b	c
(i)	-2	5	3
(ii)	7	-9	-11
(iii)	-24	-12	-5

1. Associative Property (Under addition)

(i) For any integers a, b and c , we can say that,

$$a + (b + c) = (a + b) + c$$

Now, from the given table,

here $a = -2, b = 5$ and $c = 3$

$$\text{Then, } (-2) + (5 + 3) = (-2 + 5) + 3$$

$$\Rightarrow -2 + 8 = 3 + 3$$

$$\Rightarrow 6 = 6$$

Verify

(ii) Again from the given table, we see $a = 7, b = -9$ and $c = -11$

Under addition : $a + (b + c) = (a + b) + c$

$$\Rightarrow 7 + [(-9) + (-11)] = [7 + (-9)] + (-11)$$

$$\Rightarrow 7 + (-9 - 11) = (7 - 9) + (-11)$$

$$\Rightarrow 7 + (-20) = (-2) + (-11)$$

$$\Rightarrow 7 - 20 = -2 - 11 \text{ or } -13 = -13$$

Verify

(iii) **Under addition :** We see that; $a = -24, b = -12$ and $c = -5$

Now, according to the rule,

$$a + (b + c) = (a + b) + c$$

Putting the values of a, b and c , then we get;

$$\Rightarrow (-24) + [(-12) + (-5)] = [(-24) + (-12)] + (-5)$$

$$\Rightarrow (-24) + (-12 - 5) = [(-24) - 12] + (-5)$$

$$\Rightarrow -24 + (-17) = (-24 - 12) + (-5)$$

$$\Rightarrow -24 - 17 = -36 - 5$$

$$\Rightarrow -41 = -41$$

Verify.

2. Under subtraction : For any three distinct integers a, b and c ,

(i)
$$a - (b - c) \neq (a - b) - c$$

Let us, $a = -2$, $b = 5$ and $c = 3$. Now, we see

$$\Rightarrow (-2) - (5 - 3) = [(-2) - (5)] - 3$$

$$\Rightarrow -2 - (2) = (-2 - 5) - 3$$

$$\Rightarrow -2 - 2 = -7 - 3$$

$$\Rightarrow -4 = -10$$

We can observe that $(-2) - (5 - 3) \neq [(-2) - (5)] - 3$. That is, subtraction of integers is not associative.

(ii) Let us, $a = 7$, $b = -9$ and $c = -11$. Now, we see

$$\Rightarrow 7 - [(-9) - (-11)] = (7) - [(-9) - (-11)]$$

$$\Rightarrow 7 - (-9 + 11) = 7 - [(-9 + 11)]$$

$$\Rightarrow 7 - 2 = 7 - 2$$

$$\Rightarrow 5 = 5$$

We can observe that $7 - [(-9) - (-11)] = (7) - [(-9) - (-11)]$. That is, subtraction of integers is associative.

(iii) Let us, $a = -24$, $b = -12$ and $c = -5$. Now, we see

$$\Rightarrow (-24) - [(-12) - (-5)] = [(-24) - (-12)] - (-5)$$

$$\Rightarrow (-24) - (-12 + 5) = (-24 + 12) - (-5)$$

$$\Rightarrow -24 - (-7) = (-12) + 5$$

$$\Rightarrow -24 + 7 \Rightarrow -12 + 5 \text{ or } -17 \neq -7$$

We can observe that $(-24) - [(-12) - (-5)] \neq [(-24) - (-12)] - (-5)$. That is, subtraction of integers is not associative.

3. Under multiplication : The multiplication of integers is associative, *i.e.*, for any three integers a, b and c , we have $a \times (b \times c) = (a \times b) \times c$.

(i) We have, $(-2) \times 5 \times 3 = \{(-2) \times 5\} \times 3$

$$\Rightarrow (-2) \times 15 = (-2 \times 5) \times 3$$

$$\Rightarrow -30 = -30$$

$$\therefore -30 = -30$$

(ii) We have,

$$\begin{aligned}(7) \times \{(-9) \times (-11)\} &= \{7 \times (-9)\} \times (-11) \\ \Rightarrow 7 \times 99 &= -63 \times -11 \\ 693 &= 693 \\ \therefore 693 &= 693\end{aligned}$$

(iii) We have,

$$\begin{aligned}(-24) \times \{(-12) \times (-5)\} &= \{(-24) \times (-12)\} \times (-5) \\ \Rightarrow (-24) \times (-12 \times -5) &= (-24 \times -12) \times (-5) \\ \Rightarrow (-24) \times 60 &= 288 \times (-5) \\ \Rightarrow -1440 &= -1440 \\ \therefore -1440 &= -1440\end{aligned}$$

(i) Under division : In generally, for any three distinct non-zero integers a, b and c .

$$a \div (b \div c) \neq (a \div b) \div (c)$$

Let us, $a = -2, b = 5$ and $c = 3$,

$$(-2) \div (5 \div 3) = (-2) \div \frac{5}{3} \Rightarrow -2 \times \frac{3}{5} = \frac{-6}{5}$$

$$\text{and } [(-2) \div 5] \div 3 = \frac{-2}{5} \div 3 \Rightarrow \frac{-2}{5} \times \frac{1}{3} = \frac{-2}{15}$$

Therefore, we observe that integers are not associative under division.

(ii) Let us, $a = 7, b = -9$ and $c = -11$. Now, according to the question,

$$\begin{aligned}7 \div [(-9) \div (-11)] &= [7 \div (-9)] \div (-11) \\ \Rightarrow 7 \div \left[\left(\frac{-9}{-11} \right) \right] &= \left[\left(\frac{7}{-9} \right) \right] \div (-11) \\ \Rightarrow 7 \div \frac{9}{11} &= \frac{7}{-9} \div -11 \text{ or } 7 \times \frac{11}{9} = \frac{7}{-9} \times -\frac{1}{11} \\ &\Rightarrow \frac{77}{9} = \frac{7}{99}\end{aligned}$$

Therefore, we observe that integers are not associative under division.

(iii) Let us $a = -24, b = -12$ and $c = -5$

Now, $(-24) \div [(-12) \div (-5)] = [(-24) \div (-12)] \div (-5)$

$$\begin{aligned}\Rightarrow (-24) \div \left[\left(\frac{-12}{-5} \right) \right] &= \left[\left(\frac{-24}{-12} \right) \right] \div (-5) \\ \Rightarrow -24 \div \frac{12}{5} &= \frac{24}{12} \div (-5)\end{aligned}$$

$$\text{or} \quad -24 \times \frac{5}{12} = \frac{24}{12} \times -\frac{1}{5}$$

$$\text{or} \quad -10 = -\frac{2}{5}$$

Therefore, we observe that integers are not associative under division.

4. Distributive property : Multiplication of integers is distributive over addition. For any three integers a, b and c . We have,

$$(i) \quad a \times (b + c) = (a \times b) + (a \times c)$$

Let us $a = -2, b = 5$ and $c = 3$

$$\text{We have,} \quad (-2) \times (5 + 3) = (-2 \times 5) + (-2 \times 3)$$

$$\Rightarrow \quad -2 \times 8 = -10 - 6$$

$$\Rightarrow \quad -16 = -16$$

$$\therefore \quad (-2) \times (5 + 3) = (-2 \times 5) + (-2 \times 3)$$

(ii) Let us $a = 7, b = -9$ and $c = -11$. Now according to the question,

$$7 \times [(-9) + (-11)] = (7 \times -9) + (7 \times -11)$$

$$\Rightarrow \quad 7 \times (-9 - 11) = -63 + (-77)$$

$$\Rightarrow \quad 7 \times -20 = -63 - 77$$

$$-140 = -140$$

$$\therefore \quad 7 \times [(-9) + (-11)] = (7 \times -9) + (7 \times -11)$$

(iii) Let us $a = -24, b = -12$ and $c = -5$

Now, we have,

$$(-24) \times [(-12) + (-5)] = [(-24) \times (-12)] + [(-24) \times (-5)]$$

$$\Rightarrow \quad (-24) \times (-12 - 5) = (-24 \times -12) + (-24 \times -5)$$

$$\Rightarrow \quad -24 \times -17 = (-288) + (120)$$

$$\Rightarrow \quad 408 = -168$$

$$\therefore \quad (-24) \times [(-12) + (-5)] \neq [(-24) \times (-12)] + [(-24) \times (-5)]$$

EXERCISE- 1B

1. Total number of candidates = Ruchi and her five friends is equal to six candidates.

Six candidates paid total entry fee = ₹ 90

Per candidate paid entry fee = ₹ $\frac{90}{6}$ = ₹ 15

Hence, each candidate paid entry fee is ₹ 15.

2. Total number of questions answered correctly are = 130

Marks assigned for each correct answer = 2

Total marks scored for correctly answers = $130 \times 2 = 260$

Number of questions answered incorrectly = 45

For every 3 incorrect answers, marks are deducted = 2

Every 1 incorrect answer, marks are deducted = $\frac{2}{3}$

Now, according to the question, for 45 wrong answers, marks are deducted = $\frac{2}{3} \times 45 = 30$ marks

Now, total score of Kartik Kaushik in civil services preliminary examination is = $260 - 30 = 230$ **Ans.**

3. Total distance covered by Ram Chandra Prakash = 125 km

Total taken time by Ram Chandra Prakash = 5 hours

We know, $\text{Speed} = \frac{\text{Distance}}{\text{Taken time}}$

Now, according to the given question,

Speed of car = $\frac{125}{5}$ km/hour = 25 km per hour

Hence, speed of car is 25 km/hour.

Ans.

4. Taken total loan of amount by Hariram is = ₹ 3,00,000

Total number of banks = 3

[Given : Taken the same amount from all banks]

The loan of amount from each bank = $\frac{\text{Total loan of amount by Hariram}}{\text{Total number of banks}}$
 $= \frac{\text{₹ } 3,00,000}{3} = \text{₹ } 1,00,000$

∴ Loan of amount from each bank is ₹ 1,00,000.

5. Rate of rising up = 30 ft/minute

Distance move up in 45 minutes = ?

In 45 minutes rises upto a distance = $30 \times 45 \text{ ft} = 1350 \text{ ft}$

Now, the current depth of submarine = $(4000 - 1350) \text{ ft} = 2650 \text{ ft}$

Therefore, the required position of submarine after 45 minutes is 2650 ft.

6. Record by the first scuba diver = 480 metres.

Depth reached by second scuba diver = 390 metres

Depth to break the record = Record by first scuba diver

– Depth reached by second scuba diver
 $= (480 - 390) \text{ metres} = 90 \text{ metres}$

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. Find the value of the following:

$$73 \times (-25) + (-75) \times 73 \Rightarrow 73\{(-25) + (-75)\} \text{ or } 73(-25 - 75) \\ \Rightarrow 73 \times -100 = -7300$$

Hence, the correct option is (b).

2. The value of $45 - 15 \div 3 \times 3$ is :

$$\Rightarrow 45 - \frac{15}{3} \times 3 \Rightarrow 45 - 5 \times 3 \text{ or } 45 - 15 = 30$$

Hence, the correct option is (d).

3. The value of $92 + (-36) \div (-4) \times 3$ is :

$$\Rightarrow 92 + \left(\frac{-36}{-4}\right) \times 3 \Rightarrow 92 + 9 \times 3 \text{ or } 92 + 27 = 119$$

Hence, the correct option is (d).

4. $(-5) \times (-2)$ is :

$$\Rightarrow (-5) \times (-2) = 5 \times 2 = 10$$

Hence, the correct option is (a).

5. The value of $(-17) - (-102) \div (-17) + 43 \times (-9)$ is:

$$\Rightarrow (-17) - \left(\frac{-102}{-17}\right) + 43 \times (-9) \\ \Rightarrow (-17) - 6 + 43 \times (-9) \Rightarrow -17 - 6 - 387 = -410$$

Hence, the correct option is (b).

6. The value of $30 - [9 + \{25 - (20 - 10)\}]$ is :

$$\Rightarrow 30 - [9 + \{25 - (20 - 10)\}] = 30 - [9 + \{25 - (10)\}] \\ \Rightarrow 30 - [9 + \{(25 - 10)\}] \text{ or } 30 - [(9 + 15)] \\ \Rightarrow 30 - 24 = 6$$

Hence, the correct option is (a).

7. $(-a) \times (-2) = ?$

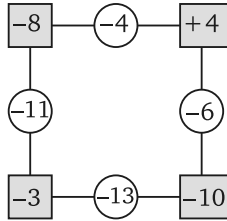
$$\Rightarrow (-a) \times (-2) = (-a \times -2) = 2a$$

Hence, the correct option is (a).

DO AND LEARN

Do yourself.

THINK, SOLVE AND LEARN



Fractions and Decimals



EXERCISE - 2A

1. Multiply the following fractions:

$$(i) \frac{4}{6} \times 5 = \frac{4 \times 5}{6} = \frac{20}{6}$$

Ans.

$$(ii) 8 \times \frac{3}{5} = \frac{8 \times 3}{5} = \frac{24}{5}$$

Ans.

$$(iii) 4 \times \frac{7}{10} = \frac{4 \times 7}{10} = \frac{2 \times 7}{5}$$

Ans.

$$(iv) 6 \times \frac{2}{5} = \frac{6 \times 2}{5} = \frac{12}{5}$$

Ans.

2. Multiply the following fractions:

$$(i) \frac{3}{5} \times \frac{5}{6} = \frac{3 \times 5}{5 \times 6} = \frac{3}{6} = \frac{1}{2}$$

Ans.

$$(ii) 3 \frac{3}{11} \times 1 \frac{2}{9} = \frac{36}{11} \times \frac{11}{9} = \frac{36 \times 11}{11 \times 9} = \frac{36}{9} = \frac{36 \div 9}{9 \div 9} = \frac{4}{1} = 4$$

Ans.

$$(iii) 5 \frac{5}{6} \times 1 \frac{2}{7} = \frac{35}{6} \times \frac{9}{7} = \frac{35 \times 9}{6 \times 7} = \frac{5 \times 9}{6} = \frac{5 \times 3}{2} = \frac{15}{2} = 7 \frac{1}{2}$$

Ans.

$$(iv) 2 \frac{1}{7} \times 1 \frac{4}{5} \times \frac{1}{3} = \frac{15}{7} \times \frac{9}{5} \times \frac{1}{3} = \frac{15 \times 9 \times 1}{7 \times 5 \times 1} = \frac{3 \times 3}{7} = \frac{9}{7} = 1 \frac{2}{7}$$

Ans.

3. Simplify:

$$(i) \frac{7}{8} \div 4 \frac{1}{2} = \frac{7}{8} \div \frac{9}{2} \text{ or } \frac{7}{8} \times \frac{2}{9} = \frac{7 \times 1}{4 \times 9} = \frac{7}{36}$$

Ans.

$$(ii) \frac{1}{2} \div \frac{2}{5} = \frac{1}{2} \times \frac{5}{2} = \frac{5}{4} = 1 \frac{1}{4}$$

Ans.

4. Simplify :

$$\begin{aligned}
 \text{(i)} \quad & \left[3\frac{1}{5} \div 1\frac{2}{3} \right] + \left[5\frac{4}{7} \div 1\frac{3}{10} \right] \\
 &= \left[\frac{16}{5} \div \frac{5}{3} \right] + \left[\frac{39}{7} \div \frac{13}{10} \right] \text{ or } \left[\frac{16}{5} \times \frac{3}{5} \right] + \left[\frac{39}{7} \times \frac{10}{13} \right] \\
 &\Rightarrow \frac{16 \times 3}{5 \times 5} + \frac{39 \times 10}{7 \times 13} \quad \text{or} \quad \frac{48}{25} + \frac{3 \times 10}{7} \Rightarrow \frac{48}{25} + \frac{30}{7} = \frac{336 + 750}{175} \\
 &\Rightarrow \frac{1086}{175} = 6\frac{36}{175} \text{ Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & \left[\frac{7}{5} \div \frac{11}{35} \right] + \left[\frac{9}{13} \div \frac{11}{117} \right] \\
 &= \left[\frac{7}{5} \times \frac{35}{11} \right] + \left[\frac{9}{13} \times \frac{117}{11} \right] \\
 &= \frac{7}{5} \times \frac{35}{11} + \frac{9 \times 9}{11} \Rightarrow \frac{7 \times 7}{11} + \frac{9 \times 9}{11} \Rightarrow \frac{49}{11} + \frac{81}{11} \Rightarrow \frac{130}{11} = 11\frac{9}{11} \quad \text{Ans.}
 \end{aligned}$$

5. Find the reciprocal of the following:

Sol. (i) The reciprocal of $\frac{9}{2}$ is $\frac{2}{9}$.

(ii) The reciprocal of 5 is $\frac{1}{5}$.

(iii) The reciprocal of $\frac{3}{4}$ is $\frac{4}{3}$.

(iv) The reciprocal of $\frac{3}{13}$ is $\frac{13}{3}$.

EXERCISE- 2B

1. Given, distance = $\frac{5}{4}$ km, Speed = $\frac{3}{8}$ km/minute

$$\text{Taken total time by Kartik} = \frac{\text{Distance}}{\text{Speed}} = \frac{\frac{5}{4}}{\frac{3}{8}} = \frac{5 \times 8}{4 \times 3} = \frac{10}{3} \text{ minutes} \quad \text{Ans.}$$

2. Covers distance in one hour = 30×2 km = 60 km

[\because Distance = Speed \times Time]

$$\left[\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{30}{1/2} = 60 \text{ km} \right]$$

Covers distance by car in 5 hours = 60×5 km = 300 km Ans.

3. In a student's hostel,

Total quantity of milk is $16\frac{4}{10}$ litres.

Each student got milk = $\frac{2}{5}$ litre

$$\begin{aligned}\text{Number of children} &= \frac{\text{Quantity of milk}}{\text{Each student got milk}} \\ &= \frac{16\frac{4}{10}}{\frac{2}{5}} = \frac{\frac{164}{10}}{\frac{2}{5}} = \frac{164 \times 5}{20} = 41\end{aligned}$$

Hence, the required number of students for distributed the milk is 41.

4. Number of pieces of sweets eaten by Aditya Kaushik

$$= 30 \times \frac{7}{10} = 21 \text{ pieces} \quad \text{Ans.}$$

5. Babita reads a book in 1 hour = $\frac{1}{5}$ part

$$\text{Babita read a book in } \frac{11}{5} \text{ hours} = \frac{1}{5} \times \frac{11}{5} = \frac{11}{25} \text{ part} \quad \text{Ans.}$$

6. **Given**, the total cloth for stitching uniforms for girls

$$= 105\frac{3}{4} \text{ m} = \frac{423}{4} \text{ metres}$$

Required cloth for stitching uniform of one girl = $2\frac{1}{4} \text{ m} = \frac{9}{4} \text{ metres}$.

$$\begin{aligned}\text{Number of girls} &= \frac{\text{Total cloth for stitching uniform}}{\text{Cloth for stitching uniform of one girl}} \\ &= \frac{\frac{423}{4}}{\frac{9}{4}} = \frac{423 \times 4}{4 \times 9} = 47\end{aligned}$$

Hence, the required number of girls for stitching uniforms for girls is 47.

Ans.

EXERCISE- 2C

1. **Decimals in descending order:**

$$117.39 > 64.55 > 41.8 > 5.359 > 1.1113$$

2. Express the following fractions as decimals:

(i) We have, $\frac{1}{20} = \frac{1 \times 5}{20 \times 5} = \frac{5}{100} = 0.05$ **Ans.**

(ii) We have, $1\frac{3}{500} = 1 + \frac{3 \times 2}{500 \times 2} = 1 + \frac{6}{1000}$
 $= 1 + 0.006 = 1.006$ **Ans.**

(iii) We have, $\frac{1}{250} = \frac{1 \times 4}{250 \times 4} = \frac{4}{1000} = 0.004$ **Ans.**

(iv) We have, $\frac{2}{25} = \frac{2 \times 4}{25 \times 4} = \frac{8}{100} = 0.08$ **Ans.**

3. Express the following decimals as fractions in lowest form:

(i) We have, $10.990 = \frac{10990}{1000} = \frac{1099}{100} = 10\frac{99}{100}$ **Ans.**

(ii) We have, $1.006 = \frac{1006}{1000} = 1\frac{6}{1000} = 1\frac{3}{500}$ **Ans.**

(iii) We have, $5.40 = \frac{540}{100} = \frac{54}{10} = 5\frac{4}{10} = 5\frac{2}{5}$ **Ans.**

(iv) We have, $6.69 = \frac{669}{100} = 6\frac{69}{100}$ **Ans.**

4. Find each of the following products:

(i) 0.0645×20

Now, $645 \times 20 = 12900$

We see the above, total number of decimal places in 0.0645 and 20 is 4.

So, $0.0645 \times 20 = 1.2900$

Hence, correct product is 1.2900.

(ii) 72.53×3

Now, $7253 \times 3 = 21759$

We see the above, total number of decimal places in 72.53 and 3 is 2.

So, $72.53 \times 3 = 217.59$

Hence, correct product is 217.59.

(iii) 0.521×1.1

Now, $521 \times 11 = 5731$

We see the above, total number of decimal places in 0.521 and 1.1 is 4.

So, $0.521 \times 1.1 = 0.5731$

Hence, correct product is 0.5731.

(iv) 14.4×1000

Now, $144 \times 1000 = 144000$

We see the above, total number of decimal places in 14.4 and 1000 is 1.

So, $14.4 \times 1000 = 14400.0$

Hence, correct product is 14400.

5. Divide the following decimal numbers by whole numbers :

(i) We have, $0.84 \div 8 = \frac{0.84}{8} = \frac{0.84 \times 125}{8 \times 125} = \frac{105}{1000} = 0.105$ **Ans.**

(ii) We have, $7.5 \div 8 = \frac{7.5}{8} \times \frac{125}{125} = \frac{937.5}{1000} = 0.9375$ **Ans.**

(iii) We have, $1.24 \div 0.5 = \frac{1.24}{0.5} \times \frac{100}{100} = \frac{124}{50} = \frac{124 \times 2}{50 \times 2} = \frac{248}{100} = 2.48$ **Ans.**

(iv) We have, $0.5 \div 2 = \frac{0.5}{2} \times \frac{10}{10} = \frac{5}{20} = \frac{5 \times 5}{20 \times 5} = \frac{25}{100} = 0.25$ **Ans.**

EXERCISE- 2D

1. Distance Kirti's school from her house = 9.5 km

Kirti's speed to cover the distance = 2.5 km/hour

Taken time by Kirti's to cover the distance

$$= \frac{\text{Total distance}}{\text{Kirti's speed}} = \frac{9.5}{2.5} = \frac{95}{25} = \frac{19}{5} = 3.8 \text{ hours}$$

Hence, taken time by Kirti's to cover the distance is 3.8 hours. **Ans.**

2. The cost of a water bottle = ₹ 23.25

The cost of 25 such water bottles = ₹ (25 × 23.25)

$$= ₹ 581.25$$

Hence, the required total amount is ₹ 581.25 **Ans.**

3. The cost of 21 toys = ₹ 761.25

$$\text{The cost of one toy} = ₹ \frac{761.25}{21} = ₹ 36.25$$

Hence, the required cost of one toy is ₹ 36.25. **Ans.**

4. The cost of 9.5 kg mangoes = ₹ 128.25

$$\begin{aligned} \text{The cost of 1 kg mangoes} &= ₹ \frac{128.25}{9.5} = ₹ \frac{128.25 \times 100}{9.5 \times 100} = ₹ \frac{12825}{950} \\ &= ₹ \frac{12825 \div 95}{950 \div 95} = ₹ \frac{135}{10} = ₹ 13.5 \end{aligned}$$

Now, according to the question,

Required cost of 3kg mangoes is = ₹ $13.5 \times 3 = ₹ 40.5$.

Hence, the required cost of 3 kg mangoes is ₹ 40.5.

Ans.

5. Total weight of bought things = 70 kg $\left[\begin{array}{l} \because 1\text{ kg} = 1000\text{ gm} \\ \therefore 95\text{ g} = \frac{95}{1000}\text{ kg} = 0.095\text{ kg} \end{array} \right]$

Weight of basmati rice = 19.300 kg

Weight of oil = 12.095 kg

Total weight of basmati rice and oil is

$$= (19.300 + 12.095)\text{ kg}$$

$$= 31.395\text{ kg}$$

Weight of flour = (Total weight of things)

$$- (\text{Total weight of basmati rice} + \text{oil})$$

$$= (70.000 - 31.395)\text{ kg} = 38.605\text{ kg}$$

Hence, the required weight of flour is 38.605 kg.

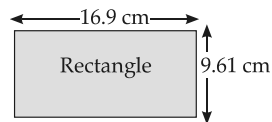
6. Given, the length of rectangle = 16.9 cm

The breadth of rectangle = 9.61 cm

Area of rectangle = (Length \times breadth) sq unit

Now, area of rectangle = $(16.9 \times 9.61)\text{ cm}^2$

$$= 162.409\text{ cm}^2$$



Hence, the required area of given rectangle is 162.409 sq. cm.

7. Weight of proteins in 1 kg pure ghee = 0.432 kg

Weight of proteins in 34.653 kg pure ghee = $(34.653 \times 0.432)\text{ kg}$

$$= 14.970096\text{ kg}$$

$$\text{or} \quad = 14.97\text{ kg (approx.)}$$

Hence, the required proteins in 34.653 kg is 14.970096 kg.

8. Convert the following :

(i) 6289 mL into L

We know that, $1000\text{ mL} = 1\text{ L}$

$$1\text{ mL} = \frac{1}{1000}\text{ L}$$

$$\therefore 6289\text{ mL} = \frac{1}{1000} \times 6289\text{ L} = 6.289\text{ L}$$

Ans.

(ii) 0.04 L into mL

We know that, $1\text{ L} = 1000\text{ mL}$

$$\therefore 0.04\text{ L} = 0.04 \times 1000\text{ mL} = 40.00\text{ mL}$$

Ans.

(iii) 2.8 kg into g

We know that, $1 \text{ kg} = 1000 \text{ g}$

$$\therefore 2.8 \text{ kg} = 2.8 \times 1000 \text{ g} = 2800.0 \text{ g}$$

Ans.

(iv) 2.84 gm into kg

We know that, $1000 \text{ g} = 1 \text{ kg}$ or $1 \text{ g} = \frac{1}{1000} \text{ kg}$

$$\therefore 2.84 \text{ gm} = \frac{1}{1000} \times 2.84 \text{ kg} = \frac{2.84}{1000} = 0.00284 \text{ kg}$$

Ans.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. The value of $618 \div 24$ is

$$618 \div 24 = \frac{618}{24} = \frac{618 \div 6}{24 \div 6} = \frac{103}{4} = 25.75$$

Hence, the correct option is (a).

2. The value of $\frac{3}{14} \div \frac{5}{21}$ is :

$$\frac{3}{14} \div \frac{5}{21} \Rightarrow \frac{3}{14} \times \frac{21}{5} = \frac{3 \times 21}{14 \times 5} = \frac{3 \times 3}{2 \times 5} = \frac{9}{10}$$

Hence, the correct option is (c).

3. $\frac{2}{5}$ of ₹ 1 is :

$$\frac{2}{5} \times ₹ 1 = \frac{2}{5} \times 100 \text{ paise} = 40 \text{ paise}$$

Hence, the correct option is (d).

4. Find the value of $\frac{1}{2} \times \frac{5}{3}$.

$$\frac{1}{2} \times \frac{5}{3} = \frac{5}{6}$$

Hence, the correct option is (a).

DO AND LEARN

Do yourself.

THINK, SOLVE AND LEARN

- Change 53500 m into km.

We know that, $1000 \text{ m} = 1 \text{ km}$

$$1 \text{ m} = \frac{1}{1000} \text{ km}$$

$$\begin{aligned} \text{Now, } 53500 \text{ m} &= \frac{1}{1000} \times 53500 \text{ km} = \frac{53500}{1000} \text{ km} \\ &= \frac{535}{10} \text{ km} = 53.5 \text{ km} \end{aligned}$$

Ans.



Rational Numbers



EXERCISE-3A

1. Positive rational numbers : $\frac{9}{8}, \frac{-5}{-8}, \frac{-19}{-13}$ **Ans.**

- Negative rational numbers : $\frac{-8}{7}, \frac{-3}{7}, \frac{9}{-83}, \frac{-21}{13}$ **Ans.**

2. Write down the denominator of each of the following rational numbers:

Sol. $0 = \frac{0 \leftarrow \text{Numerator}}{1 \leftarrow \text{Denominator}}$

Here, denominator is 1.

$$\frac{-4}{5} \leftarrow \begin{array}{l} \text{Numerator} \\ \text{Denominator} \end{array}$$

Here, denominator is 5.

$$\frac{11}{-34} \leftarrow \begin{array}{l} \text{Numerator} \\ \text{Denominator} \end{array}$$

Here, denominator is -34.

$$15 = \frac{15 \leftarrow \text{Numerator}}{1 \leftarrow \text{Denominator}}$$

Here, denominator is 1.

$$\frac{-15}{-82} \leftarrow \begin{array}{l} \text{Numerator} \\ \text{Denominator} \end{array}$$

Here, denominator is -82.

3. Write down the numerator of each of the following rational numbers :

$$\frac{5}{13} \leftarrow \begin{array}{l} \text{Numerator} \\ \text{Denominator} \end{array}$$

Hence, numerator of this given fraction is 5. **Ans.**

$$\frac{8}{9} \leftarrow \begin{array}{l} \text{Numerator} \\ \text{Denominator} \end{array}$$

Hence, numerator of this given fraction is 8. **Ans.**

$$\frac{-17}{21} \leftarrow \begin{array}{l} \text{Numerator} \\ \text{Denominator} \end{array}$$

Hence, numerator of this given fraction is -17 **Ans.**

$$\frac{15}{-4} \leftarrow \begin{array}{l} \text{Numerator} \\ \text{Denominator} \end{array}$$

Hence, numerator of this given fraction is 15. **Ans.**

$$\frac{-7}{5} \leftarrow \begin{array}{l} \text{Numerator} \\ \text{Denominator} \end{array}$$

Hence, numerator of this given fraction is -7 . **Ans.**

4. Write $\frac{-14}{42}$ in a form so that the numerator is equal to:

- (i) We have, $\frac{-14}{42}$. We will divide its numerator and denominator by 7,

because the numerator of $\frac{-14}{42}$ is -2 .

$$\frac{-14 \div 7}{42 \div 7} = \frac{-2}{6} \quad \text{Ans.}$$

- (ii) We have, $\frac{-14}{42}$. We will divide its numerator and denominator by -2 ,

because the numerator of $\frac{-14}{42}$ is 7.

$$\frac{-14 \div -2}{42 \div -2} = \frac{7}{-21} \quad \text{Ans.}$$

- (iii) We have, $\frac{-14}{42}$. We will multiply its numerator and denominator by

3, because the numerator of $\frac{-14}{42}$ is -42 .

$$\frac{-14}{42} \times \frac{3}{3} = \frac{-42}{126} \quad \text{Ans.}$$

- (iv) We have, $\frac{-14}{42}$. We will multiply its numerator and denominator by

5, because the numerator of $\frac{-14}{42}$ is -70 .

$$\frac{-14}{42} \times \frac{5}{5} = \frac{-70}{210} \quad \text{Ans.}$$

5. Express $\frac{168}{-294}$ as a rational number with denominator:

- (i) We have, $\frac{168}{-294}$

We will divide its numerator and denominator by -21 , because the denominator of $\frac{168}{-294}$ is 14.

$$\text{Therefore, } \frac{168 \div -21}{-294 \div -21} = \frac{-8}{14} \quad \text{Ans.}$$

(ii) We have, $\frac{168}{-294}$

We will divide its numerator and denominator by 42, because the denominator of $\frac{168}{-294}$ is -7 .

Therefore, $\frac{168 \div 42}{-294 \div 42} = \frac{4}{-7}$ **Ans.**

(iii) We have, $\frac{168}{-294}$

We will divide its numerator and denominator by 6, because the denominator of $\frac{168}{-294}$ is -49 .

Therefore, $\frac{168 \div 6}{-294 \div 6} = \frac{28}{-49}$ **Ans.**

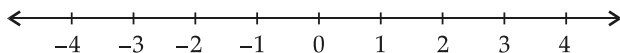
(iii) We have, $\frac{168}{-294}$

We will multiply its numerator and denominator by -5 , because the denominator of $\frac{168}{-294} \times \frac{5}{5} = \frac{-840}{+1470}$ or $\frac{-840}{1470}$ **Ans.**

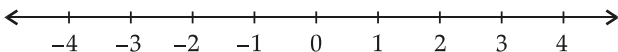
6. Represent each of the following rational numbers on the number line:

(i) Represent $\frac{3}{5}$ on the number line :

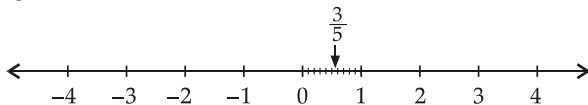
Draw a number line. Let the distance between two consecutive numbers be 1 unit.



Now, divide each unit into two equal parts. That is,

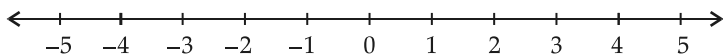


Since, $\frac{3}{5}$ is a positive rational number, show $\frac{3}{5}$ to the right of zero on the given number line.

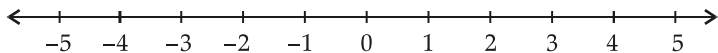


(ii) Represent $\frac{9}{4}$ on the number line :

Draw a number line. Let the distance between two consecutive numbers be 1 unit.

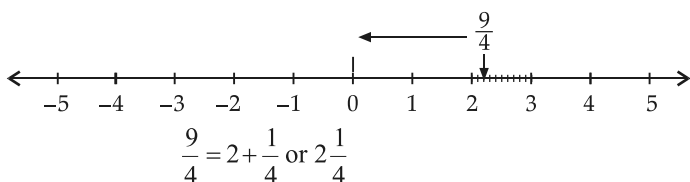


Now, divide each unit into four equal parts. That is,



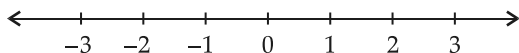
Since, $\frac{9}{4}$ is a positive rational number, show $\frac{9}{4}$ to the right of zero on the given number line.

$\frac{9}{4}$ lies between 2 and 3.

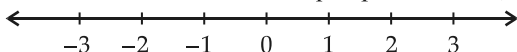


(iii) Represent $\frac{-4}{7}$ on the number line :

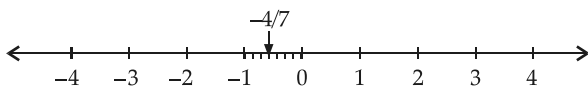
Draw a number line. Let the distance between two consecutive numbers be 1 unit.



Now, divide each unit into seven equal parts. That is,

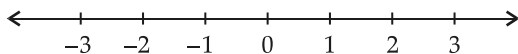


As the number $\frac{-4}{7}$ is a negative number so it will be on the left side of zero. So after zero mark, $\frac{-1}{7}, \frac{-2}{7}, \frac{-3}{7}, \frac{-4}{7}, \frac{-5}{7}, \frac{-6}{7}, \frac{-7}{7} = -1$.



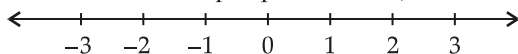
(iv) Represent $\frac{-5}{9}$ on the number line :

Draw a number line.

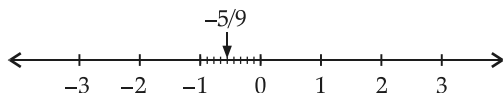


Let the distance between two consecutive numbers be 1 unit.

Divide each unit into nine equal parts. That is,



Since, $\frac{-5}{9}$ is a negative rational number, show $\frac{-5}{9}$ to the left of zero on the given number line.



7. Check if the following rational numbers are equal:

(i) $\frac{-8}{5}$ and $\frac{56}{-35}$

Multiply the numerator and denominator of $\frac{-8}{5}$ by the denominator of $\frac{56}{-35}$ i.e., by -35 , we get $\frac{-8}{5} = \frac{-8}{5} \times \frac{-35}{-35} = \frac{280}{-175}$

Multiply the numerator and denominator of $\frac{56}{-35}$ by the denominator of $\frac{-8}{5}$ i.e., by 5 , we get $\frac{56}{-35} = \frac{56}{-35} \times \frac{5}{5} = \frac{280}{-175}$

Clearly, the value of the above obtained rational numbers are equal.

Hence, the given rational numbers are **equal**.

Ans.

(ii) $\frac{-12}{7}$ and $\frac{32}{21}$

Multiply the numerator and denominator of $\frac{-12}{7}$ by the denominator of $\frac{32}{21}$ i.e., by 21 . We get $\frac{-12}{7} = \frac{-12}{7} \times \frac{21}{21} = \frac{-252}{147}$

Now, again— multiply the numerator and denominator of $\frac{32}{21}$ by the denominator of $\frac{-12}{7}$ i.e., by 7 , we get

$$\frac{32}{21} = \frac{32}{21} \times \frac{7}{7} = \frac{224}{147}$$

Clearly, the value of the above obtained rational numbers are not equal. ☐ ☐

Hence, the given rational numbers are **not equal**.

Ans.

(iii) $\frac{-7}{3}$ and $\frac{84}{-36}$

Multiply the numerator and denominator of $\frac{-7}{3}$ by the denominator

of $\frac{84}{-36}$ i.e., by -36 , we get $\frac{-7}{3} = \frac{-7}{3} \times \frac{-36}{-36} = \frac{252}{-108}$

Now, again—

Multiply the numerator and denominator of $\frac{84}{-36}$ by the denominator

of $\frac{-7}{3}$ i.e., by 3, we get

$$\frac{84}{-36} = \frac{84}{-36} \times \frac{3}{3} = \frac{252}{-108}$$

Clearly, the value of the above obtained rational numbers are equal.

Hence, the given rational numbers are **equal**.

Ans.

8. Fill in the boxes:

(i) $\frac{-6}{7} = \frac{\boxed{}}{35} = \frac{\boxed{}}{49}$

Let us in first blank square is x .

Now,

$$\frac{-6}{7} = \frac{x}{35}$$

[By cross multiplication]

$$7 \times x = -6 \times 35 \text{ or } x = \frac{-6 \times 35}{7} = -6 \times 5 = -30$$

Now, again, let us in second blank square is y .

$$\frac{-6}{7} = \frac{\boxed{-30}}{35} = \frac{\boxed{}}{49} \quad [\text{By cross multiplication}]$$

$$\frac{-6}{7} = \frac{y}{49} \text{ or } y \times 7 = -6 \times 49 \text{ or } y = \frac{-6 \times 49}{7} = -42$$

Hence, the required value of x and y are **-30 and -42** .

(ii) $\frac{-2}{-9} = \frac{\boxed{}}{18} = \frac{12}{\boxed{}}$

$$\frac{-2}{-9} = \frac{\boxed{}}{18} \text{ Let us in first square is } x.$$

$$\text{Now, } \frac{-2}{-9} = \frac{x}{18} \text{ or } -2 \times 18 = -9 \times x \Rightarrow x = \frac{-2 \times 18}{-9} = 4$$

Ans.

$$\text{Again, } \frac{-2}{-9} = \frac{12}{\boxed{}} = \frac{12}{y} \text{ Let us in second square is } y.$$

$$\frac{-2}{-9} = \frac{12}{y} \text{ or } -2 \times y = -9 \times 12 \Rightarrow y = \frac{-9 \times 12}{-2} = 54$$

Ans.

(iii) $\frac{4}{-13} = \frac{-12}{\boxed{}} = \frac{24}{\boxed{}}$

$$\frac{4}{-13} = \frac{-12}{\boxed{}} \text{ or } 4 \times \boxed{} = -13 \times -12 \Rightarrow \boxed{} = \frac{-13 \times -12}{4} = 39 \text{ Ans.}$$

$$\text{Now, again, } \frac{4}{-13} = \frac{-12}{\boxed{39}} = \frac{24}{\boxed{}} \text{ or } \frac{4}{-13} = \frac{24}{\boxed{}} \Rightarrow \boxed{} \times 4 = -13 \times 24$$

$$\boxed{} = \frac{-13 \times 24}{4} \text{ or } \boxed{} = -78 \text{ Ans.}$$

9. Write each of the following rational numbers in its standard form:

(i) $\frac{32}{28}$

We see here, denominator of $\frac{32}{28}$ is positive. We get the greatest common factor of 32 and 28 is 4.

$$\text{Now, } \frac{32}{28} = \frac{32 \div 4}{28 \div 4} = \frac{8}{7}$$

Hence, the standard form of $\frac{32}{28}$ is $\frac{8}{7}$. Ans.

(ii) $\frac{-16}{20}$

We see here, denominator of $\frac{-16}{20}$ is positive. Multiply the numerator

and denominator of $\frac{-16}{20}$ by 1. We get, the greatest common factor of 16 and 20 is 4.

$$\text{Now, } \frac{-16}{20} = \frac{-16 \div 4}{20 \div 4} = \frac{-4}{5}$$

Hence, the required standard form is $\frac{-4}{5}$.

(iii) $\frac{-24}{80}$

We see here, denominator of $\frac{-24}{80}$ is positive. Multiply the numerator

and denominator of $\frac{-24}{80}$ by 1. We get, the greatest common factor of 24 and 80 is 8.

$$\text{Now, } \frac{-24}{80} = \frac{-24 \div 8}{80 \div 8} = \frac{-3}{10}$$

Hence, the required standard form is $\frac{-3}{10}$.

(iv) $\frac{28}{63}$

We see here, denominator of $\frac{28}{63}$ is positive. Multiply the numerator and denominator of $\frac{28}{63}$ by 1. We get, the greatest common factor of 28 and 63 is 7.

Now,
$$\frac{28}{63} = \frac{28 \div 7}{63 \div 7} = \frac{4}{9}$$

Hence, the required standard form is $\frac{4}{9}$.

10. Express each of the following rational numbers to the lowest form:

(i) $\frac{14}{22}$, The greatest common factor of 14 and 22 is 2.

Now,
$$\frac{14}{22} = \frac{14 \div 2}{22 \div 2} = \frac{7}{11}$$
. Hence, lowest form is $\frac{7}{11}$.

(ii) $\frac{-36}{180}$, The greatest common factor of 36 and 180 is 36.

$$\frac{-36}{180} = \frac{-36 \div 36}{180 \div 36} = \frac{-1}{5}$$
. Hence, lowest form is $-\frac{1}{5}$.

(iii) $\frac{332}{-428}$, The greatest common factor of 332 and 428 is 4.

Now,
$$\frac{332}{-428} = \frac{332 \div 4}{-428 \div 4} = \frac{83}{-107}$$
. Hence, lowest form is $\frac{83}{-107}$.

(iv) $\frac{-32}{-56}$, The greatest common factor of 32 and 56 is 8.

Now,
$$\frac{-32}{-56} = \frac{-32 \div 8}{-56 \div 8} = \frac{-4}{-7} \quad [- \div - = +]$$

$$= \frac{4}{7}$$
. Hence, lowest form is $\frac{4}{7}$. **Ans.**

11. Determine whether the following rational numbers are in the lowest form or not?

(i) We have,
$$\frac{-66}{-32}$$

$66 = 2 \times 3 \times 11$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

HCF = 2

Dividing numerator and denominator of $\frac{-66}{-32}$ by 2, we get

$$\frac{-66}{-32} = \frac{-66 \div 2}{-32 \div 2} = \frac{-33}{-16} = \frac{33}{16}$$

$\therefore \frac{33}{16}$ is the lowest form of $\frac{-66}{-32}$. **No**

(ii) We have, $\frac{44}{128}$

$$44 = 2 \times 2 \times 11$$

$$128 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$\text{HCF} = 2 \times 2$$

$\therefore \text{HCF} = 4$

Dividing numerator and denominator of $\frac{44}{128}$ by 4, we get

$$\frac{44}{128} = \frac{44 \div 4}{128 \div 4} = \frac{11}{32}$$

$\therefore \frac{11}{32}$ is the lowest form of $\frac{44}{128}$. **No**

(iii) We have, $\frac{-15}{32}$

We observe that 15 and 32 have no common factor. Thus, HCF of 15 and 32 is 1.

$\therefore \frac{35}{8}$ is in the lowest form. **Yes**

(iv) We have, $\frac{55}{84}$

We observe that 55 and 84 have no common factor. Thus, HCF of 55 and 84 is 1.

$\therefore \frac{55}{84}$ is in lowest form. **Yes**

EXERCISE 3B

1. We have, $\frac{4}{5} = \frac{4 \times 7}{5 \times 7} = \frac{28}{35}$ and $\frac{2}{7} = \frac{2 \times 5}{7 \times 5} = \frac{10}{35}$

$$\therefore 28 > 10$$

$$\therefore \frac{28}{35} > \frac{10}{35}$$

Hence, the required ten rational numbers between $\frac{4}{5}$ and $\frac{2}{7}$ are

$$\frac{11}{35}, \frac{12}{35}, \frac{13}{35}, \frac{14}{35}, \frac{15}{35}, \frac{16}{35}, \frac{17}{35}, \frac{18}{35}, \frac{19}{35}, \frac{20}{35}.$$

Ans.

2. We have, $\frac{1}{3} = \frac{1 \times 7}{3 \times 7} = \frac{7}{21}$ and $\frac{1}{7} = \frac{1 \times 3}{7 \times 3} = \frac{3}{21}$

$$\therefore 7 > 3$$

$$\therefore \frac{7}{21} > \frac{3}{21}$$

Hence, required any three rational numbers between $\frac{1}{3}$ and $\frac{1}{7}$ are :

$$\frac{4}{21}, \frac{5}{21}, \frac{6}{21}.$$

3. We know that $-3 < -2 < -1 < 0 < 1 < 2 < 3 < 4 < 5 < 6 < 7 < 8$

$$\therefore \frac{-3}{11} < \frac{-2}{11} < \frac{-1}{11} < \frac{0}{11} < \frac{1}{11} < \frac{2}{11} < \frac{3}{11} < \frac{4}{11} < \frac{5}{11} < \frac{6}{11} < \frac{7}{11} < \frac{8}{11}$$

Hence, five rational numbers between $\frac{-3}{11}$ and $\frac{8}{11}$ are : $\frac{4}{11}, \frac{2}{11}, \frac{1}{11}, \frac{-2}{11}, \frac{-1}{11}$

[Note : Choose any five rational numbers between $\frac{-3}{11}$ and $\frac{8}{11}$]

4. Two numbers are given -2 and 2 .

I Method : Multiplying both denominator and numerator by 6, we get

$$\frac{-2 \times 6}{1 \times 6} = \frac{-12}{6} \text{ and } \frac{2 \times 6}{1 \times 6} = \frac{12}{6}$$

Hence, the five rational numbers are : $\frac{-12}{6}, \frac{-11}{6}, \frac{-10}{6}, \frac{-9}{6},$

Which on simplest position are : $\frac{-2}{1}, \frac{-11}{6}, \frac{-5}{3}, \frac{-3}{2}.$

II Method : Five rational numbers between -2 and 2 .

-2 and 2 can be written as $\frac{-6}{3}$ and $\frac{6}{3}$. Any five rational numbers between

-2 and 2 are : $\frac{-5}{3}, \frac{-4}{3}, \frac{-2}{3}, \frac{2}{3}, \frac{5}{3}.$

EXERCISE 3C

1. Find the sum of the following :

(i) $\frac{8}{27}$ and $\frac{7}{-18}$

First we replace the denominator of $\frac{7}{-18}$ in positive, we multiply in numerator and denominator by -1 .

$$\frac{7}{-18} = \frac{7}{-18} \times \frac{-1}{-1} = \frac{-7}{18}$$

Now, according to the question

$$\begin{aligned} \frac{8}{27} + \frac{-7}{18} &= \left[\frac{8}{27} \times \frac{2}{2} + \frac{-7}{18} \times \frac{3}{3} \right] \\ &= \left[\frac{16}{54} - \frac{21}{54} \right] = \frac{16-21}{54} = \frac{-5}{54} \end{aligned} \quad \text{Ans.}$$

(ii) $\frac{5}{8}$ and $\frac{-7}{2}$

Now according to the question, we get

$$\begin{aligned} &= \left[\frac{5}{8} + \frac{-7}{2} \right] = \left[\frac{5}{8} + \frac{-7}{2} \times \frac{4}{4} \right] \\ &= \left[\frac{5}{8} - \frac{28}{8} \right] = \left[\frac{5-28}{8} \right] = \frac{-23}{8} = -2\frac{7}{8} \end{aligned} \quad \text{Ans.}$$

(iii) $\frac{5}{6}$ and $\frac{7}{9}$

$$= \left[\frac{5}{6} + \frac{7}{9} \right] = \left[\frac{5}{6} \times \frac{3}{3} + \frac{7}{9} \times \frac{2}{2} \right] = \left[\frac{15}{18} + \frac{14}{18} \right] = \frac{15+14}{18} = \frac{29}{18} = 1\frac{11}{18} \quad \text{Ans.}$$

(iv) $\frac{-17}{15}$ and $\frac{-1}{5}$

$$\begin{aligned} &= \left[\frac{-17}{15} + \frac{-1}{5} \right] = \left[\frac{-17}{15} \times \frac{2}{2} + \frac{-1}{5} \times \frac{6}{6} \right] \\ &= \left[\frac{-34}{30} - \frac{6}{30} \right] = \frac{-34-6}{30} = \frac{-40}{30} = \frac{-4}{3} \end{aligned} \quad \text{Ans.}$$

2. Subtract the following :

(i) $\frac{-3}{-8}$ from $\left[\frac{-2}{7} \right]$

According to the question, we get

$$\begin{aligned} &= \left[\frac{-2}{7} \right] - \left[\frac{-3}{-8} \right] = \frac{-2}{7} - \frac{3}{8} = - \left[\frac{2}{7} + \frac{3}{8} \right] = - \left[\frac{2}{7} \times \frac{8}{8} + \frac{3}{8} \times \frac{7}{7} \right] \\ &= - \left[\frac{16}{56} + \frac{21}{56} \right] = - \left[\frac{16+21}{56} \right] = \frac{-37}{56} \end{aligned} \quad \text{Ans.}$$

$$(ii) \frac{13}{15} - \frac{12}{25}$$

According to the question, we get

$$\frac{13}{15} \times \frac{10}{10} - \frac{12}{25} \times \frac{6}{6} \Rightarrow \frac{130}{150} - \frac{72}{150} = \frac{130-72}{150} = \frac{58}{150} = \frac{29}{75}$$

Ans.

$$(iii) \frac{-4}{13} \text{ from } \left[\frac{-5}{26} \right]$$

$$\text{Now, } \left[\frac{-5}{26} \right] - \left[\frac{-4}{13} \right] = \frac{-5}{26} + \frac{4}{13}$$

$$\text{or } \frac{-5}{26} + \frac{4}{13} \times \frac{2}{2} \Rightarrow \frac{-5}{26} + \frac{8}{26} = \frac{3}{26}$$

Ans.

$$(iv) \frac{1}{4} \text{ from } \left[\frac{-3}{8} \right]$$

$$\text{Now, } \left[\frac{-3}{8} \right] - \left[\frac{1}{4} \right] = \frac{-3}{8} - \frac{1}{4} = \frac{-3}{8} - \frac{1}{4} \times \frac{2}{2}$$

$$\Rightarrow \frac{-3}{8} - \frac{2}{8} = \frac{-3-2}{8} = \frac{-5}{8}$$

Ans.

3. Simplify the following questions :

$$(i) \frac{5}{-18} \times \frac{-9}{20} = \frac{5}{18} \times \frac{9}{20} = \frac{1 \times 1}{2 \times 4} = \frac{1}{8}$$

Ans.

$$(ii) \frac{-12}{5} \times \frac{10}{-3} = \frac{12}{5} \times \frac{10}{3} = 4 \times 2 = 8$$

Ans.

$$(iii) \frac{16}{-21} \times \frac{14}{5} = -\frac{16}{21} \times \frac{14}{5} = -\frac{16}{3} \times \frac{2}{5} = \frac{-32}{15} = -2\frac{2}{15}$$

Ans.

$$(iv) \frac{25}{-9} \times \frac{3}{-10} = \frac{25}{9} \times \frac{3}{10} = \frac{5 \times 1}{3 \times 2} = \frac{5}{6}$$

Ans.

4. Find the value and express as a rational number in standard form :

$$(i) \text{ We have, } \frac{13}{25} \div \frac{26}{15} \text{ or } \frac{13}{25} \times \frac{15}{26} \Rightarrow \frac{13 \times 15}{25 \times 26} = \frac{1 \times 3}{5 \times 2} = \frac{3}{10}$$

Ans.

$$(ii) \text{ We have, } \frac{40}{3} \div \frac{-35}{18}$$

$$\Rightarrow \frac{40}{3} \times \frac{18}{-35} = -\left[\frac{40 \times 18}{3 \times 35} \right] = -\left[\frac{8 \times 6}{7} \right] = -\frac{48}{7} = -6\frac{6}{7}$$

Ans.

$$(iii) \text{ We have, } -61 \div \left[\frac{-8}{19} \right] \text{ or } -61 \times \frac{19}{-8} = \frac{61 \times 19}{8} = 144\frac{7}{8}$$

Ans.

$$(iv) \text{ We have, } \frac{90}{99} \div (-20) \text{ or } \frac{90}{99} \times -\frac{1}{20} = -\frac{10}{11} \times \frac{1}{20} = -\frac{1}{22}$$

Ans.

5. Product of two rational numbers = 45

First rational number = -90

Now, according to the question;

$$\text{Second rational number} = \frac{\text{Product of two rational number}}{\text{Given first rational number}}$$

$$\therefore \text{Second rational number (other)} = \frac{45}{-90} = -\frac{45}{90} = -\frac{1}{2}$$

Hence, the required other rational number is $-\frac{1}{2}$.

6. Product of two rational numbers = $-\frac{81}{99}$

$$\text{Given, first rational number} = \frac{-7}{18}$$

Now, according to the given question;

$$\text{Second rational number} = \frac{\text{Product of two rational numbers}}{\text{Given first rational number}}$$

$$= \frac{\frac{-81}{99}}{\frac{-7}{18}} = \frac{81 \times 18}{99 \times 7} = \frac{9 \times 18}{11 \times 7} = \frac{162}{77} = 2\frac{8}{77}$$

Hence, the required other rational number is $2\frac{8}{77}$.

7. We have, product of two numbers = $\frac{-24}{49}$, One number = $\frac{-7}{6}$

$$\therefore \text{Other number} = \frac{-24}{49} \div \frac{-7}{6} \text{ or } \frac{-24}{49} \times \frac{-6}{7} = \frac{24 \times 6}{49 \times 7} = \frac{144}{343}$$

Hence, the required other number is $\frac{144}{343}$.

Ans.

8. We have, product of two numbers = $\frac{-5}{7}$

$$\text{Given, one number} = \frac{-15}{28}$$

$$\therefore \text{Other number} = \frac{-5}{7} \div \frac{-15}{28} \text{ or } \frac{-5}{7} \times \frac{-28}{15} = \frac{1 \times 4}{3} = \frac{4}{3} = 1\frac{1}{3}$$

Hence, the required other number is $\frac{4}{3} \left(= 1\frac{1}{3} \right)$.

9. Find $(x + y) \div (x - y)$, if

(i) $x = \frac{8}{3}$, $y = \frac{3}{8}$

Now, according to the given question;

$$\Rightarrow (x + y) \div (x - y) \text{ Putting the value of } x = \frac{8}{3} \text{ and } y = \frac{3}{8}$$

$$\begin{aligned} &\Rightarrow \left[\frac{8}{3} + \frac{3}{8} \right] \div \left[\frac{8}{3} - \frac{3}{8} \right] \Rightarrow \left[\frac{64 + 9}{24} \right] \div \left[\frac{64 - 9}{24} \right] \\ &= \frac{73}{24} \div \frac{55}{24} \text{ or } \frac{73}{24} \times \frac{24}{55} = \frac{73}{55} = 1 \frac{18}{55} \end{aligned}$$

Ans.

(ii) We have, $(x + y) \div (x - y)$;

Given, $x = \frac{2}{5}$ and $y = \frac{1}{5}$

$$\text{Now, } \left[\frac{2}{5} + \frac{1}{5} \right] \div \left[\frac{2}{5} - \frac{1}{5} \right] \Rightarrow \frac{3}{5} \div \frac{1}{5} \text{ or } \frac{3}{5} \times \frac{5}{1} = 3$$

Ans.

(iii) We have, $(x + y) \div (x - y)$,

Given $x = \frac{3}{4}$ and $y = -\frac{1}{8}$

Now, according to the given question;

$$\begin{aligned} &\left[\frac{3}{4} + \left(-\frac{1}{8} \right) \right] \div \left[\frac{3}{4} - \left(-\frac{1}{8} \right) \right] \text{ or } \left[\frac{3}{4} - \frac{1}{8} \right] \div \left[\frac{3}{4} + \frac{1}{8} \right] \\ &= \left[\frac{3}{4} \times \frac{2}{2} - \frac{1}{8} \right] \div \left[\frac{3}{4} \times \frac{2}{2} + \frac{1}{8} \right] = \left[\frac{6}{8} - \frac{1}{8} \right] \div \left[\frac{6}{8} + \frac{1}{8} \right] \\ &= \frac{5}{8} \div \frac{7}{8} = \frac{5}{8} \times \frac{8}{7} = \frac{5}{7} \end{aligned}$$

Ans.

10. Given, total cost of the rope = ₹ $18 \frac{2}{9}$

Total length of the rope = $3 \frac{2}{5}$ metres

Cost per metre of the rope = ₹ $\left[18 \frac{2}{9} \div 3 \frac{2}{5} \right]$

$$= ₹ \left[\frac{164}{9} \div \frac{17}{5} \right] = ₹ \left[\frac{164}{9} \times \frac{5}{17} \right] = ₹ \frac{820}{153} = ₹ 5 \frac{55}{153}$$

Hence, the required rate per metre of the given rope is ₹ $5 \frac{55}{153}$.

11. Given, total cost of cloth = ₹ $78\frac{1}{2}$

Total length of cloth = $5\frac{3}{8}$ metres

$$\begin{aligned}\text{Cost per metre of cloth} &= ₹ \left[78\frac{1}{2} \div 5\frac{3}{8} \right] = ₹ \left[\frac{157}{2} \div \frac{43}{8} \right] = ₹ \left[\frac{157}{2} \times \frac{8}{43} \right] \\ &= ₹ \left[\frac{157 \times 4}{43} \right] = ₹ \frac{628}{43} = ₹ 14\frac{26}{43}\end{aligned}$$

Hence, the required rate per metre of cloth is ₹ $14\frac{26}{43}$.

12. Let the first number be $\frac{-33}{5}$. The other number be x .

Now, according to the given question, $\frac{-33}{5} \div x = \frac{-11}{4}$.

$$\begin{aligned}\frac{-33}{5} \times \frac{1}{x} &= -\frac{11}{4} \quad \text{or} \quad \frac{-33}{5x} = -\frac{11}{4} \Rightarrow 5x \times 11 = 33 \times 4 \\ \Rightarrow x &= \frac{33 \times 4}{11 \times 5} = \frac{3 \times 4}{5} = \frac{12}{5} = 2\frac{2}{5}\end{aligned}$$

Hence, the required other number is $2\frac{2}{5}$.

Ans.

13. Sum of $\frac{-13}{5}$ and $\frac{13}{5}$ is $= \frac{-13}{5} + \frac{13}{5} = \frac{-13+13}{5} = \frac{0}{5} = 0$

Product of $\frac{-31}{7}$ and $\frac{30}{7}$ is $= \frac{-31}{7} \times \frac{30}{7} = -\frac{930}{49}$

Now, according to the question, we get

(Sum of given numbers) \div (Product of given numbers)

$$= \frac{0}{-\frac{930}{49}} = 0$$

Hence, the required correct answer is zero.

14. Sum of the given number and the required number = $\frac{5}{9}$

Let the required number be x . Then,

$$2\frac{5}{8} + x = \frac{5}{9}$$

$$\frac{21}{8} + x = \frac{5}{9} \quad \text{or} \quad x = \frac{5}{9} - \frac{21}{8} \Rightarrow x = \frac{5}{9} \times \frac{8}{8} - \frac{21}{8} \times \frac{9}{9}$$

$$x = \frac{40}{72} - \frac{189}{72} = \frac{40-189}{72} = \frac{-149}{72} = -2\frac{5}{72}$$

Ans.

15. Sum of the given number and the required number = $\frac{-2}{3}$

Let the required number be x , then

$$\frac{-7}{5} + x = \frac{-2}{3} \Rightarrow x = \frac{-2}{3} + \frac{7}{5}$$

or
$$x = \frac{-10 + 21}{15} = \frac{11}{15}$$

16. Let the required number be x , then

$$\frac{8}{7} - x = \frac{5}{14} \text{ or } x = \frac{8}{7} - \frac{5}{14}$$

$$x = \frac{8}{7} \times \frac{2}{2} - \frac{5}{14} \text{ or } x = \frac{16}{14} - \frac{5}{14} = \frac{11}{14}$$

Hence, the required number is $\frac{11}{14}$.

17. Sum of two numbers = $\frac{7}{19}$

Given, first number = $\frac{3}{38}$

Second number = (Sum of two numbers) – (Given first number)

$$= \frac{7}{19} - \frac{3}{38} \text{ or } \frac{7}{19} \times \frac{2}{2} - \frac{3}{38}$$

$$= \frac{14}{38} - \frac{3}{38} = \frac{14-3}{38} = \frac{11}{38}$$

Hence, the required other number is $\frac{11}{38}$.

18. Sum of two rational numbers = -98

Given, one number = $\frac{-16}{9}$

Second number = (Sum of two rational number) – (Given one number)

$$= -98 - \left(\frac{-16}{9} \right)$$

$$= -98 + \frac{16}{9} \text{ or } \frac{-98}{1} \times \frac{9}{9} + \frac{16}{9} = \frac{-882}{9} + \frac{16}{9}$$

$$= \frac{-882 + 16}{9} = \frac{-866}{9} = -96\frac{2}{9}$$

Hence, the required other number is $-96\frac{2}{9}$.

Ans.

EXERCISE 3D

1. Express the following rational numbers as decimals:

(i) $\frac{437}{999}$

We have,

$$\begin{array}{r} 999 \overline{)437.0} \left(0.4374 \right. \\ \underline{0} \\ 4370 \\ \underline{-3996} \\ 3740 \\ \underline{-2997} \\ 7430 \\ \underline{-6993} \\ 4370 \\ \underline{-3996} \\ 374 \end{array}$$

$\therefore \frac{437}{999} = 0.\overline{437}$ **Ans.**

(iii) We have, $\frac{11}{3}$

$$\begin{array}{r} 3 \overline{)11} \left(3.6666 \right. \\ \underline{-9} \\ 20 \\ \underline{-18} \\ 20 \\ \underline{-18} \\ 20 \\ \underline{-18} \\ 20 \\ \underline{-18} \\ 2 \end{array}$$

$\therefore \frac{11}{3} = 3.\overline{6}$ **Ans.**

(ii) $\frac{19}{6}$

We have,

$$\begin{array}{r} 6 \overline{)19} \left(3.16666 \right. \\ \underline{-18} \\ 10 \\ \underline{-6} \\ 40 \\ \underline{-36} \\ 40 \\ \underline{-36} \\ 40 \\ \underline{-36} \\ 40 \\ \underline{-36} \\ 4 \end{array}$$

$\therefore \frac{19}{6} = 3.\overline{16}$ **Ans.**

(iv) We have, $\frac{-19}{20}$

$$\begin{array}{r} 20 \overline{)19.0} \left(0.95 \right. \\ \underline{-0} \\ 190 \\ \underline{-180} \\ 100 \\ \underline{-100} \\ 0 \end{array}$$

$\therefore \frac{-19}{20} = -0.95$ **Ans.**

2. Which of the following rational numbers can be represented only as non-terminating repeating decimals :

(i) $\frac{5}{8}$

Given number is $\frac{5}{8}$.

We know that, a number will have a terminating decimal expansion, if its denominator is of the form $2^m \times 5^n$.

The denominator of the given fraction is 8, which can be written as 2^3 .

We can also write it as $2^3 \times 5^0$.

Since, this denominator is of the form $2^m \times 5^n$, the number will have a terminating decimal expansion.

Hence, the given statement is true for terminating decimal expansion.

(ii) Given number is $\frac{63}{56}$.

For terminating decimals, factors of denominator should be in the form $2^m \times 5^n$.

Here, denominator of $\frac{63}{56}$ is 56. So, $56 = 2 \times 2 \times 2 \times 7$.

Hence, denominator has factor other than 2 or 5.

$$\frac{63}{56} = \text{Non repeating}$$

(iii) Given number is $\frac{36}{35}$.

For terminating decimals, factors of denominator should be in the form $2^m \times 5^n$.

Here, denominator of $\frac{36}{35}$ is 35. So, $35 = 5 \times 7$, prime factor of denominator is $35 = 7 \times 5 =$ other than 5. Hence, non-terminating repeating decimal.

(iv) Given number is $\frac{2}{9}$.

When we divide 2 by 9, the result is a decimal : 0.22222222.... and so on. This decimal is a repeating decimal because the number 2 is repeated infinitely after the decimal point. The bar on the top of the 2 indicates that it repeats.

3. Express the following rational numbers as decimals:

(i) We have, $\frac{47}{20}$

The denominator of $\frac{47}{20}$ is 20. Now, we think of a natural number which when multiplied by 20 gives a power of 10.

We have, $\frac{47}{20}$

Now, multiply by 5 in numerator and denominator, we get;

$$\frac{47}{20} = \frac{47}{20} \times \frac{5}{5} = \frac{235}{100} = 2.35 \quad \text{Ans.}$$

(ii) We have, $\frac{7}{40}$

Now, we multiply in denominator and numerator by 25, then we get;

$$\frac{7}{40} = \frac{7}{40} \times \frac{25}{25} = \frac{175}{1000} = 0.175 \quad \text{Ans.}$$

(iii) We have, $\frac{37}{250}$

Now, we multiply in numerator and denominator by 4, then we get;

$$\frac{37}{250} = \frac{37}{250} \times \frac{4}{4} = \frac{148}{1000} = 0.148 \quad \text{Ans.}$$

(iv) We have, $\frac{13}{8}$

Now, we multiply in numerator and denominator by 125,

then we get, $\frac{13}{8} = \frac{13}{8} \times \frac{125}{125} = \frac{1625}{1000} = 1.625 \quad \text{Ans.}$

4. Which of the following rational numbers can be represented as terminating decimals?

(i) $-\frac{4}{7} = -0.57142$

(ii) $\frac{3}{8} = 0.375$

(iii) $\frac{-2}{5} = -0.4$

(iv) $\frac{8}{6} = \frac{4}{3} = 1.3333$

We see the above rational numbers, and get;

(ii) $\frac{3}{8}$ and (iii) $\frac{-2}{5}$ rational numbers can be represented as terminating decimal. Ans.

5. Express each of the following decimal numbers in the form $\frac{p}{q}$.

(i) 1.20

The rational number 1.20 in expanded form is written as:

$$1.20 = 1 + \frac{020}{100} = 1 + \frac{2}{10} = \frac{1 \times 10 + 2 \times 1}{10} = \frac{12}{10} = \frac{6}{5} = 1\frac{1}{5} \quad \text{Ans.}$$

$$(ii) 32.5 = 32 + \frac{5}{10} = \frac{32 \times 10 + 5 \times 1}{10} = \frac{325}{10} = 32\frac{5}{10} = 32\frac{1}{2} \quad \text{Ans.}$$

$$(iii) 87.75 = 87 + \frac{75}{100} = \frac{87 \times 100 + 7 \times 10 + 5 \times 1}{100} = \frac{8700 + 70 + 5}{100} = \frac{8775}{100}$$

$$\text{or } \frac{8775}{100} = 87\frac{75}{100} = 87\frac{3}{4} \quad \text{Ans.}$$

$$(iv) 38.5 = 38 + \frac{5}{10} = \frac{38 \times 10 + 5 \times 1}{10} = \frac{380 + 5}{10} = \frac{385}{10} = 38\frac{5}{10} = 38\frac{1}{2} \quad \text{Ans.}$$

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. The value of $\frac{8}{5} + \frac{18}{5}$ is :

$$\text{Now, } \frac{8}{5} + \frac{18}{5} = \frac{8+18}{5} = \frac{26}{5} = 5\frac{1}{5}$$

Hence, the correct option is (c).

2. The standard form of $\frac{68}{-119}$ is :

$$\frac{68}{-119} = \frac{68 \div 17}{-119 \div 17} = \frac{4}{-7}$$

[Because HCF of 68 and 119 is 17, so numerator and denominator is divide by 17.]

Hence, the correct option is $\frac{4}{-7}$.

3. $-\frac{12}{14}$ is equal to :

$$\text{Now, } -\frac{12}{14} = \frac{-[12 \div 2]}{14 \div 2} = \frac{-6}{7}$$

Hence, the correct option is (c).

4. $\frac{-48}{60}$ is equal to :

$$48 = 2 \times 2 \times 2 \times 2 \times 3$$

$$60 = 2 \times 2 \times 3 \times 5$$

$$\text{HCF} = 2 \times 2 \times 3 = 12$$

The common factor number of 48 and 60 is 12.

$$\text{Now, } \frac{-48}{60} = \frac{-[48 \div 12]}{60 \div 12} = \frac{-4}{5}$$

Hence, the correct option is $-\frac{4}{5}$.

5. $\frac{-63}{-117}$ is equal to :

The common factor of 63 and 117 is 9.

$$\text{Now, } \frac{-63}{-117} = \frac{63}{117} = \frac{63 \div 9}{117 \div 9} = \frac{7}{13}$$

Hence, the correct option is (a).

DO AND LEARN

Do yourself.

THINK, SOLVE AND LEARN

LCM of denominators of 15 and 13 is 195.

$$\begin{aligned} \text{Now, } \frac{12}{15} &= \frac{12 \times 13}{15 \times 13} = \frac{156}{195} \\ \frac{-40}{13} &= \frac{-40 \times 15}{13 \times 15} = \frac{-600}{195} \end{aligned}$$

Two greatest rational numbers are in between :

$$\frac{-600}{195} < \frac{-559}{195} < \frac{-558}{195} \dots\dots\dots < \frac{154}{195} < \frac{155}{195} < \frac{156}{195} = \frac{154}{195} \text{ and } \frac{155}{195} \quad \text{Ans.}$$



4 Exponents



EXERCISE- 4A

1. Use power notation to write each of the following in a short form:

$$(i) \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} = \left[\frac{4}{5} \right]^4 \quad \text{Ans.}$$

$$(ii) \left(\frac{-4}{3} \right) \times \left(\frac{-4}{3} \right) \times \left(\frac{-4}{3} \right) \times \left(\frac{-4}{3} \right) \times \left(\frac{-4}{3} \right) \times \left(\frac{-4}{3} \right) = \left[\frac{-4}{3} \right]^6 \quad \text{Ans.}$$

2. Express each of the following as a rational number of the form $\frac{p}{q}$:

$$(i) \left[\frac{-8}{3} \right]^5 = \left[\frac{-8 \times -8 \times -8 \times -8 \times -8}{3 \times 3 \times 3 \times 3 \times 3} \right] = \frac{-32768}{343} \quad \text{Ans.}$$

$$(ii) \left[\frac{-3}{5} \right]^2 = \left[\frac{-3 \times -3}{5 \times 5} \right] = \frac{9}{25} \quad \text{Ans.}$$

3. Express each of the following rational numbers in power notation:

$$(i) \frac{64}{125} = \frac{4 \times 4 \times 4}{5 \times 5 \times 5} = \left[\frac{4}{5} \right]^3 \quad \text{Ans.}$$

$$(ii) -\frac{1}{216} = -\frac{1}{6} \times -\frac{1}{6} \times -\frac{1}{6} = \left[-\frac{1}{6} \right]^3 \quad \text{Ans.}$$

$$(iii) \frac{343}{729} = \frac{7 \times 7 \times 7}{9 \times 9 \times 9} = \left[\frac{7}{9} \right]^3 \quad \text{Ans.}$$

$$(iv) -\frac{8}{27} = -\frac{2}{3} \times -\frac{2}{3} \times -\frac{2}{3} = \left[-\frac{2}{3} \right]^3 \quad \text{Ans.}$$

4. Find the value of each of the following :

$$(i) \left[\frac{-1}{4} \right]^2 \times 3^3 \times \left(\frac{3}{4} \right)^4$$

$$= -\frac{1}{4} \times -\frac{1}{4} \times 3 \times 3 \times 3 \times \frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} \times \frac{3}{4}$$

$$= \frac{3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}{4 \times 4 \times 4 \times 4 \times 4 \times 4} = \frac{2187}{4096} \quad \text{Ans.}$$

$$(ii) \frac{35}{7} \times \left[\frac{-1}{5} \right]^2 \times \frac{9}{81} \times \left[\frac{5}{7} \right]^4 = \frac{35}{7} \times \frac{1}{25} \times \frac{9}{81} \times \frac{625}{2401} = \frac{35 \times 6 \times 625}{7 \times 25 \times 81 \times 2401}$$

$$= \frac{5 \times 25}{9 \times 2401} = \frac{125}{21609} \quad \text{Ans.}$$

EXERCISE 4B

1. Simplify :

$$(i) \left(\frac{2}{3} \right)^2 \times \left(\frac{-2}{7} \right)^3 \times \left(\frac{7}{2} \right)^4 = \frac{4}{9} \times \frac{-8}{343} \times \frac{7 \times 7 \times 7 \times 7}{2 \times 2 \times 2 \times 2}$$

$$= -\left[\frac{2 \times 2}{3 \times 3} \times \frac{2 \times 2 \times 2}{7 \times 7 \times 7} \times \frac{7 \times 7 \times 7 \times 7}{2 \times 2 \times 2 \times 2} \right]$$

$$= -\left[\frac{2^5 \times 7^4}{2^4 \times 7^3 \times 3^2} \right] = -\left[\frac{2^{5-4} \times 7^{4-3}}{3^2} \right] = -\left[\frac{2 \times 7}{3 \times 3} \right] = -\frac{14}{9} = -1\frac{5}{9} \quad \text{Ans.}$$

$$(ii) \left[\frac{4}{3} \right]^4 \times \left[\frac{3}{4} \right]^3 \times \left[\frac{2}{3} \right]^2 = \frac{4^4}{3^4} \times \frac{3^3}{4^3} \times \frac{2^2}{3^2} = \frac{4^{4-3} \times 2^2}{3^{4-3} \times 3^2} = \frac{4 \times 4}{3 \times 9} = \frac{16}{27} \quad \text{Ans.}$$

2. Simplify :

$$\begin{aligned}
 \text{(i)} \quad \left[\frac{3}{8}\right]^2 \div \left[\frac{8}{9}\right]^2 &= \left[\frac{3}{2 \times 2 \times 2}\right]^2 \div \left[\frac{2 \times 2 \times 2}{3 \times 3}\right]^2 \\
 &= \left[\frac{3}{2^3}\right]^2 \div \left[\frac{2^3}{3^2}\right]^2 = \frac{3^2}{2^6} \div \frac{2^6}{3^4} = \frac{3^2}{2^6} \times \frac{3^4}{2^6} = \frac{3^{2+4}}{2^{6+6}} = \frac{3^6}{2^{12}} \\
 &= \frac{3 \times 3 \times 3 \times 3 \times 3 \times 3}{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2} = \frac{729}{4096} \quad \text{Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad \left[\frac{2}{7}\right]^5 \div \left[\frac{1}{7}\right]^7 &= \frac{2^5}{7^5} \div \frac{1^7}{7^7} = \frac{2^5}{7^5} \times \frac{7^7}{1} \\
 &= \frac{2^5 \times 7^{7-5}}{1} = 2^5 \times 7^2 = 32 \times 49 = 1568 \quad \text{Ans.}
 \end{aligned}$$

3. Simplify and express the result in power notation:

$$\begin{aligned}
 \text{(i)} \quad \left[\frac{5}{8}\right]^4 \times \left[\frac{5}{8}\right]^4 \div \left[\frac{5}{8}\right]^{12} \\
 &= \frac{\left[\frac{5}{8}\right]^4 \times \left[\frac{5}{8}\right]^4}{\left[\frac{5}{8}\right]^{12}} = \frac{\left[\frac{5}{8}\right]^{4+4}}{\left[\frac{5}{8}\right]^{12}} = \frac{\left[\frac{5}{8}\right]^8}{\left[\frac{5}{8}\right]^{12}} = \frac{\left[\frac{5}{8}\right]^0}{\left[\frac{5}{8}\right]^{12-8}} = \frac{1}{\left[\frac{5}{8}\right]^4} \\
 &= \frac{1}{\frac{5^4}{8^4}} = \frac{8^4}{5^4} = \left[\frac{8}{5}\right]^4 \quad \text{Ans.}
 \end{aligned}$$

$$\text{(ii)} \quad \left[\left(\frac{5}{4}\right)^4\right]^3 = \left[\frac{5}{4}\right]^{4 \times 3} = \left[\frac{5}{4}\right]^{12} \quad \text{Ans.}$$

4. Simplify :

$$\begin{aligned}
 \text{(i)} \quad (5^{-1} \div 7^{-1})^3 &= \left[\frac{1}{5} \div \frac{1}{7}\right]^3 = \left[\frac{1}{5} \times \frac{7}{1}\right]^3 \\
 &= \left[\frac{7}{5}\right]^3 = \frac{7 \times 7 \times 7}{5 \times 5 \times 5} = \frac{343}{125} = 2\frac{93}{125} \quad \text{Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad (3^{-1} \times 4^{-1})^{-1} \times 5^{(-1)^3} &= \left(\frac{1}{3} \times \frac{1}{4}\right)^{-1} \times 5^{-1} \\
 &= \left(\frac{1}{12}\right)^{-1} \times \frac{1}{5} = \frac{12}{1} \times \frac{1}{5} = \frac{12}{5} = 2\frac{2}{5} \quad \text{Ans.}
 \end{aligned}$$

5. Simplify :

$$(i) (8^2 + 3^2) \times \left[\frac{1}{2} \right]^3 = (64 + 9) \times \frac{1}{8} = \frac{73}{8} = 9\frac{1}{8} \quad \text{Ans.}$$

$$(ii) (8^2 - 3^2) \times \left(\frac{2}{3} \right)^{-3} = (64 - 9) \times \left(\frac{3}{2} \right)^3 = \frac{55 \times 27}{8} = \frac{1485}{8} = 185\frac{5}{8} \quad \text{Ans.}$$

6. Express each of the following rational numbers with a negative exponent:

Sol. (i) $(8)^5 \quad \left[\because a^{-1} = \frac{1}{a} \text{ or } \frac{1}{a} = a^{-1} \right]$

$$\therefore a^1 = \frac{1}{a^{-1}}$$

$$\text{Now, } (8)^5 = \frac{1}{8^{-5}} = \left[\frac{1}{8} \right]^{-5} \quad \text{Ans.}$$

(ii) $\left[\frac{7}{6} \right]^4$ Now, we change into negative power (exponent), then we get,

$$\left[\frac{7}{6} \right]^4 = \frac{1}{\left[\frac{7}{6} \right]^{-4}} = \left[\frac{6}{7} \right]^{-4} \quad \text{Ans.}$$

$$(iii) \left[\left(\frac{3}{2} \right)^4 \right]^{-8} = \left(\frac{3}{2} \right)^{4 \times -8} = \left(\frac{3}{2} \right)^{-32} \because [(x)^m]^n = x^{m \times n} = x^{mn}$$

7. Express each of the following rational numbers with a positive exponent:

Sol. (i) $\left(\frac{3}{5} \right)^{-5} = \frac{1}{\left(\frac{3}{5} \right)^5} = \frac{1}{3^5} = \frac{7^5}{3^5} = \left(\frac{7}{3} \right)^5 \quad \text{Ans.}$

$$(ii) 9^3 \times 9^{-9} = 9^{3+(-9)} = 9^{3-9} = 9^{-6} = \frac{1}{9^6} = \frac{1}{(3 \times 3)^6}$$

$$= \frac{1}{(3^2)^6} = \frac{1}{3^{12}} = \left[\frac{1}{3} \right]^{12} \quad \text{Ans.}$$

$$(iii) \left[\left[\frac{4}{3} \right]^{-3} \right]^{-4} = \left[\frac{4}{3} \right]^{-3 \times -4} = \left[\frac{4}{3} \right]^{12} \quad \text{Ans.}$$

8. Let $\left(\frac{3}{2} \right)^{-1}$ be multiplied by z to get $\left(-\frac{4}{9} \right)^{-1}$. Then,

$$z \times \left(\frac{3}{2} \right)^{-1} = \left(-\frac{4}{9} \right)^{-1} \Rightarrow z \times \frac{2}{3} = -\frac{9}{4}$$

$$\Rightarrow z = -\frac{9}{4} \div \frac{2}{3} \text{ or } z = -\frac{9}{4} \times \frac{3}{2} = -\frac{27}{8} = -3\frac{3}{8} \quad \text{Ans.}$$

9. Let the required number z . Then,

$$\begin{aligned} \left[-\frac{7}{2}\right]^{-8} \div z &= \left[\frac{4}{49}\right]^{-2} = \frac{\left[-\frac{7}{2}\right]^{-8}}{Z} = \left[\frac{4}{49}\right]^{-2} \\ \text{or } z &= \frac{\left[-\frac{7}{2}\right]^{-8}}{\left[\frac{4}{49}\right]^{-2}} = \frac{\left(-\frac{7}{2}\right)^{-8}}{\left[\frac{2 \times 2}{7 \times 7}\right]^{-2}} = \frac{\left(-\frac{7}{2}\right)^{-8}}{\left(\frac{2}{7}\right)^{2 \times -2}} = \frac{\left(-\frac{7}{2}\right)^{-8}}{\left(\frac{2}{7}\right)^{-4}} \\ &= \frac{\left(\frac{2}{7}\right)^4}{\left(-\frac{7}{2}\right)^8} = \frac{\frac{2^4}{7^4}}{\frac{-7^8}{2^8}} = \frac{2^4 \times 2^8}{7^4 \times (-7)^8} = \frac{2^{12}}{7^{12}} = \left[\frac{2}{7}\right]^{12} = \left[\frac{2}{7}\right]^{12} \quad \text{Ans.} \end{aligned}$$

10. Let $\left[\frac{5}{8}\right]^{-3}$ be multiplied by z to get $\left[\frac{7}{8}\right]^{-1}$, then

$$\begin{aligned} \left[\frac{5}{8}\right]^{-3} \times z &= \left[\frac{7}{8}\right]^{-1} \\ z &= \frac{\left[\frac{7}{8}\right]^{-1}}{\left[\frac{5}{8}\right]^{-3}} = \frac{\left[\frac{5}{8}\right]^3}{\frac{7}{8}} = \frac{\frac{125}{512}}{\frac{7}{8}} = \frac{125 \times 8}{512 \times 7} = \frac{125}{64 \times 7} = \frac{125}{448} \end{aligned}$$

Hence, the required number.

11.

$$\begin{aligned} 8 \times 2^{x+2} &= 32 \\ 2^3 \times 2^{x+2} &= 2^5 \\ 2^{x+2+3} &= 2^5 \\ 2^{x+5} &= 2^5 \end{aligned}$$

[\because Base are same on both sides, so we will solve by exponent.]

$$\begin{aligned} x+5 &= 5 \\ x &= 5-5 \\ x &= 0 \end{aligned}$$

Hence, the required value of x is 0.

Ans.

MULTIPLE CHOICE QUESTIONS

1. The power notation of $\left(\frac{-1}{3}\right) \times \left(\frac{-1}{3}\right) \times \left(\frac{-1}{3}\right) \times \left(\frac{-1}{3}\right)$ is

$$\left(\frac{-1}{3}\right) \times \left(\frac{-1}{3}\right) \times \left(\frac{-1}{3}\right) \times \left(\frac{-1}{3}\right) = \left(\frac{-1}{3}\right)^4$$

Hence, the correct option is (c).

2. The power notation of $\frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5}$ is :

$$\frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} = \left(\frac{1}{5}\right)^5$$

Hence, the correct option is (d).

3. The value of $\left(\frac{1}{6}\right)^{-3}$ is $\left(\frac{1}{6}\right)^{-3} = (6)^3 = 6 \times 6 \times 6 = 216$

Hence, the correct option is (a).

4. The value of $\left(\frac{-2}{5}\right)^3$ is $\left(\frac{-2}{5}\right)^3 = \frac{-2}{5} \times \frac{-2}{5} \times \frac{-2}{5} = \frac{-8}{125}$

Hence, the correct option is (c).

5. The value of $(-3)^{-5} \times (-1)$ is :

$$\begin{aligned} (-3)^{-5} \times (-1) &= \frac{1}{(-3)^5} \times -1 = \frac{1}{-3 \times -3 \times -3 \times -3 \times -3} \times -1 \\ &= \frac{1}{-243} \times -1 = \frac{1}{243} \end{aligned}$$

Hence, the correct option is (b).

DO AND LEARN

Do yourself.

THINK, SOLVE AND LEARN

We know that $a^0 = 1$, then we get the value of $\left[\frac{7}{11}\right]^0 = 1$

Now, according to the question:

$$\left(\frac{2}{3}\right)^2 \times \left[\frac{7}{11}\right]^0 = \left(\frac{2}{3}\right)^2 \times 1 = \frac{2}{3} \times \frac{2}{3} \times 1 = \frac{4}{9}$$

Ans.



Algebraic Expressions



EXERCISE- 5A

1. (i) $-8x^2y$ = Variable (ii) 17 = Constants and (iii) $\frac{15}{9}m^2n$ = Variable

We see options (i) and (iii) are variables and (ii) is constant.

2. (i) Consider an expression $13x + 31y - 13$. The term of this expression are **13x**, **31y** and **-13**. IIIrd term, -13 having no variable as its factor is called the **constant** term. **Ans.**

- (ii) Consider an expression $57x + 31y - 23z + 2$. The term of this expression are **57x**, **31y**, **-23z** and **2**. IV term, $+2$ having no variable as its factor is called the **constant**. **Ans.**

3. Write all the factors of the following terms :

- (i) $14y^2z$

Factors of the terms are $14, 7, y, z$.

$$14y^2z = 14, y, y, z$$

Ans.

- (ii) $\frac{-13}{7}m^2n^2p = \frac{-13}{7}m.m.n.n.p$

Ans.

4. (i) Given expression = $5y^2 - 17x^2 + 8x$

Term with factor $x = 8x$

Coefficients of $x^2 = -17$

So, we can say that the coefficients of x^2 is -17 .

Ans.

- (ii) Given expression = $6m^2 - \frac{17}{8}m^2n + p^2$

Coefficients of m^2n is $-\frac{17}{8}$.

Ans.

5. (i) x in $3xy^2 + 8zy - 9y^2$

Given expression = $3xy^2 + 8zy - 9y^2$

Coefficient of x is $3y^2$.

- (ii) Write the coefficients of yz in $3x^2 + 5yzx^2$.

Given expression = $3x^2 + 5yzx^2$

Coefficient of yz is $5x^2$.

Ans.

6. (i) Expression = $3 - x^2 y$

Terms with factor $x^2 = -x^2 y$ and the coefficient of x^2 is $-y$. **Ans.**

- (ii) Terms with factor $x^2 = 3x^2 yz^2$ and the coefficient of x^2 is $3yz^2$.

Ans.

- (iii) Terms with factor $x^2 = 3x^2 y$ and the coefficient of x^2 is $3y$. **Ans.**

- (iv) Terms with factor $x^2 = 20x^2 y$ and the coefficient of x^2 is $20y$. **Ans.**

7. Identify the pairs of like terms from the following pairs :

Sol. Like terms (i) $4x^2 y, -5yx^2$ and (iii) $13mn^2, -\frac{15}{9}n^2m$

(ii) $13y^2x^2z, 14xz^2y$ and (iv) $18y^2x, 13xy^2z$ are not like terms.

8. Write any three like terms for the following :

(i) Like terms are : $5x^2 y, 2x^2 y, 3x^2 y$

(ii) Like terms are : $-10m^2 n^2, 5m^2 n^2, 7m^2 n^2$

(iii) Like terms are : $10y^3 z, -6y^3 z, \frac{3}{5}y^3 z$

(iv) Like terms are : $\frac{13}{8}xy^2, -10xy^2, -8xy^2$

9. (i) $7x^2 y - 3xy + 8$ is **Trinomial**.

(ii) $\frac{14x^2 y}{z}$ is **Monomial**.

(iii) $21x^2 y + 6y^2$ is **Binomial**.

(iv) $\frac{-19x^3 y^2 z}{12}$ is **Monomial**.

10. (i) Degree of the $4x^2 + 5y^2 - 3xyz$ is 3. **Ans.**

(ii) Degree of the $12m^2 n^2 p - 8p^2 + 7m^4$ is 5. **Ans.**

(iii) Degree of the $p^2 q^6 + 8pq + 7$ is 8. **Ans.**

(iv) Degree of the $-9p^2 + 8q^3 + 7p^2 q^3$ is 5. **Ans.**

EXERCISE 5B

1. Add the following terms :

(i) $10mnp, -6n^2 p^2, -7mpn, 8p^2 n^2, 3mnp$

$$\Rightarrow 10mnp + (-6n^2 p^2) + (-7mpn) + 8p^2 n^2 + 3mnp$$

$$\begin{aligned}
 &= (10mnp + 3mnp - 7mnp) + (-6n^2 p^2 + 8p^2 n^2) \\
 &= (13mnp - 7mnp) + (2p^2 n^2) \\
 &= 6mnp + 2p^2 n^2
 \end{aligned}$$

Ans.

$$\begin{aligned}
 \text{(ii)} \quad &8x^2 y, 6yx^2, -3x^2 y^2, 8y^2 x^2, 3x^2 y \\
 \Rightarrow &8x^2 y + 6yx^2 + (-3x^2 y^2) + 8y^2 x^2 + 3x^2 y \\
 &= (8x^2 y + 6x^2 y + 3x^2 y) + (-3x^2 y^2 + 8x^2 y^2) \\
 &= 17x^2 y + 5x^2 y^2
 \end{aligned}$$

Ans.

2. Add the following algebraic expressions using horizontal method.

Sol. Adding Algebraic expressions :

Horizontal Method :

$$\begin{aligned}
 \text{(i)} \quad &10x^2 - 3xy + 4y^2, 2x^2 + 2xy - 6y^2, -3x^2 - 5y^2 + 8xy \\
 &(10x^2 - 3xy + 4y^2) + (2x^2 + 2xy - 6y^2) + (-3x^2 - 5y^2 + 8xy) \\
 &= \underbrace{10x^2 + 2x^2 - 3x^2} - \underbrace{3xy + 2xy + 8xy} + \underbrace{4y^2 - 6y^2 - 5y^2} \\
 &= x^2(10 + 2 - 3) - xy(3 - 2 - 8) + y^2(4 - 6 - 5) \\
 &= x^2(9) - xy(-7) + y^2(-7) \\
 &= 9x^2 + 7xy - 7y^2
 \end{aligned}$$

Ans.

$$\begin{aligned}
 \text{(ii)} \quad &-15x^2 - 5y^2 + 2xy, 4y^2 + 2xy - 3x^2, 4x^2 - 3xy - 2y^2 \\
 &= (-15x^2 - 3x^2 + 4x^2) + (-5y^2 + 4y^2 - 2y^2) + (20xy + 2xy - 3xy) \\
 &= x^2(-15 - 3 + 4) + y^2(-5 + 4 - 2) + xy(2 + 2 - 3) \\
 &= x^2(-14) + y^2(-3) + xy(1) = -14x^2 - 3y^2 + xy
 \end{aligned}$$

Ans.

3. Add the following algebraic expressions using column method:

$$\text{(i)} \quad x^3 + 6x^2, 4x^2 - 6x^3 + 2, 8x^2 + 2x^3 + 4$$

Column method :

$$\begin{array}{r}
 x^3 + 6x^2 \\
 -6x^3 + 4x^2 + 2 \\
 + 2x^3 + 8x^2 + 4 \\
 \hline
 -3x^3 + 18x^2 + 6
 \end{array}$$

$$\text{(ii)} \quad 5x^2 + 3y^2 - 2z^2, 4x^2 - 6z^2 + 2y^2, 4z^2 - 6y^2 + 2x^2$$

$$\begin{array}{r}
 5x^2 + 3y^2 - 2z^2 \\
 4x^2 + 2y^2 - 6z^2 \\
 + 2x^2 - 6y^2 + 4z^2 \\
 \hline
 11x^2 - y^2 - 4z^2
 \end{array}$$

Ans.

4. Given, three sides of triangles are :

First side = $(4x + 6y - 3)$ cm

Second side = $(5x + 2)$ cm

Third side = $(2x + y + 4)$ cm

We know that, the perimeter of triangle

= Sum of given three sides of triangle

= (First side + Second side + Third side) unit

= $(4x + 6y - 3)$ cm + $(5x + 2)$ cm + $(2x + y + 4)$ cm

= $(4x + 5x + 2x + 6y + y - 3 + 2 + 4)$ cm

= $11x + 7y + 3$ cm

Hence, the required perimeter of triangle is $(11x + 7y + 3)$ cm.

5. Given, $P = 2m^2 + 5n^2 - 6$, $Q = m^2 - 6n^2 + 8$ and $R = 3n^2 + 4m^2 + 2$

Now, according to the question; [Putting the value of P, Q and R]

$2P + Q + 3R = 2(2m^2 + 5n^2 - 6) + (m^2 - 6n^2 + 8) + 3(3n^2 + 4m^2 + 2)$

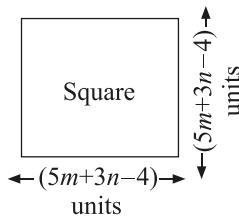
= $4m^2 + 10n^2 - 12 + m^2 - 6n^2 + 8 + 9n^2 + 12m^2 + 6$

= $(4m^2 + m^2 + 12m^2) + (10n^2 - 6n^2 + 9n^2) - (12 + 8 + 6)$

= $(17m^2 + 13n^2 + 2)$

Ans

6. Given, side of square = $(5m + 3n - 4)$ units



We know that, the perimeter of square = $4 \times (\text{side})$ unit

Now, Perimeter of square = $4 \times (5m + 3n - 4)$ units

= $(20m + 12n - 16)$ units

Hence, the required perimeter of square is $(20m + 12n - 16)$ units. **Ans.**

7. Given, length of rectangle

$$= (4x^2 + 5y - 3) \text{ cm}$$

$$\text{Breadth of rectangle} = (3x^2 - 2y + 2) \text{ cm}$$

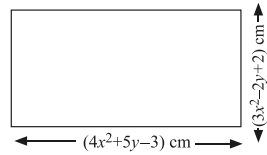
We know that,

$$\text{Perimeter of rectangle} = 2[\text{Length} + \text{Breadth}] \text{ unit}$$

Now, according to the given question, we get

$$\begin{aligned} \text{Perimeter of rectangle} &= 2[(4x^2 + 5y - 3) + (3x^2 - 2y + 2)] \text{ cm} \\ &= 2[(4x^2 + 5y - 3 + 3x^2 - 2y + 2)] \text{ cm} \\ &= 2(4x^2 + 3x^2 + 5y - 2y - 3 + 2) \text{ cm} \\ &= 2(7x^2 + 3y - 1) \text{ cm} = (14x^2 + 6y - 2) \text{ cm} \end{aligned}$$

Hence, the required perimeter of rectangle is $(14x^2 + 6y - 2) \text{ cm}$.



EXERCISE 5C

1. Subtract the following:

(i) $15xyz$ from $-3xyz$

$$\Rightarrow -3xyz - (15xyz) = -3xyz - 15xyz$$

$$\Rightarrow -xyz (+3 + 15) = -xyz (18) = -18xyz$$

Ans.

(ii) $7a^2b^2$ from $8a^2b^2$

$$\Rightarrow 8a^2b^2 - 7a^2b^2$$

$$\Rightarrow a^2b^2 (8 - 7) = a^2b^2 (1) = a^2b^2$$

Ans.

2. Subtract the following:

(i) $y^3 - 3x^2 + 5xy^2$ from $6xy^2 - 2y^3 + 4x^2$

$$= (6xy^2 - 2y^3 + 4x^2) - (y^3 - 3x^2 + 5xy^2)$$

$$= 6xy^2 - 2y^3 + 4x^2 - y^3 + 3x^2 - 5xy^2$$

$$\text{or } 6xy^2 - 5xy^2 - 2y^3 - y^3 + 4x^2 + 3x^2$$

$$\text{or } xy^2 (6 - 5) - y^3 (2 + 1) + x^2 (4 + 3) = xy^2 - 3y^3 + 7x^2$$

Ans.

(ii) $15xy - 7y^2 + 4x^2$ from $8y^2 - 3x^2 - 8xy$

$$\Rightarrow (8y^2 - 3x^2 - 8xy) - (15xy - 7y^2 + 4x^2)$$

$$\Rightarrow 8y^2 - 3x^2 - 8xy - 15xy + 7y^2 - 4x^2$$

$$\Rightarrow 8y^2 + 7y^2 - 3x^2 - 4x^2 - 8xy - 15xy$$

$$= y^2 (8 + 7) - x^2 (3 + 4) - xy (8 + 15)$$

$$\Rightarrow 15y^2 - 7x^2 - 23xy$$

Ans.

(i) $-x^2 + 7xy - 3y^2$ from $3x^2 + 8xy - 2y^2$

(i) $-x^2 + 7xy - 3y^2$ from $3x^2 + 8xy - 2y^2$

$$3x^2 + 8xy - 2y^2$$

$$\begin{array}{r} -x^2 \quad + \quad 7xy \quad - \quad 3y^2 \\ (+) \quad (-) \quad (+) \\ \hline 4x^2 \quad + \quad xy \quad + \quad y^2 \end{array} \quad \begin{array}{l} \leftarrow \text{Changing the sign of each term of} \\ \text{subtrahend.} \\ \leftarrow \text{Adding} \end{array}$$

Hence, the required truly answer is $4x^2 + xy + y^3$.

(ii) $9a^2 - 6ab + 5b^2$ from $7b^2 + 8ab - 3a^2$

$$7b^2 + 8ab - 3a^2$$

$$\begin{array}{rcll} 5b^2 & - & 6ab & + & 9a^2 & \leftarrow \text{Changing the sign of each term of} \\ (-) & & (+) & & (-) & \text{subtrahend.} \\ \hline 2b^2 & + & 14ab & - & 12a^2 & \leftarrow \text{Adding} \end{array}$$

Hence, required the truly answer is $2b^2 + 14ab - 12a^2$. **Ans.**

(iii) $7m^2 + 2mn - 6n^2$ from $5m^2 + 2mn - 3n^2$

$$5m^2 + 2mn - 3n^2$$

$$\begin{array}{rcl} 5m^2 & + & 2mn & - & 3n^2 \\ 7m^2 & + & 2mn & - & 6n^2 \leftarrow \text{Changing the sign of each term of} \\ (-) & & & & \text{subtrahend.} \\ \hline -2m^2 & + & 0 & + & 3n^2 \leftarrow \text{Adding} \end{array}$$

Hence, required the truly answer is $-2m^2 + 3n^2$. **Ans.**

<p>4. Sum of $3ab - 6b^2$ and $5a^2 + 2ab$</p> $= (3ab - 6b^2) + (5a^2 + 2ab)$ $= \underset{\substack{\uparrow \qquad \qquad \qquad \uparrow \\ = 5ab + 5a^2 - 6b^2}}{3ab - 6b^2 + 5a^2 + 2ab}$	<p>Sum of $-6ab + 8a^2$ and $-4b^2 + 8ab$</p> $= (-6ab + 8a^2) + (-4b^2 + 8ab)$ $= -6ab + 8a^2 - 4b^2 + 8ab$ $= -6ab + 8ab + 8a^2 - 4b^2$ $= 2ab + 8a^2 - 4b^2$
--	---

$$2ab + 8a^2 - 4b^2$$

$$\begin{array}{r} 5ab \quad + \quad 5a^2 \quad - \quad 6b^2 \leftarrow \text{Changing the sign of each term of} \\ (-) \quad \quad \quad (-) \quad \quad \quad (+) \quad \quad \quad \text{subtrahend.} \\ \hline -3ab \quad + \quad 3a^2 \quad + \quad 2b^2 \quad \textbf{Ans.} \end{array}$$

5. Let z should be added. Then,

$$(6m^2 + 8mnp - 3n^2) + z = (-7mnp - 8m^2)$$

$$\text{Now, } z = (-7mnp - 8m^2) - (6m^2 + 8mnp - 3n^2)$$

$$\Rightarrow z = -7mnp - 8m^2 - 6m^2 - 8mnp + 3n^2$$

$$\Rightarrow z = -7mnp - 8mnp - 8m^2 - 6m^2 + 3n^2$$

$$\Rightarrow z = mnp(-7-8) + m^2(-8-6) + 3n^2 = -15mnp - 14m^2 + 3n^2$$

Hence, $(-15mnp, -14m^2 + 3n^2)$ should be added.

6. Let z should be subtracted. Then,

$$(3p^2 + 5pm - 6m^2) - z = (-3pm - 4p^2 + 8m^2)$$

$$\Rightarrow z = (3p^2 + 5pm - 6m^2) - (-3pm - 4p^2 + 8m^2)$$

$$\Rightarrow z = 3p^2 + 5pm - 6m^2 + 3pm + 4p^2 - 8m^2$$

$$\Rightarrow z = 3p^2 + 4p^2 + 5pm + 3pm - 6m^2 - 8m^2$$

$$\Rightarrow z = p^2(3+4) + pm(5+3) + m^2(-6-8)$$

$$\Rightarrow z = 7p^2 + 8pm - 14m^2$$

Hence, $7p^2 + 8pm - 14m^2$ should be added.

Ans.

EXERCISE 5D

1. If $x = 4$, find the value of the following:

(i) Value of $(x + 3)$ when $x = 4$ is $(4 + 3) = 7$

Ans.

(ii) Value of $(9 - 3x)$ when $x = 4$ is $(9 - 3 \times 4) = (9 - 12) = -3$

Ans.

(iii) Value of $(3x - 6)$ when $x = 4$ is $(3 \times 4 - 6) = (12 - 6) = 6$

Ans.

2. Find the value of the following expressions if $x = 3$ and $y = -2$.

(i) Value of $(5x + 4y - 6)$ when $x = 3$ and $y = -2$ is

$$(5 \times 3 + 4 \times -2 - 6) = \{15 + (-8 - 6)\} = (15 - 14) = 1$$

Hence, the required value of $(5x + 4y - 6)$ is 1.

(ii) Value of $(2x^2 - 6xy + 16)$, when $x = 3$, $y = -2$ is

$$\{2 \times (3)^2 - 6 \times 3 \times (-2) + 16\} = (18 + 36 + 16) = 70$$

Ans.

(iii) Value of $(4x + 6y)$, when $x = 3$, $y = -2$ is

$$(4 \times 3 + 6 \times -2) = 0$$

Ans.

3. Find the value of the following expressions if $a = -2$ and $b = 3$.

(i) Value of $16a + 4 - 5b^2$, when $a = -2$ and $b = 3$ is

$$16 \times (-2) + 4 - 5 \times (3)^2 = -32 + 4 - 45 = -73$$

Ans.

(ii) Value of $a^4 + 2ab^2 - 6b^2$, when $a = -2$ and $b = 3$ is

$$\begin{aligned} & (-2)^4 + 2 \times -2 \times (3)^2 - 6 \times (3)^2 \\ & = 16 - 36 - 54 = -90 + 16 = -74 \end{aligned}$$

Ans.

(iii) Value of $8a^2 + 5b - 6$, when $a = -2$ and $b = 3$ is

$$\begin{aligned} & 8 \times (-2)^2 + 5 \times 3 - 6 \\ & = 32 + 15 - 6 = 41 \end{aligned}$$

Ans.

4. Find the value of the following expressions if $m = 2$, $n = -1$, $a = 3m$ and $b = 5n$.

(i) Value of $m^2 + 3mn - n^2$, when $m = 2$, $n = -1$, then

$$(2)^2 + 3 \times 2 \times (-1) - (-1)^2 = 4 - 6 - 1 = -7 + 4 = -3,$$

Hence, the required value of $(m^2 + 3mn - n^2)$ is -3 .

Ans.

(ii) Value of $a^2 + 4ab + b^2$, when $a = 3m$ and $b = 5n$, then

$$= (3m)^2 + 4 \times 3m \times 5n + (5n)^2 = 9m^2 + 60mn + 25n^2 \quad \dots(i)$$

Now, putting the value of $m = 2$ and $n = -1$ in the equation (i), then we get

$$\begin{aligned} & = 9 \times (2)^2 + 60 \times 2 \times (-1) + 25 \times (-1)^2 \\ & = 36 - 120 + 25 = 61 - 120 = -59 \end{aligned}$$

Hence, the required value of $a^2 + 4ab + b^2$ is -59 .

Ans.

(iii) Value of $(m^3 - n^3 + 3mn)$ when $m = 2$, $n = -1$, then

$$\begin{aligned} & = (2)^3 - (-1)^3 + (3 \times 2 \times -1) = 8 - (-1) - 6 \\ & = 8 + 1 - 6 = 9 - 6 = 3 \end{aligned}$$

Hence, the required value of $(m^3 - n^3 + 3mn)$ is 3 .

Ans.

5. $5y^2 + 6y - a = 8$ (Given), when $y = 2$

$$5(2)^2 + 6 \times 2 - a = 8 \Rightarrow 20 + 12 - a = 8 \text{ or } a = 32 - 8 = 24$$

Hence, the required value of a is 24 .

6. $6m^2 - 5mn + 2b = -10$, when $m = 1$ and $n = -2$

We get, $6 \times (1)^2 - 5 \times 1 \times (-2) + 2 \times b = -10$

$$6 + 10 + 2b = -10 \text{ or } 16 + 2b = -10$$

$$\Rightarrow 2b = -10 - 16 \Rightarrow 2b = -26 \text{ or } b = -13$$

Hence, the required value of b is -13 .

Ans.

EXERCISE 5E

Multiply the following algebraic expressions ;

1. $5x^4$ and $4x^7$

$$\Rightarrow 5x^4 \times 4x^7 = 20x^{4+7} = 20x^{11}$$

Ans.

2. m^2 and $3n^2$

$$\Rightarrow m^2 \times 3n^2 = 3m^2n^2$$

Ans.

3. $2m^2$ and $3m$

$$\Rightarrow 2m^2 \times 3m = 6m^{2+1} = 6m^3$$

Ans.

4. $15xy^2z$ and $5x^2yz^2$

$$\Rightarrow 15xy^2z \times 5x^2yz^2 = 15 \times 5x^{1+2}y^{2+1}z^{1+2} = 75x^3y^3z^3$$

Ans.

5. $20k^2$ and $5k^3$

$$\Rightarrow 20k^2 \times 5k^3 = 20 \times 5k^{2+3} = 100k^5$$

Ans.

6. $2x^2$ and $5xy$

$$\Rightarrow 2x^2 \times 5xy = 2 \times 5x^{2+1}y = 10x^3y$$

Ans.

7. $15x^2y^3z^8$ and $2xy^8z$

$$\Rightarrow 15x^2y^3z^8 \times 2xy^8z = 15 \times 2x^{2+1}y^{3+8}z^{8+1} = 30x^3y^{11}z^9$$

Ans.

8. $90c^4$ and $\frac{1}{45}c^2$

$$\Rightarrow 90c^4 \times \frac{1}{45}c^2 = 2c^{4+2} = 2c^6$$

Ans.

9. $15xy$ and $\frac{1}{15}xy$

$$\Rightarrow 15xy \times \frac{1}{15}xy = x^{1+1}y^{1+1} = x^2y^2$$

Ans.

10. $\frac{1}{3}xy^2z$ and $3x^2y^{-2}z^{-1}$

$$\begin{aligned} \Rightarrow \frac{1}{3}xy^2z \times 3x^2y^{-2}z^{-1} &= \frac{1}{3} \times 3x \cdot x^2y^2 \cdot y^{-2}z \cdot z^{-1} \\ &= x^{1+2}y^{2+(-2)}z^{1+(-1)} = x^3y^{2-2}z^{1-1} \\ &= x^3y^0z^0 = x^3 \times 1 \times 1 = x^3 \end{aligned}$$

Ans.

11. $2t$ and $3t^2$

$$\Rightarrow 2t \times 3t^2 = 6t^{1+2} = 6t^3$$

Ans.

12. $16xy$ and $\frac{1}{4}x^{-1}y^{-1}$

$$\begin{aligned}\Rightarrow 16xy \times \frac{1}{4}x^{-1}y^{-1} &= 16 \times \frac{1}{4}xy \times x^{-1}y^{-1} = 4x^{1+(-1)}y^{1+(-1)} \\ &= 4x^{1-1}y^{1-1} = 4x^0y^0 = 4 \times 1 \times 1 = 4\end{aligned}$$

Ans.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. The factors of $4x^2y^2$ are:

$$4x \cdot x \cdot y \cdot y$$

The correct option is (a).

2. The sum of $3ab$, $-2ab$ and $8ab$ is:

$$= (3ab) + (-2ab) + (8ab) = 3ab - 2ab + 8ab = ab(3 - 2 + 8) = 9ab$$

The correct option is (a).

3. The expression $3x^2y + 4x - 4yx^2 - 8xy$ is a quadrinomial.

The correct option is (d).

4. The numerical coefficient of x in $15x + 3y$ is 15.

The correct option is (b).

5. Algebraic expression for “one-fifth of the product of numbers x and y subtracted from 20” is

$$\Rightarrow \left(20 - \frac{1}{5}xy\right) = \left(20 - \frac{xy}{5}\right)$$

The correct option is (a).

6. The terms in the expression $4xy^2 - 5x$ are:

$$4xy^2, -5x.$$

The correct option is (d).

DO AND LEARN

Do yourself.

THINK, SOLVE AND LEARN

Given,

$$6x^2 - 5xy + 2a = -10$$

...(i)

Now, putting the value of $x = 1$ and $y = -2$ in above equation (i), then we get,

$$\Rightarrow 6 \times (1)^2 - 5 \times 1 \times (-2) + 2a = -10$$

$$\Rightarrow 6 + 10 + 2a = -10$$

$$\Rightarrow 2a = -10 - 6 - 10 \quad \text{or} \quad 2a = -26$$

$$\Rightarrow a = \frac{-26}{2} = -13$$

Hence, the required value of a is -13 .



Simple Equations



EXERCISE 6A

1. Write LHS and RHS of each of the following questions :

Sol. (i) $2x - 8 = 9$ (ii) $8x = 80$ (iii) $13x + 14y = 19 + x$

(i) LHS = $2x - 8$ and RHS = 9

(ii) LHS = $8x$ and RHS = 80

(iii) LHS = $13x + 14y$ and RHS = $19 + x$

2. Convert the following statements to equations:

(i) 7 added to a number gives 21.

By adding x to 7, we get 21

Now, $7 + x = 21$

(ii) A number subtracted from 25 gives 13.

$$25 - x = 13$$

Ans.

(iii) Five times a number is 25.

$$5x = 25$$

Ans.

(iv) The sum of 8 and twice a number is 32 $\Rightarrow 8 + 2x = 32$

Ans.

3. Write an equation of the following:

(i) Let Aditya's age be x years.

Kirti's father age = 28 years older than Aditya = $(28 + x)$ years

Combined age = 46 years

Now, according to question,

$$\Rightarrow x + 28 + x = 46$$

$$\Rightarrow 2x + 28 = 46$$

$$\Rightarrow 2x = 46 - 28 \text{ or } 2x = 18 \Rightarrow x = \frac{18}{2} = 9 \text{ years}$$

Age of Aditya is 9 years.

The required expression is $2x + 28 = 46$.

Ans.

(ii) Babita needs more ₹ 60 to have extract money required to buy the chair.

Given, Babita has = ₹ 240

Cost of the chair = ₹ 300

$$\Rightarrow 240 + x = 300 \Rightarrow x = ₹ (300 - 240) \Rightarrow x = ₹ 60$$

The required expression is $x = ₹ (300 - 240)$.

(iii) Let the total number of toys in the box be x .

Gave to friends = 63 toys

Left in the box = 31 toys

Now, according to the question,

$$\Rightarrow x - 63 = 31 \Rightarrow x = 31 + 63 \quad \text{or} \quad x = 94 \text{ toys}$$

Hence, required the number of toys in the box is 91 toys and required expression is $x - 63 = 31$. **Ans.**

4. Convert the following equations into statements:

(i) $2x + 6 = 120$ = Six added to two times of a number gives 120.

(ii) $2x + 5 = 15$ \Rightarrow Five added to two times of a number gives 15. **Ans.**

(iii) $\frac{4x}{9} = 16$ \Rightarrow Four times of a number divide by nine is 16. **Ans.**

5. Find the solution of the following equations by trial and error method:

(i) $x + 4 = 10$

x	LHS	RHS	Condition satisfied ? Yes/No
1	$1 + 4$	10	No
2	$2 + 4$	10	No
3	$3 + 4$	10	No
4	$4 + 4$	10	No
5	$5 + 4$	10	No
6	$6 + 4$	10	Yes

Hence, the required value of x is 6 for the condition of satisfaction.

(ii) $b - 6 = 4$

b	LHS	RHS	Condition satisfied ? Yes/No
1	$1 - 6$	4	No
2	$2 - 6$	4	No
3	$3 - 6$	4	No
4	$4 - 6$	4	No
5	$5 - 6$	4	No
6	$6 - 6$	4	No
7	$7 - 6$	4	No
8	$8 - 6$	4	No
9	$9 - 6$	4	No
10	$10 - 6$	4	Yes

Hence, the required value for satisfaction is 10.

(iii) $7q = 49$

q	LHS	RHS	Condition satisfied ? Yes/No
1	7×1	49	No
2	7×2	49	No
3	7×3	49	No
4	7×4	49	No
5	7×5	49	No
6	7×6	49	No
7	7×7	49	Yes

Hence, the required value for satisfaction condition is 7.

EXERCISE 6B

Solve the following equations by the method of balancing :

1. We have, $x + 16 = 36$

Subtract 16 the both sides,

We get, $x + 16 - 16 = 36 - 16 \Rightarrow x = 20$

Hence, required the value of x is 20.

2. We have, $x + 7 = 13$

Subtract 7 the both sides,

We get, $x + 7 - 7 = 13 - 7 \Rightarrow x = 6$

Hence, the required value of x is 6.

3. We have, $2m + 5 = 15$

Subtract 5 the both sides, we get;

$$2m + 5 - 5 = 15 - 5 \Rightarrow 2m = 10$$

Now, again, divide by 2 both sides then we get;

$$m = 5$$

Hence, the required value of m is 5.

4. $13 + y = 21$

Subtract 13 both sides, then we get;

$$13 - 13 + y = 21 - 13 \Rightarrow y = 8$$

Hence, the required value of y is 8 for balancing.

Ans.

5. $\frac{x}{13} = 15$

Multiply both sides by 13, we get;

$$\frac{x}{13} \times 13 = 15 \times 13 \Rightarrow x = 195$$

Hence, the required value of $x = 195$ for balancing.

6.
$$\frac{6x}{5} = 180^\circ$$

Multiply both sides by $\frac{5}{6}$, then we get;

$$\frac{6x}{5} \times \frac{5}{6} = 180 \times \frac{5}{6} \Rightarrow x = 150$$

Hence, the required value of x is 150 for balancing.

7.
$$7d + 5 = 40$$

Subtract 5 both sides, we get

$$7d + 5 - 5 = 40 - 5 \Rightarrow 7d = 35$$

Now, divide both sides by 7, we get;

$$\frac{7}{7}d = \frac{35}{7} \Rightarrow d = 5$$

Hence, the required value of d is 5.

8.
$$5x + 20 = 40$$

Subtract both sides by 20, then we get;

$$5x + 20 - 20 = 40 - 20 \Rightarrow 5x = 20$$

Divide both sides by 5, then we get;

$$\frac{5x}{5} = \frac{20}{5} \text{ or } x = 4$$

Hence, the required value of x is 4.

9.
$$4q + 3 = 43$$

Subtract 3 both sides, we get;

$$4q + 3 - 3 = 43 - 3 \Rightarrow 4q = 40$$

Divide both sides by 4, then we get;

$$\frac{4q}{4} = \frac{40}{4} \Rightarrow q = 10$$

Hence, the required value of q is 10.

10.
$$15 + 2r = 55$$

Subtract 15 both sides, we get

$$15 - 15 + 2r = 55 - 15 \Rightarrow 2r = 40$$

Divide both sides by 2, we get;

$$\frac{2r}{2} = \frac{40}{2} \text{ or } r = 20$$

Hence, the required value of r is 20 for balance.

11. $3x - 3 = 6$

Add 3 both sides, then we get;

$$3x - 3 + 3 = 6 + 3 \Rightarrow 3x = 9$$

Divide both sides by 3, we get;

$$\frac{3x}{3} = \frac{9}{3} \quad \text{or} \quad x = 3$$

Hence, the required value of x is 3 for balancing.

12. $8x - 4 = 60$

Add 4 both sides, we get ;

$$8x - 4 + 4 = 60 + 4 \Rightarrow 8x = 64$$

Divide both sides by 8, we get ;

$$\frac{8x}{8} = \frac{64}{8} \quad \text{or} \quad x = 8$$

Hence, the required value of x is 8 for balancing.

EXERCISE 6C

1. Solve the following equations:

(i) $2x - 7 = 11$

Let us first solve the equation by balancing. Add 7 to both the sides of the equation. That is

$$2x - 7 + 7 = 11 + 7$$

$$\Rightarrow 2x = 18$$

Now, divide both sides by 2, we get

$$\frac{2x}{2} = \frac{18}{2} \quad \text{or} \quad x = 9$$

Therefore, $x = 9$ is the required solution.

Ans.

(ii) $6 + x = 9$

Let us first solve the equation by balancing. Subtract 6 both sides of equation.

That is, $6 + x - 6 = 9 - 6$ or $x = 3$

Hence, the required value of x is 3.

Ans.

(iii) $x - 8 = 24$

Let us first solve the equation by balancing. Add 8 both sides, we get

$$x - 8 + 8 = 24 + 8 \quad \text{or} \quad x = 32$$

Therefore, $x = 32$ is the required solution.

Ans.

(iv) $x - 19 = 8$

Let us first solve the equation by balancing. Add 19 to both sides, we get

$$x - 19 + 19 = 8 + 19 \text{ or } x = 27$$

Therefore, $x = 27$ is the required solution.

(v) $x + 25 = 54$

Let us first solve the equation by balancing. Subtract 25 both sides, we get

$$x + 25 - 25 = 54 - 25 \text{ or } x = 29$$

Therefore, $x = 29$ is required solution.

(vi) $3x - 5 = 28$

Let us first solve the equation by balancing. Add 5 both sides, then we get

$$3x - 5 + 5 = 28 + 5 \text{ or } 3x = 33$$

Now, divide both sides by 3, we get

$$\frac{3x}{3} = \frac{33}{3} \text{ or } x = 11$$

Therefore, $x = 11$ is required solution.

2. Solve the following equations :

Sol. (i) $7m = 35$

Let us solve this equation by dividing both the sides of the equation by 7.

$$\frac{7m}{7} = \frac{35}{7} \Rightarrow m = 5$$

Therefore, $m = 5$ is the required solution.

(ii) $9m = 81$

Let us solve this equation by dividing both the sides of the equation by 9.

$$\frac{9m}{9} = \frac{81}{9} \Rightarrow m = 9$$

Therefore, $m = 9$ is the required solution.

(iii) $4x = 56$

Let us solve this equation by dividing both the sides of the equation by 4.

$$\frac{4x}{4} = \frac{56}{4} \Rightarrow x = 14$$

Therefore, $x = 14$ is the required solution.

(iv) $\frac{x}{7} = 3$

To solve the given equation, multiply both sides by 7, we get

$$\frac{x}{7} \times 7 = 3 \times 7 \Rightarrow x = 21$$

Therefore, $x = 21$ is the required solution.

(v) $\frac{x}{5} = 25$

Multiply both sides by 5, we get

$$\frac{x}{5} \times 5 = 25 \times 5 \Rightarrow x = 125$$

Therefore, $x = 125$ is the required solution.

(vi) $\frac{x}{9} = 7$

Multiply both sides by 9, we get

$$\frac{x}{9} \times 9 = 7 \times 9 \Rightarrow x = 63$$

Therefore, $x = 63$ is the required solution.

3. Solve the following equations :

(i) $3x + 4 = 34$

Let us first solve the given equation by balancing. Subtract 4 the both sides of the equation. That is,

$$3x + 4 - 4 = 34 - 4$$

$$\Rightarrow 3x = 30$$

Now, dividing both sides by 3,

$$\Rightarrow \frac{3x}{3} = \frac{30}{3} \text{ or } x = 10$$

Hence, the required value of x is **10** for balancing equation.

(ii) $10x - 64 = 26$

Let us first solve the given equation by balancing. Add 64 to the both sides of the equation, then we get

$$10x - 64 + 64 = 26 + 64$$

$$\Rightarrow 10x = 90$$

$$\frac{10x}{10} = \frac{90}{10} \quad [\text{Dividing both sides by 10}]$$

$$\Rightarrow x = 9$$

Hence, the required value of x is 9 for balancing equation.

(iii) $2x - 56 = 12$

Let us first solve the given equation by balancing. Add 56 to the both sides of the equation, then we get

$$2x - 56 + 56 = 12 + 56$$

$$\Rightarrow 2x = 68$$

Now, dividing both sides by 2, we get $x = 34$

Hence, the required value of x is **34** for balancing.

(iv) $\frac{x}{7} + 1 = 2$

Let us first solve the equation by balancing. Subtract 1 both sides of the equation, we get

$$\frac{x}{7} + 1 - 1 = 2 - 1 \text{ or } \frac{x}{7} = 1$$

Now, multiply both sides by 7, then we get

$$\Rightarrow \frac{x}{7} \times 7 = 1 \times 7 \Rightarrow x = 7$$

Hence, the required value of x is 7.

(v) $\frac{x}{3} - 42 = 18$

Let us first solve the given equation by balancing. Add 42 to the both sides of the equation. That is,

$$\frac{x}{3} - 42 + 42 = 18 + 42 \text{ or } \frac{x}{3} = 60$$

Now, multiply both sides by 3, we get

$$\Rightarrow \frac{x}{3} \times 3 = 60 \times 3 \Rightarrow x = 180$$

Hence, the required value of x is 180.

EXERCISE-6D

1. Let the required number be x . Then, three times x is $3x$.

It is given equal to 36. So, we get $3x = 36$

$$\Rightarrow x = \frac{36}{3} = 12$$

Hence, the required number is 12.

2. Let the required number be x .

According to the question, $x + \frac{x}{2} = 66$

$$\Rightarrow \frac{2x+x}{2} = 66 \text{ or } \frac{3x}{2} = 66 \Rightarrow x = \frac{66 \times 2}{3} = 44$$

Hence, the required number is 44.

3. Let the first number be x ; and second number be $(64-x)$

According to the question,

$$\Rightarrow x \times 3 = (64-x) \text{ or } 3x = 64-x$$

$$\Rightarrow 3x+x=64 \quad \text{or} \quad 4x=64 \Rightarrow x = \frac{64}{4} \Rightarrow x=16$$

Hence, the required first number is 16 and other number will be
 $(64-x) = (64-16) = 48$.

4. I am three times as old age my son's age.

Let, my son's age present age be x .

My age = $3x$

Five years later, my son's age = $(x+5)$ years

My age = $(3x+5)$ years

Five years later, I shall be two and half times as old as my son

$$\Rightarrow 3x+5 = 2\frac{1}{2} \times (x+5) \Rightarrow 3x+5 = \frac{5}{2}(x+5)$$

$$\Rightarrow 6x+10 = 5x+25 \quad (\text{Comparing both sides})$$

$$\Rightarrow 6x-5x = 25-10$$

$$\Rightarrow x = 15$$

My son's age present age be 15 years and my age = $3x = 3 \times 15 = 45$ years

Hence, my age and son's age are 45 years and 15 years.

Ans.

5. Let the three integers be x , $x+2$ and $x+4$. Then,

$$3x = 2(x+4) + 3$$

$$\Rightarrow 3x = 2x + 8 + 3$$

$$\Rightarrow 3x - 2x = 11 \quad \Rightarrow \quad x = 11$$

$$\text{Third integer} = (x+4) = (11+4) = 15$$

Hence, the required third integer is 15.

6. Given, one-third of one-fourth of the number = 15

Three-tenth of that number = ?

$$\text{Let, the number is 'n', then, } \frac{1}{3} \times \frac{1}{4} \times n = 15$$

$$\Rightarrow \frac{n}{12} = 15 \quad [\text{Multiply both sides by 2}]$$

$$\Rightarrow \frac{n}{12} \times 12 = 15 \times 12 \Rightarrow n = 180$$

Now, put the value of $n = 180$, then three-tenths of that number will be

$$= \frac{3}{10} \times n = \frac{3}{10} \times 180 = \frac{3 \times 180}{10} = 3 \times 18 = 54$$

Hence, three-tenths of that number is 54.

Ans.

7. Let $x =$ First integer

Let $(x + 1) =$ Second integer and let $(x + 2) =$ Third integer

So, $x + (x + 1) + (x + 2) = 228$

$$\Rightarrow x + x + x + 1 + 2 = 228 \Rightarrow 3x + 3 = 228$$

Adding -3 both sides, then we get

$$3x + 3 + (-3) = 228 + (-3)$$

$$\text{or} \quad 3x + 3 - 3 = 228 - 3 \text{ or } 3x = 228 - 3$$

$$\Rightarrow 3x = 225$$

Now, dividing both sides by 3, then we get

$$\Rightarrow \frac{3x}{3} = \frac{225}{3} \text{ or } x = 75, \text{ is the first integer.}$$

$$\Rightarrow (x + 1) = (75 + 1) = 76, \text{ is the second integer.}$$

$$\text{and} \quad (x + 2) = (75 + 2) = 77, \text{ is the third integer.}$$

$$\text{Therefore,} \quad x = \text{First integer} = 75$$

$$x + 1 = \text{Second integer} = 75 + 1 = 76$$

$$x + 2 = \text{Third integer} = 75 + 2 = 77$$

Ans.

8. Let the units digit be x . Then,

$$\text{Ten's digit} = (9 - x)$$

$$\therefore \text{Number} = 10 \times (9 - x) + x$$

$$\text{or} \quad \text{Number} = (90 - 10x + x) = (90 - 9x)$$

Adding 27 to the number $90 - 9x$, we get

$$(90 - 9x + 27) = 117 - 9x = 9x + 9,$$

$$\text{Now,} \quad 117 - 9x = 9x + 9 \Rightarrow 9x + 9x = 117 - 9 \Rightarrow 18x = 108$$

$$\text{or} \quad x = \frac{108}{18} = \frac{18}{3} = 6$$

$$\text{Therefore,} \quad \text{units digit} = 6$$

$$\text{and} \quad \text{ten's digit} = (9 - x) = (9 - 6) = 3$$

$$\text{Hence, the required number is } = 3 \times 10 + 6 = 36$$

[**Proof :** A number has two digits whose sum is 9. So, $(6 + 3)$ is 9.]

10. Let Sunil's present age be x years.

After 15 years, Sunil will be four times as old.

$$\Rightarrow 4 \times x = x + 15$$

$$\Rightarrow 4x - x = 15 \text{ or } 3x = 15 \Rightarrow x = 5 \text{ years}$$

Hence, Sunil present age is 5 years.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. Given, $2x - 8 = 6$ or $2x = 6 + 8$

$$\Rightarrow 2x = 14 \text{ or } x = \frac{14}{2} = 7$$

Required value of x is 7. Hence, correct option is (c).

2. Given, $\frac{x}{2} = 8$ or $x = 8 \times 2$ or $x = 16$

Required value of x is 16. Hence, correct option is (d).

3. Given, $5x = 45$ or $x = \frac{45}{5}$ or $x = 9$

Required value of x is 9. Hence, correct option is (d).

4. Given, $x - 45 = 15$ or $x = 15 + 45$ or $x = 60$

Required value of x is 60. Hence, the correct option is (c).

5. Given, $x + 9 = 10 \Rightarrow x = 10 - 9$ or $x = 1$

Required value of x is 1.

Hence, the correct option is (b).

DO AND LEARN

Do yourself.

THINK , SOLVE AND LEARN

1. In $\triangle ABC$,

We know that, $\angle A + \angle B + \angle C = 180^\circ$

Here, $\angle A = 85^\circ$, $\angle B = x^\circ$ and $\angle C = 40^\circ$

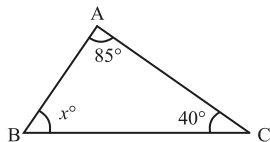
Now, $85^\circ + x^\circ + 40^\circ = 180^\circ$

$$\Rightarrow x^\circ + 125^\circ = 180^\circ$$

$$\Rightarrow x^\circ = 180^\circ - 125^\circ$$

$$\Rightarrow x^\circ = 55^\circ$$

Hence, the required value of $x^\circ = 55^\circ$.





Ratio, Proportion and Unitary Method



EXERCISE 7A

1. Express the following ratios in the simplest form:

- (i) 25 : 100 (ii) 25 mL : 75 mL (iii) 50 g : 4 kg (iv) 6 mm : 6 cm

Sol. (i) Given, ratio 25 : 100

The HCF of 25 and 100 is 25.

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

Hence, the simplest form of 25 : 100 is 1 : 4.

Ans.

- (ii) We have, 25 mL : 75 mL

The HCF of 25 and 75 is 25.

$$\text{Therefore, } 25 \text{ mL} : 75 \text{ mL} = \frac{(25 \div 25) \text{ mL}}{(75 \div 25) \text{ mL}} = \frac{1 \text{ mL}}{3 \text{ mL}} = 1 \text{ mL} : 3 \text{ mL}$$

Hence, the simplest form of 25 mL : 75 mL is 1 mL : 3 mL

Ans.

- (iii) We have, 50 g : 4 kg

We know that 1 kg = 1000 g

$$\Rightarrow 50 \text{ g} : 4000 \text{ g}$$

The HCF of 50 and 4000 is 50.

Therefore, 50 g : 4 kg

$$\Rightarrow 50 \text{ g} : 4000 \text{ g} = \frac{(50 \div 50) \text{ g}}{(4000 \div 50) \text{ g}} = \frac{1 \text{ g}}{80 \text{ g}} = 1 \text{ g} : 80 \text{ g}$$

Hence, the required value of 50 g : 4 kg is 1 g : 80 g or 1 : 80.

Ans.

- (iv) We have, 6 mm : 6 cm

We know that 1 cm = 10 mm

Therefore, 6 mm : 60 mm [HCF of 6 and 60 is 6.]

$$\Rightarrow \frac{(6 \div 6) \text{ mm}}{(60 \div 6) \text{ mm}} = \frac{1 \text{ mm}}{10 \text{ mm}} = 1 \text{ mm} : 10 \text{ mm}$$

Hence, the required value of 6 mm : 6 cm is 1 mm : 10 mm.

$$\Rightarrow 1 : 10$$

Ans.

2. Write to equivalent ratios for the following ratios :

$$(i) 5 : 25 = \frac{5}{25} = \frac{5 \times 2}{25 \times 2} = \frac{10}{50} = 10 : 50$$

$$(ii) 3 : 4 = \frac{3}{4} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8} = 6 : 8$$

$$(iii) 2 : 7 = \frac{2}{7} = \frac{2 \times 2}{7 \times 2} = \frac{4}{14} = 4 : 14$$

$$(iv) 8 : 5 = \frac{8}{5} = \frac{8 \times 2}{5 \times 2} = \frac{16}{10} = 16 : 10$$

Ans.

3. Determine whether the following ratios are equivalent or not.

(i) 3 : 4 and 18 : 24

We have, $3 : 4 = \frac{3}{4}$ [It is simplest form.]

Similarly, $18 : 24 = \frac{18}{24}$ [HCF of 18 and 24 is 6.]

$$= \frac{18 \div 6}{24 \div 6} = \frac{3}{4}$$

Now, by comparing the two fractions, we can observe that both the fractions are equal. (yes)

Hence, $3 : 4 = 18 : 24$

(ii) 4 : 5 and 20 : 25

We have, $4 : 5 = \frac{4}{5}$ [It is simplest form.]

Similarly, $20 : 25 = \frac{20}{25}$ [HCF of 20 and 25 is 5.]

$$= \frac{20 \div 5}{25 \div 5} = \frac{4}{5}$$

Now, by comparing the two fractions, we can observe that both the fractions are equal. Hence, 4 : 5 and 20 : 25 are equal. (Yes)

(iii) 7 : 4 and 49 : 28

We have, 7 : 4 and 49 : 28

$$7 : 4 = \frac{7}{4} \text{ [It is simplest form.]}$$

Similarly, $49 : 28 = \frac{49}{28}$ [HCF of 49 and 28 is 7]

$$\frac{49}{28} = \frac{49 \div 7}{28 \div 7} = \frac{7}{4}$$

Therefore, the ratio 7 : 4 and 49 : 28 are equivalent. (Yes)

(iv) $6 : 11$ and $42 : 55$

We have, $6 : 11$ and $42 : 55$

$$6 : 11 = \frac{6}{11} \text{ [It is simplest form.]}$$

Similarly, $42 : 55 = \frac{42}{55}$ [HCF of 42 and 55 is 1.]

Therefore, $6 : 11$ and $42 : 55$ are not equivalent. (No)

4. Compare the following ratios :

(i) $5 : 2$ and $20 : 4$

(ii) $2 : 3$ and $4 : 6$

(iii) $4 : 6$ and $24 : 36$

(iv) $6 : 7$ and $42 : 56$

Sol. (i) We have, $5 : 2 = \frac{5}{2}$ [It is in simplest form.]

Similarly, $20 : 4 = \frac{20}{4}$ [HCF of 20 and 4 is 4.]

$$= \frac{20 \div 4}{4 \div 4} = \frac{5}{1} = 5$$

Now, according to question, comparing :

$$\frac{5}{2} < 5 \text{ or } 5 : 2 < 20 : 4 \quad \textbf{Ans.}$$

(ii) We have, $2 : 3 = \frac{2}{3}$ [It is in simplest form.]

Similarly, $4 : 6 = \frac{4}{6}$ [HCF of 4 and 6 is 2.]

$$\Rightarrow \frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{2}{3}$$

Now, according to the question : comparing $\frac{2}{3} = \frac{2}{3}$ or $2 : 3 = 4 : 6$

Therefore, the ratios $2 : 3$ and $4 : 6$ are equivalent. **Ans.**

(iii) We have, $4 : 6 = \frac{4}{6}$ [HCF of 4 and 6 is 2.]

$$\Rightarrow \frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{2}{3}$$

Similarly, $24 : 36 = \frac{24}{36}$ [HCF of 24 and 36 is 12.]

$$\frac{24}{36} = \frac{24 \div 12}{36 \div 12} = \frac{2}{3}$$

$$\therefore 4 : 6 = 24 : 36$$

Therefore, the comparing position of $4 : 6$ and $24 : 36$ are equivalent.

Ans.

(iv) We have $6 : 7 = \frac{6}{7}$ [$\frac{6}{7}$ is in simplest form.]

Similarly, $42 : 56 = \frac{42}{56}$ [HCF of 42 and 56 is 14.]

$$\text{Now, } \frac{42}{56} = \frac{42 \div 14}{56 \div 14} = \frac{3}{4}$$

Therefore, the comparing position of $6 : 7$ and $42 : 56$ are not equivalent.

$\therefore 6 : 7 > 42 : 56$ **Ans.**

5. The ratio of Monu's share to Sonu's share = $5 : 3$

That means, if we divide the total amount of money into 8 equal parts.

Then, Sonu has 3 parts while Monu has 5 parts.

It is given that Monu received ₹ 1250

$$\Rightarrow 5 \text{ parts} = ₹ 1250$$

$$\Rightarrow 1 \text{ part} = ₹ \frac{1250}{5} = ₹ 250$$

If 1 part is ₹ 250, then 3 parts = ₹ $3 \times 250 = ₹ 750$

Therefore, Sonu received = ₹ 750

Total amount = ₹ $1250 + ₹ 750 = ₹ 2000$ **Ans.**

6. Perimeter of a triangle = 48 cm (Given)

Let the required length of triangle be x .

Now, length of sides of triangle according to the given ratios are :

Length of first side of triangle = $3x$

Length of second side of triangle = $4x$

and Length of third side of triangle = $5x$

Perimeter of triangle = Sum of all three sides

$$\text{Now, } 48 = 3x + 4x + 5x$$

$$\Rightarrow 12x = 48 \Rightarrow x = \frac{48}{12} = 4, \text{ value of } x \text{ is } 4. \quad \textbf{Ans.}$$

7. Given, total weight = 45 gms and ratio between gold and copper is $7 : 2$.

Gold weight + Copper weight = Total weight

$$\Rightarrow 7x + 2x = 45$$

$$\Rightarrow 9x = 45 \text{ or } x = \frac{45}{9} \text{ or } x = 5$$

\therefore Gold weight = $7x = 7 \times 5 = 35$ gms

Copper weight = $2x = 2 \times 5 = 10$ gms **Ans.**

8. Given, ratio in between two numbers = 2 : 3

Let the two numbers $2x$ and $3x$.

Larger number = $30 + \text{half of the smaller number}$

$$\Rightarrow 3x = 30 + 2x \times \frac{1}{2}$$

$$\Rightarrow 3x = 30 + x \Rightarrow 3x - x = 30$$

$$\Rightarrow 2x = 30 \quad \text{or} \quad x = \frac{30}{2} = 15$$

$$\therefore \text{Larger number} = 3x = 3 \times 15 = 45$$

$$\text{Smaller number} = 2x = 2 \times 15 = 30$$

So, the numbers are 30 and 45.

Ans.

EXERCISE 7B

1. State if each pair forms a proportion.

(i) We have $12 : 24 :: 3 : 4$

In a proportion $a : b :: c : d$, we always have $(a \times d) = (b \times c)$,

That is, Product of extremes = Product of means

Now, $12 : 24 :: 3 : 4$

$$12 \times 4 = 24 \times 3 \Rightarrow 48 = 72 \quad \text{No} \quad \text{Ans.}$$

(ii) We have, $6 : 9 :: 2 : 3$

We know that

Product of extremes = Product of means

$$\Rightarrow 6 \times 3 = 9 \times 2 \text{ or } 18 = 18 \quad \text{Yes} \quad \text{Ans.}$$

(iii) We have, $4 : 2 :: 20 : 6$

We know that

Product of extremes = Product of means

$$\Rightarrow 4 \times 6 = 2 \times 20 \text{ or } 24 = 40 \quad \text{No} \quad \text{Ans.}$$

(iv) We have, $4 : 3 :: 8 : 6$

We know that

Product of extremes = Product of means

$$\Rightarrow 4 \times 6 = 3 \times 8$$
$$\Rightarrow 24 = 24 \quad \text{Yes} \quad \text{Ans.}$$

(v) We have, $25 \text{ cm} : 1 \text{ m} :: ₹ 40 : ₹ 160$

We know that $1 \text{ m} = 100 \text{ cm}$

Now, $25 \text{ cm} : 100 \text{ cm} :: ₹ 40 : ₹ 160$

Product of extremes = Product of means

$$25 \times 160 = 100 \times 40$$

$$4000 = 4000$$

Yes

Ans.

(vi) We have, 200 mL : 25 L :: ₹ 4 : ₹ 50

We know that 1 L = 1000 mL

Now, 200 mL : 25000 mL :: ₹ 4 : ₹ 50

Product of extremes = Product of means

$$\Rightarrow 200 \times 50 = 25000 \times 4 \text{ or } 10000 = 100000 \text{ No} \quad \mathbf{Ans.}$$

2. Find the value of x in each of the following proportions.

(i) We have, $64 : 16 :: x : 4$

We know that,

Product of extremes = Product of means

$$\Rightarrow 64 \times 4 = 16 \times x \Rightarrow x = \frac{64 \times 4}{16}$$

$$\Rightarrow x = 4 \times 4 = 16$$

So, $64 : 16 :: x : 4$ and value of x is 16.

Ans.

(ii) We have, $x : 4 :: 22 : 2$

We know that,

Product of extremes = Product of means

$$\Rightarrow x \times 2 = 4 \times 22 \text{ or } x = \frac{4 \times 22}{2} \text{ or } x = 2 \times 22 = 44$$

So, $x : 4 :: 22 : 2$ and value of x is 44.

Ans.

(iii) We have, $125 : x :: 725 : 5$

We know that ,

Product of extremes = Product of means

$$\Rightarrow 125 \times 5 = x \times 725 \Rightarrow x = \frac{125 \times 5}{725} \Rightarrow x = \frac{25}{29} = 0.862$$

So, $125 : x :: 725 : 5$ and value of x is **0.862**.

Ans.

(iv) We have, $130 : 10 :: 26 : x$

We know that,

Product of extremes = Product of means

$$\Rightarrow 130 \times x = 10 \times 26$$

$$\Rightarrow x = \frac{10 \times 26}{130} = \frac{26}{13} = 2 \text{ or } x = 2$$

So, $130 : 10 :: 26 : x$ and value of x is **2**.

Ans.

(v) We have, $524 : 2 :: x : 10$

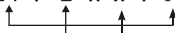
In a proportion $a : b :: c : d$, we always have ;



$$a \times d = b \times c$$

Now according to question, $524 : 2 :: x : 10$

We know that,



Product of extremes = Product of means

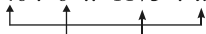
$$\Rightarrow 524 \times 10 = 2 \times x$$

$$\Rightarrow x = \frac{524 \times 10}{2} \text{ or } x = 524 \times 5 = 2620$$

So, $524 : 2 :: x : 10$ and value of x is **2620**.

Ans.

(vi) We have, $2346 : 6 :: 1173 : x$



We know that,

Product of extremes = Product of means

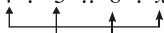
$$\Rightarrow 2346 \times x = 6 \times 1173$$

$$\Rightarrow x = \frac{6 \times 1173}{2346} \text{ or } x = 3$$

So, $2346 : 6 :: 1173 : x$ and value of x is **3**.

Ans.

(vii) We have, $4 : 3 :: 8 : x$



We know that,

Product of extremes = Product of means

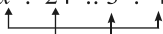
$$\Rightarrow 4 \times x = 3 \times 8 \Rightarrow x = \frac{3 \times 8}{4} = 6$$

$$\therefore x = 6$$

So, $4 : 3 :: 8 : x$ and value of x is **6**.

Ans.

(viii) We have, $x : 24 :: 3 : 4$



We know that,

Product of extremes = Product of means

$$\Rightarrow x \times 4 = 24 \times 3 \Rightarrow x = \frac{24 \times 3}{4} = 18$$

$$\therefore x = 18$$

So, $x : 24 :: 3 : 4$ and value of x is **18**.

Ans.

EXERCISE 7C

1. Let x number of metres of cloth can be bought in ₹ 600.

$$\text{Then, cost of one metre} = ₹ \frac{600}{x} \quad \dots(i)$$

and cost of 30 metres of cloth is ₹ 3900.

$$\text{Then, cost of one metre cloth} = ₹ \frac{3900}{130} \quad \dots(ii)$$

So, from equation (i) and (ii), we get

$$\begin{aligned} ₹ \frac{600}{x} &= ₹ \frac{3900}{130} \text{ or } \frac{600}{x} = \frac{3900}{130} \text{ or } \frac{600}{x} = \frac{390}{13} \\ \Rightarrow x &= \frac{600 \times 13}{390} = \frac{600}{30} = 20 \text{ metres} \end{aligned}$$

Hence, the required length of cloth in ₹ 600 is 20 metres. **Ans.**

2. For 75 quantity food least for 32 days.

The quantity of food available = 75×32

Now, 35 students leave the hostel.

$$\text{Number of days food will get} = \frac{75 \times 32}{40} = \frac{75 \times 8}{10} = \frac{15 \times 8}{2} = 60 \text{ days}$$

3. 78 words type in 3 minutes, then in,

$$1 \text{ minute} = \frac{78}{3} = 26 \text{ words}$$

$$\text{To taken total time for typing 364 words} = \frac{364}{26} = 14 \text{ minutes}$$

Hence, taken time to typing 364 word is 14 minutes. **Ans.**

4. Let x km covered distance in 24.2 litres.

$$\text{Now, according proportion} \Rightarrow \frac{102}{x} = \frac{6.8}{24.2} \text{ or } 6.8 \times x = 102 \times 24.2$$

$$\Rightarrow x = \frac{102 \times 24.2}{6.8} = 363 \text{ km}$$

Hence, the required covered distance in 24.2 litre is 363 Km. **Ans.**

5. 90 kilograms person with mass contains 60 kg of water.

$$1 \text{ kg person with mass contains} = \frac{60}{90} \text{ kg water}$$

$$50 \text{ kg person with mas contains} = \frac{60}{90} \times 50 \text{ kg water}$$

$$= \frac{2}{3} \times 50 \text{ kg water}$$

$$= \frac{100}{3} \text{ kg water} = 33.33 \text{ kg}$$

6. 30 dozen of bananas cost is = ₹ 300

$$1 \text{ dozen of bananas cost is} = ₹ \frac{300}{30}$$

$$5 \text{ dozens of bananas cost is} = ₹ \frac{300}{30} \times 5 = ₹ 50$$

Hence, the required value of 5 dozens of bananas cost is ₹ 50. **Ans.**

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. The simplest form of 96 : 780 is:

HCF of 96 and 780 is 12. Then,

$$96 : 780 = \frac{96 \div 12}{780 \div 12} = \frac{8}{65} = 8 : 65$$

Hence, the simplest form of 96 : 780 is 8 : 65. So, the correct option is (a).

2. Sum of ratio = 3 + 2

$$\text{First part} = \frac{700 \times 3}{5} = 140 \times 3 = 420$$

$$\text{Second part} = \frac{700 \times 2}{5} = 140 \times 2 = 280$$

So, the correct option (b). **Ans.**

3. If 5 : x :: 75 : 30, then the value of x :

$$\Rightarrow 5 : x :: 75 : 30$$

We know that, Product of extremes = Product of means

$$\Rightarrow 5 \times 30 = x \times 75 \text{ or } x = \frac{5 \times 30}{75} = \frac{5 \times 6}{15} = 2$$

Hence, required value of x is 2. So, the correct option is (b). **Ans.**

4. 12 pens cost = ₹ 960

$$1 \text{ pen cost} = ₹ \frac{960}{12} = ₹ 80$$

$$\therefore 15 \text{ pens cost is } ₹ 80 \times 15 = ₹ 1200$$

Hence, correct option is (c).

5. The unit of ratio is expressed as **none**.
The correct option is (d).

DO AND LEARN

Do yourself

THINK, SOLVE AND LEARN

Cost of 6 sharpeners is = ₹ 36

Cost of 1 sharpener is = ₹ $\frac{36}{6}$

Cost of 15 sharpeners is ₹ $\frac{36}{6} \times 15 = ₹ 90$

∴ Required value of 15 sharpeners is ₹ 90.



8 Percentage and Its Applications



EXERCISE 8A

1. Convert each of the following fractions into a percentage.

(i) We have, $\frac{4}{5} = \frac{4}{5} \times 100 = 4 \times 20 = 80\%$

Therefore, $\frac{4}{5} = 80\%$

(ii) We have, $\frac{111}{25} = \frac{111}{25} \times 100 = 444\%$

Therefore, $\frac{111}{25} = 444\%$

(iii) We have, $\frac{5}{50} = \frac{5}{50} \times 100 = 5 \times 2 = 10\%$

Therefore, $\frac{5}{50} = 10\%$

(iv) We have, $\frac{15}{25} = \frac{15}{25} \times 100 = 15 \times 4 = 60\%$

Therefore, $\frac{15}{25} = 60\%$

2. Convert each of the following percents into a fraction :

(i) We have, $3\% = \frac{3}{100}$

Therefore, $3\% = \frac{3}{100}$

Ans.

$$(ii) \text{ We have, } 195\% = \frac{195}{100} = \frac{39}{20}$$

$$\text{Therefore, } 195\% = \frac{39}{20} \quad \text{Ans.}$$

$$(iii) \text{ We have, } 82\% = \frac{82}{100} = \frac{41}{50}$$

$$\text{Therefore, } 82\% = \frac{41}{50} \quad \text{Ans.}$$

$$(iv) \text{ We have, } 63\% = \frac{63}{100}$$

$$\text{Therefore, } 63\% = \frac{63}{100} \quad \text{Ans.}$$

3. Convert each of the following decimals into a percentage.

$$(i) \text{ We have, } 0.2 = 0.2 \times 100 = 20\%$$

$$\text{Therefore, } 0.2 = 20\%$$

$$(ii) \text{ We have, } 45.6 = 45.6 \times 100 = 4560\%$$

$$\text{Therefore, } 45.6 = 4560\%$$

$$(iii) \text{ We have, } 0.006 = 0.006 \times 100 = 0.6\%$$

$$\text{Therefore, } 0.006 = 0.6\%$$

$$(iv) \text{ We have, } 3.63 = 3.63 \times 100 = 363\%$$

$$\text{Therefore, } 3.63 = 363\%$$

4. Convert each of the following per cents into a decimal.

$$(i) \text{ We have, } 27\% = \frac{27}{100} = 0.27$$

$$\text{Hence, the required value is } 0.27 \quad \text{Ans.}$$

$$(ii) \text{ We have, } 90\% = \frac{90}{100} = 0.9$$

$$\text{Hence, the required value is } 0.9 \quad \text{Ans.}$$

$$(iii) \text{ We have, } 134\% = \frac{134}{100} = 1.34$$

$$\text{Hence, the required value is } 1.34 \quad \text{Ans.}$$

$$(iv) \text{ We have, } 93\% = \frac{93}{100} = 0.93.$$

$$\text{Hence, the required value is } 0.93 \quad \text{Ans.}$$

5. Convert each of the following ratio into a percentage.

(i) We have, $1 : 10 = \frac{1}{10} \times 100 = 10\%$

Therefore, $1 : 10 = 10\%$ **Ans.**

(ii) We have, $6 : 25 = \frac{6}{25} \times 100 = 24\%$

Therefore, $6 : 25 = 24\%$ **Ans.**

(iii) We have, $48 : 148 = \frac{48}{148} \times 100 = 32.432\%$

Therefore, $48 : 148 = 32.432\%$ **Ans.**

(iv) We have, $64 : 100 = \frac{64}{100} \times 100 = 64\%$

Therefore, $64 : 100 = 64\%$ **Ans.**

6. Convert each of the following per cents into a ratio.

(i) We have, $10\% = \frac{10}{100} = 1 : 10$

Therefore, $10\% = 5 : 4$ **Ans.**

(ii) We have, $96\% = \frac{96}{100} = \frac{24}{25} = 24 : 25$

Therefore, $96\% = 24 : 25$ **Ans.**

(iii) We have, $125\% = \frac{125}{100} = \frac{5}{4} = 5 : 4$

Therefore, $125\% = 5 : 4$ **Ans.**

(iv) We have, $92\% = \frac{92}{100} = \frac{46}{50} = \frac{23}{25} = 23 : 25$

Therefore, $92\% = 23 : 25$ **Ans.**

EXERCISE-8B

1. Find the value of the following:

(i) Value of 75% of 150 $= \frac{75}{100} \times 150 = \frac{75 \times 15}{10}$
 $= \frac{75 \times 3}{2} = \frac{225}{2} = 112.5$ **Ans.**

(ii) Value of 40% of 120 $= \frac{40}{100} \times 120 = 48$ **Ans.**

(iii) Value of 80% of 600 $= \frac{80}{100} \times 600 = 80 \times 6 = 480$ **Ans.**

$$(iv) \text{ Value of } 55\% \text{ of } 180 = \frac{55}{100} \times 180 = \frac{55 \times 18}{10} = 99 \quad \text{Ans.}$$

$$2. \text{ Value of increase} = (125 - 80) = 45$$

$$\text{Increase value in per cent} = \frac{45}{80} \times 100 = \frac{45}{8} \times 10 = \frac{450}{8} = 56.25\%$$

Hence, the required increase value is 56.25%.

$$3. \text{ Price of a cycle is increased from ₹ 2100 to ₹ 2520.}$$

$$\text{Value of increase} = ₹ (2520 - 2100) = ₹ 420$$

$$\text{Required percentage of increase} = \frac{420}{2100} \times 100 = \frac{420}{21} = 20\% \quad \text{Ans.}$$

Therefore, required percentage of increase is 20%.

$$4. \text{ We have, } 15\% \text{ of } 200 \text{ is } = \frac{15}{100} \times 200 = 30$$

According to question, number which is 15% less than 200 is

$$(200 - 30) = 170$$

Therefore, required value is 170.

$$5. \text{ Let the amount be } x.$$

$$\text{Therefore, } 10\% \text{ of } x = ₹ 1000 \text{ or } \frac{10}{100} \times x = ₹ 1000$$

$$\Rightarrow \frac{x}{10} = ₹ 1000 \text{ or } x = ₹ 10000$$

So, the required amount is ₹ 10,000. Ans.

$$6. \text{ Total students} = 20 \text{ (Given)}$$

$$\text{Good in science} = 70\%$$

$$\text{Number of students good in science is} = 70\% \text{ of } 20$$

$$= \frac{70}{100} \times 20 = 14 \text{ students}$$

Now, number of students are not good in science

$$= \text{Total students} - \text{Good in science students}$$

$$= (20 - 14) \text{ students} = 6 \text{ students} \quad \text{Ans.}$$

Hence, the required students are not good in science is 6. Ans.

$$7. (i) \text{ We have, } 46\% \text{ of } 92 \text{ is } \frac{46}{92} \times 100 = 100 \times \frac{1}{2} = 50\%$$

Therefore, 50% of 92 is 46. Ans.

(ii) **Concept :** 15 paise of (2 rupees 70 paise) equal to 5.55%.

Because, we need to convert both of the data provided in the question to a similar quantity, *i.e.*, either both to rupees or both to paise.

We know that 1 rupees = 100 paise

Therefore, 2 rupees 70 paise = (2×100) paise + 70 paise
 $= (200 + 70)$ paise = 270 paise

Now, 15 paise of 270 paise $= \frac{15}{270} \times 100 = \frac{15}{27} \times 10 = \frac{5}{9} \times 10 = \frac{50}{9}$

$$5\frac{5}{9} = 5.55\%$$

Hence, the correct answer is 5.55%.

Ans.

[We can write it $5\frac{5}{9}\%$, because 5.55% and $5\frac{5}{9}\%$ are nearly equal.]

EXERCISE-8C

1. Kartik's total monthly salary = ₹ 14,400

Kartik saves from his salary = ₹ 900

Kartik's saving percentage $= \frac{900}{14400} \times 100 = \frac{900}{144} = 6.25\%$

Hence, Kartik's saving percentage is 6.25%.

Ans.

2. Quantity of alloy = 30 kg

Percentage of copper in the alloy = 30%

Percentage of zinc in the alloy = 40%

Percentage of nickel $= 100 - (30 + 40) = 100 - 70 = 30\%$

Now, find the 30% of 30 kg mass of nickel $= \frac{30}{100} \times 30 = \frac{900}{100} = 9$ kg

Hence, the required value of nickel in alloy is 9 kg.

Ans.

3. Total number of matches = 20

First school win matches $= \frac{20 \times 20}{100} = 4$ matches

Hence, the required winning matches by 1st school is 5.

Ans.

4. Let the number of students in the class be 100.

Number of students who came to school on foot = 25%

Number of students who came by motorbike = 65%

\therefore Number of students who came by school bus $= 100 - (25 + 65)$
 $= 100 - 90 = 10\%$

\therefore 10 out of 100 students came by school bus.

i.e., 10% of students came by school bus.

Hence, the required number of students who came by school bus is 10%.

Ans.

5. It is given that a family spends 35% of its monthly income of ₹ 7500 on food.

So, expenditure on food is given by, $\text{₹} \left(\frac{35}{100} \times 7500 \right) = \text{₹} 35 \times 75 = \text{₹} 2625$

So, the expenditure on food is ₹ 2625.

6. Let, the salary of Mr. Sharma be 100.

Spends of food of his income = 40%

Spends on clothes on his income = 10%

Spends on house rent on his income = 20%

Saving of Mr. Sharma of his salary is $= 100 - (40 + 10 + 20)$
 $= (100 - 70) = 30\%$

Saving of Mr. Sharma of his salary is $= \text{₹} \left(\frac{30}{100} \times 30400 \right)$
 $= \text{₹} 30 \times 304 = \text{₹} 9120$

Hence, the required income of Mr. Sharma of his salary is ₹ 9120. **Ans.**

7. As we know, percentages are used to express fractions that have 100 as their denominator. In this case, we can say that

$$25\% = \frac{25}{100} = \frac{1}{4}$$

$$\frac{1}{4} \Rightarrow \text{One chip burned for every four chips baked}$$

Since, we know how many chocolate chips burned, we can scale up this number by using the $\frac{1}{4}$ ratio to find the total number of chocolate chips baked.

$$625 \text{ burned} \times \frac{4 \text{ baked}}{1 \text{ burned}} = 2500 \text{ baked}$$

Therefore, the bakeshop baked 2500 chocolates chips that day. **Ans.**

8. Officer's total salary = ₹ 25,000

Saving income per month by officer = ₹ 4000

Percentage of saving per month is $= \frac{4000}{25000} \times 100 = 16\%$

Therefore, Officer's saving percentage of salary per month is 16%.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. Let us the amount be x .

Now, $x \times 15\% = ₹ 45$

$$\text{So, } \frac{x \times 15}{100} = ₹ 45 \text{ or } x = ₹ \frac{45 \times 100}{15} = ₹ 300$$

Hence, the correct answer is (a).

Ans.

2. The total population of village = 750

Number of uneducated person = 50

Number of educated person = $(750 - 50) = 700$ person

Now, the percentage of educated person is

$$= \frac{700}{750} \times 100 = 93.33\%$$

Hence, the correct option is (b).

3. Let his monthly income be ₹ x .

Spend = 84% of x

Saving = $(100 - 84)\% = 16\%$

Now, 16% of $x = ₹ 810$

$$\frac{16}{100} \times x = ₹ 810$$

$$\text{or } x = ₹ \frac{810 \times 100}{16} = ₹ 5062.50$$

Hence, the required monthly income is ₹ 5062.50. So, the correct option is (c).

4. Babita Rani secures marks in total paper = 25%

Maximum marks of the papers = 480

$$\text{Marks will be secure each paper} = \frac{25}{100} \times 480 = 120 \text{ marks}$$

Hence, the correct option is (d).

5. 70% more than ₹ 75 is = ?

$$\Rightarrow \frac{70}{100} \times 75 = \frac{70 \times 75}{100} = ₹ 52.5$$

Now, more than ₹ 70 is = ₹ $(70 + 52.5) = ₹ 127.50$

Hence, correct option is (a).

DO AND LEARN

Do yourself.

THINK, SOLVE AND LEARN

Given, the total population of village = 93400

Population of males in village = 35%

So, the population of females in village = $(100 - 35) = 65\%$

Females population in village are = $\frac{93400 \times 65}{100} = 934 \times 65 = 60,710$ Ans.

[Note Hint : that \rightarrow Males + Females = Total Population]



Commercial Mathematics



EXERCISE- 9A

1. Give, the cost price of a television set = ₹ 9,684

Sold at the loss = ₹ 684

We know, that the cost price is greater than selling price; then

$$\text{S.P.} = \text{C.P.} - \text{Loss}$$

$$\text{S.P.} = ₹ 9684 - ₹ 684 = ₹ (9684 - 684) = ₹ 9000$$

Hence, the selling price required is ₹ 9000.

2. Cost price (C.P.) = ₹ 200

Selling price (S.P.) = ₹ 250

Since, $\text{S.P.} > \text{C.P.}$; there is profit. So, Profit = $\text{S.P.} - \text{C.P.}$

$$\text{Profit} = ₹ (250 - 200) = ₹ 50$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100 = \frac{50}{200} \times 100 = 25\%$$

Hence, the required profit is ₹ 50 and profit% is 25%.

Ans.

3. Cost price of bag is = ₹ 300

Selling price of bag is = ₹ 250

We know that the selling price is less than the cost price is called loss.

So, Loss = $\text{C.P.} - \text{S.P.}$ or Loss = ₹ $(300 - 250) = ₹ 50$, there is loss.

$$\begin{aligned} \text{Loss per cent} &= \left[\frac{\text{Loss}}{\text{C.P.}} \times 100 \right] \% = \left[\frac{50}{300} \times 100 \right] \% \\ &= \frac{100}{6} \% = \frac{50}{3} \% = 16\frac{2}{3} \% \end{aligned}$$

Hence, the required loss per cent is $16\frac{2}{3} \%$.

Ans.

4. Sold motor bike by Rakesh Sharma = ₹ 24,900

Profit = ₹ 600, when selling price is greater than cost price.

Now, Selling price = Cost price + Profit

$$\text{₹ } 24900 = \text{Cost price} + \text{₹ } 600$$

$$\text{Cost price} = (\text{₹ } 24900 - \text{₹ } 600) = \text{₹ } (24900 - 600) = \text{₹ } 24,300$$

Hence, the cost price of motor bike is ₹ 24,300.

5. Cost price of a washing machine = ₹ 7,282

Sold it at profit = ₹ 208

Selling price = Cost price + Profit

$$\text{Selling price} = (\text{₹ } 7282 + \text{₹ } 208) = \text{₹ } (7282 + 208) = \text{₹ } 7,490$$

Hence, the required selling price of washing machine is ₹ 7,490.

6. **Note :** See the given table in text book Ex.-9A.

- (i) Given, C.P. = ₹ 5000, S.P. = ₹ 6000, Profit = ₹ 1000

Loss : No chance for loss, because, here S.P. > C.P.

[So, S.P. > C.P., there is profit]

$$\text{Profit \%} = \left[\frac{\text{Profit}}{\text{C.P.}} \times 100 \right] \% = \left[\frac{1000}{5000} \times 100 \right] \% = 20\%$$

Therefore, Loss = No, Profit % = 20% and Loss% = No.

Ans.

- (ii) Given, C.P. = ₹ 6200, S.P. = ₹ 6000. No chance for profit, because

Here, C.P. > S.P. [∴ S.P. < C.P. So, there is loss

$$\text{Loss} = \text{C.P.} - \text{S.P.} \Rightarrow \text{Loss} = \text{₹ } [6200 - 6000] = \text{₹ } 200$$

$$\text{Loss \%} = \left[\frac{\text{Loss}}{\text{C.P.}} \times 100 \right] \% = \left[\frac{200}{6200} \times 100 \right] \% = \left[\frac{2}{62} \times 100 \right] \%$$

$$= \left[\frac{100}{31} \right] \% = 3.2\%$$

Ans.

- (iii) Given, C.P. = ₹ 2400, Profit = ₹ 400

$$\Rightarrow \text{S.P.} = \text{C.P.} + \text{Profit}$$

$$\text{or } \text{S.P.} = \text{₹ } 2400 + \text{₹ } 400 = \text{₹ } (2400 + 400) = \text{₹ } 2800$$

Loss : No chance loss here, because profit is show here.

$$\begin{aligned} \text{Profit \%} &= \left[\frac{\text{Profit}}{\text{C.P.}} \times 100 \right] \% = \left[\frac{400}{2400} \times 100 \right] \% = \left[\frac{100}{6} \right] \% = \frac{50}{3} \% \\ &= 16.67\% \end{aligned}$$

Therefore, S.P. = ₹ 2800, Loss = No, Profit% = 16.67% and Loss% = No.

Ans.

(iv) Given, C.P. = ₹ 1900, Loss = ₹ 300

We know that, Loss = C.P. – S.P.

$$\Rightarrow ₹ 300 = ₹ 1900 - \text{S.P.} \quad \text{or} \quad \text{S.P.} = ₹ 1900 - ₹ 300 \\ = ₹ (1900 - 300) = ₹ 1600$$

$$\text{Loss \%} = \left[\frac{\text{Loss}}{\text{C.P.}} \times 100 \right] \% = \left[\frac{300}{1900} \times 100 \right] \% = \frac{300}{19} \% = 15.79\%$$

Therefore, S.P. = ₹ 1600, Profit = No,

Profit % = No, Loss % = 15.79%

Ans.

(v) Given, S.P. = ₹ 1590, Profit = ₹ 190

We know that, C.P. = S.P. – Profit

$$\text{C.P.} = ₹ 1590 - ₹ 190 = ₹ (1590 - 190) = ₹ 1400$$

Since, S.P. > C.P. There is profit. No loss.

$$\text{Profit \%} = \left[\frac{190}{1400} \times 100 \right] \% = \left[\frac{19000}{1400} \right] \% = \frac{190}{14} \% = 13.57\%$$

Therefore, C.P. = ₹ 1400, Loss = No, Profit % = 13.57%,

Loss % = No.

Ans.

EXERCISE-9B

1. Find the principal when :

(i) Time = 3 years, Simple interest = ₹ 600 and Rate of interest = 4% p.a.

$$\text{Therefore, Principal} = \frac{\text{Simple interest} \times 100}{\text{Rate of interest} \times \text{Time}} \\ = ₹ \frac{600 \times 100}{4 \times 3} = ₹ \frac{200 \times 100}{4} = ₹ 50 \times 100 = ₹ 5000$$

Hence, the required principal is ₹ 5000.

Ans.

(ii) Given, Time = 4 years,

Simple interest = ₹ 400 and Rate of interest = 5% p.a.

$$\text{Therefore, Principal} = \frac{\text{Simple interest} \times 100}{\text{Rate of interest} \times \text{Time}} \\ = ₹ \frac{400 \times 100}{5 \times 4} = ₹ 100 \times 20 = ₹ 2000$$

Hence, the required principal is ₹ 2000.

Ans.

2. Find the rate of interest when :

(i) Principal = ₹ 3000, Simple interest = ₹ 360 and Time = 3 years

We know that,

$$\text{Rate of Interest} = \frac{100 \times \text{S.I.}}{P \times T} = \frac{100 \times 360}{3000 \times 3} = \frac{36}{3 \times 3} = \frac{36}{9} = 4\%$$

Hence, the required rate of interest is 4%.

Ans.

(ii) Principal = ₹ 2100, Simple interest = ₹ 336 and Time = 2 years

We know that,

$$\text{Rate of interest} = \frac{100 \times \text{S.I.}}{P \times T} = \frac{100 \times 336}{2100 \times 2} = \frac{336}{42} = \frac{56}{7} = 8\%$$

Hence, the required rate of interest is 8%.

Ans.

3. Complete the table :

(i) Given, $P = ₹ 300$, $R = 10\%$ p.a. and $T = 1$ year. Find S.I. = ?

$$\text{Now, S.I.} = \frac{P \times R \times T}{100} = \frac{300 \times 10 \times 1}{100} = ₹ 30$$

Hence, the required simple interest

$$= \frac{P \times R \times T}{100} = \frac{300 \times 10 \times 1}{100} = ₹ 30$$

Ans.

And Total Amount = Principal + S.I.

$$= (₹ 300 + ₹ 30) = ₹ 330$$

Ans.

(ii) Given, $P = ₹ 500$, $R = 8\%$ p.a. and $T = 1$ year and S.I. = ₹ 40

$$\text{Total Amount} = ₹ (P + \text{S.I.}) = ₹ (500 + 40) = ₹ 540$$

Ans.

(iii) Given, $P = ₹ 1000$, $R = 4\%$ p.a. and $T = 1$ year,

$$\text{Total Amount} = ₹ 1040$$

$$\text{S.I.} = A - P = (₹ 1040 - ₹ 1000) = ₹ (1040 - 1000) = ₹ 40$$

Ans.

4. Principal = ₹ 10,000, Time = 4 years, $R = 6\%$, Find = Simple interest?

$$\text{Therefore, Simple interest} = \frac{P \times R \times T}{100} = ₹ \frac{10,000 \times 6 \times 4}{100}$$

$$= ₹ 100 \times 24 = ₹ 2400$$

$$\text{Total Amount} = (\text{S.I.} + \text{Principal}) = ₹ 2400 + ₹ 10,000 = ₹ 12,400$$

Hence, the required amount of Rakesh is ₹ 12,400.

Ans.

5. Principal of Mr. Anil Kaushik is ₹ 2000, Interest rate = 4% p.a.

Time = 5 years, Total amount = ?

We know, that the total amount = Principal + S.I. and

$$\text{S.I.} = ₹ \left[\frac{\text{Principal} \times \text{Rate of interest} \times \text{Time}}{100} \right]$$

$$= ₹ \left[\frac{2000 \times 4 \times 5}{100} \right] = ₹ 400$$

$$\text{Total Amount} = (\text{₹ } 2000 + \text{₹ } 400) = \text{₹ } 2400$$

Hence, the required total amount is ₹ 2400 and S.I. is ₹ 400. **Ans.**

6. Let the sum be ₹ x.

Given, Simple interest = ₹ 450, Time = 3 years, Interest rate = 2.5% p.a.

$$\begin{aligned} \text{We know that, Principal} &= \frac{\text{Simple interest} \times 100}{\text{Time} \times \text{Rate of interest}} \\ &= \text{₹ } \frac{450 \times 100}{3 \times 2.5} = \text{₹ } \frac{450000}{3 \times 25} = \text{₹ } \frac{150000}{25} = \text{₹ } 6000 \end{aligned}$$

Hence, the required principal is ₹ 6000. **Ans.**

MULTIPLE CHOICE QUESTIONS

Choose the correct answer :

1. Profit = (S.P.) – (.....)

We know, Profit = (S.P.) – (C.P.)

Hence, the correct option is (a).

2. Loss = (C.P.) – (.....)

We know, Loss = C.P. – (S.P.)

Hence, the correct option is (b).

3. Given, Principal = ₹ 4000, Rate of interest = 6 paise per rupee/month

We use the formula of simple interest is :

$$\begin{aligned} \text{Simple interest} &= \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100} \\ &\left[\text{Time} = 6 \text{ months} = \frac{6}{12} \text{ year} \right] \end{aligned}$$

Now, S.I. on Re1 for 1 year $6 \times 12 = 72$ paise

So, Rate = 72%

Now, according to the given question,

$$\begin{aligned} \text{S.I.} &= \text{₹ } \frac{4000 \times 72 \times 6}{100 \times 12} = \text{₹ } \frac{40 \times 72 \times 6}{12} = \text{₹ } 40 \times 36 \\ &= \text{₹ } 1440 \end{aligned}$$

Hence, the correct option is (c). **Ans.**

4. Let the time be 'n' years. Given, Principal = ₹ 1750, A.P. = ₹ 1900

Rate of interest = 14% p.a.

$$\text{S.I.} = \text{A.P.} - \text{P} = \text{₹ } (1900 - 1750) = \text{₹ } 150$$

$$\text{We know that, Time } (n) = \frac{\text{S.I.} \times 100}{P \times R}$$

$$n = \frac{150 \times 100}{1750 \times 14} = \frac{30}{49} \text{ years}$$

Hence, the correct option is (d).

5. Let the money be x .

So, Principle (P) = x and total amount (A.P.) = $P \times 3 = x \times 3 = 3x$

S.I. = A.P. - $P = (3x - x) = 2x$, Taken time = 8 years

We know that,

$$\text{Rate of interest} = \frac{\text{S.I.} \times 100}{P \times T} = \frac{2x \times 100}{x \times 8} = \frac{100}{4} = 25\%$$

Hence, the correct option is (a).

6. Given, Principal = ₹ 4800, Rate of interest = 6%, Time = $\frac{466}{360}$ years

Because we know that 365 day has in 1 year. So,

$$\begin{aligned} \text{Simple interest} &= \frac{\text{Principal} \times \text{Rate} \times \text{time}}{100} = \frac{4800 \times 6 \times 466}{100 \times 365} \\ &= \frac{48 \times 6 \times 466}{365} = ₹ 367.9 \end{aligned}$$

Hence, the nearly answer is option (b).

Ans.

7. Given, Principle = ₹ 500, Time = 1 year, Rate of interest = 15%

We know that,

$$\text{Simple interest} = ₹ \frac{500 \times 15 \times 1}{100} = ₹ 75$$

Hence, the correct option is (d).

Ans.

THINK, SOLVE AND LEARN

Given, the total population of village = 93400

Population of males in village = 35%

$$\text{Number of males in village} = \frac{93400 \times 35}{100} = 934 \times 35 = 32690 \text{ males}$$

Now, Population of females in village

= Total population of village - Population of males

$$= (93400 - 32690) = 60710 \text{ females}$$

Ans.



Lines and Angles



EXERCISE- 10A

1. Find the complement of each of the following angles:

- (i) 38° (ii) 72° (iii) 54° (iv) 60°

Sol. (i) We know that sum of the measures of two angles is 90° . Then the angles are called complementary angles.

Given, first angle = 30°

Complementary angle of 38° is $(90^\circ - 38^\circ) = 52^\circ$

Hence, required angle is 52° .

- (ii) Given, first angle = 72°

Complementary angle of $72^\circ = (90^\circ - 72^\circ) = 18^\circ$

Hence, required angle is 18° .

- (iii) Given, first angle = 54°

Complementary angle of $54^\circ = (90^\circ - 54^\circ) = 36^\circ$

Hence, required angle is 36° .

- (iv) Given, first angle = 60°

Complementary angle of 60° is $(90^\circ - 60^\circ) = 30^\circ$

Hence, the required angle is 30° .

2. Find the supplement of each of the following angles:

- (i) 80° (ii) 110° (iii) 145° (iv) 75°

We know that, the two angles are said to be supplementary angles, if the sum of their measure is 180° , and each of them is called a supplementary (supplement) of the other.

Given, first angle = 80°

Supplement of $80^\circ = (180^\circ - 80^\circ) = 100^\circ$

Hence, the required angle is 100° .

Ans.

- (ii) Given, first angle = 110°

Now, supplement of $110^\circ = (180^\circ - 110^\circ) = 70^\circ$

Hence, the required angle is 70° .

Ans.

- (iii) Given, first angle = 145°

So, the supplement of $145^\circ = (180^\circ - 145^\circ) = 35^\circ$

Hence, the required angle is 35° .

Ans.

(iv) Given, the first angle = 75°

So, the supplement of $75^\circ = (180^\circ - 75^\circ) = 105^\circ$

Hence, the required angle is 75° .

Ans.

3. Identify the complementary and supplementary pairs of angles from the following pairs:

(i) 25° , 65°

We have, pair of angles = 25° , 65°

We know that the sum of the measures of two angles is 90° . Then the angles are called complementary angles and each angle is called a complementary each other.

So, $120^\circ + 60^\circ = 180^\circ$

Hence, the angles 120° , 60° is supplementary.

Ans.

(ii) 120° , 60°

We have, pair of angles = 120° , 60°

We know that the sum of the measures of two angles is 180° , then the angles are called supplementary angles and each angle is called a supplementary each other.

So, $120^\circ + 60^\circ = 180^\circ$

Hence, the angles 120° , 60° is supplementary.

Ans.

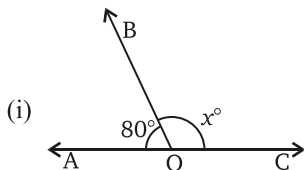
(iii) Given, 100° , 80°

Now, $100^\circ + 80^\circ = 180^\circ$

Hence, the angles 100° , 80° is supplementary.

Ans.

4. Find the value of x° in each of the following figures :



From the given figure,

$$\angle AOB + \angle BOC = \angle AOC \quad [\text{Supplementary angles}]$$

$$\angle AOB = 80^\circ \text{ and } \angle BOC = x^\circ \text{ (Given)}$$

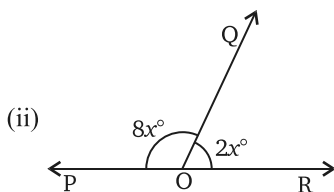
$$\text{We know, } \angle AOB + \angle BOC = \angle AOC$$

$$\Rightarrow \text{Equal to a straight line} = 180^\circ = \text{Supplementary.}$$

$$80^\circ + x^\circ = 180^\circ$$

$$\Rightarrow x^\circ = 180^\circ - 80^\circ \Rightarrow x^\circ = 110^\circ$$

Hence, the required angle of x° is 110° .



From the given figure,

$$\angle POQ = 8x^\circ \text{ and } \angle ROQ = 2x^\circ$$

$$\angle POQ + \angle ROQ = \angle POR = \text{Straight angle} = 180^\circ = \text{Supplementary}$$

Now, according to the figure, we get

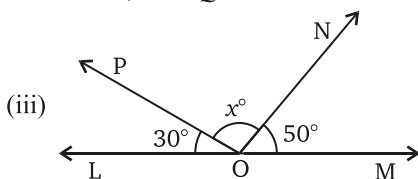
$$8x^\circ + 2x^\circ = 180^\circ$$

$$10x^\circ = 180^\circ \text{ or } x^\circ = \frac{180^\circ}{10} \Rightarrow x = 18^\circ \text{ (Putting } x = 18^\circ \text{)}$$

Value of $\angle POQ = 8x^\circ = 8 \times 18 = 144^\circ$ and value of

$$\angle ROQ = 2x^\circ = 2 \times 18^\circ = 36^\circ$$

Hence, $\angle POQ = 8x^\circ = 144^\circ$ and $\angle ROQ = 2x^\circ = 36^\circ$ is supplementary.



From the given figure, we have,

$$\angle LQP = 30^\circ, \angle PQN = x^\circ, \angle MQN = 50^\circ \text{ [Given]}$$

$$\text{Now, } \angle LQP + \angle PQN + \angle MQN = \angle LQM = 180^\circ$$

$$\text{[Putting the value of } \angle LQP = 30^\circ, \angle PQN = x^\circ \text{ and } \angle MQN = 50^\circ \text{]}$$

$$30^\circ + x^\circ + 50^\circ = 180^\circ$$

$$x^\circ + 80^\circ = 180^\circ$$

or

$$x = 180^\circ - 80^\circ \text{ or } x = 100^\circ$$

Hence, the required value of x° is 100° .

EXERCISE- 10B

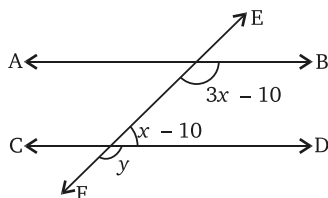
1. Find the value of x and y , and the remaining angles if $AB \parallel CD$.

(i) We have, $AB \parallel CD$ (Given)

$$\angle 3x - 10 + \angle x - 10 = 180^\circ$$

The sum of interior angles on the same side of the transversal is 180° .

$$\text{So, } 3x - 10 + x - 10 = 180^\circ$$



$$\begin{aligned} \Rightarrow 4x^\circ - 20^\circ &= 180^\circ \\ \Rightarrow 4x^\circ &= 180^\circ + 20^\circ \Rightarrow 4x^\circ = 200^\circ \\ \Rightarrow x &= \frac{200}{4} = 50^\circ, \text{ value of } x \text{ is } 50^\circ. \\ \Rightarrow \angle 3x - 10^\circ &= 3 \times 50^\circ - 10^\circ = 150^\circ - 10^\circ = 140^\circ \\ \text{and } \angle x - 10^\circ &= 50^\circ - 10^\circ = 40^\circ \end{aligned}$$

From the figure, we see, $\angle y + \angle x - 10 = 180^\circ$ [Putting $x = 50^\circ$]

$$y + 40^\circ = 180^\circ \Rightarrow y = 180^\circ - 40^\circ \text{ or } y = 140^\circ$$

Hence, value of $x = 50^\circ$ and $y = 140^\circ$

Ans.

(ii) We have

$$4x + 10 = 2x + 70$$

[Vertically opposite angles]

$$4x - 2x = 70 - 10$$

$$2x = 60 \text{ or } x = \frac{60}{2} = 30^\circ$$

Value of $x^\circ = 30^\circ$

Now, $4x + 10 = y$ [Pairs of alternate interior angles are equal]

So, $4 \times 30 + 10 = y$ or $y = 120 + 10^\circ = 130^\circ$ or $y = 130^\circ$.

Hence, the required value of $x = 30^\circ$ and $y = 130^\circ$

Ans.

2. Given, lines a and b are parallel.

$$\angle Q = \angle 67^\circ$$

[Vertically opposite angles]

$\angle PQR + \angle QRS =$ Supplementary angles

Or consecutive interior angles are supplementary. [$a \parallel b$ and $c \parallel d$]

$$67 + \angle QRS = 180^\circ$$

$$\angle QRS = 180^\circ - 67^\circ = 113^\circ$$

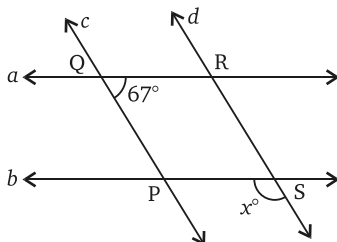
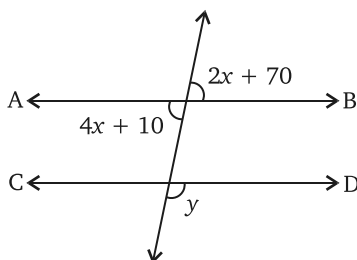
$$\angle QRS = \angle x$$

Pairs of corresponding angles are equal.

$$\angle x = 113^\circ$$

Hence, $x = 113^\circ$, $\angle PQR = 67^\circ$, then $\angle QRS = 113^\circ$

Ans.



3. From the given figure,

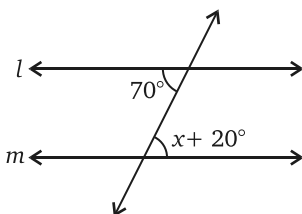
$$l \parallel m \text{ (Given)}$$

$$70^\circ = x + 20^\circ$$

[Pairs of alternate interior angles are equal]

$$\text{So, } x = 70 - 20 \Rightarrow x = 50^\circ$$

Hence, the required value of x is 50° .



4. In figure, line $l \parallel m$, n is transversal and $\angle 1 = 50^\circ$. Find all the other angles marked in the figure.

$$\text{Given, } \angle 1 = 50^\circ$$

$$\angle 1 = \angle 3$$

[Vertically opposite angles]

$$\angle 3 = 50^\circ$$

$$\text{and } \angle 3 = \angle 7$$

[Corresponding angles]

$$\therefore \angle 1 = \angle 7$$

$$\text{or } \angle 7 = 50^\circ \quad [\because \angle 1 = 50^\circ, \text{ given}]$$

$$\text{Now, } \angle 7 + \angle 8 = 180^\circ$$

$$50^\circ + \angle 8 = 180^\circ \text{ or } \angle 8 = 180^\circ - 50^\circ \text{ or } \angle 8 = 130^\circ$$

$$\angle 3 = \angle 5 \text{ [Pair of alternate interior angles are equal]}$$

$$\angle 5 = 50^\circ$$

$$\angle 8 = \angle 4 \text{ [Corresponding angles are equal]}$$

$$\text{So, } \angle 4 = 130^\circ \quad [\because \angle 8 = 130^\circ]$$

$$\angle 4 = \angle 2 \text{ [Vertically opposite angles]}$$

$$\angle 2 = 130^\circ$$

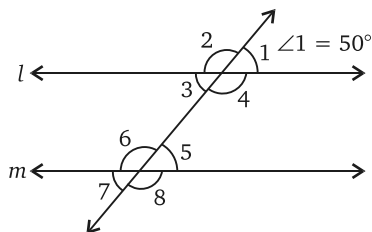
$$\angle 8 = \angle 6 \text{ [Vertically opposite angles]}$$

$$\angle 6 = 130^\circ$$

$$\text{Hence, } \angle 1 = 50^\circ, \angle 2 = 130^\circ, \angle 3 = 50^\circ, \angle 4 = 130^\circ, \angle 5 = 50^\circ,$$

$$\angle 6 = 130^\circ, \angle 7 = 50^\circ, \angle 8 = 130^\circ$$

Ans.



MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. Let one angle be x° . Then, the other angle is $(x + 48)^\circ$.

Now, x° and $(x + 48)^\circ$ are supplementary angles.

$$\therefore x^\circ + (x^\circ + 48)^\circ = 180^\circ \text{ or } 2x^\circ + 48^\circ = 180^\circ$$

or $2x^\circ = 180^\circ - 48^\circ \Rightarrow 2x^\circ = 132^\circ$ or $x^\circ = 66^\circ$

Hence, the measure of two angles are 66° and $(66 + 48)^\circ = 114^\circ$

So, 66° , 114° or option (a) is correct.

Ans.

2. An angle which is complement of itself is :

Let first angle be x° and complement of itself is x° .

Therefore, $x + x = 90^\circ$

$$2x = 90^\circ \text{ or } x = \frac{90^\circ}{2} = 45^\circ$$

Hence, the required on angle is 45° .

Ans.

3. Let first angle be x .

Second angle $= 4x$

According to question, $x + 4x = 90^\circ$ or $5x = 90^\circ$ or $x = \frac{90^\circ}{5} = 18^\circ$

Its complement angle is $4x = 4 \times 18 = 72^\circ$

Ans.

4. We know that, the sum of three angles of a triangle is 180° .

Therefore, correct option is (c).

Ans.

5. We know that, the sum of four angles of a quadrilateral is 360° .

Therefore, correct option is (d).

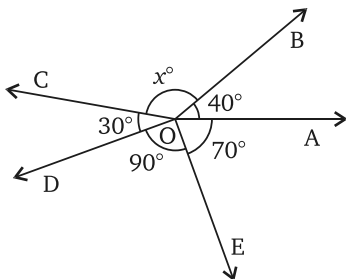
Ans.

DO AND LEARN

Do yourself .

THINK, SOLVE AND LEARN

We know, a complete angle is equal to 360° .



$$\angle AOB + \angle BOC + \angle COD + \angle DOE + \angle EOA = \text{a complete angle} \\ = 360^\circ$$

$$\Rightarrow 40^\circ + x^\circ + 30^\circ + 90^\circ + 70^\circ = 360^\circ \Rightarrow x + 330^\circ = 360^\circ$$

$$\Rightarrow x = 360^\circ - 330^\circ = 30^\circ$$

Hence, the required value of x is 30° .

Ans.

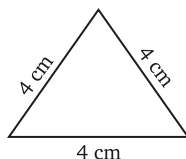


11 Triangle and Its Properties

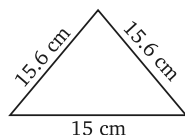


1. In figures, the length (in cm) of each side has been indicated along the side. State for each triangle, whether it is scalene, isosceles, equilateral:

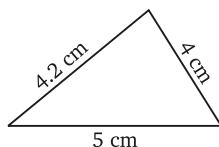
- (i) In this given figure, all sides of triangle are equal, so it is an equilateral triangle.



- (ii) We see in the given figure, and get, two sides are equal in this triangle, so it is an isosceles triangle.



- (iii) We see in the given figure, and get, all sides are different in this triangle, so the given triangle is scalene triangle.

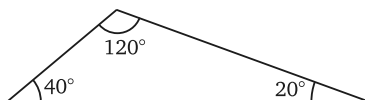


2. There are some triangles are given below. These measures of some of their angles have been indicated. State for each triangle whether it is acute, right or obtuse:

- (i) From the figure, we see that

$$120^\circ > 40^\circ$$

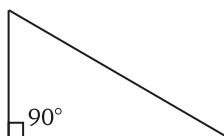
$$120^\circ > 20^\circ$$



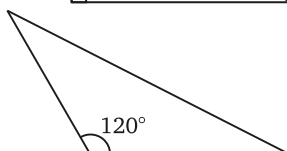
We know that, a triangle whose

any one of the angles is an obtuse angle or more than 90° . Or an obtuse angle is an angle which is greater than 90° and less than 180° . So, it is an obtuse angled triangle.

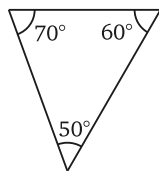
- (ii) From the given figure, a triangle in which one of the interior angles is 90° . So, it is a right angled triangle.



- (iii) From the figure, angles between 90° and 180° are known as obtuse angled triangle.



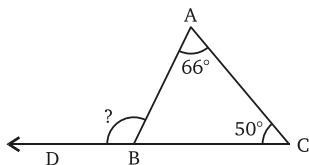
- (iv) From the given figure, we that, all the three angles of the triangle are less than 90° . Hence, this is an acute-angled triangle.



3. Find the unknown angles specified below in each triangle:

- (i) The exterior angle of the triangle is equal to the sum of its interior opposite angles. So, the required unknown $\angle ? = (66 + 50)^\circ = 116^\circ$

Hence, the required unknown angle is 116.



- (ii) From the given figure, we get

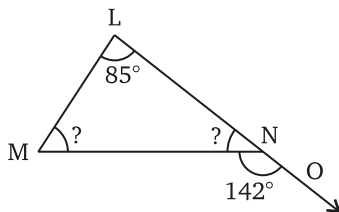
$$\angle LMN + \angle MLN = \angle MND$$

$$? + 85^\circ = 142^\circ$$

or $\rightarrow ?$ Unknown angle

$$= 142^\circ - 85^\circ = 57^\circ$$

So, $\angle LMN = \angle ? = 57^\circ$



We know that the sum of interior angles in a triangle is equal to 180° .

$$\angle LMN + \angle MNL + \angle MLN = 180^\circ$$

$$57 + \angle ? + 85^\circ = 180^\circ$$

$$\angle ? = 180^\circ - (57 + 85)^\circ = 180^\circ - 142^\circ = 38^\circ$$

So, the $\angle MNL = \angle ? = 38^\circ$

Ans.

- (iii) From the given figure,

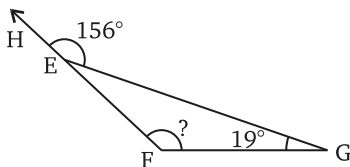
$$\angle EFG + \angle FGE = \angle GEH$$

$$? + 19^\circ = 156^\circ$$

$$? = 156^\circ - 19^\circ$$

or

$$? = \angle EFG = 137^\circ$$



- (iv) From the given figure,

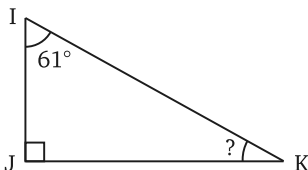
$$\angle J = 90^\circ, \angle I = 61^\circ$$

We know that the sum of interior angles of a triangle is 180° .

$$\text{Now, } \angle IJK + \angle JKI + \angle JIK = 180^\circ$$

$$[\angle IJK = \angle J = 90^\circ, \angle JIK = 61^\circ]$$

$$90^\circ + ? + 61^\circ = 180^\circ$$



$$151^\circ + ? = 180^\circ$$

$$? = 180^\circ - 151^\circ = 29^\circ$$

Hence, the required angle $\angle JKI = ? = 29^\circ$

Ans.

4. Find the value of x and find the all angles of the triangles shown below:

- (i) From the given figure, according to the rule of an exterior angle of a triangle.

We know that the exterior angle of the triangle is equal to the sum of its interior opposite angles. So,

$$(7x + 12)^\circ + (3x - 6)^\circ = 116^\circ$$

$$\Rightarrow (7x + 3x + 12 - 6)^\circ = 116^\circ$$

$$\Rightarrow (10x + 6)^\circ = 116^\circ$$

$$\text{or } 10x = 116 - 6 \text{ or } 10x = 110$$

$$\Rightarrow x = 11$$

Hence, the required value of x is 11.

- (ii) From the given figure, and according to the rule of an exterior angle of a triangle,

$$(x + 50)^\circ = (5x - 9)^\circ + (3x + 10)^\circ$$

$$\Rightarrow x + 50 = 5x - 9 + 3x + 10$$

$$\Rightarrow x + 50 = 8x + 1$$

$$\Rightarrow 8x - x = 50 - 1 \text{ or } 7x = 49 \text{ or } x = \frac{49}{7} = 7$$

Hence, the required value of x is 47.

- (iii) We know that the sum of interior angles of a triangle is 180° . So, sum of property

$$\Rightarrow (3x - 1)^\circ + (x + 8)^\circ + (x + 3)^\circ = 180^\circ$$

$$\Rightarrow (3x + x + x - 1 + 8 + 3)^\circ = 180^\circ$$

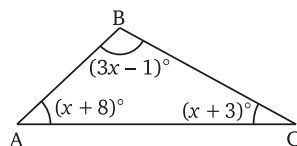
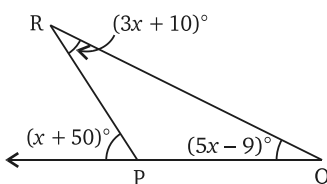
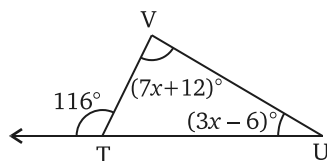
$$\Rightarrow (5x + 10)^\circ = 180^\circ$$

$$\Rightarrow 5x = 180 - 10$$

$$\Rightarrow 5x = 70$$

$$\Rightarrow x = \frac{70}{5} = 14$$

Hence, the required value of x is 34.



5. Choose the appropriate word from the brackets:
- (i) The incentre **always** lies inside the triangle.
 - (ii) Orthocentre of a triangle **sometimes** lies outside a triangle.
 - (iii) Centroid **always** lies inside the triangle.
6. Fill in the blanks :
- (i) In an acute-angled triangle, the circumcentre lies **inside** the triangle.
 - (ii) In a right-angled triangle, the orthocentre lies on the **vertex** of the triangle.
 - (iii) A triangle in which the two altitudes of a triangle are two of its sides is **right angle triangle**.

EXERCISE- 11B

1. Is it possible to have a triangle with the following measurements as their side lengths?

- (i) 5 cm, 7 cm, 9 cm

Yes, it is possible to construct a triangle with lengths of its sides 5 cm, 7 cm and 9 cm because the sum of two sides of a triangle is greater than the third side.

Hence, yes, we can construct a triangle of 5 cm, 7 cm and 9cm.

- (ii) 2 cm, 3 cm, 6 cm

No, because the triangles has the property that sum of any two sides is always greater than the 3rd side but in this case it is not possible because $2\text{ cm} + 3\text{ cm} = 5\text{ cm}$ and it is not greater than the IIIrd side that is 6 cm.

- (iii) 2 cm, 6 cm, 8 cm

Here, $2\text{ cm} + 6\text{ cm} = 8\text{ cm}$ is not greater than the length of the remaining side. And so, the construction of triangle is not possible. Hence, No, we can not construct a triangle.

- (iv) 3 cm, 4 cm, 6 cm

Here, two smaller sides are 3 cm and 4 cm. 6 cm is a greater side.

Sum of smaller sides = $(3 + 4)\text{ cm} = 7\text{ cm}$

$\therefore 7 > 6$

\Rightarrow Sum of smaller sides $>$ Greater side.

\Rightarrow So, we can construct a triangle of 3 cm, 4 cm and 6 cm. **Ans.**

2. Sum of two sides should be greater than the third side.

Difference between two sides should be lesser than the third side.

Let the third side be x cm. Then, we have,

$(5+2)\text{cm} > x$ [Sum any two sides is greater than the third side]

$$7\text{ cm} > x$$

$(5-2)\text{cm} < x$ [Difference of any two sides is less than the third sides]

$$3\text{ cm} < x$$

Therefore, third side must be greater than 3 cm and less than 7 cm.

3. Find the values of x and y in the following isosceles triangles :

(i) From the given figure,

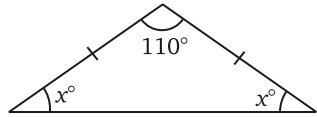
$$x + x + 10^\circ = 180^\circ$$

Because the sum of interior angles of a triangle is 180° .

$$\text{So, } 2x^\circ + 110^\circ = 180^\circ$$

$$\Rightarrow 2x^\circ = 180^\circ - 110^\circ \Rightarrow 2x = 70^\circ$$

$$\Rightarrow x^\circ = \frac{70^\circ}{2} \text{ or } x = 35^\circ$$



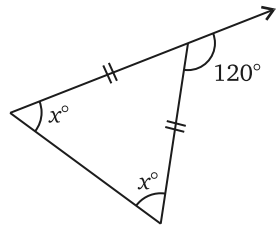
(ii) From the given figure,

We know that the exterior angle of the triangle is equal to the sum of its interior opposite angles. So,

$$\Rightarrow 120^\circ = x + x$$

$$\Rightarrow 2x = 120^\circ$$

$$\text{or } x = \frac{120}{2} = 60^\circ$$



So, the required value of x is 60° .

(iii) From the given figure,

We know that the exterior angle of the triangle is equal to the sum of its interior opposite angles.

$$\text{Now, } 122^\circ = y + y \text{ or } 2y = 122^\circ$$

$$\Rightarrow y = 61^\circ$$

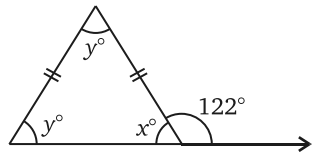
Again, we know the sum interior angles of a triangle is 180° . So,

$$\therefore x + y + y = 180^\circ \quad \dots(i)$$

$$[\because x + 122 = \text{straight line} = \text{supplementary angle} = 180^\circ]$$

$$\therefore x + 122 = 180^\circ$$

$$x = 180 - 122 \text{ or } x = 58^\circ$$



Now, putting the value of $x = 58^\circ$ in equation (i) then we get,

$$58 + y + y = 180^\circ \text{ or } 2y = 180^\circ - 58^\circ$$

$$2y = 122^\circ \text{ or } y = \frac{122}{2} = 61^\circ$$

Hence, the required angle are $x = 58^\circ$ and $y = 61^\circ$.

EXERCISE -11C

1. Find the third side of the following right-angled triangles:

- (i) Hypotenuse = 13 cm, One side = 5 cm

In the right-angled triangle :

Let the length of the third side be x cm.

By Pythagoras theorem,

$$\Rightarrow [\text{Hypotenuse}]^2 = [\text{Base}]^2 + [\text{Height}]^2$$

$$\Rightarrow [13 \text{ cm}]^2 = [5 \text{ cm}]^2 + [x \text{ cm}]^2$$

$$\Rightarrow 169 \text{ cm}^2 = 25 \text{ cm}^2 + x^2 \text{ cm}^2$$

$$\Rightarrow x^2 \text{ cm}^2 = 169 \text{ cm}^2 - 25 \text{ cm}^2$$

$$\text{or } [x \text{ cm}]^2 = 144 \text{ cm}^2$$

$$\Rightarrow [x \text{ cm}]^2 = [12 \text{ cm}]^2 \text{ or } x \text{ cm} = 12 \text{ cm}$$

Hence, the length of the third side is 12 cm.

Ans.

- (ii) Let the length of the Hypotenuse be x .

By Pythagoras theorem,

$$\Rightarrow [\text{Hypotenuse}]^2 = [\text{Base}]^2 + [\text{Height}]^2$$

$$\Rightarrow [\text{Hypotenuse}]^2 = [24 \text{ cm}]^2 + [10 \text{ cm}]^2$$

$$\Rightarrow [\text{Hypotenuse}]^2 = 576 \text{ cm}^2 + 100 \text{ cm}^2$$

$$= 676 \text{ cm}^2$$

$$\Rightarrow [\text{Hypotenuse}]^2 = [26 \text{ cm}]^2$$

$$\text{or } \text{Hypotenuse} = 26 \text{ cm}$$

Hence, the required value of Hypotenuse is 26 cm.

- (iii) Hypotenuse = 50 cm, One side = 48 cm

Let the third side be x .

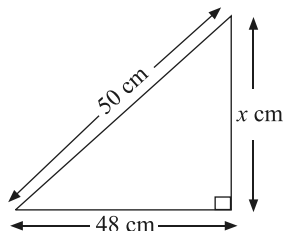
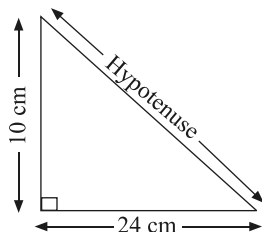
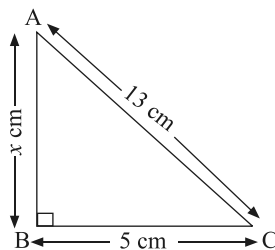
By the Pythagoras theorem,

$$[\text{Hypotenuse}]^2 = [\text{Base}]^2 + [\text{Height}]^2$$

$$\Rightarrow [50 \text{ cm}]^2 = [48 \text{ cm}]^2 + [x]^2$$

$$\Rightarrow [x]^2 = [50 \text{ cm}]^2 - [48 \text{ cm}]^2$$

$$[\because a^2 - b^2 = (a + b)(a - b)]$$



$$\Rightarrow [x^2] = (50 + 48)\text{cm} \times (50 - 48)\text{cm}$$

$$\Rightarrow [x]^2 = 98\text{cm} \times 2\text{cm} \text{ or } [x]^2 = 196\text{cm}^2$$

$$\Rightarrow [x]^2 = [14\text{cm}]^2 \text{ or } x = 14\text{ cm}$$

Hence, the required value of x is 14 cm.

- (iv) One side = 18 cm, Other side = 80 cm

Let the third side (Hypotenuse) be x .

By the Pythagoras theorem,

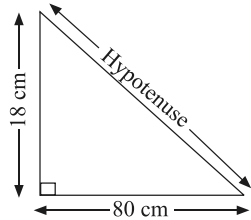
$$[\text{Hypotenuse}]^2 = [\text{Base}]^2 + [\text{Height}]^2$$

$$\Rightarrow [x]^2 = [80\text{cm}]^2 + [18\text{cm}]^2$$

$$\Rightarrow [x]^2 = 6400\text{cm}^2 + 324\text{cm}^2 = 6724\text{cm}^2$$

$$\Rightarrow x = 82\text{ cm}$$

Hence, the required value of third side is 82 cm.



2. Verify whether the following sets of lengths can form a right-angled triangle or not.

- (i) 9 cm, 40 cm and 41 cm

Yes. 9 cm, 40 cm and 41 cm triangle is right angled.

$$\Rightarrow [9\text{ cm}]^2 + [40\text{cm}]^2 = 81\text{cm}^2 + 1600\text{cm}^2 = 1681\text{cm}^2 = [41\text{cm}]^2$$

We know that the sum of the squares of the 2 of them should be equal to the square of the third.

Since, the squares of 9 and 40 add up to the square of 41.

These form a Pythagorean triplet.

Hence, can be used to represent the three sides of a right-angled triangle.

- (ii) 6 ft, 8 ft and 10 ft

The longest side length is 10 ft; and the smaller sides are of lengths 6 ft and 8 ft.

Now, the sum of square of the smaller sides is given as :

$$6^2 + 8^2 = 10^2$$

$$36 + 64 = 100$$

As the sum of squares of the smaller sides is equal to the square of the longer side that is $6^2 + 8^2 = 10^2$. So, by the Pythagorean theorem, the sides form a right-triangle.

Hence, the correct answer is Yes, and the given triangle is right triangle.

(iii) 14 m, 40 m and 50 m

The longest side length is 50 m; and the smaller sides are of lengths 14 m and 40 m.

Now, $14^2 + 40^2 = 50^2$

$$196 + 1600 = 2500 \text{ [Both sides are not equal.]}$$

As the sum of squares of the smaller sides is not to the square of the longer side that is $14^2 + 40^2 \neq 50^2$

Hence, the correct answer is No, and the given triangle is not a right triangle.

3. Given, length of a rectangular field = 15 m

Breadth of the rectangular field = 8 m

Diagonal of the rectangular field = ?

We know that, **(Pythagoras theorem)**

$$\begin{aligned} \text{Diagonal of the rectangular field} &= \sqrt{(\text{Length})^2 + (\text{Breadth})^2} \\ &= \sqrt{(15)^2 + (8)^2} \\ &= \sqrt{225 + 64} = \sqrt{289} = 17 \text{ m} \end{aligned}$$

Hence, the length of diagonal of rectangular is 17 m.

Ans.

4. Find the height of an equilateral triangle whose is 4 cm.

Sol. Let $\triangle ABC$ be the given equilateral triangle.

Let $AD \perp BC$

$BD = DC$

[All angles in a triangle is equal

$$\angle A = \angle B = \angle C = 60^\circ]$$

In $\triangle ABD$, $\angle B = 60^\circ$, $\angle ADB = 90^\circ$

$\therefore \angle BAD = 30^\circ$ [Remaining angle of a triangle]

$\therefore \triangle ABD$ is a 30° , 60° and 90° triangle.

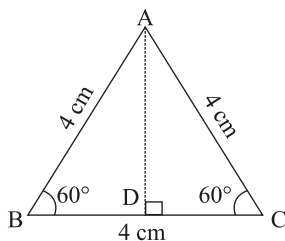
$$\begin{aligned} \therefore AD &= \sqrt{(AB)^2 - (BD)^2} \left[\because BD = \frac{BC}{2} = \frac{4}{2} = 2 \text{ cm} \right] \\ &= \sqrt{(4)^2 - (2)^2} \\ &= \sqrt{16 - 4} = \sqrt{12} = 2\sqrt{3} \text{ cm} \end{aligned}$$

\therefore The height of the equilateral triangle is $2\sqrt{3}$ cm.

Ans.

5. Given, Length of ladder = 29 m

Foot of the ladder or from the base of building = 21 m



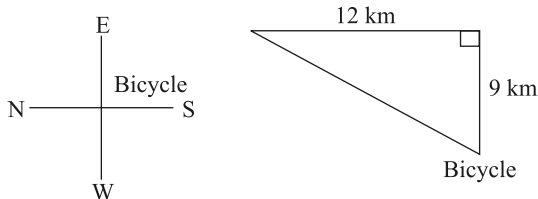
Height of the wall, where the ladder touch to above point of the wall

$$= \sqrt{(29)^2 - (21)^2} = \sqrt{841 - 441} = \sqrt{400} = 20 \text{ m}$$

Hence, the required height of the wall, where the ladder is touching above point of the wall is 20 m. **Ans.**

6. Sudha rides her bicycle in East = 9 km

Rides her bicycle in North = 12 km



$$\text{Far from her starting point} = \sqrt{9^2 + 12^2} = \sqrt{81 + 144} = \sqrt{225} = 15 \text{ m}$$

Hence, the required distance is 15 m.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. We know that, the sum of all interior angles in a triangle is 180° .

$$\text{So, the third angle} = 180^\circ - (75 + 85) = 180^\circ - 160^\circ = 20^\circ$$

Hence, the correct option is (b).

2. One angle of a triangle has measure = 56°

Other two angles are equal. Let the other two angles be x and x .

$$\text{Now,} \quad x + x + 56 = 180^\circ$$

$$2x = 180 - 56$$

$$\Rightarrow \quad 2x = 124$$

$$x = \frac{124}{2} \Rightarrow x = 62$$

Hence, the required other two equal angles are : 62° , 62° and the correct option is (b).

3. By the angle sum property

$$2x + 3x + 5x = 180^\circ$$

[We know that, the sum of interior angles of a triangle is 180° .]

$$\Rightarrow \quad 10x = 180^\circ$$

$$\Rightarrow \quad x = \frac{180^\circ}{10} \text{ or } x = 18^\circ$$

Now, according to the ratio of angles are :

$$2x = 2 \times 18 = 36^\circ$$

$$3x = 3 \times 18 = 54^\circ$$

$$5x = 5 \times 18 = 90^\circ$$

Hence, the correct option is (a).

Ans.

4. Given, first side of right angled $AB = 8$ cm

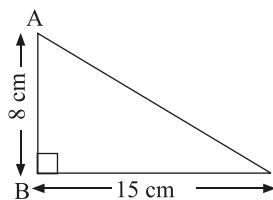
(Height)

Second side of right angled $BC = 15$ cm

(Base)

By Pythagoras theorem, we have

Third side (Hypotenuse)



$$= [\sqrt{(AB)^2 + (BC)^2}] \text{ units}$$

$$= [\sqrt{(8)^2 + (15)^2}] \text{ cm} = [\sqrt{64 + 225}] \text{ cm}$$

$$= [\sqrt{289}] \text{ cm} = 17 \text{ cm}$$

Hence, the required third side of right triangle is 17 cm. Correct option is (c).

DO AND LEARN

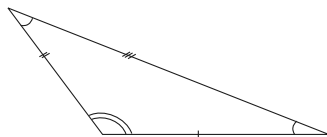
Do yourself.

THINK, SOLVE AND LEARN

1. According to the lengths of their sides, triangles can be classified into three types which are : (i) scalene, (ii) isosceles and (iii) equilateral

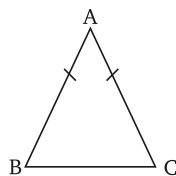
Let us discuss them one by one.

- 1. Scalene Triangle :** A scalene triangle has all side lengths of different measures. No side will be equal in length to any of the other sides in such a triangle. In a scalene triangle, all the interior angles are also different. The figure given below illustrates a scalene triangle.



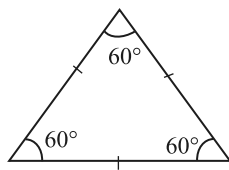
In the given figure, we can see that the all sides of the triangle seem to be unequal.

- 2. Isosceles Triangle :** In an isosceles triangle, the lengths of two of the three sides are equal. So, the angles opposite the equal sides are equal to each other. We can say in other words— an



isosceles triangle has two equal sides and two equal angles. In the given figure, we can see the two sides of the triangle appears to be equal, whereas the base of the triangle here is smaller than the other two sides.

- 3. Equilateral Triangle :** In an equilateral triangle, all the lengths of the sides are equal, in such a case, each of the interior angles will have a measure of 60° . Since the angles of an equilateral triangle are same, it is known as an equilateral triangle.



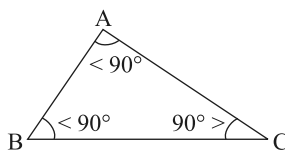
See the given figure, all the three sides of the triangle equal to 60° .

Types of Triangles Based on Angles

Triangles can be classified into three types with respect to their interior angles which are :

- (i) Acute-angled (ii) Obtuse angled (iii) Right angled

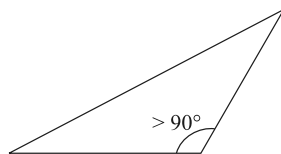
- (i) Acute Triangle :** An acute triangle is a triangle whose all the three interior angles are acute. In other words, if all interior angles are less than 90° , then it is an acute-angled triangle. See the given figure



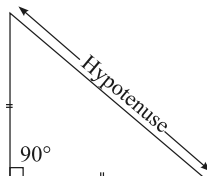
$$\angle A < 90^\circ, \angle B < 90^\circ \text{ and } \angle C < 90^\circ$$

We can see all interior angles of the triangle, is less than 90° .

- (ii) Obtuse Triangle :** Obtuse triangles are those in which one of the three interior angles has a measure greater than 90° . In other words, if one of the angles in a triangle is an obtuse angle, then the triangle is called an obtuse angled triangle. We can see that one of the angles is more than 90° . Hence, it is an obtuse triangle.



- (iii) Right Triangle :** A right triangle in which one of the angles is 90° . In a right angled triangle, the side opposite to the right angle (90° – angle) will be the longest side and is called the hypotenuse. We may come across triangle types with combined names like right isosceles triangle and such, but this only implies that the triangle has two equal sides with one of the interior angles being 90° . In the given figure, one among the three angle is 90° , thus it is a right triangle.





Geometry Constructions



EXERCISE- 12A

1. $AB = 6.5$ cm, $BC = 4.5$ cm, $\angle ABC = 60^\circ$, $AB \parallel CD$, $AC \parallel BD$

Steps of construction :

Step 1. Draw line $BC = 4.5$ cm.

Step 2. From B measure 60° , and draw a line $AB = 6.5$ cm.

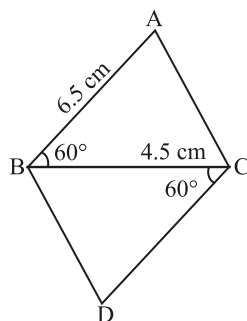
Step 3. Join AC .

Step 4. Now, from $\angle BCD$ measure 60° and draw a line.

Step 5. From $\angle ACB$ measure the angle the same angle on $\angle CBD$.

Step 6. Put an arc on the angle than this arc on $\angle CBD$ and BD draw.

Step 7. The point where B and C intersect is point D .



2. **Step of construct :**

Step 1. Draw a line l and take, a point p outside of l .

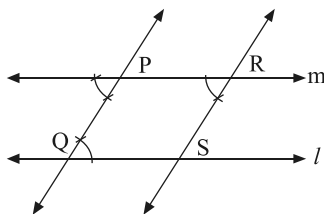
Step 2. Take point Q on the line and join PQ .

Step 3. Make equal angle at point P such that $\angle Q = \angle P$.

Step 4. Extend line at P to get line m .

Step 5. Similarly, take a point R on the line m , at point R , draw angles such that $\angle P = \angle R$.

Step 6. Extended line at R which intersects at S on line L . Draw line RS . Therefore, we get parallelogram $QPRS$.



3. **Steps of construction :**

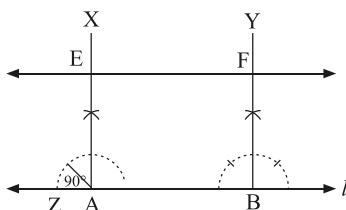
Step 1. Draw a line l .

Step 2. Take any two points A and B on l .

Step 3. At A and B , construct right angles $\angle XAZ = 90^\circ$ and $\angle YBL = 90^\circ$.

Step 4. With A as centre and radius equal to 4.5 cm, draw an arc cutting AX at E .

Step 5. With B as centre and radius equal to 4.5 cm, draw an arc cutting BY at F .

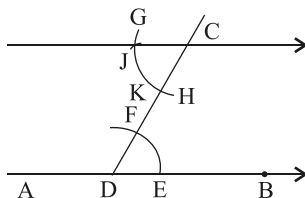


Step 6. Join EF and produce it on both sides to get the required line parallel to l at a distance of 4.5 cm from it.

4. Steps of construction :

Step 1. Draw a line AB and take a point C outside AB .

Step 2. Take any point D on it and join C to D .



Step 3. With D as the centre and taking convenient radius.

Draw an arc cutting AB at E and CD at F .

Step 4. With C as the centre and same radius as in step-3, draw an arc GH cutting CD at R .

Step 5. With the same arc EF , draw the equal arc cutting GH at K .

Step 6. Join JC to draw a line R .

$\therefore AB \parallel R$

5. Steps of construction :

Step 1. Take three non linear point A , B and C .

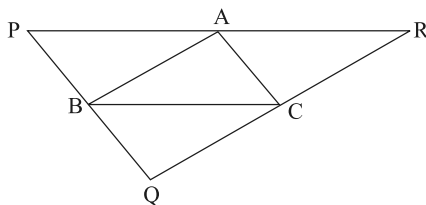
Step 2. Join A to B , B to C and C to A .

Step 3. Draw a line PR parallel to BC passing through the vertex A .

Step 4. Similarly, draw a line PQ parallel to AC passing through the vertex B .

Step 5. Also, draw a line QR parallel to AB passing through the vertex C .

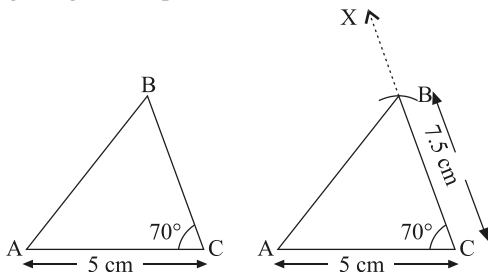
Thus, we get the required triangle.



EXERCISE 12B

1. Given, $BC = 7.5\text{cm}$, $AC = 5\text{cm}$ and $\angle C = 70^\circ$

First draw a rough sketch of $\triangle ABC$. Then, draw the required $\triangle ABC$ by following the given steps of construction :



Step of construction :

Step 1. Draw a line segment $AC = 5\text{ cm}$.

Step 2. At C , construct $\angle C = 70^\circ$.

Step 3. With C as centre and radius equal to 7.5 cm , draw an arc cutting CX at B .

Step 4. Join AB . Hence, $\triangle ABC$ is the required triangle.

2. **Steps of construction :**

Step 1. Firstly, we draw, a rough sketch of triangle with given measures marked on it.

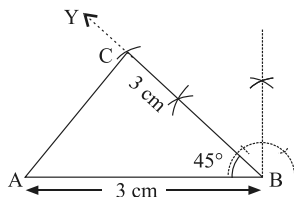
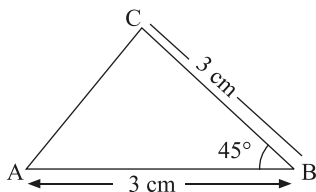
Step 2. Draw a line segment AB of length 3 cm .

Step 3. Draw an angle of 45° on point B and produce it to ray Y .

Step 4. With B as centre, draw an arc of 3 cm which intersects ray BY at C .

Step 5. Join A to C .

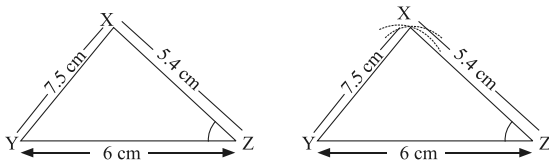
Thus, $\triangle ABC$ is the required on isosceles triangle.



3. Given, $XY = 7.5\text{cm}$, $YZ = 6\text{cm}$ and $ZX = 5.4\text{ cm}$

First draw a rough sketch of $\triangle XYZ$. Then, draw a required $\triangle XYZ$ by following the given steps of construction.

Steps of construction :



Step 1. Draw a line segment $YZ = 6$ cm.

Step 2. With Y as centre and radius equal to 7.5 cm draw an arc.

Step 3. With Z as centre and radius equal to 5.4 cm, draw another arc cutting the previous arc at X .

Step 4. Join XY and XZ .

Hence, $\triangle XYZ$ is the required triangle.

4. Steps of construction :

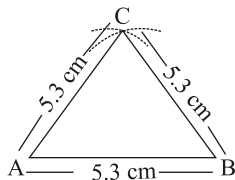
Step 1. Draw a line segment $AB = 5.3$ cm.

Step 2. With A as the centre and a radius equal to AB , draw an arc.

Step 3. With B as the centre and the same radius as above, draw another arc. Cutting the previously drawn arc at C .

Step 4. Join AC and BC .

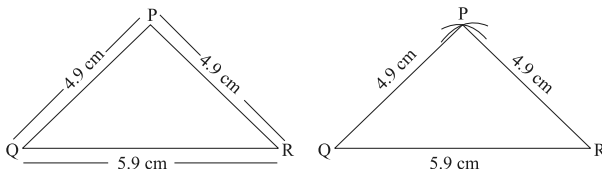
Thus, $\triangle ABC$ is a required triangle.



- 5.** Given, $PQ = PR = 4.9$ cm and $QR = 5.9$ cm, measure $\angle P$ and $\angle Q$.

Draw a rough sketch of $\triangle PQR$. Then, draw the required $\triangle PQR$ by following the given steps of construction.

Steps of construction :



Step 1. Draw a line segment $QR = 5.9$ cm.

Step 2. With Q as centre and radius equal to 4.9 cm, draw an arc.

Step 3. With R as centre and radius equal to 4.9 cm. Draw another arc cutting the previous arc at P .

Step 4. Join PQ and PR .

Hence, $\triangle PQR$ is the required an isosceles triangle.

Type of triangle is an isosceles triangle, because $PQ = PR = 4.9$ cm

6. Given, $MN = 4.8$ cm

$$LN = 6.1$$
 cm

and $\angle N = 45^\circ$

First draw a rough sketch of $\triangle LMN$.

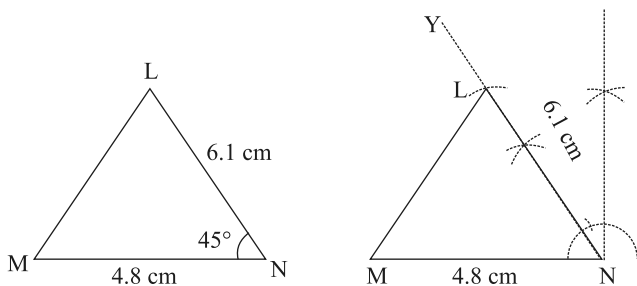
Then, draw the required $\triangle LMN$ by following the given steps of construction.

Steps of construction:

Step 1. Draw a line segment $MN = 4.8$ cm.

Step 2. At N , draw an angle of 45° on point N and produce it to ray NY .

Step 3. With N as centre draw an arc of 6.1 cm which intersect ray NY at L .



Step 4. Now, join M to L .

Thus, LMN is the required $\triangle LMN$.

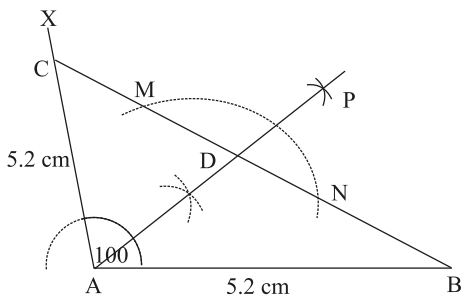
7. Steps of construction :

Step 1. Draw $AB = 5.2$ cm

Step 2. Draw

$$\angle BAX = 100^\circ$$

Step 3. With A as the centre, cut the ray AX at 5.2 cm at point C .



Step 4. Join BC .

Step 5. With A as the centre and any radius, draw an arc cutting BC at M and N .

Step 6. With M as the centre and the radius more than half of MN , draw an arc.

Step 7. With N as the centre and the same radius as before, draw another arc cutting the previously arc at P .

Step 8. Join AP meeting BC at D .

$\therefore AD \perp BC$

EXERCISE-12C

1. To construct : $\triangle ABC$, where $\angle A = 60^\circ$ and $\angle B = 30^\circ$ and $AB = 5.8$ cm.

Steps of construction :

Step 1. Draw a line segment

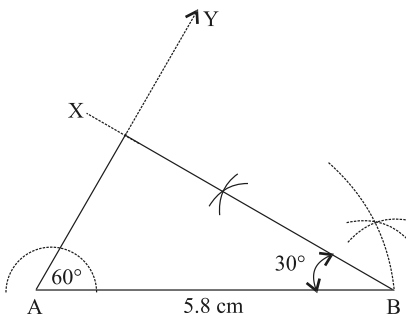
$AB = 5.8$ cm.

Step 2. At point A draw an

angle $\angle YAB = 60^\circ$ with the help of compass.

Step 3. At point B draw

$\angle XBA = 30^\circ$ with the help of compass.



Step 4. AY and BX intersect at the point C .

Step 5. It is the required triangle ABC .

2. To construct a right-angled $\triangle ABC$, where $\angle C = 90^\circ$, $AC = 6$ cm and $CA = 6$ cm.

Steps of construction:

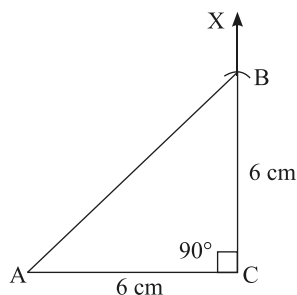
Step 1. Draw a line segment $AC = 6$ cm.

Step 2. At C , draw CX perpendicular AC .

Step 3. With C as the centre, draw an arc of radius 6 cm which should intersect CX at point B .

Step 4. Join BA .

Step 5. $\triangle ABC$ is the required isosceles right-angle triangle.



3. **Steps of construction:**

Step 1. Draw a line segment

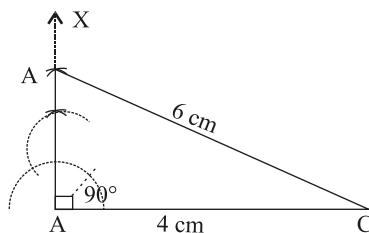
$BC = 4$ cm.

Step 2. At point B , draw a ray BX making an angle of 90° , with BC .

Step 3. Taking C as centre, draw an

arc of 6 cm radius to intersect ray BX at point A .

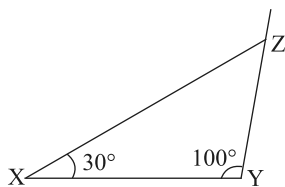
Step 4. Join A to C to obtain the required $\triangle ABC$.



4. Steps of construction :

Step 1. Draw a line segment $XY = 6$ cm, with the help of scale.

Step 2. Make an $\angle ZXY = 30^\circ$ on X and another $\angle XYZ = 100^\circ$ on Y with the help of compass.



Step 3. These two angle are intersect each other at a point called as Z .

Step 4. Thus a $\triangle XYZ$ is formed as shown in the constructed figure.

5. Construct a $\triangle ABC$ with $AB = 4.5$ cm, $\angle B = 35^\circ$ and $\angle C = 65^\circ$

In $\triangle ABC$, given $\angle B = 35^\circ$ and $\angle C = 65^\circ$

We know that, $\angle A + \angle B + \angle C = 180^\circ$

[\therefore Sum property of angle rule]

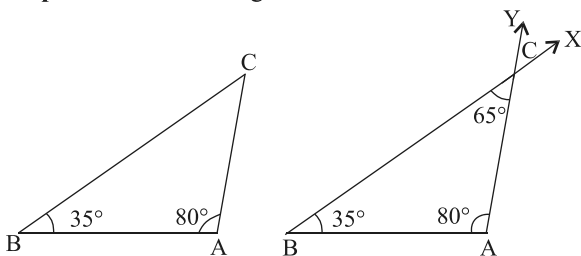
Now, $\angle A + 35^\circ + 65^\circ = 180^\circ$

$\Rightarrow \angle A + 100^\circ = 180^\circ$ or $\angle A = 180^\circ - 100^\circ \Rightarrow \angle A = 80^\circ$

Now, we first draw a rough sketch of $\triangle ABC$. Then, draw a required $\triangle ABC$ by following steps of construction.

Steps of construction :

Step 1. Draw a line segment $AB = 4.5$ cm.



Step 2. At B , draw an angle $\angle XBA = 35^\circ$, with the help of compass.

Step 3. At A , draw an angle $\angle YAB = 80^\circ$, with the help of compass.

Step 4. Let BX and AY intersect at the point C .

Step 5. It is the required triangle ABC .

6. Steps of construction :

Step 1. Draw a line segment $BC = 4.8$ cm.

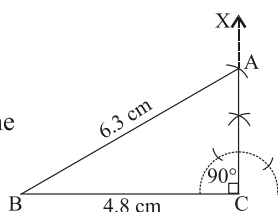
Step 2. With C , as a centre draw an angle of 90° .

Step 3. Then, with B as a center and open compass with radius equal to 6.3 cm.

Step 4. Mark a point or arc on the line CX .

Step 5. Name the point as A , and join AB .

Step 6. Hence, ABC is a required triangle.



7. A rough sketch of the required ΔPQR is as follows :

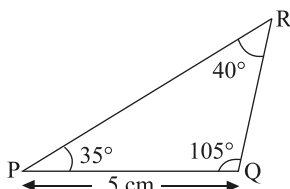
In order to construct ΔPQR , the measure of $\angle RPQ$ has to be calculated. According to the angle sum property of triangles.

$$\Rightarrow \angle PQR + \angle PRQ + \angle RPQ = 180^\circ$$

$$\Rightarrow 105^\circ + 40^\circ + \angle RPQ = 180^\circ$$

$$\Rightarrow 145^\circ + \angle RPQ = 180^\circ$$

$$\text{or } \angle RPQ = 180^\circ - 145^\circ = 35^\circ$$



The steps of construction are as follows :

Step 1. Draw a line segment $PQ = 5$ cm.

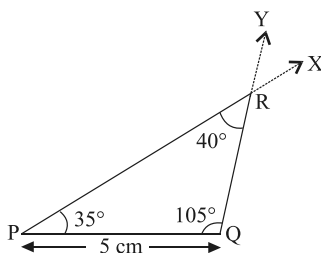
Step 2. At P , draw a ray PX making an angle of 35° with PQ .

Step 3. At Q , draw a ray QY making an angle of 105° with PQ .

Step 4. Point R has to lie on both the rays, PX and QY .

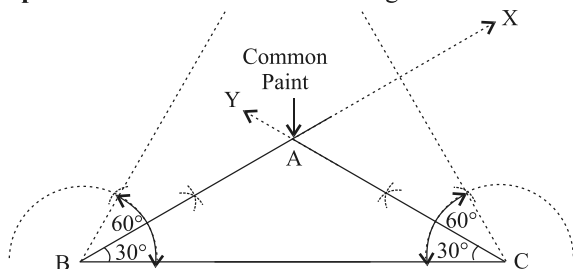
Step 5. Therefore, R is the point of intersection of these two rays.

This is the required triangle PQR .



8. **Steps of construction :**

Step 1. First of all draw a line segment $BC = 6.4$ cm.



Step 2. On both the ends of line segment construct 30° .

Step 3. To construct 30° first construct 60° on both the ends and than bisect it.

Step 4. Point A has to lie on both the rays, BX and CY .

Step 5. Therefore, A is the point of intersection of these two rays.

This is the required triangle ABC .

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. Parallel lines meet at **no point**.

Hence, the correct answer is (c).

2. The perpendicular distance between two parallel lines is same everywhere.

Hence, the correct answer is (a).

3. If no angle is given, then how many sides must we have to construct a triangle?

Ans. 3. Hence, the correct option is (c).

4. If the two sides of a triangle are given, then how many angles including sides must also be given to construct a triangle?

Ans. 1. Hence, the correct option is (b).

5. If one side is given, then how many angles must also be given to construct a triangle?

Ans. 2. Hence, the correct option is (a).

THINK, SOLVE AND LEARN

- Draw the line segment of 7.3 cm and find its axis.

Sol. Steps of construction :

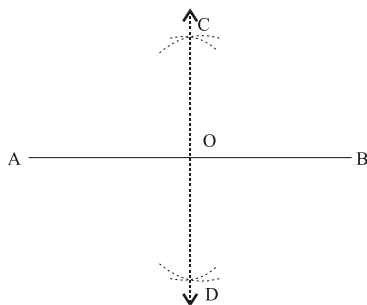
Step 1. Draw a line segment $AB = 7.3$ cm.

Step 2. Taking A and B as centres and radius more than half of AB , draw two arcs which intersect each other at the point C and D .

Step 3. Join CD .

Step 4. Then, CD is the axis of symmetry of the line segment AB .

Hence, we get a figure as shown.





13 Three-dimensional Shapes



EXERCISE-13A

1. Identify the following shapes. Write the name of the solid it represents below each picture:

(i)



Cuboid

(ii)



sphere

(iii)



Cuboid

(iv)



Cylinder

(v)



Cylinder

(vi)



Cone

(vii)



Cube

(viii)



Cuboid

2. Name each solid figures:

(i)



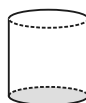
Cone

(ii)



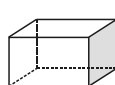
Cube

(iii)



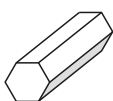
Cylinder

(iv)



Cuboid

(v)



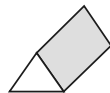
**Hexagonal
prism**

(vi)



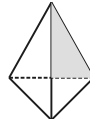
**Square
pyramid**

(vii)



**Triangular
r prism**

(viii)



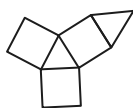
**Triangular
prims**

3. Fill in the following table :

Name of Solid	Number of Faces	Number of Edges	Number of Vertices
Cube	6	12	8
Cuboid	6	12	8
Cone	2	1	1
Cylinder	3	2	Zero, N/L
Sphere	1	N/L	N/L

EXERCISE-13B

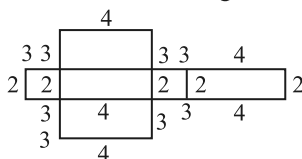
1. (iv)



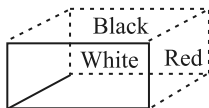
Because, the net (iv) can be folded as a triangular prism.

2. Draw the nets of the following solid shapes :

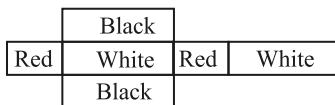
(i) **Cuboid** : The net of the given cuboid is shown below :



(ii) **Rectangular prism** : A rectangular prism has 6 faces, 12 edges and 8 vertices. In the 12 edges, 3 edges intersect to form right angles at each vertices.

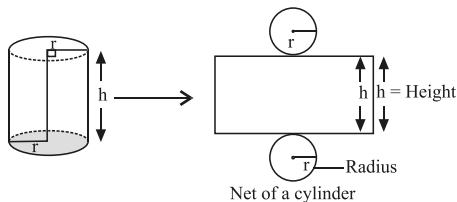


Rectangular prism



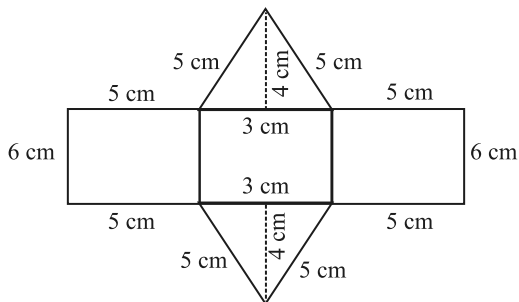
Net of a rectangular prism

(iii) **Cylinder** : A cylinder is a three-dimensional solid figure which has two identical circular bases joined by a curved surface at a particular distance from the centre which is the height of the cylinder.

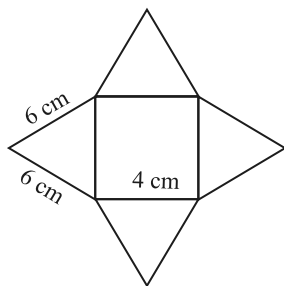


Net of a cylinder

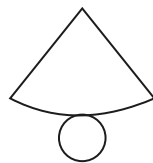
(iv) **Triangular prism :**



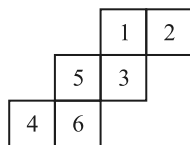
- (v) **Pyramid :** The net of a square pyramid provides a flattened view of each face and the square base along with its dimensions. When placed horizontally, the net of the pyramid with a square base is seen in a 2D shape and when folded the solid shape becomes 3D shape of a square pyramid. The net of a square pyramid has the same number of faces when it is flattened.



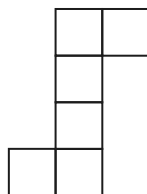
- (vi) **Cone :** The net of a cone is a whole small circle and a sector of a big circle, where the arc length of the sector is the same as the circumference of the small circle.



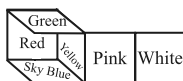
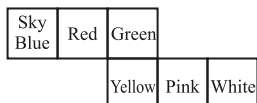
3. (i) By observing the figure the sum of the opposite faces is equal to seven. So, the given net can be folded into a net of dice.



- (ii) The net can be folded into a cube.

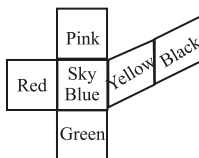
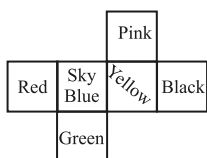


(iii) The given net can be folded as a cube. Because, it can be folded as below.

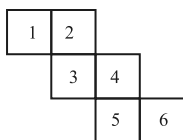


(iv) None

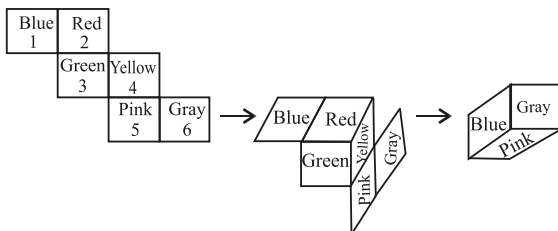
4. (i) The given net can be folded as a cube. Because, it can be folded as below :



(ii) The given net is folded as dice is shown in figure below;

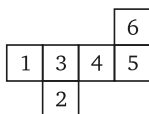


1 = Blue, 2 = Red, 3 = Green, 4 = Yellow, 5 = Pink, 6 = Gray

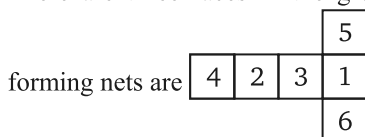


No, this cannot be a net for die. By observing the figure we can say that, one pair of opposite face will have 1 and 4, another pair of opposite side face will have 3 and 6, the sum of these two opposite faces are not equal to 7.

5. (i) Net in form cube.



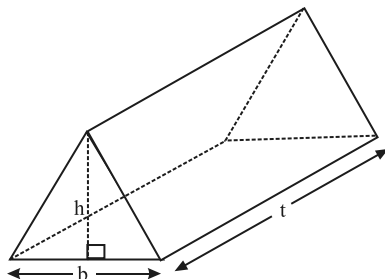
- (ii) There are three faces in the given net. The two possibilities of



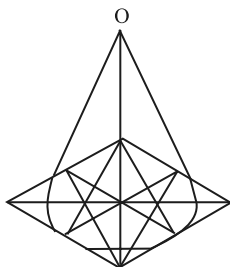
EXERCISE-13C

- 1. Triangular prism :** The properties of a triangular prism help us to identify it easily. Listed below are a few properties of a triangular prism :

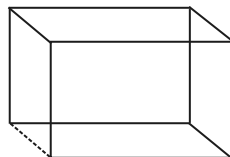
- (i) A triangular prism has 5 faces, 9 edges and 6 vertices.
- (ii) It is a polyhedron with 3 rectangular faces and two triangular faces.
- (iii) The two triangular bases are congruent to each other.
- (iv) Any cross section of a triangular prism is in the shape of a triangle.



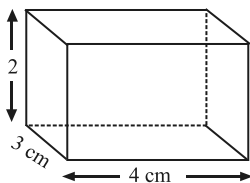
- 2. Draw an isometric sketch of cone.**



- 3. An isometric sketch of a cube represents three faces that resemble three equilateral parallelogram. The parallel edges of the cube appear as parallel lines. The horizontal edges of the cube are drawn at an angle from the horizontal axes and vertical edges are parallel to the principal axes.**



4. Isometric sketch for a cuboid of dimensions $4 \times 3 \times 2$



5. Do yourself.
6. Do yourself.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

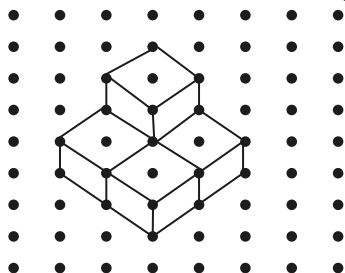
1. A cuboid has rectangular faces are 6.
Hence, the correct option is (a).
2. A cuboid has edges are 12.
Hence, the correct option is (b).
3. A cube has vertices are 8.
Hence, the correct option is (c).
4. A triangular pyramid shown in figure has faces are four.
Hence, the correct option is (a).
5. A sphere has vertices are none.
Hence, the correct option is (a).

DO AND LEARN

Do yourself.

THINK, SOLVE AND LEARN

An isometric sketch of each of the following oblique shapes.



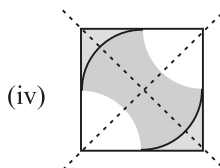
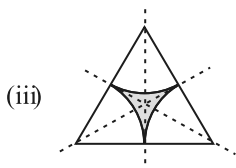
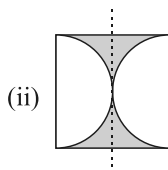
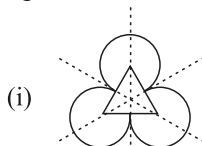


14 Symmetry



EXERCISE 14-+A

1. Identify multiple lines of symmetry, if any in each of the following figures:



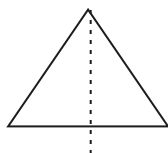
2. What other name can you give to the line of symmetry of:

- (i) An isosceles triangle?

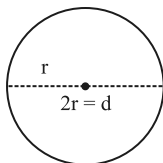
Altitude (Median)

The line of symmetry of an isosceles triangle coincides with the median (altitude) of the triangle.

Therefore, the median (altitude) can also be called the line of symmetry for an isosceles triangle.



- (ii) A circle of ? **Diameter**

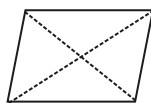


The line of symmetry of a circle is diameter ($d = 2r$).

3. State the number of lines of symmetry for the following figures:

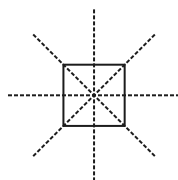
- (i) **A rhombus**

There are two lines of symmetry in a rectangle.

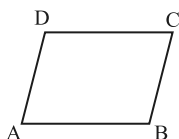


(ii) **A square**

There are four lines of symmetry in a square.



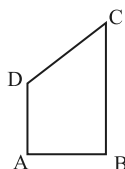
(iii) **A parallelogram**



There is no line of symmetry in a parallelogram.

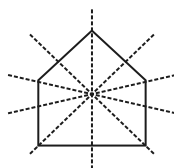
(iv) **A quadrilateral :**

There are no line of symmetry in a quadrilateral.



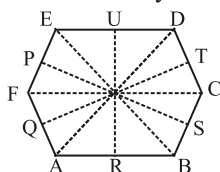
(v) **A regular pentagon**

A pentagon has five lines of symmetry as can be seen in the diagram.



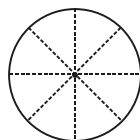
(vi) **A regular hexagon**

There are six lines of symmetry in a regular diagram.



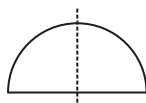
(vii) **A circle**

There are infinite lines of symmetry in a circle. Some of these are represented as the given circle's figure.



(viii) **A semi circle**

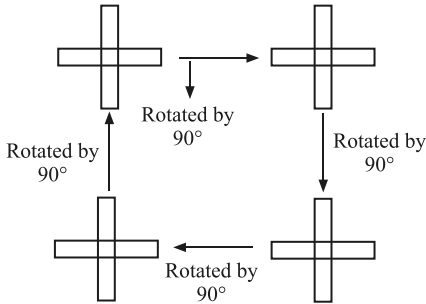
From the figure of semi-circle, it is a very clear that, semi-circle has only one line of symmetry.



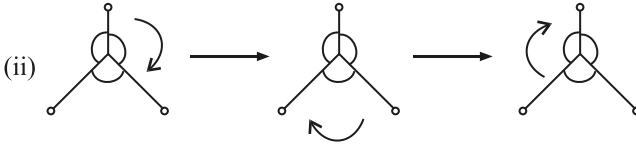
4. A scalene triangle, a parallelogram, and a trapezium do not have any line of symmetry.

EXERCISE-14 B

1. Give the order of rotational symmetry for each of the following figures :



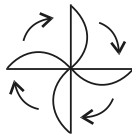
The given figure has its rotational symmetry as 4.



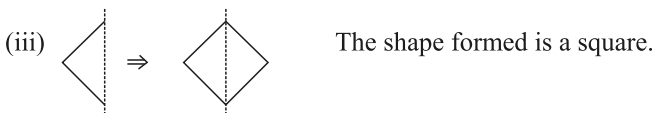
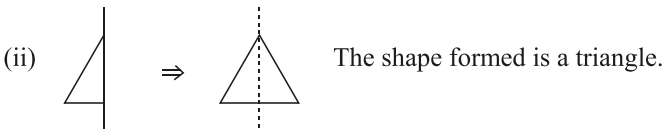
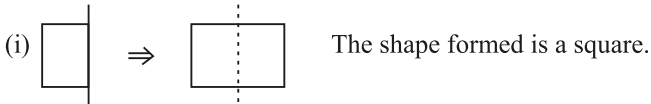
The given figure has its rotational symmetry as 3.

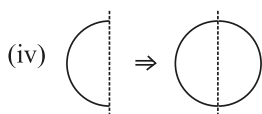
- (iii) The given figure has its rotational symmetry as 3.

- (iv) The given figure has its rotational symmetry as 4.



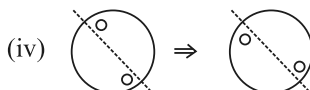
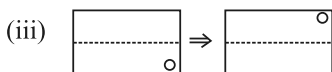
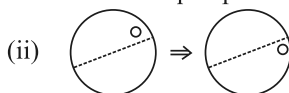
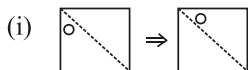
2. In the following figures, the mirror line (*i.e.*, the line of symmetry) is given as dotted line. Complete each figure performing reflection in the dotted (mirror) line. Also, try to recall the name of the complete figure.





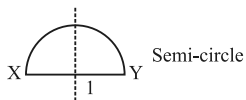
The shape formed is a circle.

3. In this question a line of symmetry and a hole is given, and we have to find the other hole. The other hole should be at that place such that if it is divided by any line of symmetry, it will divide it in equal parts.



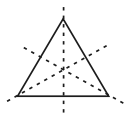
4. An equilateral triangle and a square are two figures that have both line symmetry and rotational symmetry.
5. A semi-circle, an isosceles triangle are figures that have a line of symmetry but lack rotational symmetry.
6. Hence, a scalene triangle is a figure that has neither a line of symmetry nor a rotational symmetry.
7. A semi-circle has only one line of symmetry. In the figure, there is one line of symmetry. The figure is symmetric along the perpendicular bisector l of the diameter XY .

A semi-circle does not have any rotational symmetry.

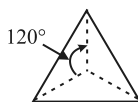
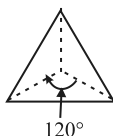
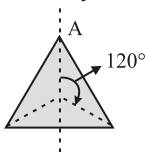


8. (i) An equilateral triangle has both line and rotational symmetries of order more than 1.

Line symmetry:

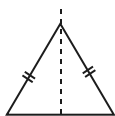


Rotational symmetry :

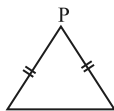
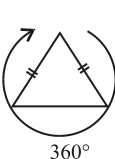


- (ii) An isosceles triangle has only one line of symmetry and no rotational symmetry of order more than 1.

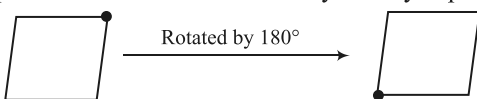
Line symmetry :



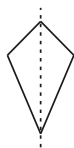
Rotational symmetry :



(iii) A quadrilateral with a rotational symmetry is parallel.



(iv) A kite is a quadrilateral with line of symmetry but not rotational symmetry.



MULTIPLE CHOICE QUESTIONS

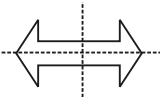
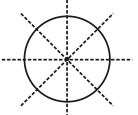
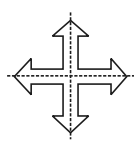
Choose the correct answer

1. The number of lines of symmetry of regular hexagon is 6.
Hence, the correct option is (c).
2. The number of lines of symmetry of a rhombus is 2.
Hence, the correct option is (b).
3. The number of lines of symmetry of a parallelogram is 2.
Hence, the correct option is (b).
4. The number of lines of symmetry of a rectangle is 2.
Hence, the correct option is (b).
5. The number of lines of symmetry of a square is 4.
Hence, the correct option is (d).
6. The number of lines of symmetry of an equilateral triangle is 3.
Hence, the correct option is (c).

DO AND LEARN

Do yourself.

THINK, SOLVE AND LEARN

- (a)  \Rightarrow The number of lines of symmetry is four.
- (b)  \Rightarrow The number of lines of symmetry is infinite number.
- (c)  \Rightarrow The number of lines of symmetry is two.



15 Perimeter and Area

EXERCISE- 15A

- We know that the rhombus is a parallelogram and area of parallelogram is equal to the product of its base and height.
 \therefore Area of rhombus = Base \times Height
 Given, Base of rhombus = Side of rhombus = 7.2 cm
 Height of rhombus = Altitude of rhombus = 6 cm
 \therefore Area of rhombus = $7.2 \times 6 \text{ cm}^2 = 43.2 \text{ cm}^2$
 Hence, the required area of rhombus is 43.2 sq. cm.
- We know that,
 Area of parallelogram = Base \times Altitude
 Given, Base of parallelogram is 8 cm and altitude is 4.5 cm.
 Therefore,
 Area of parallelogram = $8 \times 4.5 \text{ cm}^2 = 36.0 \text{ cm}^2$
 Hence, the required area of parallelogram is 36 cm^2 .
- Given that
 Perimeter of rhombus = 24 m and Area of rhombus = 42 m^2
 One side of rhombus = $\frac{\text{Perimeter of rhombus}}{4} = \frac{24}{4} \text{ m} = 6 \text{ m}$
 \therefore Area of rhombus = Base \times Height
 $\Rightarrow 42 = 6 \times h$ [Let us height of rhombus be h .]

$$\Rightarrow h = \frac{42}{6} \text{ m or } h = 7 \text{ m}$$

\therefore Altitude of rhombus $= h = 7 \text{ m}$ **Ans.**

4. Given, Base of parallelogram (base) $= 2 \times \text{height}$

Area of parallelogram $= \text{Base} \times \text{height}$ [Given, Area $= 512 \text{ cm}^2$]

$$\Rightarrow 512 = 2 \times \text{Height} \times \text{Height}$$

$$\Rightarrow (\text{Height})^2 = \frac{512}{2} \text{ cm} = 256 \text{ cm}$$

$$\Rightarrow \text{Height} = \sqrt{256} \text{ cm} = 16 \text{ cm}$$

$$\text{Base of altitude} = 2 \times \text{Height} = 2 \times 16 \text{ cm} = 32 \text{ cm}$$

Hence, the required height of parallelogram is 16 cm and base of altitude is 32 cm.

5. Given, the ratio of adjacent sides of parallelogram is 2 : 3.

Let the length of the adjacent side be $2x$ and $3x$ respectively.

Also, parameter of parallelogram $= 50 \text{ cm}$

According to the question,

$$2(2x + 3x) = 50$$

$$\Rightarrow 10x = 50$$

$$\Rightarrow x = \frac{50}{10} = 5 \text{ cm}$$

Thus, the adjacent sides of parallelogram are $(2x) = 2 \times 5 = 10 \text{ cm}$

and $(3x) = 3 \times 5 \text{ cm} = 15 \text{ cm}$

Hence, area of the parallelogram $= 150 \times 10 \text{ cm}^2 = 150 \text{ cm}^2$ **Ans.**

6. We have, given area of rhombus $= 96 \text{ cm}^2$

And its diagonal is 16 cm.

We know that the,

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2 \text{ sq. unit}$$

$$\text{Now, } 96 = \frac{1}{2} \times 16 \times d_2$$

$$\Rightarrow 96 = 8d_2$$

$$\text{or } d_2 = \frac{96}{8} = 12$$

$$\Rightarrow d_2 = \text{Second diagonal is } 12 \text{ cm.}$$

We know that, diagonals of rhombus perpendicularly bisect each other.

So, $AO = 8 \text{ cm}$ and $DO = 6 \text{ cm}$... (i)

In triangle AOD ,

$$AD^2 = AO^2 + DO^2 \text{ [By us Pythagoras theorem]}$$

$$\Rightarrow AD^2 = 8^2 + 6^2 = 64 + 36 = 100 \text{ cm}$$

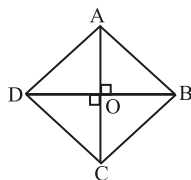
$$AD = 10 \text{ cm}$$

Length of sides of a rhombus is 10 cm.

Perimeter of rhombus = $4 \times \text{side}$

$$= 4 \times 10 \text{ cm} = 40 \text{ cm}$$

Hence, the required perimeter of rhombus is 40 cm.



EXERCISE- 15B

1. Find the area of each of the following triangles :

(i) Area of triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

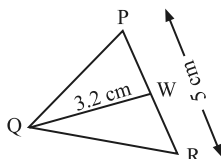
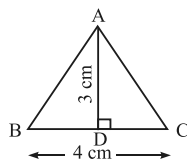
$$= \frac{1}{2} \times 4 \times 3 \text{ cm}^2 = 6 \text{ cm}^2$$

Hence, the required area of triangle is 6 cm^2 .

(ii) Area of triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

$$= \frac{1}{2} \times 5 \times 3.2 \text{ cm}^2 = 8 \text{ cm}^2$$

Hence, the required area of triangle is 8 cm^2 .



2. Area of triangular field = $\frac{\text{Total cost}}{\text{Rate per hectare}}$

$$= \frac{332.10}{24.6} \text{ hectare}$$

$$= 13.5 \text{ hectares}$$

$$= (13.5 \times 10000) \text{ m}^2 = 135000 \text{ m}^2$$

Let us altitude of triangular field be x meters. Base = $3x$ meter.

$$\text{Area of the triangular field} = \frac{1}{2} \times \text{Base} \times \text{Height (altitude)}$$

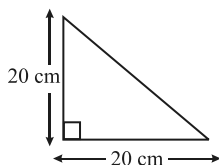
$$135000 = \frac{1}{2} \times 3x \times x$$

$$\Rightarrow x^2 = \frac{135000 \times 2}{3} = \frac{270000}{3} = 90000$$

$$\Rightarrow x^2 = (300)^2 \text{ or } x = 300 \text{ m}$$

Hence, the required height of triangular field is 300 m and its base is
 $3x = 3 \times 300 = 900 \text{ m}$

$$\begin{aligned} \text{3. Area of right-angled triangle} &= \frac{1}{2} \times \text{Base} \times \text{Height} \\ &= \frac{1}{2} \times 20 \times 20 \text{ cm}^2 \\ &= 200 \text{ cm}^2 \end{aligned}$$

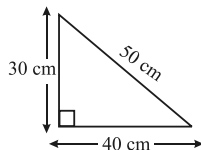


Hence, the required area of given right-angled triangle is 200 cm^2 .

4. Given, Two sides of triangular are 40 cm and 30 cm.
 And the other third side is 50 cm.

So, the triangle is right angled and then we get its

$$\begin{aligned} \text{Area} &= \frac{1}{2} \times \text{Base} \times \text{Height} \\ &= \frac{1}{2} \times 40 \times 30 \text{ cm}^2 \\ &= 600 \text{ sq. cm} \end{aligned}$$



$$\begin{aligned} \text{Again perimeter of right angle is} &= \text{Sum of all three sides} \\ &= 40 \text{ cm} + 30 \text{ cm} + 50 \text{ cm} \\ &= 120 \text{ cm} \end{aligned}$$

Hence, the required perimeter and area of the right-angled shape are
 120 cm and 60 cm^2 .

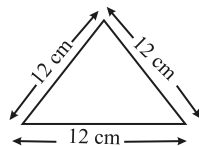
5. Given, side of equilateral triangle is 12 cm.

We know that the area of an equilateral triangle

$$= \frac{\sqrt{3}}{4} a^2, \text{ where } a \text{ is the side of equilateral triangle.}$$

$$\text{So, } a = 12 \text{ cm}$$

$$\text{Now, area of equilateral triangle} = \frac{\sqrt{3}}{4} \times 12 \times 12 \text{ cm}^2 = 36\sqrt{3} \text{ cm}^2$$



Hence, the required area of equilateral triangle is $36\sqrt{3} \text{ cm}^2$.

Ans.

6. Let the base and altitude be $3x$ and $4x$ respectively.

$$\text{Now, Area of triangle} = \frac{1}{2} \times \text{Base} \times \text{Height} = \frac{1}{2} \times 3x \times 4x = 6x^2$$

It is given that area of the triangle is 249 cm^2 , then

$$\Rightarrow 6x^2 = 249 \text{ or } x^2 = \frac{249}{6}$$

$$\Rightarrow x^2 = 49 \text{ or } (x)^2 = (7)^2 \text{ or } x = 7$$

According to question, base of triangle = $3x = 3 \times 7 = 21$ cm
and Height (altitude) of triangle = $4x = 4 \times 7 = 28$ cm

Ans.

7. Given, Area of triangle = 76 cm^2 and Base = 19 cm

We know that, area of triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

$$\Rightarrow 76 = \frac{1}{2} \times 19 \times \text{Height}$$

$$\Rightarrow \text{Height} = \frac{76 \times 2}{19} \text{ cm} = 8 \text{ cm}$$

Hence, the required height (altitude) of triangle is 8 cm.

8. Given, Area of square = Area of triangle

$$\text{Area of triangle} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

$$(60 \text{ m})^2 = \frac{1}{2} \times x \times 90 \text{ m}^2 \quad [\because \text{Let the base be } x \text{ m. }]$$

$$\Rightarrow 45x = 3600$$

$$\Rightarrow x = \frac{3600}{45} = 80 \text{ m}$$

Hence, the required base of triangle 80 m.

Ans.

EXERCISE- 15(C)

1. Find the area and circumference of the circle whose radius is :

(i) 3.5 cm (ii) 5.6 cm (iii) 28 m (iv) 87.5 km

Sol. (i) Circumference of the circle = $2\pi r$

$$= 2\pi \times 3.5 = 7.0\pi \text{ cm}$$

$$= 7 \times \frac{22}{7} \text{ cm} = 22 \text{ cm}$$

$$\text{Area of circle} = \pi r^2$$

$$= \frac{22}{7} \times 3.5 \times 3.5 \text{ cm}^2 \left[\because \frac{22}{7} \text{ and } r = 3.5 \text{ cm} \right]$$

$$= 22 \times 3.5 \times 0.5 \text{ cm}^2 = 38.5 \text{ cm}^2$$

Hence, the required area of circle is 38.5 cm^2 and circumference is 22 cm.

$$(ii) \text{ Circumference of the circle} = 2\pi r = 2 \times \frac{22}{7} \times 5.6 \text{ cm} = 35.2 \text{ cm}$$

$$\text{Area of the circle} = \pi r^2 = \frac{22}{7} \times (5.6 \text{ cm})^2 = 98.56 \text{ cm}^2$$

Hence, the required area and circumference of circle is 98.56 cm² and 35.2 cm. **Ans.**

$$(iii) \text{ Area of circle} = \pi r^2 = \frac{22}{7} \times 28 \times 28 \text{ m}^2 = 2464 \text{ m}^2 \quad [\because r = 28 \text{ m}]$$

$$\text{Circumference} = 2\pi r = 2 \times \frac{22}{7} \times 28 \text{ m} = 176 \text{ m} \quad \textbf{Ans.}$$

$$(iv) \text{ Area of circle} = \pi r^2 = \frac{22}{7} \times 87.5 \times 87.5 \text{ km}^2 \quad [\text{Given, } r = 87.5 \text{ km}]$$

$$= 24062.5 \text{ km}^2$$

$$\text{Circumference of circle} = 2\pi r = 2 \times \frac{22}{7} \times 87.5 \text{ km} = 550 \text{ km} \quad \textbf{Ans.}$$

2. Find the area and circumference of the circle whose diameter is :

- (i) 7.7 cm (ii) 4.2 cm (iii) 24.5 m (iv) 7 km

Sol. (i) Given, diameter = 7.7 cm

$$\text{Area of the circle} = \pi r^2 = \frac{22}{7} \times \frac{7.7}{2} \times \frac{7.7}{2} \text{ cm}^2 = 46.585 \text{ cm}^2$$

Circumference of the circle

$$= 2\pi r = 2 \times \frac{22}{7} \times \frac{7.7}{2} = 22 \times 1.1 \text{ cm} = 24.2 \text{ cm}$$

(ii) Given, diameter = 4.2 cm

$$\text{Area of circle} = \frac{22}{7} \times \frac{4.2}{2} \times \frac{4.2}{2} \text{ cm}^2 = 13.86 \text{ cm}^2 \quad \textbf{Ans.}$$

$$\text{Circumference of circle} = 2\pi r = 2 \times \frac{22}{7} \times \frac{4.2}{2} \text{ cm} = 13.2 \text{ cm}$$

(iii) Given, diameter = 24.5 m

Area of circle

$$= \frac{22}{7} \times \left(\frac{24.5}{2} \right)^2 \text{ m}^2 = \frac{22}{7} \times \frac{24.5}{2} \times \frac{24.5}{2} \text{ m}^2 = 471.625 \text{ m}^2$$

$$\text{Circumference of circle} = 2\pi r = 2 \times \frac{22}{7} \times \frac{24.5}{2} \text{ m} = 77 \text{ m} \quad \textbf{Ans.}$$

$$(iv) \text{ Area of circle} = \pi r^2 = \frac{22}{7} \times \left(\frac{7}{2} \right)^2 \text{ km} = \frac{22 \times 49}{28} \text{ km}^2 = 38.5 \text{ km}^2$$

$$\text{Circumference of circle} = 2\pi r = 2 \times \frac{22}{7} \times \frac{7}{2} = 22 \text{ km} \quad \textbf{Ans.}$$

3. Given, radius of semi-circular plate = 3.85 cm

Perimeter of semi-circular plate = $(\pi + 2)r$

$$= \left(\frac{22}{7} + 2 \right) \times 3.85 \text{ cm} = \left(\frac{22+14}{7} \right) \times 3.85 \text{ cm}$$

$$= \frac{36}{7} \times 3.85 \text{ cm} = 19.8 \text{ cm}$$

Hence, the required perimeter of a semi-circular plate is 19.8 cm.

4. Given, side of square is 22 cm. The wire has same length.

Hence, perimeter of square and circumference of circle are equal.

According to the given question,

Circumference of circle = Perimeter of square

$$2\pi r = 4 \times (\text{side})$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 4 \times 22$$

$$\Rightarrow r = \frac{4 \times 22 \times 7}{2 \times 22} = 14 \text{ cm}$$

Now, area of enclosed shape circular wire

$$= \pi r^2 = \frac{22}{7} \times 14^2 \text{ cm}^2$$

$$= \frac{22}{7} \times 196 \text{ cm}^2 = 22 \times 28 \text{ cm}^2 = 616 \text{ cm}^2$$

Hence, the required area of the circle is 616 cm²

Ans.

5. Let the number of revolution be n .

Total distance = 121 km,

We know that 1 km = 100000 cm = 10⁵ cm

and circumference of circle = $2\pi r$

$$\left[\because r = \frac{d}{2} \right]$$

Distance covered = $n \times \text{Circumference}$

$$121 \times 10^5 = n \times 2 \times \frac{22}{7} \times \frac{77}{2}$$

$$\Rightarrow n = \frac{121 \times 10^5 \times 7 \times 2}{2 \times 22 \times 77}$$

$$= \frac{121 \times 10^5 \times 1}{22 \times 11} = \frac{11 \times 10^5}{22} = \frac{100000}{2} = 50000$$

Hence, the required number of revolutions by wheel are 50000.

Ans.

6. Given, circular park of radius (s) = 12 cm

Radius of outer circle = $R = (12 + 3) = 15$ cm

Area of the road = Area of outer circle – Area of inner circle

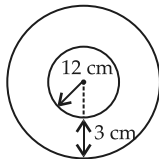
$$= \pi R^2 - \pi r^2 = \pi (R^2 - r^2)$$

$$= \frac{22}{7} [15^2 - 12^2] \text{ cm}^2$$

$$= \frac{22}{7} \times (15 + 12)(15 - 12) \text{ cm}^2$$

$$[\because a^2 - b^2 = (a + b)(a - b)]$$

$$= \frac{22}{7} (27) \times (3) \text{ cm}^2 = \frac{22}{7} \times 81 \text{ cm}^2 = 254.57 \text{ cm}^2$$



Hence, the required area of road is 254.57 cm^2 .

7. We have,

Area of two circles are in the ratio = 16 : 25

$$\frac{A_1}{A_2} = \frac{16}{25}$$

$$\therefore \frac{\pi R^2}{\pi r^2} = \frac{16}{25} \quad \text{or} \quad \frac{R^2}{r^2} = \frac{16}{25} \quad \text{or} \quad \frac{R}{r} = \frac{4}{5}$$

According to the question,

$$\text{Ratio of their circumferences} = \frac{C_1}{C_2} = \frac{2\pi R}{2\pi r} = \frac{R}{r} = \frac{4}{5}$$

\therefore The ratio of circumferences is 4 : 5.

Ans.

8. Length of the rope acts as the radius of circular path.

Area of circle = πr^2

Area of circular ground = $3.14 \times (10\text{ m})^2$ [$\because \pi = 3.14$]

$$= 3.14 \times 100 \text{ m}^2$$

$$= 314 \text{ m}$$

Hence, required area of circle is 314 m

9. It is given that diameter of a circular garden = 28 m

We know that,

Length of fencing = Circumference the circle = πd

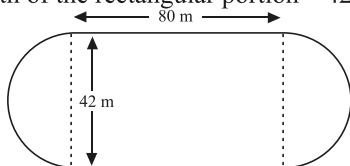
$$\text{Substituting the value} = \frac{22}{7} \times 28 \text{ m} = 88 \text{ m}$$

As 1 m of fencing costs = ₹ 300

Total cost of wooden fencing around a circular garden
 $= 88 \times 300 = ₹ 26400$

Therefore, the total cost of wooden fencing a circular garden is
 $₹ 26400$.

10. Given, Length of the rectangular portion = 80 m
 Breadth of the rectangular portion = 42 m



Let r be the radius of each of the semicircular parts.

Area of the playground = Area of rectangle part

+ Area of the two semicircles

$$= [\text{Length} \times \text{Breadth}] + \left[\frac{\pi r^2}{2} \times 2 \right] \text{ sq. unit.}$$

$$= \left[(80 \times 42) + \frac{22}{7} \times \left(\frac{42}{2} \right)^2 \right] \text{ m}^2$$

$$= \left[3360 + \frac{22}{7} \times (21)^2 \right] \text{ m}^2$$

$$= [3360 + 1386] \text{ m}^2$$

$$= 4746 \text{ m}^2$$

Hence, the required area of the playground is 4746 m^2 .

Ans.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer

1. Area of a triangle is : $\frac{1}{2} \times \text{base} \times \text{height}$

Hence, the correct option is (b).

2. Given, Circumference of circle = 44 cm
 Circumference of circle = $2\pi r$

Now, $44 = 2 \times \frac{22}{7} \times r$

$$\Rightarrow r = \frac{44 \times 7}{2 \times 22} = 7 \text{ cm}$$

Hence, the required radius is 7 cm.

Correct option is (c).

3. Given, Area of Δ is 100 cm^2 .

$$\text{Altitude} = 10 \text{ cm}$$

We know that, Area of $\Delta = \frac{1}{2} \times \text{Base} \times \text{Height (Altitude)}$

$$\Rightarrow 100 = \frac{1}{2} \times \text{Base} \times 10$$

$$\Rightarrow \text{Base} = \frac{100 \times 2}{10} = 20 \text{ cm}$$

Hence, the correct option is (a).

4. Given, Area of parallelogram = 620 cm^2
One side = 20 cm

We know that,

Area of parallelogram = Side \times Altitude

$$\Rightarrow 620 = 20 \times \text{Altitude}$$

$$\Rightarrow \text{Altitude} = \frac{620}{20} \text{ cm} = 31 \text{ cm}$$

Hence, the correct option is (c).

DO AND LEARN

Do yourself.

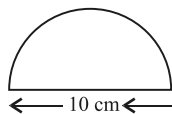
THINK, SOLVE AND LEARN

Given, Diameter = 10 cm

$$\text{Radius } (r) = \frac{\text{Diameter } (d)}{2} = \frac{10}{2} \text{ cm} = 5 \text{ cm}$$

Perimeter of the given figure = Circumference of semicircle + Diameter

$$\begin{aligned} &= \pi r + D \\ &= \left[\frac{22}{7} \times 5 + 10 \right] \text{ cm} \\ &= \left[\frac{110}{7} + 10 \right] \text{ cm} \\ &= 25.71 \text{ cm} \end{aligned}$$



Therefore, the perimeter of the given figure is 25.71 cm.



16 Data Handling



EXERCISE- 16A

1. Find the mean of the numbers given below :

(i) 2, 9, 3 and 6

(ii) 1.3, 2.1, 4.6 and 3.8

Sol. (i) We know that,

$$\begin{aligned}\text{Mean } (\bar{x}) &= \frac{\text{Sum of observations}}{\text{Number of observations}} \\ &= \frac{2+9+3+6}{4} = \frac{20}{4} = 5\end{aligned}$$

Hence, the required mean is 5.

(ii) We know that,

$$\text{Mean } (\bar{x}) = \frac{1.3+2.1+4.6+3.8}{4} = \frac{11.8}{4} = 2.95$$

Hence, the required means is 2.95.

2. The first ten odd number are : 1, 3, 5, 7, 9, 11, 13, 15, 17, 19.

We know that,

$$\text{Mean} = \frac{\text{Sum of all the observations}}{\text{Total number of observations}}$$

Now, mean calculation;

$$\text{Mean } (\bar{x}) = \frac{1+3+5+7+9+11+13+15+17+19}{10} = \frac{100}{10} = 10$$

Hence, the required mean is 10.

Ans.

3. The first five whole numbers are : 0, 1, 2, 3, 4.

$$\begin{aligned}\text{We know that, Mean } (\bar{x}) &= \frac{\text{Sum of all the observations}}{\text{Total number of observations}} \\ &= \frac{0+1+2+3+4}{5} = \frac{10}{5} = 2\end{aligned}$$

Hence, the required mean of the first five whole numbers is 2.

4. Total numbers of innings = 8

Scores of cricketer in eight innings = 58, 76, 40, 35, 46, 45, 0, 100

$$\text{Mean of the score} = \frac{58+76+40+35+46+45+0+100}{8} = \frac{400}{8} = 50$$

Hence, the required mean of the cricketer in eight innings is 50 runs.

$$\begin{aligned}5. \text{ Average weekly pocket money} &= \frac{\text{Sum of all the observations}}{\text{Total number of observations}} \\ &= ₹ \frac{130+160+175+180+135}{5} \\ &= ₹ \frac{780}{5} = ₹ 156\end{aligned}$$

Hence, the required average weekly pocket money is ₹ 156.

6. Let the first five days be M, T, W, Th and F.

For the first four days, mean attendance is 780.

Therefore, we have;

$$\frac{(M + T + W + Th)}{4} = 780 \text{ or } M + T + W + Th = 3120 \quad \dots(i)$$

Now, again, for the first five days, mean attendance is 840.

Therefore we have;

$$\frac{(M + T + W + Th + F)}{5} = 840$$

$$M + T + W + Th + F = 4200 \quad \dots(ii)$$

By subtracting (i) from (ii), we get

$$\begin{array}{rcl} M + T + W + Th + F & = & 4200 \\ M + T + W + Th & = & -3120 \\ \hline & & F = 1080 \end{array}$$

Therefore, the number of students present on Friday is 1080.

Ans.

7. Given, Mean = 9

Total given numbers are : 18, 5, 3, 12, 17, 10, x, 6, 6.

We know that,

$$\text{Mean } (\bar{x}) = \frac{\text{Sum of all the observations}}{\text{Total number of observations}}$$

$$\Rightarrow 9 = \frac{18 + 5 + 3 + 12 + 17 + 10 + x + 6 + 6}{9}$$

$$\Rightarrow 81 = 77 + x \text{ or } x = 81 - 77 = 4$$

Hence, the required number of x is 4.

Ans.

8.

Size (in cm) x	Number of shoes f	Size (in cm) \times Number of shoes $f \cdot x$
24	3	$24 \times 3 = 72$
25	2	$25 \times 2 = 50$
26	14	$26 \times 14 = 364$
27	7	$27 \times 7 = 189$
28	9	$28 \times 9 = 252$
29	14	$29 \times 14 = 406$
30	12	$30 \times 12 = 360$
Total	$\Sigma f = 61$	$\Sigma fx = 1693$

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Mean} = \frac{1693}{61} = 27.75$$

Hence, the required value of mean of the shoes is 27.75.

Ans.

EXERCISE-16 B

1. Find the median of the following:

- (i) 3, 6, 7, 10, 12, 15, 17 (ii) 5, 9, 4, 3, 10, 6, 7

Sol. (i) Arranging the given number in the ascending order, we get

3, 6, 7, 10, 12, 15, 17 [Given numbers are already in ascending order]

Here, $n = 7$, so n is odd.

$$\text{Median} = \text{Value of } \frac{1}{2}(n+1) \text{th observation}$$

$$= \text{Value of } \frac{1}{2}(7+1) \text{th observation}$$

$$\Rightarrow \text{Median} = \text{Value of } \frac{8}{2} \text{th observation}$$

Median = Value of 4th observation is 10.

Therefore, the median of the given number is 10.

Ans.

(ii) Arranging the given number in the ascending order, we get

3, 4, 5, 6, 7, 9, 10

Here, $n = 7$. So, n is odd.

$$\therefore \text{Median} = \text{Value of } \frac{1}{2}(n+1) \text{th term}$$

$$= \text{Value of } \frac{1}{2}(7+1) \text{th term}$$

$$= \text{Value of } \frac{1}{2} \left[\left(\frac{1}{2} \times 8 \right) \right] \text{th term}$$

$$= \text{Value of 4th term} = 6$$

Therefore, the median is 6.

Ans.

2. The ages (in years) of eight teachers are : 24, 27, 43, 36, 42, 33, 21, 26.

Arranging in the ascending order, we get

21, 24, 26, 27, 33, 36, 42, 43

Here, $n = 8$, so n is even.

∴ Median

$$= \frac{1}{2} \left\{ \text{Value of } \left[\frac{n}{2} \right] \text{th observation} + \text{Value of } \left[\frac{n}{2} + 1 \right] \text{th observation} \right\}$$

Median

$$= \frac{1}{2} \left\{ \text{Value of } \left[\frac{8}{2} \right] \text{th observation} + \text{Value of } \left[\frac{8}{2} + 1 \right] \text{th observation} \right\} \text{ years}$$

$$\begin{aligned} \text{Median} &= \frac{1}{2} \{ \text{Value of 4th observation} + \text{Value of 5th observation} \} \text{ years} \\ &= \frac{1}{2} [27 + 33] = \frac{1}{2} \times 60 = 30 \text{ years} \end{aligned}$$

Hence, the required median is 30 years.

Ans.

3. Given, 9 workers salaries are :

₹ 84, ₹ 60, ₹ 50, ₹ 40, ₹ 45, ₹ 42, ₹ 38, ₹ 65, ₹ 71

Arranging the salaries of workers in the ascending order,
we get; ₹ 38, ₹ 40, ₹ 42, ₹ 45, ₹ 50, ₹ 60, ₹ 65, ₹ 71, ₹ 84

Here $n = 9$, so n is odd.

$$\therefore \text{Median of salaries} = \text{Value of } \left[\frac{1}{2}(n+1) \right] \text{th term}$$

$$= \text{Value of } \left[\frac{1}{2}(9+1) \right] \text{th term} = \text{Value of } \left[\frac{10}{2} \right] \text{th term}$$

$$= \text{Value of 5th term} = ₹ 50$$

Therefore, the median worker's salaries is ₹ 50.

4. Given, observations in ascending order are :

17, 20, 28, 32, x , $x+1$, 54, 62, 74, 80

Median = 35.5

Value of $x = ?$

Here, $n = 10$, so n is even.

Median

$$= \frac{1}{2} \left\{ \text{Value of } \left[\frac{n}{2} \right] \text{th observation} + \text{Value of } \left[\frac{n}{2} + 1 \right] \text{th observation} \right\}$$

Median

$$= \frac{1}{2} \left\{ \text{Value of } \left[\frac{10}{2} \right] \text{th observation} + \text{Value of } \left[\frac{10}{2} + 1 \right] \text{th observation} \right\}$$

$$35.5 = \frac{1}{2} \{ \text{Value of 5th observation} + \text{Value of 6th observation} \}$$

$$35.5 = \frac{1}{2} \{ (x + x + 1) \} \quad \text{or} \quad 35.5 = \frac{2x + 1}{2}$$

$$\Rightarrow 71.0 = 2x + 1 \quad \text{or} \quad 2x = 71 - 1 \quad \text{or} \quad 2x = 70$$

$$\Rightarrow x = \frac{70}{2} \quad \text{or} \quad x = 35$$

Hence, the median is 35.

5.

x	$y (f)$	Cumulative frequency (C.F.)
3	3	= 3
10	2	2 + 3 = 5
6	4	4 + 5 = 9
12	8	8 + 9 = 17
7	13	13 + 17 = 30
15	10	10 + 30 = 40
$n = 40$		

Here, the total of frequency (n) = 40, which is even.

\therefore Median

$$= \frac{1}{2} \left\{ \text{Value of } \left[\frac{n}{2} \right] \text{th observation} + \text{Value of } \left[\frac{n}{2} + 1 \right] \text{th observation} \right\}$$

$$= \frac{1}{2} \left\{ \text{Value of } \left[\frac{40}{2} \right] \text{th observation} + \text{Value of } \left[\frac{40}{2} + 1 \right] \text{th observation} \right\}$$

$$= \frac{1}{2} \{ \text{Value of 20th observation} + \text{Value of 21th observation} \}$$

$$= \frac{1}{2} [7 + 7] = \frac{1}{2} \times 14 = 7$$

Hence, required median is 7.

6. Calculate the median for the given data :

Marks (x)	Number of students f	Cumulative frequency (C.F.) ($C.f.$)
17	5	= 5
20	4	4 + 5 = 9
22	3	3 + 9 = 12
15	9	9 + 12 = 21
30	10	10 + 21 = 31
25	6	6 + 31 = 37
$n = 37$		

Here, the total frequency (n) = 37, which is odd.

\therefore Median = Value of $\left[\frac{n+1}{2} \right]$ th observation

Median = Value of $\left[\frac{37+1}{2} \right]$ th observation

= Value of $\left[\frac{38}{2} \right]$ th observation

= Value of 19th observation = 15

EXERCISE-6C

1. Find the mode of the following distributions :

(i) 10, 8, 4, 7, 8, 11, 15, 8, 4, 2 (ii) 23, 25, 29, 19, 25, 30, 8, 9, 15, 25

Sol. (i) On arranging the data in ascending order, we get

2, 4, 4, 7, 8, 8, 8, 10, 11, 15

Here, 8 occurs most frequency *i.e.*, 3 times

Hence, the mode is 8.

(ii) On arranging the data in ascending order, we get

8, 9, 15, 19, 23, 25, 25, 25, 29, 30

Here, 25 occurs most frequency *i.e.*, 3 times

Hence, the mode is 25.

2. Arranging the marks of 15 students in ascending order, we get;

8, 9, 15, 17, 19, 21, 23, 24, 25, 25, 25, 28, 29, 30

Here, n is 15, which is an odd number, we know

Median = $\left(\frac{n+1}{2} \right)$ th observation

Thus, we have

Median score = $\left(\frac{15+1}{2} \right)$ th observation = Value of 8th observation

= 24

Median score is 24.

Now, we again study the above ascending order, then we get

25 occurs most frequency *i.e.*, 4 times.

Hence, the mode is 25.

Ans.

3. Marks in a subject of 12 students are :

31, 37, 35, 38, 42, 23, 17, 18, 35, 25, 35, 29

On arranging the data in ascending order, we get

17, 18, 23, 25, 29, 31, 35, 35, 35, 37, 38, 42

Here, $n = 12$, which is an even.

\therefore Median

$$\begin{aligned} &= \frac{1}{2} \left\{ \text{Value of } \left[\frac{n}{2} \right] \text{th observation} + \text{Value of } \left[\frac{n}{2} + 1 \right] \text{th observation} \right\} \\ &= \frac{1}{2} \left\{ \text{Value of } \left[\frac{12}{2} \right] \text{th observation} + \text{Value of } \left[\frac{12}{2} + 1 \right] \text{th observation} \right\} \\ &= \frac{1}{2} \{ \text{Value of 6th observation} + \text{Value of 7th observation} \} \\ &= \frac{1}{2} \{ (31 + 35) \} = \frac{1}{2} \times 66 = 33 \end{aligned}$$

Median = 33

Mode : Since, 35 occurs maximum number of times in the data.

\therefore Mode = 35

Mean : Let the mean of the above data be x .

\therefore Mode = 3 Median – 2 Mean

$$35 = 3 \times 33 - 2x$$

$$35 = 99 - 2x$$

$$\text{or} \quad 2x = 99 - 35$$

$$2x = 64$$

$$\text{or} \quad x = \frac{64}{2} = 32$$

So, the value of mean is 32.

Hence, the required values of :

$$\text{Mean} = 32$$

$$\text{Median} = 33$$

$$\text{Mode} = 35$$

Ans.

4. Amounts of ten members (in ₹) = 150, 200, 500, 350, 500, 250, 700, 320, 1000, 500

Median : On arranging the data in ascending order, we get

150, 200, 250, 320, 350, 500, 500, 500, 700, 1000

Here, $n = 10$, which is an even.

\therefore Median

$$= \frac{1}{2} \left\{ \text{Value of } \left[\frac{n}{2} \right] \text{th observation} + \text{Value of } \left[\frac{n}{2} + 1 \right] \text{th observation} \right\}$$

$$\begin{aligned}
&= \frac{1}{2} \left\{ \text{Value of } \left[\frac{10}{2} \right] \text{th observation} + \text{Value of } \left[\frac{10}{2} + 1 \right] \text{th observation} \right\} \\
&= \frac{1}{2} \{ \text{Value of 5th observation} + \text{Value of 6th observation} \} \\
&= \frac{1}{2} \{ (350 + 500) \} = \frac{1}{2} \times 850 = 425
\end{aligned}$$

Median = 425

Mode : Since, 500 occurs maximum number of times in the data.

\therefore Mode = 500

Mean : Let the mean of above data be x .

\therefore Mode = 3 Median – 2 Mean

$$500 = 3 \times 425 - 2 \times x$$

$$500 = 1275 - 2x$$

$$\text{or } 2x = 1275 - 500$$

$$2x = 775$$

$$x = \frac{775}{2} = 387.5$$

Hence, the required values of

Median = 425

Mean = 387.5

Mode = 500

Ans.

5. Daily wages of 45 workers in a factory are :

Daily wages (in ₹)	Number of workers f	Cumulative frequency (C.F.) (C.F.)
100	6	= 6
125	8	8 + 6 = 14
150	9	9 + 14 = 23
175	12	12 + 23 = 35
200	10	10 + 35 = 45
$n = 45$		

Here, $n = 45$ is and odd.

\therefore Median = Value of $\frac{1}{2}(n+1)$ th observation

$$\begin{aligned}
 &= \text{Value of } \frac{1}{2}(45+1) \text{th observation} \\
 &= \text{Value of } \left(\frac{1}{2} \times 46\right) \text{th observation} = 23 \text{th observation}
 \end{aligned}$$

So, median is 150.

Mode : Since, 175 occurs maximum number of times in the given data.

$$\therefore \text{Mode} = 175$$

Mean : Let the mean of the above data be x .

$$\therefore \text{Mode} = 3 \text{ Median} - 2 \text{ Mean}$$

$$175 = 3 \times 150 - 2x$$

$$2x = 450 - 175$$

$$\Rightarrow 2x = 275 \Rightarrow x = \frac{275}{2} = 137.5$$

Hence, Median = ₹ 150

Mean = ₹ 137.5

Mode = ₹ 175

6. Given data = 1, 5, 7, $(x+1)$, 9, $(x-2)$, 3

Given Mean = 4 and $n = 7$

$$\text{Mean} = \frac{\text{Sum of given observations}}{\text{Number of observations}}$$

$$4 = \frac{1+5+7+x+1+9+x-2+3}{7}$$

$$\Rightarrow 28 = 24 + 2x \quad \text{or} \quad 2x = 28 - 24$$

$$\Rightarrow 2x = 4 \quad \text{or} \quad x = \frac{4}{2} = 2$$

Value of x is 2.

So, the correctly data is : 1, 5, 7, $(2+1)$, 9, $(2-2)$, 3

$$\begin{aligned}
 &\text{or} \\
 &= 1, 5, 7, 3, 9, 0, 3
 \end{aligned}$$

Mode : Since, 3 occurs maximum number of times in the data.

$$\therefore \text{Mode} = 3$$

Hence, the required value of : $x = 2$, mode = 3.

Ans.

7. Given data : 9, 7, 11, 3, 5

On arranging the data in ascending order, we get,

$$3, 5, 7, 9, 11$$

Here, $n = 5$, which is odd.

\therefore Median = Value of $\frac{1}{2}(n+1)$ th observation

= Value of $\frac{1}{2}(5+1)$ th observation

= Value of $\left(\frac{1}{2} \times 6\right)$ th observation = Value of 3rd observation

= 7

So, the median is 7.

$$\text{Mean } (\bar{x}) = \frac{\text{Sum of observations}}{\text{Number of observations}} = \frac{3+5+7+9+11}{5} = \frac{35}{5} = 7$$

Mean is 7.

We know that,

$$\text{Mode} = 3 \text{ Median} - 2 \text{ Mean}$$

$$= 3 \times 7 - 2 \times 7$$

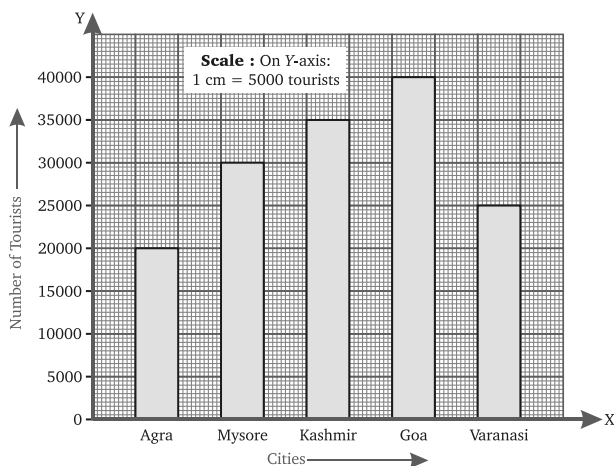
$$= 21 - 14 = 7$$

Hence, mean = 7, median = 7 and mode = 7.

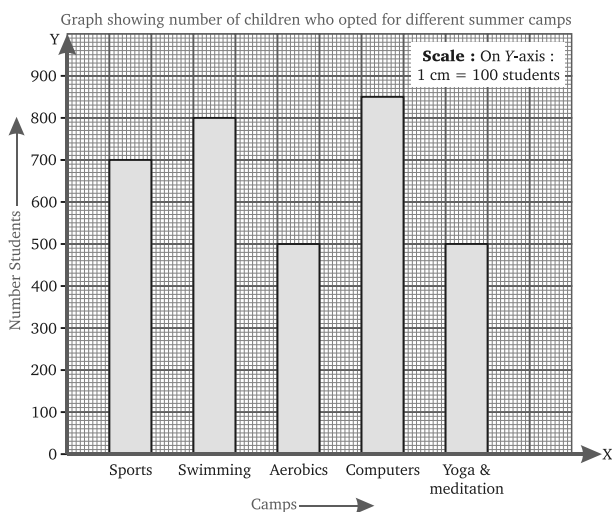
Ans.

EXERCISE -16D

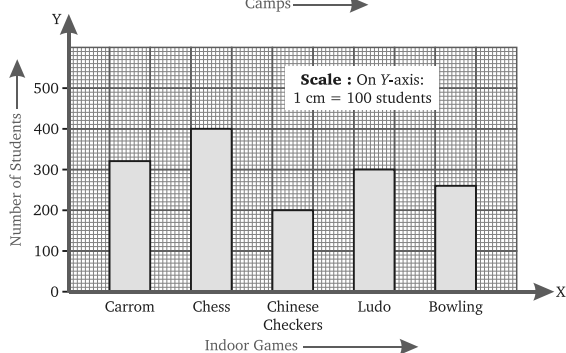
1.



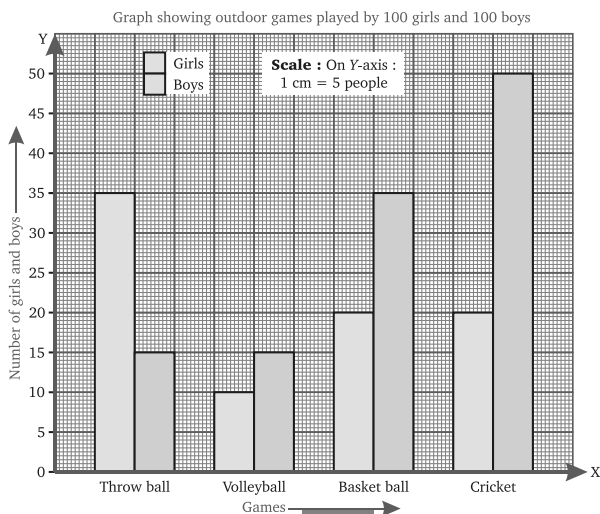
2.



3.



4.



MULTIPLE CHOICE QUESTIONS

Choose the correct answer :

1. The range of the data 14, 6, 12, 17, 21, 10, 4, 3 is :

We know that the difference between the highest and lowest observations in the given data is called its range.

Arranging the given data in ascending order, we get

3, 4, 6, 10, 12, 14, 17, 21

The highest observation is 21.

The lowest observation is 3.

$$\begin{aligned}\text{Range} &= \text{Highest observation} - \text{Lowest observation} \\ &= 21 - 3 = 18\end{aligned}$$

Therefore, the range is 18.

Hence, the correct option is (c).

2. Let x, y, z be three observations.

$$\text{Mean of given observations} = \frac{x + y + z}{3}$$

Hence, the correct option is (b).

3. **Given data :** 40, 50, 60, 68, 94, 98, 99

(Given above data is already in ascending order.)

$n = 7$, which is an odd.

$$\therefore \text{Median Value of } \frac{1}{2}(n+1) \text{ th observation}$$

$$= \text{Value of } \frac{1}{2}(7+1) \text{ th observation}$$

$$= \text{Value of } \left(\frac{1}{2} \times 8\right) \text{ th observation}$$

$$= \text{Value of 4th observation} = 68$$

\therefore Median = 68. Hence, the correct option is (c).

4. Mode of the data 2, 2, 2, 3, 3, 4, 5, 5, 5, 5, 6, 8 and 5

Here, 5 occurs most frequency *i.e.*, four times.

Hence, the mode is 5. So, the correct option is (c).

5. The difference between the highest and the lowest observations in the data is called range.

Hence, the correct option is (b).