# 1. Integers

## Exercise 1A

**1.** (i) $|-13|-|9| = 13-9 = \mathbf{4}$

(ii), (iii) Do yourself.

**2.** to **5.**; Do yourself.

**6.** (i) Addition of 52, 63 and (–34)

$$52 + 63 + (-34) = \mathbf{81}$$

(ii) and (iii) Do yourself.

(iv) Addition of (–19), (–38) and (–57)

$$(-19) + (-38) + (-57) = -19 - 38 - 57 = \mathbf{-114}$$

**7.** Sum of two integers $= -84$

One of them $= -81$

Let the other integer $= x$

Then, $-81 + x = -84$

$$x = -84 + 81 = \mathbf{-3}$$

Thus, –3 is the other integer.

**8.** Depth in swimming pool the boy swim = 3 m

Bird is flying at the height of = 25 m

Vertical distance between them = 3 + 25 = **28 m**

Thus, vertical height between them is 28 m.

**9.** On a particular day temperature = 14 °C

Temperature dropped = 21 °C

Temperature during night = 14 °C – 21 °C = **– 7 °C**

Thus, temperature during night is –7 °C.

**10.** Do yourself.

## Exercise 1B

**1.** to **2.**; Do yourself.

**3.** Scores in five successive round = 15, –3, –7, 12 and 8

Total = 15 + (–3) + (–7) + 12 + 8 = **25**

Thus, total score is 25.

**4.** Deposited amount in account = ₹ 4370

Withdraw amount = ₹ 2875

Again deposited amount = ₹ 1550

Balance in account = ₹ 4370 – ₹ 2875 + ₹ 1550

= ₹ **3045**

Thus, ₹ 3045 balance in account.

**5.** Difference of two integers $= -10$

One of them $= 16$

Let other integer $= x$

then, $x - 16 = -10$

$x = -10 + 16 = 6$

Thus, other integer is 6.

**6.** Temperature outside a cold storage $= 35\,°C$

Temperature inside a cold storage $= -10\,°C$

Difference between temperature $= 35 - (-10) = 45\,°C$

Thus, 45°C is the difference between oustide and inside temperature.

## Exercise 1C-1D

Do yourself.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** to **7.**; Do yourself.

**8.** Team A scored in three successive rounds $= -30, 20, 0$

Total score of team A in three successive rounds

$= -30 + 20 + 0 = \mathbf{-10}$

Team B scored in three successive rounds $= 20, 0, -30$

Total score of team B in three successive rounds

$= 20 + 0 + (-30) = \mathbf{-10}$

Thus, scores of both teams are same.

**9.** Do yourself.

**10.** Do yourself.

**11.** Watch getting slow for each hour = 3 minutes

Exact time should be from 8 am to after 10 hours = 6 pm

In 10 hours watch getting slow $= 3 \times 10 = 30$ minutes

So, watch will show time = 30 minutes less than 6 pm = **5 : 30 pm**

Thus, 5 : 30 pm will be the time after 10 hours in the watch.

**12.** Depreciation in first year $= ₹\,3000$

Price of scooter $= ₹\,48000$

Price of scooter after first year's depreciation

$= ₹\,48000 - ₹\,3000 = ₹\,45000$

After first year depreciation $= ₹\,1200$ per year

Depreciation of remain 5 years $= ₹\,1200 \times 5 = ₹\,6000$

Price of scooter after 6 years $= ₹\,45000 - ₹\,6000 = ₹\,\mathbf{39000}$

Thus, price of scooter will remain ₹ 39000 after 6 years.

**13.** Do yourself.

**14.** Do yourself.

**15.** Decreasing rate of temperature of a substance = 2°C per 10 minutes

Temperature of substance at 5 o'clock = 10 °C

Let at $x$ o'clock temperature of substance = −4 °C

Fall in temperature = 10 °C − (−4 °C) = 14 °C

So, 2 °C temperature falls in = 10 minutes

1 °C temperature will fall = $\frac{10}{2}$ minutes

14 °C temperature will fall = $\frac{10}{2} \times 14 = 70$ minutes

So, time at temperature of substance is −4 °C

= 5 hours + 70 minutes = 6 : 10

Thus, at 6 : 10 o'clock temperature of substance will be 4 °C below zero.

**16.** Product of two integers = −216

One of them = −18

Let the other integer = $x$

Then, $(-18) \times x = -216$

$$x = \frac{-216}{-18} = 12$$

Thus, other integer is 12.

**17.** Inside temperature of room = 4 °C

Outside temperature of room = 36 °C

Rate of increases temperature = 4 °C per 30 minutes

Let $x$ minutes will it take to reach the outside

Increment in temperature = 36 °C − 4 °C = 32 °C

Now, 4 °C temperature increases in = 30 minutes

1 °C temperature will increased in = $\frac{30}{4}$ minutes

32 °C temperature will increased in = $\frac{30}{4} \times 32 = 240$ minutes

Or $\frac{240}{60} =$ **4 hours**

Thus, it will take 4 hours to reach the outside temperature.

# 2. Fractions

## Exercise 2A

Do yourself.

## Exercise 2B

**1.** to **3.**; Do yourself.

**4.** Let $x$ should be added

then, $$2\frac{5}{7} + x = 4\frac{1}{14}$$

$$\frac{19}{7} + x = \frac{57}{14}$$

$$x = \frac{57}{14} - \frac{19}{7} = \frac{57 - 38}{14} = \frac{19}{14} = \mathbf{1\,\frac{5}{14}}$$

**5.** Do yourself.

**6.** $$\text{Cost of a book} = ₹\,85\frac{1}{5} = ₹\,\frac{426}{5}$$

$$\text{Cost of a notebook} = ₹\,25\frac{1}{4} = ₹\,\frac{101}{4}$$

$$\text{Total cost of both items} = \frac{426}{5} + \frac{101}{4} = \frac{1704 + 505}{20}$$

$$= \mathbf{\frac{2209}{20}\ or\ 110\,\frac{9}{20}}$$

**7.** Part of property given by a man to his son $= \frac{4}{7}$th

Part of property given by a man to his daughter $= \frac{5}{8}$th

$\frac{32,\ 35}{56}$ Since $\mathbf{35 > 32.}$

Thus, daughter got more of his property.

**8.** Proceed as Q.No. 7.

**9.** Amount of incense in three soaps A, B, C $= \frac{1}{17}, \frac{3}{19}, \frac{5}{21}$

$\frac{399,\ 1071,\ 1615}{6783}$ Since, $\mathbf{399 < 1017 < 1615}$

So, Soap C has most and soap A has least incense.

**10.** $$\text{Weight of apples} = 3\frac{1}{4}\text{ kg} = \frac{13}{4}\text{ kg}$$

$$\text{Weight of pears} = 2\frac{2}{5}\text{ kg} = \frac{12}{5}\text{ kg}$$

$$\text{Weight of oranges} = 5\frac{2}{5}\text{ kg} = \frac{27}{5}\text{ kg}$$

$$\text{Total weight of fruits} = \frac{13}{4} + \frac{12}{5} + \frac{27}{5} = \frac{65 + 48 + 108}{20}$$

$$= \frac{221}{20}\text{ kg or } \mathbf{11\,\frac{1}{20}\ kg}$$

Thus, total weight of fruits is $11\frac{1}{20}$ kg.

**11.** Length of pencil $= 17\frac{3}{4} = \frac{71}{4}$ cm

It is sharpened $= 2\frac{1}{3}$ cm $= \frac{7}{3}$ cm

Remaining length $= \frac{71}{4} - \frac{7}{3} = \frac{213 - 28}{12}$

$= \frac{185}{12} = \mathbf{15\frac{5}{12}}$ **cm**

Thus, remaining length of pencil is $15\frac{5}{12}$ cm.

**12.** Naman walks to go school $= 5\frac{1}{2}$ km $= \frac{11}{2}$ km

Naman sides to bus $= 12\frac{3}{4}$ km $= \frac{51}{4}$ km

Naman walks again $= 1\frac{2}{3} = \frac{5}{3}$ km

Total distance $= \frac{11}{2} + \frac{51}{4} + \frac{5}{3} = \frac{66 + 153 + 20}{12}$

$= \frac{239}{12} = \mathbf{19\frac{11}{12}}$ **km**

Thus, $19\frac{11}{12}$ km is the total distance travelled by Naman.

## Exercise 2C

**1.** (i) $\frac{5}{11} \times \frac{11}{5} = \frac{55}{55} = \mathbf{1}$

(ii), (iii) Do yourself.

(iv) $3\frac{1}{5} \times \frac{25}{32} = \frac{16}{5} \times \frac{25}{32} = \frac{5}{2} = \mathbf{2\frac{1}{2}}$

(v), (vi), (vii), (viii), (ix), (x) Do yourself.

**2.** (i) $\frac{5}{6} \times \frac{32}{25} \times \frac{3}{2} = \frac{8}{5} = \mathbf{1\frac{3}{5}}$

(ii), (iii), (iv), (v), (vi) Do yourself.

**3.** (i) One-half of ₹ 124 $= \frac{1}{2}$ of ₹ 124 $= \frac{1}{2} \times$ ₹ 124 $=$ **₹ 62**

(ii), (iii), (iv) Do yourself.

**4.** Cost of 1 kg rice $= ₹44\frac{2}{3} = ₹\frac{134}{3}$

Cost of $3\frac{1}{3}$ kg rice $= \frac{134}{3} \times 3\frac{1}{3} = \frac{134}{3} \times \frac{10}{3} =$ **₹ 148** $\mathbf{\frac{8}{9}}$

Thus, cost of $3\frac{1}{3}$ kg rice is ₹$148\frac{8}{9}$.

**5.** Speed of fox $= 150\frac{2}{3}$ mile/hour $= \frac{452}{3}$ mile/hour

Speed of panther $= \frac{452}{3} \times 10 = \frac{4520}{3} = \mathbf{1506\frac{2}{3}}$ **mile/hour**

Thus, speed of panther is $1506\frac{2}{3}$ mile/hour.

**6.** A farmer can put up a fence in one day $= \frac{1}{3}$ km

A farmer can put up a fence in $6\frac{2}{3}$ days $= \frac{1}{3} \times \frac{20}{3} = \frac{20}{9} = \mathbf{2\frac{2}{9}}$ **km**

Thus, $2\frac{2}{9}$ km is the length of fence that he can put up in $6\frac{2}{3}$ days.

**7.** Aman spends on food and rent $= \frac{3}{5}$

Remaining part of his salary $= 1 - \frac{3}{5} = \frac{2}{5}$

Now, $\frac{1}{5}$ of $\frac{2}{5} = \frac{1}{5} \times \frac{2}{5} = \frac{2}{25}$

$\frac{2}{25}$ of ₹ 40,000 = ₹ **3200**

So, Aman donates ₹ 3200.

**8.** 1 marble weigh $= 10\frac{1}{2}$ grams $= \frac{21}{2}$ grams

230 marbles weighs $= \frac{21}{2} \times 230$ gram $=$ **2415 grams**

Thus, weight of 230 marbles is 2415 grams.

**9.** A car can run in 1L of petrol $= 16\frac{1}{4}$ km or $\frac{65}{4}$ km

A car can run in $5\frac{2}{3}$ L of petrol $= \frac{65}{4} \times \frac{17}{3} = \frac{1105}{12} = \mathbf{92\frac{1}{12}}$ **km**

Thus, $92\frac{1}{12}$ km is the distance can cover in $5\frac{2}{3}$ L of petrol.

## Exercise 2D

**1.** (i) The reciprocal of $\frac{3}{2} = \mathbf{\frac{2}{3}}$

(ii), (iii), (iv) and (v) Do yourself.

**2.** (i) $\frac{4}{5} \div \frac{7}{15} \Rightarrow \frac{4}{5} \times \frac{15}{7} = \frac{12}{7} = \mathbf{1\frac{5}{7}}$

(ii), (iii), (iv), (v) Do yourself.

(vi) $3\frac{4}{7} \div 1\frac{5}{14} \Rightarrow \frac{25}{7} \div \frac{19}{14} \Rightarrow \frac{25}{7} \times \frac{14}{19} = \frac{50}{19} = \mathbf{2\,\frac{12}{19}}$

(vii), (viii), (ix) Do yourself.

**3.** A factory produced steel in a month $= 6000\frac{5}{12}$ tons $= \frac{72005}{12}$ tons

A factory produced steel in a day $= \frac{72005}{12} \div 30$

$= \frac{72005}{12} \times \frac{1}{30} = \frac{14401}{72} = \mathbf{200\,\frac{1}{72}\ tons}$

Thus, $200\frac{1}{72}$ tons is the daily production.

**4.** The product of two numbers $= 5\frac{2}{3} = \frac{17}{3}$

One of them is $= 2\frac{4}{15} = \frac{34}{15}$

Other is $\frac{17}{3} \div \frac{34}{15} = \frac{17}{3} \times \frac{15}{34} = \mathbf{2\,\frac{1}{2}}$

Thus, other number is $2\frac{1}{2}$.

**5.** The number should be multiplied $\frac{5}{6} \div 3\frac{4}{7}$

$= \frac{5}{6} \div \frac{25}{7} = \frac{5}{6} \times \frac{7}{25} = \mathbf{\frac{7}{30}}$

Thus, required number is $\frac{7}{30}$.

**6.** A boat can carry $= 690\,\text{kg}$

A box weight $= 7\frac{2}{3} = \frac{23}{3}\,\text{kg}$

The boat can carry $= 690 \div \frac{23}{3} = \frac{690 \times 3}{23} = \mathbf{90\ boxes}$

Thus, 90 boxes can be shipped.

**7.** $\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{420\frac{2}{5}}{4\frac{1}{5}} = \frac{\frac{2102}{5}}{\frac{21}{5}} = \frac{2102}{21} = \mathbf{100\,\frac{2}{21}\ km/hour}$

Thus, speed is $100\frac{2}{11}$ km/hour.

**8.** Area of rectangle $= 83\frac{3}{4}\,\text{m}^2 = \frac{335}{4}\,\text{m}^2$

One side of rectangle $= 12\frac{1}{2}\,\text{m} = \frac{25}{2}\,\text{m}$

$$\text{Other side of rectangle} = \frac{335}{4} \div \frac{25}{2} = \frac{335}{4} \times \frac{2}{25}$$
$$= \frac{67}{10} = \mathbf{6\,\frac{7}{10}\,m}$$

Thus, the other side is $6\frac{7}{10}$ m.

**9.** $\text{Number of cans of juice} = \frac{20}{1\frac{1}{3}} = \frac{20 \times 3}{4} = \mathbf{15\ cans}$

Thus, there are 15 cans of juice used.

**10.** Do yourself.

**11.** $\text{Length of cloth} = 77\frac{1}{2}\text{ m or } \frac{155}{2}\text{ m}$

$\text{Length of each piece} = 5\frac{1}{6}\text{ m or } \frac{31}{2}\text{ m}$

$$\text{Number of pieces can be cut} = \frac{\text{Total length of cloth}}{\text{Length of each piece}}$$
$$= \frac{155/2}{31/2} = \frac{155}{31} = 5$$

Thus, 5 pieces can be cut from cloth.

**12.** Let the number is $x$

Then, $4\frac{7}{8} \times x = 87\frac{3}{4}$

$\frac{39}{8} \times x = \frac{351}{4}$

$x = \frac{351/4}{39/8} = \frac{351 \times 8}{39 \times 4} = 18$

Thus, 18 is the required number.

**13.** Quantity of milk each student gets everyday $= \frac{1}{3}$ L

Total consumption of milk per day $= 57\frac{2}{3}$ L or $\frac{173}{3}$ L

Number of students in hostel

$$= \frac{\text{Total consumption of milk per day}}{\text{Quantity of milk each student gets everyday}}$$
$$= \frac{173/3}{1/3} = 173$$

Thus, 173 students are there in the hostel.

**14.** $\text{Weight of apples} = 5\frac{1}{4}\text{ kg or } \frac{21}{4}\text{ kg}$

$$\text{Cost of } \frac{21}{4} \text{ kg apples} = ₹\,336$$

$$\text{Per kg rate of apples} = \frac{336}{21/4} = \frac{336 \times 4}{21} = ₹\,64$$

Thus, rate of apples is ₹ 64 per kg.

**15.** $\text{Length of a rectangular plot} = 12\frac{1}{2}\text{ m or } \frac{25}{2}\text{ m}$

$$\text{Area of a rectangular plot} = 68\frac{3}{4}\text{ m}^2 \text{ or } \frac{275}{4}\text{ m}$$

$$\text{Width of plot} = \frac{\text{Area of plot}}{\text{Length of plot}} = \frac{275/4}{25/2}$$

$$= \frac{275 \times 2}{25 \times 4} = \mathbf{\frac{11}{2}\ m \text{ or } 5\frac{1}{2}\ m}$$

Thus, width of plot is $5\frac{1}{2}$ m.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** to **6.**; Do yourself.

**7.** Study hours of Juhi $= 5\frac{2}{3}$ or $\frac{17}{3}$ hours

Time devotes for Science and Mathematics $= 2\frac{4}{5}$ or $\frac{14}{5}$ hours

$$\text{Time devotes for other subjects} = \frac{17}{3} - \frac{14}{5} = \frac{85 - 42}{15}$$

$$= \frac{43}{15} = \mathbf{2\,\frac{13}{15}\ hours}$$

Thus, $2\frac{13}{15}$ hours she does devote for other subjects.

**8.** Do yourself.

**9.** $$\text{Cost of 1L petrol} = ₹\,78\frac{2}{3} \text{ or } ₹\,\frac{236}{3}$$

$$\text{Cost of 12L petrol} = ₹\,\frac{236}{3} \times 12 = ₹\,944$$

Thus, cost of 12 L petrol is ₹ 944.

**10.** $$\text{Total students in class} = 56$$

$$\text{Number of boys in class} = 56 \times \frac{5}{8} = 35 \text{ boys}$$

$$\text{Then, number of girls} = 56 - 35 = \mathbf{21\ girls}$$

Thus, there are 21 girls in a class.

**11.** Number of pages in book $= 400$ pages

$$\text{Riya reads daily} = 400 \times \frac{1}{20} = 20 \text{ pages}$$

Number of pages she can read in 7 days $= 20 \times 7 =$ **140 pages**

Thus, 140 pages she can read in 7 days.

**12.** Do yourself.

**13.** Do yourself.

**14.** $$\text{Length of cord} = 10\frac{2}{5} \text{ m or } \frac{52}{5} \text{ m}$$

Number of equal pieces $= 4$

$$\text{Length of each piece} = \frac{52/5}{4} = \frac{52}{5 \times 4} = \mathbf{\frac{13}{5} \text{ m or } 2\frac{3}{5} \text{ m}}$$

Thus, $2\frac{3}{5}$ m is the length of each piece.

**15.** $$\text{Cost of 15 pens} = ₹60\frac{3}{5} \text{ or } ₹\frac{303}{5}$$

$$\text{Cost of 1 pen} = \frac{303/5}{15} = \frac{303}{5 \times 15}$$

$$= ₹\mathbf{\frac{101}{25} \text{ or } ₹4\frac{1}{25}}$$

Thus, cost of 1 pen is $₹4\frac{1}{25}$.

**16.** Distance covered by Virat in 2 hours $= 80\frac{2}{5}$ km or $\frac{402}{5}$ km

$$\text{Distance he will cover in 1 hour} = \frac{402/5}{2} = \frac{402}{5 \times 2}$$

$$= \frac{201}{5} \text{ km or } 40\frac{1}{5} \text{ km}$$

Thus, he cover $40\frac{1}{5}$ km in each hour.

# 3. Decimal

## Exercise 3A

Do yourself.

## Exercise 3B

**1.** to **2.**; Do yourself.

**3.** It must be subtracted $= 90.1 - 9.09 =$ **81.01**

**4.** It must be added $301.5 - 294.315 =$ **7.185**

**5.** Parul had thread = 100 m
Thread broke = 12.03 m
Left thread = 100 m – 12.03 m = **87.97 m**
Thus, 87.97 m thread was left.

**6.** Rohit was standing from a plane mirror = 5.36 ft
The distance of image from him = 5.36 ft + 5.36 ft = **10.72 ft**

**7.** Mrs. Lipika bought flour = 4 kg 250 g
Mrs. Lipika bought nuts = 3 kg 50 g
Mrs. Lipika bought olive oil = 350 g
Total weight did she buy = 4 kg 250 g + 3 kg 50 g + 350 g
= **7 kg 650 g**
Thus, 7 kg 650 g is the total weight which she carrying.

**8.** The length of triathlon = 10 km
Rahul ran = 5.1 km
Rahul cycled = 4.2 km
Total of running and cycling = 5.1 km + 4.2 km = 9.3 km
Rest distance = 10 km – 9.3 km
= **0.7 km or 700 m**
So, Rahul swam 0.7 km or 700 m.

## Exercise 3D

**1.** to **5.**; Do yourself.

**6.** Cost of 31 eggs = ₹ 173.60
Cost of 1 egg = ₹ 173.60 ÷ 31 = ₹ **5.60**
Thus, cost per egg is ₹ 5.60.

**7.** Number of sweet balls = 588.38 g ÷ 45.26 = **13**
Thus, number of sweet balls is 13.

**8.** Total of rainfall in one month = 37.02 mm
Rainfall in one day = 37.02 mm ÷ 30 = **1.234 mm**
Thus, rainfall in one day is 1.234 mm.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** to **6.**; Do yourself.

**7.** Cost of shoes = ₹ 999.99
Cost of sleepers = ₹ 179.99
Total cost of both the items = ₹ 999.99 + ₹ 179.99
= ₹ **1179.98**
Thus, total cost of both the items is ₹ 1179.98.

**8.** Amount of money Heena has = ₹ 500
Cost of umbrella = ₹ 129.65
Cost of sketch pens = ₹ 45.75
Cost of pencil packet = ₹ 37.95
Total cost of all the items = ₹ 129.65 + ₹ 45.75 + ₹ 37.95
= ₹ 213.35
Money left with her after purchasing = ₹ 500 – ₹ 213.35
= ₹ **286.65**
Thus, ₹ 286.65 will be left with her after purchasing.

**9.** Length of rope = 100 m
Length of two pieces = 37.65 m and 19.39 m
Length of remaining rope = 100 – (37.65 + 19.39) = **42.96 m**
Thus, 42.96 m is the remaining length of rope.

**10.** Do yourself.

**11.** Do yourself.

**12.** Thickness of 1 sheet of paper = 0.632 mm
Thickness of 124 such sheet of paper = 0.632 × 124
= **78.368 mm** or **7.8368 cm**
Thus, thickness of 124 such sheet of paper is 7.8368 cm.

**13.** Weight of Juhi = 35.658 kg
Then, weight of her sister = 35.658 × 1.8 = **64.1844 kg**
Thus, weight of her sister is 64.1844 kg.

**14.** Quantity of mustard oil in a drum = 3349.500 L
Capacity of small container = 16.500 L
So, small container can be filled = $\frac{3349.500}{16.500}$ = **203**
Thus, 203 times the small container can be filled by it.

**15.** Do yourself.

**16.** Do yourself.

**17.** Weight of 86 bags of wheat = 5666.540 kg
Weight of each bag of wheat = $\frac{5666.540}{86}$ = **65.890 kg**
Thus, weight of each bag of wheat is 65.890 kg.

**18.** Cost of 56 chairs = ₹ 13198.64
Cost of 1 chair = $\frac{13198.64}{56}$ = ₹ **235.69**
Thus, cost of 1 chair is ₹ 235.69.

**19.** Cost of 48 wrist watches = ₹ 4722.24
Cost of 1 wrist watch = $\frac{4722.24}{48}$ = ₹ **98.38**
Thus, cost of 1 wrist watch is ₹ 98.38.

# 4. Rational Numbers

## Exercise 4A

**1.** Do yourself.

**2.** Do yourself.

**3.** (i) $\frac{2}{10} = \frac{2 \times 1}{2 \times 5} = \mathbf{\frac{1}{5}}$

(ii) $\frac{-36}{180} = \frac{-2 \times 2 \times 3 \times 3}{2 \times 2 \times 3 \times 3 \times 5} = \mathbf{\frac{-1}{5}}$

| | |
|---|---|
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

| | |
|---|---|
| 2 | 180 |
| 2 | 90 |
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

(iii), (iv) Do yourself.

**4.** (i) $\frac{2}{3} = \frac{x}{135}$

By cross multiplication

$$2 \times 135 = 3 \times x$$
$$x = \frac{2 \times 135}{3}$$
$$x = 2 \times 45$$
$$x = \mathbf{90}$$

(ii) $\frac{5}{x} = \frac{90}{216}$

By cross multiplication

$$90 \times x = 5 \times 216$$
$$x = \frac{5 \times 216}{90}$$
$$\Rightarrow \quad x = \mathbf{12}$$

(iii), (iv) Do yourself.

(v) $\frac{72}{81} = \frac{8}{x}$

By cross multiplication

$$72 \times x = 8 \times 81$$

*i.e.,* $$x = \frac{8 \times 81}{72}$$

Or $x = \frac{81}{9} = \mathbf{9}$

**5.** Do yourself.

**6.** (i) $\frac{-144}{-504} = \frac{144}{504}$

$= \frac{2 \times 2 \times 2 \times 2 \times 3 \times 3}{2 \times 2 \times 2 \times 3 \times 3 \times 7} = \frac{\mathbf{2}}{\mathbf{7}}$

| 2 | 144 |
|---|---|
| 2 | 72 |
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

| 2 | 504 |
|---|---|
| 2 | 252 |
| 2 | 126 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

(ii) Do yourself.

(iii) $\frac{240}{-840} = \frac{24}{-84}$

$= \frac{2 \times 2 \times 2 \times 3}{-2 \times 2 \times 3 \times 7} = \frac{\mathbf{2}}{\mathbf{-7}}$

| 2 | 24 |
|---|---|
| 2 | 12 |
| 2 | 6 |
| 3 | 3 |
| | 1 |

| 2 | 84 |
|---|---|
| 2 | 42 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

(iv) $\frac{225}{625} = \frac{3 \times 3 \times 5 \times 5}{5 \times 5 \times 5 \times 5} = \frac{\mathbf{9}}{\mathbf{25}}$

| 5 | 225 |
|---|---|
| 5 | 45 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

| 5 | 625 |
|---|---|
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

**7.** Do yourself.

## Exercise 4B

**1.** (i) $\frac{2 \times -28}{5 \times -28} = \frac{\mathbf{-56}}{\mathbf{-140}}$ (ii) $\frac{2 \times 77}{5 \times 77} = \frac{\mathbf{154}}{\mathbf{385}}$

(iii) $\frac{2 \times -375}{5 \times -375} = \frac{\mathbf{-750}}{\mathbf{-1875}}$ (iv) $\frac{2 \times 250}{5 \times 250} = \frac{\mathbf{500}}{\mathbf{1250}}$

(v) Do yourself.

**2.** (i) $\frac{5}{6}$ and $\frac{7}{9}$

LCM of 6 and 9 is 18.

$$\frac{5}{6}, \frac{7}{9} = \frac{5 \times 3, 7 \times 2}{18} = \mathbf{\frac{15}{18}, \frac{14}{18}}$$

(ii) Do yourself.

(iii) $\frac{4}{5}, \frac{17}{20}, \frac{23}{40}$ and $\frac{11}{16}$

LCM of 5, 20, 40 and 16 is 80.

$$= \frac{4 \times 16, 17 \times 4, 23 \times 2, 11 \times 5}{80} = \frac{64, 68, 46, 55}{80}$$

$$= \mathbf{\frac{64}{80}, \frac{68}{80}, \frac{46}{80}, \frac{55}{80}}$$

**3.** Do yourself.

**4.** (i) $\frac{-9}{12}$ and $\frac{8}{-12}$

Because numerators are not equal.

Therefore $\frac{-9}{12} \neq \frac{8}{-12}$

(ii) $\frac{-16}{20}$ and $\frac{20}{-25}$

LCM of 20 and 25 is 100.

$$= \frac{-16 \times 5, -20 \times 4}{100} = \frac{-80, -80}{100}$$

or $\frac{-80}{100}, \frac{-80}{100}$

Clearly $\frac{-80}{100} = \frac{-80}{100}$

Therefore, $\mathbf{\frac{-16}{20} = \frac{20}{-25}}$

(iii) Do yourself.

(iv) $\frac{-8}{-14}$ and $\frac{13}{21}$

LCM of 14 and 21 is 42.

$$= \frac{8 \times 3, 13 \times 2}{42} = \frac{24}{42}, \frac{26}{42}$$

$\frac{24}{42} \neq \frac{26}{42}$ [$\because$ Numerators are not equal]

Therefore $\frac{\mathbf{-8}}{\mathbf{-14}} \neq \frac{\mathbf{13}}{\mathbf{21}}$

**5.** (i) $0 > \frac{-4}{7}$, since $\frac{-4}{7}$ lies left to zero in number line

(ii) $\frac{5}{-9} = \frac{5 \times -1}{-9 \times -1} = \frac{-5}{9}, \frac{3}{7}$

$\frac{3}{7} > \frac{-5}{9}$ because in number line $\frac{-5}{9}$ lies left to zero and $\frac{3}{7}$ lies right to zero.

(iii) $\frac{-9}{-5} = \frac{-9 \times -1}{-5 \times -1} = \frac{9}{5}; 0$

$\frac{9}{5} > 0$

Since, $\frac{9}{5}$ lies right to zero in number line.

(iv) $\frac{7}{-5}, \frac{-21}{-23}$

$$\frac{7}{-5} = \frac{7 \times -1}{-5 \times -1} = \frac{-7}{5}; \frac{-21}{-23} = \frac{-21 \times -1}{-23 \times -1} = \frac{21}{23}$$

$$\frac{21}{23} > \frac{-7}{5}$$

Since, negative numbers is always less than positive number.

**6.** (i) $-4 \times 7 = -28; -5 \times 5 = -25$

As $-25 > -28$ So, $-5 \times 5 > -4 \times 7$

*i.e.,* $\frac{-4}{5} < \frac{-5}{7}$

(ii) $-8 \times 4 = -32; -7 \times 5 = -35$

As $-32 > -35$ *i.e.,* $-8 \times 4 > -7 \times 5$

$\therefore \frac{-8}{5} > \frac{-7}{4}$

(iii) $-7 \times -48 = 336; 42 \times 8 = 336$

As $336 = 336$ $\therefore \frac{-7}{8} = \frac{42}{-48}$

(iv) $\frac{1}{-3}; \frac{-1}{4}$

$1 \times 4 = 4; -3 \times -1 = 3$

As $4 > 3$

*i.e.* $\frac{1}{-3} > \frac{-1}{4}$

(v) $\frac{-3}{8}; \frac{-2}{7}$

$-3 \times 7 = -21; -2 \times 8 = -16$

As $-16 > -21$ *i.e.* $\frac{-3}{8} < \frac{-2}{7}$

(vi) $\frac{-4}{3}; \frac{-3}{2}$

$-4 \times 2 = -8; -3 \times 3 = -9$

As $-8 > -9$ $\therefore \frac{-4}{3} > \frac{-3}{2}$

**7.** (i) Writing each number with positive denominator
Already these are positive.

So, the given rational numbers are $\frac{-3}{7}, \frac{-3}{2}, \frac{-3}{4}$

LCM of their denominators *i.e.* 2, 4, 7 = 28

To write the rational numbers with this LCM 28 as their denominators, we have;

| 2 | 2, 4, 7 |
|---|---|
| | 1, 2, 7 |

$$\text{LCM} = 2 \times 2 \times 7 = 28$$

$$\frac{-3}{7} = \frac{-3 \times 4}{7 \times 4} = \frac{-12}{28}$$

$$\frac{-3}{2} = \frac{-3 \times 14}{2 \times 14} = \frac{-42}{28}$$

$$\frac{-3}{4} = \frac{-3 \times 7}{4 \times 7} = \frac{-21}{28}$$

$$-42 < -21 < -12$$

Hence, the given rational numbers in ascending order are

$$\frac{-3}{2}, \frac{-3}{4}, \frac{-3}{7}$$

(ii) Write each number with positive denominator

$$\frac{5}{-12} = \frac{5 \times (-1)}{-12 \times -1} = \frac{-5}{12}$$

$$\frac{9}{-24} = \frac{9 \times (-1)}{-24 \times -1} = \frac{-9}{24}$$

LCM of their denominators *i.e.,* 4, 12, 16, 24 is 48.

To write the rational numbers with this LCM *i.e.,* 48 as their denominators, we have :

| | |
|---|---|
| 4 | 4,12, 16, 24 |
| 3 | 1, 3, 4, 6 |
| 2 | 1, 1, 4, 2 |
| 2 | 1, 1, 2, 2 |
| | 1, 1, 1, 1 |

$$\text{LCM} = 4 \times 3 \times 2 \times 2 = 48$$

$$\frac{-3}{4} = \frac{-3 \times 12}{4 \times 12} = \frac{-36}{48}$$

$$\frac{-5}{12} = \frac{-5 \times 4}{12 \times 4} = \frac{-20}{48}$$

$$\frac{-9}{24} = \frac{-9 \times 2}{24 \times 2} = \frac{-18}{48}$$

$$\frac{-7}{16} = \frac{-7 \times 3}{16 \times 3} = \frac{-21}{48}$$

$$\text{As } -36 < -21 < -20 < -18$$

$\therefore$ Ascending order is $\frac{-3}{4} < \frac{-7}{16} < \frac{-5}{12} < \frac{-9}{24}$.

**8.** (i) Write each number with positive denominator

$$\frac{17}{-30} = \frac{17 \times (-1)}{-30 \times -1} = \frac{-17}{30}$$

LCM of their denominators 10, 20, 15, 30 is 60

To write rational numbers with LCM *i.e.,* 60 as their denominators.

| | |
|---|---|
| 5 | 10, 20, 15, 30 |
| 2 | 2, 4, 3, 6 |
| 3 | 1, 2, 3, 3 |
| 2 | 1, 2, 1, 1 |
| | 1, 1, 1, 1 |

$$\text{LCM} = 5 \times 2 \times 3 \times 2 = 60$$

$$\frac{-3}{10} = \frac{-3 \times 6}{10 \times 6} = \frac{-18}{60}$$

$$\frac{-11}{20} = \frac{-11 \times 3}{20 \times 3} = \frac{-33}{60}$$

$$\frac{-7}{15} = \frac{-7 \times 4}{15 \times 4} = \frac{-28}{60}$$

$$\frac{-17}{30} = \frac{-17 \times 2}{30 \times 2} = \frac{-34}{60}$$

As $-18 > -28 > -33 > -34$

Descending order is $\frac{-3}{10} > \frac{-7}{15} > \frac{-11}{20} > \frac{-17}{30}$.

(ii) Write each number with positive denominator

*i.e.,* $\frac{2}{-5} = \frac{2 \times -1}{-5 \times -1} = \frac{-2}{5}; \frac{19}{-30} = \frac{19 \times -1}{-30 \times -1} = \frac{-19}{30}$

LCM of their denominators 5, 10, 15, 30 is 30

To write rational numbers with LCM *i.e.,* 30 as their denominators

| | |
|---|---|
| 5 | 5, 10, 15, 30 |
| 3 | 1, 2, 3, 6 |
| 2 | 1, 2, 1, 2 |
| | 1, 1, 1, 1 |

$\text{LCM} = 5 \times 3 \times 2 = 30$

$\frac{-7}{10} = \frac{-7 \times 3}{10 \times 3} = \frac{-21}{30}$

$\frac{-11}{15} = \frac{-11 \times 2}{15 \times 2} = \frac{-22}{30}$

$\frac{2}{-5} = \frac{2 \times 6}{-5 \times 6} = \frac{12}{-30}$

$\frac{19}{-30} = \frac{19 \times 1}{-30 \times 1} = \frac{19}{-30}$

As, $12 > 19 > -21 > -22$

Descending order is

$$\frac{2}{-5} > \frac{19}{-30} > \frac{-7}{10} > \frac{-11}{15}$$

(iii) and (iv) Do yourself.

**9.** Do yourself.

**10.** (i) $\left|\frac{2}{5} - \frac{8}{9}\right|$

LCM of 5 and 9 is 45.

$$\left|\frac{9 \times 2 - 8 \times 5}{45}\right| = \left|\frac{18 - 40}{45}\right| = \left|\frac{-22}{45}\right| = \mathbf{\frac{22}{45}}$$

(ii) $\left|\frac{7}{3} - \left(\frac{-8}{15}\right)\right| = \left|\frac{7}{3} + \frac{8}{15}\right|$ LCM of 3 and 15 is 15.

$$= \left|\frac{7 \times 5 + 8}{15}\right| = \left|\frac{35 + 8}{15}\right|$$

$$= \left|\frac{43}{15}\right| = \mathbf{2\,\frac{13}{15}}$$

(iii) $\left|-10-\left(\frac{10}{-3}\right)\right|=\left|-10+\frac{10}{3}\right|=\left|\frac{-30+10}{3}\right|=\left|\frac{-20}{3}\right|$

$=\frac{20}{3}=\mathbf{6\,\frac{2}{3}}$

**11.** (i) –3 and 2

For two rational numbers $\frac{1}{2}(-3+2)=\frac{-1}{2}$

Hence, $-3<\frac{-1}{2}<2$

Now a rational number between –3 and $\frac{-1}{2}$

$=\frac{1}{2}\left[-3+\left(\frac{-1}{2}\right)\right]$

$=\frac{1}{2}\times\frac{-7}{2}=\frac{-7}{4}$

Thus, $\frac{-1}{2}$ and $\frac{-7}{4}$ is the two rational numbers between –3 and 2.

(ii) and (iii) Do yourself.

(iv) $\frac{-7}{9}$ and $\frac{-1}{3}$

For two rational numbers

$\frac{1}{2}\left(\frac{-7}{9}+\frac{-1}{3}\right)=\frac{-5}{9}$

Hence, $-\frac{7}{9}<-\frac{5}{9}<-\frac{1}{3}$

Now a rational number between $-\frac{7}{9}$ and $-\frac{5}{9}$

$=\frac{1}{2}\left(-\frac{7}{9}+\frac{-5}{9}\right)=\frac{-6}{9}$

Thus, $-\frac{5}{9}$ and $\frac{-6}{9}$ is the two rational numbers between $\frac{-7}{9}$ and $\frac{-1}{3}$.

**12.** Do yourself.

**13.** Do yourself.

## Exercise 4C

**1.** (i) $\frac{-3}{11}+\frac{5}{11}$

Both the denominators are same so 11 is LCM

$=\frac{-3+5}{11}=\frac{2}{11}$

(ii), (iii) (iv), (v), (vi) and (vii) Do yourself.

(viii) $\frac{6}{-7} + \frac{-4}{21} + \frac{8}{-28}$

LCM of 7, 21 and 28 is 84

$$= \frac{-72 - 16 - 24}{84} = \frac{-112}{84} = -\frac{\mathbf{4}}{\mathbf{3}}$$

**2.** (i) $\frac{5}{8} - \frac{3}{8}$

Both the denominators are same so 8 is LCM

$$= \frac{5 - 3}{8} = \frac{2}{8} = \frac{\mathbf{1}}{\mathbf{4}}$$

(ii), (iii), (iv), (v), (vi) and (viii) Do yourself.

(vii) $7 - \frac{3}{-15}$

LCM of 1 and 15 is 15

$$\frac{105 - (-3)}{15} = \frac{108}{15} = \mathbf{7}\,\frac{\mathbf{3}}{\mathbf{5}}$$

**3.** (i) $\frac{-5}{18} + \frac{7}{12} + \frac{-8}{15} + \frac{3}{10}$

LCM of 18, 12, 15 and 10 is 180

$$= \frac{-50 + 105 - 96 + 54}{180} = \frac{\mathbf{13}}{\mathbf{180}}$$

(ii) and (iii) Do yourself.

(iv) $\frac{-3}{5} + \frac{7}{8} + \frac{-4}{15} + \frac{-2}{3}$

LCM of 5, 8, 15 and 3 is 120

$$= \frac{-72 + 105 - 32 - 80}{120} = \frac{\mathbf{-79}}{\mathbf{120}}$$

(v) Do yourself.

(vi) $\frac{-5}{16} + \frac{17}{32} + \frac{-11}{48} - 2$

LCM of 16, 32, 48 and 1 is 96

$$= \frac{-30 + 51 - 22 - 192}{96} = \frac{-193}{96} \text{ or } -\mathbf{2}\,\frac{\mathbf{1}}{\mathbf{96}}$$

**4.** Do yourself.

**5.** Do yourself.

**6.** Do yourself.

**7.** Sum of two rational numbers $= \frac{-15}{23}$

$$\text{One of them} = \frac{-4}{11}$$

Let other rational number = $x$

Then, $\frac{-4}{11} + x = \frac{-15}{23}$

$$x = \frac{4}{11} - \frac{15}{23}$$

$$x = \frac{92 - 165}{253} = \mathbf{\frac{-73}{253}}$$

Thus, $\frac{-73}{253}$ is the other rational number.

**8.** Let rational number $x$ should be subtracted from $\frac{-4}{15}$ to get $\frac{-17}{25}$

Then, $\frac{-4}{15} - x = \frac{-17}{25}$

$$x = \frac{-4}{15} + \frac{17}{25}$$

$$x = \frac{-20 + 51}{75} = \mathbf{\frac{31}{75}}$$

Thus, $\frac{31}{75}$ should be subtracted from $\frac{-4}{15}$ to get $\frac{-17}{25}$.

**9.** Let rational number $x$ should be added to $\frac{-9}{13}$ to get $\frac{3}{-26}$

Then, $\frac{-9}{13} + x = \frac{3}{-26}$

$$x = \frac{3}{-26} + \frac{9}{13}$$

$$x = \frac{-3 + 18}{26} = \mathbf{\frac{15}{26}}$$

Thus, $\frac{15}{26}$ should be added to $\frac{-9}{13}$ to get $\frac{3}{-26}$.

## Exercise 4D

**1.** to **8.**; Do yourself.

**9.** Cost of 1 kg desi ghee = ₹ $320\frac{4}{5}$ or ₹ $\frac{1604}{5}$

Cost of $20\frac{3}{4}$ or $\frac{83}{4}$ kg desi ghee $= \frac{1604}{5} \times \frac{83}{4}$

$$= ₹\frac{33283}{5} \text{ or } ₹\mathbf{6656\frac{3}{5}}$$

Thus, ₹ $6656\frac{3}{5}$ is the cost of $20\frac{3}{4}$ kg of desi ghee.

**10.** Product of two rational numbers $= -\frac{12}{25}$

$$\text{One of them} = \frac{18}{-65}$$

$$\text{Let the other number} = x$$

Then $$x \times \frac{18}{-65} = \frac{-12}{25}$$

$$x = \frac{12}{25} \times \frac{65}{18}$$

$$x = \mathbf{\frac{26}{15}}$$

Thus, other number is $\frac{26}{15}$.

**11.** Sum of $\frac{12}{25}$ and $\frac{-13}{50} = \frac{12}{25} + \frac{-13}{50} = \frac{24-13}{50} = \frac{11}{50}$

Difference of $\frac{12}{25}$ and $\frac{-13}{50}$

$$= \frac{12}{25} - \frac{-13}{50} = \frac{24+13}{50} = \frac{37}{50}$$

Now, $$\frac{11/50}{37/50} = \mathbf{\frac{11}{37}}$$

**12.** Required cloth for making a dress $= 4\frac{3}{5}$ m or $\frac{23}{5}$ m

Required length of cloth for making 20 dress $= \frac{23}{5} \times 20 =$ **92 m**

Length of cloth buys by a person = 100 m
Left cloth after making 20 dress = 100 m – 92 m = 8 m
Thus, 92 m length of cloth required to making 20 dresses and 8 m cloth will left after making 20 dresses.

**13.** Do yourself.

**14.** Do yourself.

**15.** Cost of $3\frac{1}{5}$ or $\frac{16}{5}$ kg of sugar $= ₹105\frac{2}{5}$ or $₹\frac{527}{5}$

$$\text{Cost of 1 kg of sugar} = \frac{527/5}{16/5} = \frac{527}{16} = ₹\,\mathbf{32\,\frac{15}{16}}$$

Thus, cost of 1 kg of sugar is $₹32\frac{15}{16}$.

**16.** Total length of pipe = 16 m

Length of piece $= 1\frac{3}{5}$ m or $\frac{8}{5}$ m

Number of pieces can be cut from pipe

$$= \frac{\text{Total length of pipe}}{\text{Length of each piece}} = \frac{16}{8/5} = \frac{16 \times 5}{8} = \mathbf{10}$$

Thus, 10 pieces can be cut from a pipe.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** to **8.** Do yourself.

**9.** Sum of two rational numbers $= \frac{2}{5}$

One of them $= \frac{-4}{7}$

Let other number $= x$

Then, $\frac{-4}{7} + x = \frac{2}{5}$

$$x = \frac{4}{7} + \frac{2}{5}$$

$$x = \frac{20 + 14}{35} = \frac{34}{35}$$

Thus, $\frac{34}{35}$ is the other number.

**10.** Let $x$ should be added $\frac{-5}{12}$ to get $\frac{-7}{8}$

$$\frac{-5}{12} + x = \frac{-7}{8}$$

$$x = \frac{-7}{8} + \frac{5}{12}$$

$$x = \frac{-21 + 10}{24} = \mathbf{\frac{-11}{24}}$$

Thus, $\frac{-11}{24}$ should be added to $\frac{-5}{12}$ to get $\frac{-7}{8}$.

**11.** Let $x$ should be subtracted from $\frac{-2}{3}$ to get $\frac{-5}{6}$

Then, $\frac{-2}{3} - x = \frac{-5}{6}$

$$x = \frac{-2}{3} + \frac{5}{6}$$

$$x = \frac{-4 + 5}{6} = \mathbf{\frac{1}{6}}$$

Thus, $\frac{1}{6}$ should be subtracted from $\frac{-2}{3}$ to get $\frac{-5}{6}$.

# 5. Exponents and Powers

## Exercise 5A

**1.** (i) $3 \times 3 \times 3 \times 3 \times 3 = \mathbf{3^5}$

(ii) $m \times m \times m = \mathbf{m^3}$

(iii) $2 \times 2 \times n \times n \times n \times n = \mathbf{2^2 \times n^4}$

(iv) $a \times a \times a \times b \times b \times b \times b \times c = \mathbf{a^3 \times b^4 \times c}$

**2.** (i) $2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = \mathbf{64}$

(ii) $5^5 = 5 \times 5 \times 5 \times 5 \times 5 = \mathbf{3125}$

(iii) $(-6)^4 = -6 \times -6 \times -6 \times -6 = \mathbf{1296}$

(iv) $\left(\frac{1}{3}\right)^4 = \frac{1^4}{3^4} = \frac{1 \times 1 \times 1 \times 1}{3 \times 3 \times 3 \times 3} = \frac{1}{81}$

(v) $\left(\frac{-2}{3}\right)^5 = \frac{(-2)^5}{3^5} = \frac{-2 \times -2 \times -2 \times -2 \times -2}{3 \times 3 \times 3 \times 3 \times 3} = \mathbf{\frac{-32}{243}}$

(vi) $(-2)^9 = -2 \times -2 \times -2 \times -2 \times -2 \times -2 \times -2 \times -2 \times -2$

$= \mathbf{-512}$

**3.** (i) $\left(\frac{3}{7}\right)^2 = \frac{3 \times 3}{7 \times 7} = \mathbf{\frac{9}{49}}$

(ii) $\left(\frac{3}{4}\right)^5 = \frac{3 \times 3 \times 3 \times 3 \times 3}{4 \times 4 \times 4 \times 4 \times 4} = \mathbf{\frac{243}{1024}}$

(iii) $\left(-\frac{2}{3}\right)^4 = \frac{-2 \times -2 \times -2 \times -2}{3 \times 3 \times 3 \times 3} = \mathbf{\frac{16}{81}}$

**4.** (i) $(-3) \times (-2)^3 = -3 \times -2 \times -2 \times -2 = \mathbf{24}$

(ii) $(-3)^2 \times (-5)^2 = -3 \times -3 \times -5 \times -5 = \mathbf{225}$

(iii) $(-2)^3 \times (-10)^4 = -2 \times -2 \times -2 \times -10 \times -10 \times -10 \times -10$

$= \mathbf{-80000}$

(iv) $(-1^5) = -1 \times -1 \times -1 \times -1 \times -1 = \mathbf{-1}$

(v) $25^2 \times (-1)^{17} = 25 \times 25 \times -1 = \mathbf{-625}$

(vi) Do yourself.

**5.** (i) $5 \times 10^3 = 5 \times 1000 = \mathbf{5000}$

(ii) $2^5 \times 7 = 2 \times 2 \times 2 \times 2 \times 2 \times 7 = \mathbf{224}$

(iii) $3^3 \times 10^4 = 3 \times 3 \times 3 \times 10 \times 10 \times 10 \times 10 = \mathbf{270000}$

**6.** (i) $4^3 = 4 \times 4 \times 4 = 64; 3^4 = 3 \times 3 \times 3 \times 3 = 81$

$\therefore$ $\mathbf{3^4}$ is greater.

(ii) $7^3$ or $3^7$; $7^3 = 7 \times 7 \times 7 = 343$;

$3^7 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 2187$

$\therefore$ $\mathbf{3^7}$ is greater.

(iii) $4^5 = 4 \times 4 \times 4 \times 4 \times 4 = 1024$; $5^4 = 5 \times 5 \times 5 \times 5 = 625$

$\therefore$ $\mathbf{4^5}$ is greater.

(iv) $2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024$;

$10^2 = 10 \times 10 = 100$

$\therefore$ $\mathbf{2^{10}}$ is greater.

**7.** (i) $8 = 2 \times 2 \times 2 = 2^3$

| | |
|---|---|
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

(ii) $128 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = \mathbf{2^7}$

| | |
|---|---|
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

(iii) Do yourself.

(iv) $1024 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = \mathbf{2^{10}}$

| | |
|---|---|
| 2 | 1024 |
| 2 | 512 |
| 2 | 256 |
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

**8.** Let $(-2)^x = -32$

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

Base is equal, so exponent should be same.

*i.e.,* $x = \mathbf{5}$

**9.** (i) $9 = -3 \times -3 = \mathbf{(-3)^2}$

(ii) $-27 = -3 \times -3 \times -3 = \mathbf{(-3)^3}$

(iii) $81 = -3 \times -3 \times -3 \times -3 = \mathbf{(-3)^4}$

(iv) Do yourself.

**10.** (i) $7^x = 343$

$7^x = 7 \times 7 \times 7 = 7^3$

Base is equal, exponent should be same

*i.e.,* $x = \mathbf{3}$

| | |
|---|---|
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

(ii) $3^x = 729$

$3^x = 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$3^x = 3^6$

Base is equal, exponent should be same

*i.e.,* $x = 6$

| | |
|---|---|
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(iii) $(-8)^x = -512$

$(-8)^x = -8 \times -8 \times -8$

$(-8)^x = (-8)^3$

Base is equal, exponent should be same

*i.e.,* $x = \mathbf{3}$

| | |
|---|---|
| 8 | 512 |
| 8 | 64 |
| 8 | 8 |
| | 1 |

(iv) $(-4)^x = -1024$

$(-4)^x = -4 \times -4 \times -4 \times -4 \times -4$

$(-4)^x = (-4)^5$

Base is equal, exponent should be same

*i.e.,* $x = \mathbf{5}$

| | |
|---|---|
| 4 | 1024 |
| 4 | 256 |
| 4 | 64 |
| 4 | 16 |
| 4 | 4 |
| | 1 |

(v) $\left(\frac{2}{5}\right)^x = \frac{32}{3125}$

$\left(\frac{2}{5}\right)^x = \frac{2\times2\times2\times2\times2}{5\times5\times5\times5\times5}$

$\left(\frac{2}{5}\right)^x = \frac{2^5}{5^5}$

$\left(\frac{2}{5}\right)^x = \left(\frac{2}{5}\right)^5$

Base is equal, exponent should be same

*i.e.*, $x = \mathbf{5}$

| 2 \| 32 |
|---|
| 2 \| 16 |
| 2 \| 8 |
| 2 \| 4 |
| 2 \| 2 |
| \| 1 |

| 5 \| 3125 |
|---|
| 5 \| 625 |
| 5 \| 125 |
| 5 \| 25 |
| 5 \| 5 |
| \| 1 |

(vi) $\left(\frac{-3}{4}\right)^x = \frac{-243}{1024}$

$\left(\frac{-3}{4}\right)^x = \frac{-3\times-3\times-3\times-3\times-3}{4\times4\times4\times4\times4}$

$\left(\frac{-3}{4}\right)^x = \frac{(-3)^5}{(4)^5}$

$\left(\frac{-3}{4}\right)^x = \left(\frac{-3}{4}\right)^5$

Base is equal, exponent should be same

*i.e.*, $x = \mathbf{5}$

| 3 \| 243 |
|---|
| 3 \| 81 |
| 3 \| 27 |
| 3 \| 9 |
| 3 \| 3 |
| \| 1 |

| 4 \| 1024 |
|---|
| 4 \| 256 |
| 4 \| 64 |
| 4 \| 16 |
| 4 \| 4 |
| \| 1 |

**11.** (i) $72 = 2\times2\times2\times3\times3 = \mathbf{2^3 \times 3^2}$

| 2 \| 72 |
|---|
| 2 \| 36 |
| 2 \| 18 |
| 3 \| 9 |
| 3 \| 3 |
| \| 1 |

(ii) $360 = 2\times2\times2\times3\times3\times5 = \mathbf{2^3 \times 3^2 \times 5^1}$

| 2 \| 360 |
|---|
| 2 \| 180 |
| 2 \| 90 |
| 3 \| 45 |
| 3 \| 15 |
| 5 \| 5 |
| \| 1 |

(iii) $405 = 3 \times 3 \times 3 \times 3 \times 5 = \mathbf{3^4 \times 5^1}$

| 5 | 405 |
|---|---|
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(iv), (v), (vi) and (vii) Do yourself.

(viii) 8400

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

$= \mathbf{2^4 \times 3^1 \times 5^2 \times 7}$

| 5 | 8400 |
|---|---|
| 5 | 1680 |
| 3 | 336 |
| 2 | 112 |
| 2 | 56 |
| 2 | 28 |
| 2 | 14 |
| 7 | 7 |
| | 1 |

**12.** Do yourself.

## Exercise 5B

**1.** (i) $\frac{25}{64} = \frac{5^2}{8^6} = \left(\frac{\mathbf{5}}{\mathbf{8}}\right)^{\mathbf{2}}$

| 5 | 25 |
|---|---|
| 5 | 5 |
| | 1 |

$= 5 \times 5 = 5^2$

| 2 | 64 |
|---|---|
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

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

$= 8 \times 8 = 8^2$

(ii) $-\frac{125}{216} = \frac{-5^3}{6^3} = \left(\frac{-5}{6}\right)^3$

| | |
|---|---|
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

$= 5 \times 5 \times 5 = 5^3$

| | |
|---|---|
| 3 | 216 |
| 2 | 72 |
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

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

$= 2^3 \times 3^3 = (3 \times 2)^3 = 6^3$

(iii) $\frac{-343}{729} = \frac{-7^3}{9^3} = \left(\frac{-7}{9}\right)^3$

| | |
|---|---|
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

$= 7 \times 7 \times 7 = 7^3$

| | |
|---|---|
| 9 | 729 |
| 9 | 81 |
| 9 | 9 |
| | 1 |

$= 9 \times 9 \times 9 = 9^3$

(iv) Do yourself.

**2.** (i) $3^4 \times 2^4$

As we know that $a^m \times b^m = (a \times b)^m = (ab)^m$

$= (3 \times 2)^4 = \mathbf{6^4}$

(ii) $(-3)^6 \times (-5)^6 = (-3 \times -5)^6 = \mathbf{15^6}$

(iii) Do yourself.

(iv) $\left(\frac{2}{3}\right)^6 \times \left(\frac{1}{12}\right)^6 = \left(\frac{2}{3} \times \frac{1}{12}\right)^6 = \left(\frac{\mathbf{1}}{\mathbf{18}}\right)^{\mathbf{6}}$

**3.** As we know that $a^m \times a^n = a^{m+n}$

(i) $3^5 \times 3^4 = 3^{5+4} = \mathbf{3^9}$

(ii) $a^5 \times a^3 = a^{5+3} = \boldsymbol{a^8}$

(iii) $(-4)^5 \times (-4)^{11} = (-4)^{5+11} = \mathbf{(-4)^{16}}$

(iv) $\left(\frac{3}{5}\right)^6 \div \left(\frac{3}{5}\right)^2$

As we know $a^m \div a^n = a^{m-n}$

*i.e.*, $= \left(\frac{3}{5}\right)^{6-2} = \left(\frac{\mathbf{3}}{\mathbf{5}}\right)^{\mathbf{4}}$

(v) $(-4)^7 \div (-4)^3 = (-4)^{7-3} = \mathbf{(-4)^4}$

(vi) $8^x \times 8^3 = \mathbf{8^{x+3}}$

**4.** As we know that $a^m \times a^n = a^{m+n}$; $a^m \div a^n = a^{m-n}$

(i) $5^3 \times 5^7 \times 5^{12} = 5^{3+7+12} = \mathbf{5^{22}}$

(ii) $a^5 \times a^3 \times a^7 = a^{5+3+7} = \boldsymbol{a^{15}}$

(iii) $(7^{12} \times 7^3) \div 7^4 = 7^{12+3} \div 7^4 = 7^{15} \div 7^4 = 7^{15-4} = \mathbf{7^{11}}$

(iv) Do yourself.

**5.** (i) $\frac{a^3 \times a^5}{(a^3)^2} = \frac{a^{3+5}}{a^{3\times 2}} = \frac{a^8}{a^6} = a^{8-6} = \boldsymbol{a^2}$

(ii) $(2^3)^4 \div 2^5 = 2^{3\times 4} \div 2^5 = 2^{12} \div 2^5 = 2^{12-5} = \mathbf{2^7}$

(iii) $[(6^2)^3 \div 6^3] \times 6^5$

$= [6^{2\times 3} \div 6^3] \times 6^5 = [6^6 \div 6^3] \times 6^5$

$= 6^{6-3} \times 6^5 = 6^3 \times 6^5$

$= 6^{3+5} = \mathbf{6^8}$

(iv) Do yourself.

**6.** (i) $\frac{(2^5)^2 \times 7^3}{8^3 \times 7}$ $\because 8 = 2^3$

$= \frac{2^{5\times 2} \times 7^3}{(2^3)^3 \times 7} = \frac{2^{10} \times 7^3}{2^9 \times 7^1}$

$= 2^{10-9} \times 7^{3-1} = 2^1 \times 7^2$

$= 2 \times 49 = 98$

(ii) $\dfrac{25 \times 5^2 \times t^8}{10^3 \times t^4}$

$\because \quad 10 = 5 \times 2;\ 25 = 5 \times 5 = 5^2$

$$= \frac{5^2 \times 5^2 \times t^8}{(5 \times 2)^3 \times t^4} = \frac{5^{2+2} \times t^8}{5^3 \times 2^3 \times t^4}$$

$$= \frac{5^4}{5^3} \times \frac{t^8}{t^4} \times \frac{1}{2^3} = \frac{5^{4-3} \times t^{8-4}}{2^3}$$

$$= \frac{5 \times t^4}{2^3} = \frac{5 \times t^4}{8} = \mathbf{\frac{5t^4}{8}}$$

(iii) $\dfrac{3^5 \times 10^5 \times 25}{5^7 \times 6^5}$

As $\quad 10 = 5 \times 2;\ 25 = 5 \times 5;\ 6 = 3 \times 2$

$$= \frac{3^5 \times (5 \times 2)^5 \times 5 \times 5}{5^7 \times 6^5}$$

$$= \frac{3^5 \times 5^5 \times 2^5 \times 5^2}{5^7 \times (3 \times 2)^5}$$

$$= \frac{3^5 \times 2^5 \times 5^{5+2}}{5^7 \times 3^5 \times 2^5} = \frac{3^5}{3^5} \times \frac{2^5}{2^5} \times \frac{5^7}{5^7}$$

$$= 3^{5-5} \times 2^{5-5} \times 5^{7-7} = 3^0 \times 2^0 \times 5^0$$

$$= 1 \times 1 \times 1 = 1$$

(iv) $\left(\dfrac{-3}{5}\right)^{-3}$

As we know $\quad a^{-n} = \dfrac{1}{a^n} = \dfrac{1}{\left(\frac{-3}{5}\right)^3} = \left(\dfrac{-5}{3}\right)^3$

$$= \frac{(-5)^3}{(3)^3} = \frac{-5 \times -5 \times -5}{3 \times 3 \times 3} = \mathbf{\frac{-125}{27}}$$

**7.** (i) $(2^2)^{100}$

As we know $\quad (a^m)^n = a^{mn} = 2^{2 \times 100} = \mathbf{2^{200}}$

(ii) $((-7)^6)^5 = (-7)^{6 \times 5} = \mathbf{(-7)^{30}}$

(iii) $(3^2)^5 \times (3^4)^7 = 3^{2 \times 5} \times 3^{4 \times 7}$

$$= 3^{10} \times 3^{28} = 3^{10+28} = \mathbf{3^{38}}$$

(iv) Do yourself.

**8.** (i) $\dfrac{2^4 \times 2 \times 7^3 \times 7^6}{2^3 \times 7^4}$

$$= \frac{2^{4+1} \times 7^{3+6}}{2^3 \times 7^4} = \frac{2^5}{2^3} \times \frac{7^9}{7^4}$$

$$= 2^{5-3} \times 7^{9-4} = \mathbf{2^2 \times 7^5}$$

(ii) $\dfrac{(3^2)^3 \times (-2)^5}{(-2)^3}$

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

$$= 3^6 \times (-2)^{5-3} = \mathbf{3^6 \times (-2)^2}$$

(iii) $\dfrac{2^8 \times a^5}{4^3 \times a^3}$

As $4 = 2^2$

$$= \frac{2^8 \times a^5}{(2^2)^3 \times a^3} = \frac{2^8}{2^6} \times \frac{a^5}{a^3}$$

$$= 2^{8-6} \times a^{5-3} = 2^2 \times a^2$$

$$= (2 \times a)^2 = \mathbf{(2a)^2}$$

(iv) $\dfrac{3 \times 7^2 \times 11^8}{21 \times 11^3}$

As $21 = 7 \times 3$

$$= \frac{3 \times 7^2 \times 11^8}{3 \times 7 \times 11^3} = \frac{7^2}{7^1} \times \frac{11^8}{11^3}$$

$$= 7^{2-1} \times 11^{8-3} = \mathbf{7^1 \times 11^5}$$

(v) $(2^0 + 3^0)4^0$

As we know $a^0 = 1$

*i.e.*, $2^0 = 1; 3^0 = 1; 4^0 = 1 = (1 + 1) \times 1 = 2 \times 1 = 2$

(vi) $3^0 \times 4^0 \times 5^0$

As we know $a^0 = 1$

$$3^0 = 1; 4^0 = 1; 5^0 = 1$$

$$= 1 \times 1 \times 1 = \mathbf{1}$$

**9.** (i) $\left[\dfrac{-1}{2}\right]^5 \times 2^6 \times \left(\dfrac{3}{4}\right)^3$

$$= \frac{(-1)^5 \times 2^6 \times 3^3}{(2^5) \times 4^3} = \frac{-1 \times 64 \times 27}{32 \times 64} = -\frac{\mathbf{27}}{\mathbf{32}}$$

(ii) $\left[\left(\frac{-3}{4}\right)^3 \div \left(\frac{-5}{2}\right)^3\right] \times \left(\frac{-2}{3}\right)^4 = \left(\frac{3}{4} \times \frac{2}{5}\right)^3 \times \left(\frac{-2}{3}\right)^4$

$= \frac{3^3}{10^3} \times \frac{-2 \times -2 \times -2 \times -2}{3 \times 3 \times 3 \times 3}$

$= \frac{27 \times 16}{1000 \times 81} = \mathbf{\frac{2}{375}}$

**10.** (i) $3^3 \times 2^2 + 2^2 \times 5^0$

$= 3 \times 3 \times 3 \times 2 \times 2 + 2 \times 2 \times 1$

$= 108 + 4 = 112$

$= 2 \times 2 \times 2 \times 2 \times 7 = \mathbf{2^4 \times 7^1}$

| | |
|---|---|
| 2 | 112 |
| 2 | 56 |
| 2 | 28 |
| 2 | 14 |
| 7 | 7 |
| | 1 |

(ii) $9^2 + 11^2 - 2^2 \times 3 \times 17^0$

$2^2 \times 3 \times 17^0 = 4 \times 3 \times 1 = 12$

$9^2 = 9 \times 9 = 81$

$11^2 = 11 \times 11 = 121$

$= 81 + 121 - 12 = 202 - 12 = 190$

| | |
|---|---|
| 2 | 190 |
| 5 | 95 |
| 19 | 19 |
| | 1 |

$= \mathbf{2^1 \times 5^1 \times 19^1}$

**11.** (i) $\left(\frac{3}{2}\right)^{-1} \div \left(\frac{-2}{5}\right)^{-1}$

$= \left(\frac{2}{3}\right)^1 \div \left(\frac{5}{-2}\right)^1$

$= \frac{2}{3} \div \frac{5}{-2}$

$= \frac{2}{3} \times \frac{-2}{5} = \mathbf{\frac{-4}{15}}$

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

$= \frac{-1\times -1\times -1\times -1}{4\times 4\times 4\times 4} = \mathbf{\frac{1}{256}}$

**12.** $\left(\frac{5}{11}\right)^{2y} \times \left(\frac{5}{11}\right)^3 = \left(\frac{5}{11}\right)^7$

$a^m \times a^n = a^{m+n}$

$\left(\frac{5}{11}\right)^{2y+3} = \left(\frac{5}{11}\right)^7$

Since base are equal then exponent should be same

$2y + 3 = 7$

$2y = 7 - 3$

$2y = 4$

$y = \frac{4}{2} = \mathbf{2}$

Thus, value of $y$ is 2.

**13.** $\left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} + \left(\frac{1}{5}\right)^{-2} - \left(\frac{1}{6}\right)^{-2}$

$= \frac{1}{\left(\frac{1}{3}\right)^2} + \frac{1}{\left(\frac{1}{4}\right)^2} + \frac{1}{\left(\frac{1}{5}\right)^2} - \frac{1}{\left(\frac{1}{6}\right)^2}$

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

$= 9 + 16 + 25 - 36 = \mathbf{14}$

**14.** Proceed as Question 12.

**15.** Let $x$ should be multiplied to $\left(\frac{4}{7}\right)^{-4}$

Then, $\left(\frac{4}{7}\right)^{-4} \times x = \left(\frac{7}{4}\right)^5$

$x = \left(\frac{7}{4}\right)^5 \div \left(\frac{4}{7}\right)^{-4}$

$x = \left(\frac{7}{4}\right)^5 \times \left(\frac{7}{4}\right)^{-4}$

$x = \left(\frac{7}{4}\right)^{5-4} = \mathbf{\frac{7}{4}}$

**16.** (i) $3.27 \times 10^6 = \mathbf{3270000}$

(ii), (iii) Do yourself.

(iv) $3.127 \times 10^{-7} = \mathbf{0.0000003127}$

(v) Do yourself.

**17.** (i) $476000 = \mathbf{4.76 \times 10^5}$ (ii) $8460 \times 10^3 = \mathbf{8.46 \times 10^6}$

(iii) $0.00025 = \mathbf{2.5 \times 10^{-4}}$ (iv) $\frac{4}{100000} = \frac{4}{10^5} = \mathbf{4 \times 10^{-5}}$

(v) $3246 = \mathbf{3.246 \times 10^3}$

**18.** (i) $6.5 \times 10^{-6} = \mathbf{0.0000065}$

(ii) Do yourself.

(iii) $5.6146929 \times 10^7 = \mathbf{56146929}$

(iv), (v) Do yourself.

**19.** (i) $980000000, n = 8 = \mathbf{9.8 \times 10^8}$

(ii), (iii) Do yourself.

(iv) $10700000000, n = 9 = \mathbf{10.7 \times 10^9}$

**20.** (i) $1050000 = \mathbf{1.05 \times 10^6}$

(ii) $1353000000 = \mathbf{1.353 \times 10^9}$

$1361000000 = \mathbf{1.361 \times 10^9}$

(iii) $1027000000 = \mathbf{1.027 \times 10^9}$

$531200000 = \mathbf{5.312 \times 10^8}$

$495800000 = \mathbf{4.958 \times 10^8}$

(iv) $\frac{1}{1000000} = \frac{1}{10^6} = \mathbf{1 \times 10^{-6}}$

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** (i) $\left(\frac{3}{5}\right)^4 \times \left(\frac{1}{3}\right)^3 = \frac{3 \times 3 \times 3 \times 3 \times 1 \times 1 \times 1}{5 \times 5 \times 5 \times 5 \times 3 \times 3 \times 3} = \mathbf{\frac{3}{625}}$

(ii) Do yourself

(iii) $\left(\frac{1}{3}\right)^4 \div \left(\frac{1}{9}\right)^6$

$= \frac{1 \times 1 \times 1 \times 1}{3 \times 3 \times 3 \times 3} \times \frac{9 \times 9 \times 9 \times 9 \times 9 \times 9}{1 \times 1 \times 1 \times 1 \times 1 \times 1} = \frac{6561}{1} = \mathbf{6561}$

(iv) $(-2)^5 \div \left(\frac{-1}{3}\right)^3 = (-2)^5 \times \left(\frac{-3}{1}\right)^3$

$= -2 \times -2 \times -2 \times -2 \times -2 \times -3 \times -3 \times -3$

$= 32 \times 27 = \mathbf{864}$

**2.** (i) $\frac{1}{243} = \frac{1}{3^5} = \left(\frac{\mathbf{1}}{\mathbf{3}}\right)^{\mathbf{5}}$ (ii) $\frac{-16}{729} = -\left(\frac{\mathbf{4}}{\mathbf{27}}\right)^{\mathbf{2}}$

(iii) $\frac{-625}{14641} = -\left(\frac{\mathbf{5}}{\mathbf{11}}\right)^{\mathbf{4}}$ (iv) $\frac{-2401}{-256} = \frac{2401}{256} = \left(\frac{\mathbf{7}}{\mathbf{4}}\right)^{\mathbf{4}}$

**3.** (i) $(-3)^5 = -243$ (ii) Do yourself.

$$\text{Reciprocal} = \frac{-1}{[-3]^5}$$

(iii) $\left(-\frac{1}{5}\right)^8 \div \left(\frac{1}{5}\right)^2 = \left(+\frac{1}{5}\right)^6 = \frac{1}{15625}$

Reciprocal = **15625**

(iv) $\left(\frac{3}{7}\right)^3 \times \left(\frac{7}{3}\right)^5 = \left(\frac{3}{7}\right)^3 \times \left(\frac{3}{7}\right)^{-5}$

$= \left(\frac{3}{7}\right)^{-2} = \left(\frac{7}{3}\right)^2 = \frac{49}{9}$

$$\text{Reciprocal} = \frac{\mathbf{9}}{\mathbf{49}}$$

**4.** Do yourself. **5.** Do yourself.

**6.** Do yourself. **7.** Do yourself.

**8.** (i) Do yourself.

(ii) $729 \times 64$

$729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6$

$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$

$729 \times 64 = \mathbf{3^6 \times 2^6}$

| | |
|---|---|
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

| | |
|---|---|
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

(iii) $384 \times 147$

$384 = 3 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^7 \times 3$

$147 = 3 \times 7 \times 7 = 3 \times 7^2$

$384 \times 147 = \mathbf{2^7 \times 3^2 \times 7^2}$

| 3 | 384 |
|---|---|
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| | 2 |

| 3 | 147 |
|---|---|
| 7 | 49 |
| 7 | 7 |
| | 1 |

**9.** Do yourself.

**10.** Do yourself.

**11.** Do yourself.

**12.** Do yourself.

**13.** Do yourself.

# 6. Algebraic Expressions

## Exercise 6A

Do yourself.

## Exercise 6B

**1.** (i) $8x^2y + 6yx^2 + (-3x^2y^2) + 8y^2x^2 + 3x^2y$

$= 8x^2y + 3x^2y + 6yx^2 + 8x^2y^2 - 3x^2y^2$

$= \mathbf{17x^2y + 5x^2y^2}$

(ii), (iii) and (iv) Do yourself.

**2.** (i) $2a^2 + 5b^2 + 3a^2 - 6b^2 + (-6a^2 + 8b^2)$

$= 2a^2 + 3a^2 - 6a^2 + 5b^2 - 6b^2 + 8b^2$

$= \mathbf{-a^2 + 7b^2}$

(ii) and (iii) Do yourself.

(iv) $-15x^2 - 5y^2 + 2xy + 4y^2 + 2xy - 3x^2 + 4x^2 - 3xy - 2y^2$

$= -15x^2 - 3x^2 + 4x^2 + 2xy + 2xy - 3xy - 5y^2 + 4y^2 - 2y^2$

$= \mathbf{-14x^2 + xy - 3y^2}$

**3.** (i) $5x^2 + 3y^2 - 2z^2$

$4x^2 + 2y^2 - 6z^2$

$+ 2x^2 - 6y^2 + 4z^2$

$11x^2 - y^2 - 4z^2$

(ii), (iii) and (iv) Do yourself.

**4.** (i) $5m^2n$ from $6nm^2 = 6m^2n - 5m^2n = \boldsymbol{m^2n}$

(ii) Do yourself.

(iii) $7a^2b^2$ from $8a^2b^2 = 8a^2b^2 - 7a^2b^2 = \boldsymbol{a^2b^2}$

(iv) Do yourself.

**5.** Proceed as Q. No. 4

**6.** (i) and (ii) Do yourself.

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

$7m^2 + 2mn - 6n^2$

$- \quad - \quad +$

$-2m^2 \quad + 3n^2$

(iv) Do yourself.

**7.** Do yourself.

**8.** Measure of three sides of a triangle = $(4x + 6y - 3)$ cm

$(5x + 2)$ cm and $(2x + y + 4)$ cm

Perimeter of triangle = Sum of all the sides

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

$= \boldsymbol{(11x + 7y + 3)\ cm}$

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

**9.** Do yourself.

**10.** Length of cloth purchased by Juhi for curtains = $(5x + 9y + 10)$ m

Length of cloth purchased by Juhi for covers sofa

$= (2x + y + 3)$ m

Total cloth she did purchase $= (5x + 9y + 10)$ m $+ (2x + y + 3)$ m

$= (7x + 10y + 13)$ m

Thus, she did purchase $(7x + 10y + 13)$ m cloth.

**11.** Let $x$ should be added to $6m^2 + 8mnp - 3n^2$ to obtain $-7mnp - 8m^2$

Then, $6m^2 + 8mnp - 3n^2 + x = -7mnp - 8m^2$

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

$x = -15mnp - 14m^2 + 3n^2$

Thus, $\boldsymbol{-15mnp - 14m^2 + 3n^2}$ should be added.

**12.** Length of a rectangle $= (4x^2 + 5y - 3)$ cm

Breadth of a rectangle $= (3x^2 - 2y + 2)$ cm

Perimeter of rectangle $= 2$ (length + breadth)

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

$= 2(7x^2 + 3y - 1)$

$= \mathbf{(14x^2 + 6y - 2)\ cm}$

Thus, perimeter of rectangle is $(14x^2 + 6y - 2)$ cm.

**13.** Do yourself.

**14.** Measure of each side of square $= (5m + 3n - 4)$ units

Perimeter of square $= 4 \times$ Side

$= 4(5m + 3n - 4)$

$= \mathbf{(20m + 12n - 16)\ units}$

Thus, perimeter of square is $(20m + 12n - 16)$ units.

**15.** Do yourself.

**16.** $P = 2m^2 + 5n^2 - 6$

$Q = m^2 - 6n^2 + 8$

$R = 3n^2 + 4m^2 + 2$

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

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

$= \mathbf{17m^2 + 13n^2 + 2}$

## Exercise 6C

**1.** (i) $7x \times 5x^2 = \mathbf{35x^3}$

(ii) $-5x^3 \times 7x^2 = \mathbf{-35x^5}$

(iii) $20x \times (-25x^2y) = \mathbf{-500x^3y}$

(iv) $2a^2bc \times 4ab^2 = \mathbf{8a^3b^3c}$

(v) $3.2x^6y^3 \times 5x^2y^2 = \frac{32}{10}x^6y^3 \times 5x^2y^2$

$= \frac{160}{10}x^8y^5 = \mathbf{16x^8y^5}$

(vi) $x^{-6} \times x^7 \times (-2x) = -2x^{-6+7+1} = \mathbf{-2x^2}$

**2.** $(-2x^2) \times (7x^2) \times (6x^3) = \mathbf{-84x^7}$

Put $x = 1$ in both sides

$(-2 \times 1^2)(7 \times 1^2)(6 \times 1^3) = -84 \times 1$

$-84 = \mathbf{-84}$ Hence proved.

**3.** $2ab \times (-5a^2) \times (-4.4a^2b) = 44a^{2+1+2}b^{1+1} = \mathbf{44a^5b^2}$

When $a = -1, b = 2 = 44 \times (-1)^5 \times (2)^2 = -44 \times 4$

$= \mathbf{-176}$

**4.** $a = 1, b = 2$

$= (5a^6)(-10ab^2)(-2a^2b^3)$

$= 100a^{6+2+1}b^{2+3} = \mathbf{100a^9b^5}$

$= 100 \times (1)^9 \times (2)^5$

$= 100 \times 1 \times 32 = \mathbf{3200}$

**5.** (i) $a^7 \times a^{10} \times a^{-3} = a^{7+10-3} = a^{7+7} = \mathbf{a^{14}}$

(ii) $x^{-5} \times (-2x^3) \times 7x^5 = -14x^{-5+3+5} = \mathbf{-14x^3}$

**6.** (i) $5a(a^2 + a + 3) = 5a \times a^2 + 5a \times a + 5a \times 3$

$= \mathbf{5a^3 + 5a^2 + 15a}$

(ii) Do yourself.

(iii) $0.1a(0.01a + 0.0016) = \frac{1}{10}a\left(\frac{a}{100} + \frac{16}{10000}\right)$

$= \frac{\mathbf{a^2}}{\mathbf{1000}} + \frac{\mathbf{16a}}{\mathbf{100000}}$

**7.** (i) $(3x + 5) \times 7x = 3x \times 7x + 5 \times 7x = \mathbf{21x^2 + 35x}$

(ii), (iii) Do yourself.

(iv) $(5x^2 + 7x) \times 5x^2 = \mathbf{25x^4 + 35x^3}$

(v) $\left(\frac{1}{2}x - \frac{1}{3}y\right) \times 6xy = \frac{1}{2} \times 6x^2y - \frac{6}{3}xy^2 = \mathbf{3x^2y - 2xy^2}$

(vi) $(0.2a - 0.1b) \times 0.3ab = 0.2a \times 0.3ab - 0.1b \times 0.3ab$

$= \mathbf{0.06a^2b - 0.03ab^2}$

**8.** (i) $(2x + 9) \times (6x + 5) = 2x \times 6x + 6x \times 9 + 5 \times 2x + 45$

$= 12x^2 + 54x + 10x + 45$

$= \mathbf{12x^2 + 64x + 45}$

(ii), (iii) Do yourself.

(iv) $(2.5a + 2.3b) \times (2.5a - 2.3b) = (2.5a)^2 - (2.3b)^2$

$= \mathbf{6.25a^2 - 5.29b^2}$

**9.** (i) $a(a - b) + b(a - b) = a^2 - ab + ab - b^2 = \mathbf{a^2 - b^2}$

(ii) Do yourself.

(iii) $a(a^2 + 1) + b(b^2 + 1) - (a + b) = a^3 + a + b^3 + b - a - b$

$= \mathbf{a^3 + b^3}$

(iv) Do yourself.

**10.** (i) $(2x-5)\times(7+4x) = 2x\times 7 - 35 + 2x\times 4x - 5\times 4x$

$= 14x - 35 + 8x^2 - 20x$

$= \mathbf{8x^2 - 6x - 35}$

If $(x=2) = 8(2)^2 - 6(2) - 35$

$= 8\times 4 - 12 - 35$

$= 32 - 12 - 35 = \mathbf{-15}$

(ii), (iii) Do yourself.

(iv) $(p^2-q^2)(p-q) = \mathbf{p^3 - pq^2 - p^2q + q^3}$

If $p=2, q=0 = (2)^3 - (2)\times 0 - (2)^2 \times 0 + 0 = 8$

**11.** (i) $(2x+3y)(4x^2y + 5xy^2)$

$= 8x^3y + 12x^2y^2 + 10x^2y^2 + 15xy^3$

$= \mathbf{8x^3y + 22x^2y^2 + 15xy^3}$

(ii) $(a^5+5)(b^3+3)+4 = a^5b^3 + 5b^3 + 3a^5 + 15 + 4$

$= \mathbf{a^5b^3 + 5b^3 + 3a^5 + 19}$

(iii) $(a+bcd)(a^3 + b^3c^3d^3)$

$= \mathbf{a^4 + ab^3c^3d^3 + a^3bcd + b^4c^4d^4}$

(iv) $(t^2+s^3)(t^2-s^3)$ is of the form $(a+b)(a-b) = a^2 - b^2$

$= (t^2)^2 - (s^3)^2 = \mathbf{t^4 - s^6}$

**12.** (i) $(x+y)(x^2 - xy + y^2)$

$= x(x^2 - xy + y^2) + y(x^2 - xy + y^2)$

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

$= \mathbf{x^3 + y^3}$

(ii) $x^2 + (3x-y)(3x + y + y^2)$

$= x^2 + 9x^2 + 3xy + 3xy^2 - 3xy - y^2 - y^3$

$= \mathbf{10x^2 - y^2 - y^3 + 3xy^2}$

(iii) $x(x + y^2 + z) + y^2(x + y + z) - z(x + y^2)$

$= x^2 + xy^2 + zx + xy^2 + y^3 + y^2z - zx - zy^2$

$= \mathbf{x^2 + 2xy^2 + y^3}$

**13.** Do yourself.

## Exercise 6D

**1.** (i) $(a-5)\times(a-5) = (a-5)^2 = \mathbf{a^2 + 25 - 10a}$

(ii) Do yourself.

(iii) $\left(\frac{5}{2}x - 7\right)\times\left(\frac{5}{2}x - 7\right) = \left(\frac{5}{2}x - 7\right)^2 = \mathbf{\frac{25}{4}x^2 + 49 - 35x}$

**2.** (i) $(x+3)(x+3) = (x+3)^2 = \mathbf{x^2 + 9 + 6x}$

(ii) $(2y+5)(2y+5) = (2y+5)^2 = \mathbf{4y^2 + 25 + 20y}$

(iii) Do yourself.

(iv) $(1.1m + 2.1)(1.1m + 2.1)$

$= (1.1m + 2.1)^2$

$= (1.1m)^2 + (2.1)^2 + 2 \times (1.1m) \times (2.1)$

$= \mathbf{1.21m^2 + 4.41 + 4.62m}$

(v), (vi), Do yourself.

**3.** (i) $(6x + 7)(6x - 7) = (6x)^2 - (7)^2 = \mathbf{36x^2 - 49}$

(ii), (iii) Do yourself.

**4.** (i) $(6x - 8y)(6x + 8y) = (6x)^2 - (8y)^2 = \mathbf{36x^2 - 64y^2}$

Another method : By multiplication

$(6x - 8y)(6x + 8y) = 6x(6x - 8y) + 8y(6x - 8y)$

$= 36x^2 - 48xy + 48xy - 64y^2$

$= \mathbf{36x^2 - 64y^2}$

(ii), (iii) Do yourself.

(iv) $(1.7p^3 + 1.2q^3)(1.7p^3 - 1.2q^3)$

$= (1.7p^3)^2 - (1.2q^3)^2$

$= \mathbf{2.89p^6 - 1.44q^6}$

Another method : By multiplication

$(1.7p^3 + 1.2q^3)(1.7p^3 - 1.2q^3)$

$= 2.89p^6 + 2.04p^3q^3 - 2.04p^3q^3 - 1.44q^6$

$= \mathbf{2.89p^6 - 1.44q^6}$

**5.** (i) $(a - 5)^2 = a^2 + (5)^2 - 2 \times 5 \times a$

$= a^2 + 25 - 10a$

Another Method : By expanding.

$(a - 5)(a - 5) = a(a - 5) - 5(a - 5)$

$= a^2 - 5a + 5a + 25$

$= \mathbf{a^2 + 25 - 10a}$

(ii) and (iii) Do yourself.

**6.** (i) $(a^2 - b^2)^2 = (a^2)^2 + (b^2)^2 - 2a^2b^2$

$= \mathbf{a^4 + b^4 - 2a^2b^2}$

(ii), (iii) and (iv) Do yourself.

**7.** (i), (ii), (iii) Do yourself.

(iv) $\left(2r^2 - \frac{1}{400}t^2\right)^2 - \left(2r^2 + \frac{1}{400}t^2\right)^2$

$= \left\{(2r^2)^2 + \left(\frac{1}{400}t^2\right)^2 + 2.2r^2 \cdot \frac{1}{400}t^2\right\}$

$\quad - \left\{(2r^2)^2 + \left(\frac{1}{400}t^2\right)^2 - 2.2r^2 \cdot \frac{1}{400}t^2\right\}$

$= 4r^4 + \frac{1}{160000}t^4 - \frac{r^2t^2}{100} - 4r^4 - \frac{1}{160000}t^4 - \frac{r^2t^2}{100}$

$= -\mathbf{\frac{1}{50}\, r^2t^2}$

**8.** (i) $71^2 = (70 + 1)^2$

$= (70)^2 + (1)^2 + 2 \times 70 \times 1$

$= 4900 + 1 + 140 = \mathbf{5041}$

(ii), (iii) Do yourself.

**9.** (i) $(ab + bc)^2 - 2ab^2c = a^2b^2 + b^2c^2 + 2ab^2c - 2ab^2c$

$= \mathbf{a^2b^2 + b^2c^2}$

(ii) Do yourself.

**10.** (i) $4x + 6$

$x = 3, y = -2$

$= 4 \times 3 + 6 = 12 + 6 = \mathbf{18}$

(ii), (iii) and (iv) Do yourself.

**11.** Do yourself.

**12.** Do yourself.

**13.** Given $5y^2 + 6y - a = 8$ for $y = 2$

Then, $5\,(2)^2 + 6 \times 2 - a = 8$

$5 \times 4 + 12 - a = 8$

$20 + 12 - a = 8$

$32 - a = 8$

$a = 32 - 8 = \mathbf{24}$

**14.** Proceed as Q. No. 13.

**15.** (i) $105 \times 95 = (100 + 5)(100 - 5)$

$= (100)^2 - (5)^2 = 10000 - 25 = \mathbf{9975}$

(ii) Do yourself.

(iii) $297 \times 303 = (300 - 3) \times (300 + 3)$

$= (300)^2 - (3)^2$

$= 90000 - 9 = \mathbf{89991}$

**16.** (i) $51^2 - 49^2 = (51)^2 - (49)^2$

$(51 + 49)(51 - 49) = 100 \times 2 = \mathbf{200}$

(ii) Do yourself.

(iii) $233^2 - 227^2 = (233)^2 - (227)^2$

$= (233 + 227)(233 - 227)$

$= 460 \times 6 = \mathbf{2760}$

**17.** (i) $8a = 35^2 - 27^2$

$8a = (35)^2 - (27)^2$

$8a = (35 + 27)(35 - 27)$

$8a = 62 \times 8$

$a = \dfrac{62 \times 8}{8} = \mathbf{62}$

(ii) Do yourself.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** to **5.**; Do yourself.

**6.** Let $m$ should be added to $3x^2 - 6x - 7$ to make $4x^2 + x - 2$

Then, $3x^2 - 6x - 7 + m = 4x^2 + x - 2$

$m = (4x^2 + x - 2) - (3x^2 - 6x - 7)$

$m = \mathbf{x^2 + 7x + 5}$

Thus, $x^2 + 7x + 5$ should be added.

**7.** Proceed as Q. No. 6.

**8.** Difference of both polynomial

$= (y^4 - 12y^2 + y + 14) - (17y^3 + 34y^2 - 51y + 68)$

$= y^4 - 12y^2 + y + 14 - 17y^3 - 34y^2 + 51y - 68$

$= \mathbf{y^4 - 17y^3 - 46y^2 + 52y - 54}$

**9.** Proceed as Q. No. 8.

**10.** Let $m$ should be taken away from $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$

Then, $3x^2 - 4y^2 + 5xy + 20 - m = -x^2 - y^2 + 6xy + 20$

$m = (3x^2 - 4y^2 + 5xy + 20) - (-x^2 - y^2 + 6xy + 20)$

$m = 3x^2 + x^2 - 4y^2 + y^2 + 5xy - 6xy + 20 - 20$

$m = 4x^2 - 3y^2 - xy$

Thus, $4x^2 - 3y^2 - xy$ should be taken away.

**11.** Sum of $2y^2 + 3yz, -y^2 - yz - z^2$ and $yz + 2z^2$

$= (2y^2 + 3yz) + (-y^2 - yz - z^2) + (yz + 2z^2)$

$= 2y^2 - y^2 + 3yz - yz + yz - z^2 + 2z^2$

$= y^2 + 3yz + z^2$

Sum of $3y^2 - z^2$ and $-y^2 + yz + z^2$

$= (3y^2 - z^2) + (-y^2 + yz + z^2)$

$= 3y^2 - y^2 + yz - z^2 + z^2$

$= 2y^2 + yz$

Now subtraction of $y^2 + 3yz + z^2$ and $2y^2 + yz$

$= (y^2 + 3yz + z^2) - (2y^2 + yz)$

$= y^2 - 2y^2 + 3yz - yz + z^2$

$= \mathbf{-y^2 + 2yz + z^2}$

**12.** (i) $-x^2yz(xy^2z - x^2z) = -x^3y^3z^2 + x^4yz^2$

If $x = -1, y = 1, z = 2$

$= -(-1)^3(1)^3(2)^2 + (-1)^4(1)(2)^2$

$= 1 \cdot 1 \cdot 4 + 1 \cdot 1 \cdot 4 = 4 + 4 = 8$

(ii) Do yourself.

**13.** (i) $(1.5x - 4y)(1.5x + 4y + 3)$

$= 1.5x \times (1.5x + 4y + 3) - 4y(1.5x + 4y + 3)$

$= 2.25x^2 + 6xy + 4.5x - 6xy - 16y^2 - 12y$

$= \mathbf{2.25x^2 - 16y^2 + 4.5x - 12y}$

(ii) Do yourself.

**14.** (i) $(3x + 7)^2 - 84x = (3x)^2 + (7)^2 + 2 \times 3x \times 7 - 84x$

$= 9x^2 + 49 + 42x - 84x$

$= 9x^2 + 49 - 42x$

$= (3x)^2 + (7)^2 - 2 \times 3x \times 7$

$= \mathbf{(3x - 7)^2}$

(ii) $(89p - 5q)^2 + 1780pq$

$= 7921p^2 + 25q^2 - 890pq + 1780pq$

$= \mathbf{(89p + 5q)^2}$

**15.** (i) $(x - 1)(x + 1)(x^2 + 1)(x^4 + 1)$

$= (x^2 - 1)(x^2 + 1)(x^4 + 1)$

$= (x^4 - 1)(x^4 + 1)$

$= (x^4)^2 - (1)^2 = \mathbf{x^8 - 1}$

(ii) Do yourself.

**16.** (i) $5x = (45)^2 - (30)^2$

$5x = (45+30)(45-30)$

$5x = 75 \times 15$

$x = \dfrac{75 \times 15}{5}$

$x = 75 \times 3 = \mathbf{225}$

(ii) Do yourself.

# 7. Linear Equations in One Variable

## Exercise 7A

**1.** (i) $3x - 5 = 7$

On both sides

$3x - 5 + 5 = 7 + 5$

$3x = 12$

On divide by 3 both sides

$\dfrac{3x}{3} = \dfrac{12}{3}$

$x = \mathbf{4}$

(ii) Do yourself.

(iii) $9m - 6 = 2m + 4$

On subtracting $2m$ both sides

$9m - 6 - 2m = 2m + 4 - 2m$

$7m - 6 = 4$

On adding 6 both sides

$7m - 6 + 6 = 4 + 6$

$7m = 10$

On divide by 7 both sides

$\dfrac{7m}{7} = \dfrac{10}{7}$

$m = \dfrac{\mathbf{10}}{\mathbf{7}}$

(iv) $n - \dfrac{3}{5} = 8$

On adding $\dfrac{3}{5}$ both sides

$n - \dfrac{3}{5} + \dfrac{3}{5} = 8 + \dfrac{3}{5}$

$n = \dfrac{40+3}{5} = \mathbf{\dfrac{43}{5}}$

(v) Do yourself.

(vi) $\frac{W}{-4} = 7$

On multiply by $-4$ both sides

$$\frac{W}{-4} \times -4 = 7 \times -4$$

$$W = \mathbf{-28}$$

**2.** (i) $3 - 5x + 2x = 6x + 5$

$$-5x + 2x - 6x = 5 - 3$$

$$-9x = 2$$

$$x = -\frac{\mathbf{2}}{\mathbf{9}}$$

(ii) $\frac{3p-2}{5} - \frac{p}{3} = 8$

$$\frac{3(3p-2) - 5p}{15} = 8$$

$$9p - 6 - 5p = 8 \times 15$$

$$4p - 6 = 120$$

$$4p = 120 + 6$$

$$p = \frac{126}{4} = \frac{\mathbf{63}}{\mathbf{2}}$$

(iii) Do yourself.

(iv) $5(6x + 1) = 3(-7 + 2x)$

$$30x + 5 = -21 + 6x$$

$$30x - 6x = -21 - 5$$

$$24x = -26$$

$$x = \frac{-26}{24} = \frac{\mathbf{-13}}{\mathbf{12}}$$

(v) Do yourself.

(vi) $\frac{2}{5}(m-5) + \frac{3}{10}(m+2) = 24$

$$\frac{4(m-5) + 3(m+2)}{10} = 24$$

$$4m - 20 + 3m + 6 = 24 \times 10$$

$$7m - 14 = 240$$

$$7m = 240 + 14$$

$$7m = 254$$

$$m = \frac{\mathbf{254}}{\mathbf{7}}$$

**3.** (i) $5x - 6 = 9$

On adding 6 both sides

$$5x - 6 + 6 = 9 + 6$$
$$5x = 15$$

On divide by 5 both sides

$$\frac{5x}{5} = \frac{15}{5}$$
$$x = \mathbf{3}$$

Let's put the value of $x$ in equation

$$5 \times 3 - 6 = 9$$
$$15 - 6 = 9$$
$$9 = 9$$

both sides are equal so value of $x = 3$

(ii), (iii), (iv) and (v) Do yourself.

(vi) $7m - 8 = 2m + 7$

On subtracting $2m$ both sides

$$7m - 8 - 2m = 2m + 7 - 2m$$
$$5m - 8 = 7$$

On adding 8 both sides

$$5m - 8 + 8 = 7 + 8$$
$$5m = 15$$

On dividing 5 both sides

$$\frac{5m}{5} = \frac{15}{5}$$
$$m = \mathbf{3}$$

Let's put the value of $m$ in equation

$$7 \times 3 - 8 = 2 \times 3 + 7$$
$$21 - 8 = 6 + 7$$
$$13 = 13$$

Both sides are equal so value of $m = 3$.

**4.** (i) Do yourself.

(ii) $15m + 4m - 3 = 21 - 2m + 8$

$$15m + 4m + 2m = 21 + 8 + 3$$
$$21m = 32$$
$$m = \frac{32}{21}$$

Let's put the value of $m$ in equation

$$15 \times \frac{32}{21} + 4 \times \frac{32}{21} - 3 = 21 - 2 \times \frac{32}{21} + 8$$
$$\frac{160}{7} + \frac{128}{21} - 3 = 21 - \frac{64}{21} + 8$$

$$\frac{480+128-63}{21}=\frac{441-64+168}{21}$$

$$\frac{545}{21}=\frac{545}{21}$$

Both sides are equal so value of $m=\mathbf{\frac{32}{21}}$.

(iii), (iv) and (v) Do yourself.

(vi) $$4x+\frac{12}{5}=\frac{37}{10}$$

$$4x=\frac{37}{10}-\frac{12}{5}$$

$$4x=\frac{37-24}{10}$$

$$4x=\frac{13}{10}$$

$$x=\frac{13}{10\times 4}=\frac{13}{40}$$

Let's put the value of $x$ in equation

$$4\times\frac{13}{40}+\frac{12}{5}=\frac{37}{10}$$

$$\frac{13}{10}+\frac{12}{5}=\frac{37}{10}$$

$$\frac{13+24}{10}=\frac{37}{10}$$

$$\frac{37}{10}=\frac{37}{10}$$

Both sides are equal so value of $x=\mathbf{\frac{13}{40}}$.

## Exercise 7B

**1.** Let the one number be $x$ and other $95-x$

$$x+3=95-x$$

$$2x=95-3$$

$$2x=92$$

$$x=\frac{92}{2}=46$$

Therefore the numbers are **46** and **49.**

**2.** Let the number be $x$, $x+1$ and $x+2$

$$x+x+1+x+2=24$$

$$3x+3=24$$

$$3x=24-3$$

$$3x = 21 = 7$$

Therefore the numbers are $7, 7 + 1, 7 + 2 =$ **7, 8** and **9.**

**3.** Let the number be $x$.

$$2x + 7 = 49$$
$$2x = 49 - 7$$
$$\Rightarrow \quad 2x = 42$$
$$\Rightarrow \quad x = \frac{42}{2}$$
$$\Rightarrow \quad x = \mathbf{21}$$

**4.** Let the number be $x$

$$3x - 22 = 68$$
$$3x = 68 + 22$$
$$3x = 90$$
$$\Rightarrow \quad x = \frac{90}{3} \Rightarrow \quad x = \mathbf{30}$$

**5.** Let the number be $x$

$$7x - 3 = 53$$
$$7x = 56$$
$$x = \mathbf{8}$$

**6.** Let $x$ be the no. of 10 rupee note and $y$ that of 50 rupee note.

Given that, $10x + 50y = 250$ ...(i)

And $x = y + 1$ ...(ii)

Putting the value of $x$ from equation (ii) in equation (i).

We get, $10(y + 1) + 50y = 250$

$$10y + 10 + 50y = 250$$
$$60y = 240$$
$$y = \frac{240}{60} = 4$$

From equation (ii). $x = y + 1, x = 4 + 1 = 5$

No. of 10 rupee note = **5,** No. of 50 rupee note = **4**

**7.** Let the breadth $= x$

And Length $= 2x + 2$

Perimeter of rectangle $= 2 \times (l + b)$

$$28 = 2 \times (x + 2x + 2)$$
$$14 = 3x + 2$$
$$\Rightarrow \quad 3x = 12$$
$$\Rightarrow \quad x = 4$$

Breadth = **4 cm,** Length = **10 cm.**

**8.** Let Rahul's age $= x$

Mother's age $= 6x$

After 5 years $x + 5 + 20 = 6x + 5$

$$x + 25 = 6x + 5$$
$$25 - 5 = 6x - x$$
$$20 = 5x \quad \Rightarrow \quad x = 4$$

**4 years** and $6 \times 4 =$ **24 years.**

**9.** Let breadth be $x$ and length be $x + 4$

Perimeter of the rectangle $= 2 \times$ (length + breadth)

$$84 = 2 \times (x + 4 + x)$$
$$42 = 2x + 4$$
$$42 - 4 = 2x$$
$$\Rightarrow \quad 38 = 2x \Rightarrow x = 19$$

Breadth = **19 m** Length = **23 m**

**10.** Let the present age of Riya be $x$.

After 15 years

$$x + 15 = 4x$$
$$3x = 15$$
$$x = 5$$

$\therefore$ Present age of Riya is **5 years.**

**11.** Let the one prize = $x$; and other prize = $(63 - x)$

$$100x + (63 - x) \times 25 = 3000$$
$$100x + 1575 - 25x = 3000$$
$$75x = 1425 \Rightarrow x = \frac{1425}{75} = 19$$
$$19, 63 - 19 = 44$$

No. of 100 rupee prizes = 19, No. of 25 rupee prizes = **44**

**12.** Do yourself.

**13.** Let the total worth of Sanjay's property be $x$

$$\text{Son's share} = \frac{x}{5}$$
$$\text{Daughter's share} = \frac{x}{5}$$
$$\text{Wife's share} = \frac{3x}{5}$$
$$\text{If wife's share} = 288000$$
$$288000 = \frac{3x}{5}$$
$$3x = 288000 \times 5$$
$$x = \frac{288000 \times 5}{3}$$
$$= ₹ \textbf{480000}$$

**₹ 480000** is total worth of Sanjay.

**14.** Let one part $= x$ and other part $x + 10$

$$\frac{x}{x+10} = \frac{3}{5}$$

$$5x = 3x + 30$$

$$5x - 3x = 30$$

$$2x = 30$$

$$\Rightarrow \quad x = 15$$

First part $=$ **15** and other $=$ **25**

Total number $= 15 + 25 =$ **40**

**15.** Let the boys $= x$, and girls $= \frac{2x}{5}$

$$\frac{2x}{5} + x = 35$$

$$\Rightarrow \quad \frac{2x + 5x}{5} = 35$$

$$\Rightarrow \quad \frac{7x}{5} = 35$$

$$\Rightarrow \quad x = \frac{35 \times 5}{7}$$

$$\Rightarrow \quad x = \mathbf{25}$$

Boys $=$ **25**

**16.** Let the distance covered by Neha $= x$ km

The distance covered by Megha $= (18 - x)$ km

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\frac{5}{2} = \frac{18 - x}{t}$$

$$\Rightarrow \quad t = \frac{36 - 2x}{5}$$

And $\quad 2 = \frac{x}{t} \quad \Rightarrow \quad t = \frac{x}{2}$

According to the condition

$$\frac{36 - 2x}{5} = \frac{x}{2}$$

$$72 - 4x = 5x$$

$$72 = 9x$$

$$\Rightarrow \quad x = 8$$

$$t = \frac{8}{2} = \mathbf{4\ hours}$$

**17.** Let the number be $x$.

$$\left(x-\frac{1}{2}\right)\times 4=5$$

$$x-\frac{1}{2}=\frac{5}{4}$$

$$\Rightarrow \quad x=\frac{5}{4}+\frac{1}{2}$$

$$x=\frac{5+2}{4}=\boldsymbol{\frac{7}{4}}$$

**18.** Do yourself.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** Do yourself.

**2.** Do yourself.

**3.** Do yourself.

**4.** Do yourself.

**5.** $x^4-3x^3-px-5=23$

$x=-2$

Then, $(-2)^4-3(-2)^3-p(-2)-5=23$

$16+24+2p-5=23$

$2p=23-16-24+5$

$2p=-12$

$p=-6$

Thus, value of $p$ is $-6$.

**6.** Let required number $= x$

A number is greater than 15 and it is less than 51, then

$x-15=51-x$

$2x=66$

$x=\mathbf{33}$

Thus, required number is 33.

**7.** Let the required number $= x$

5 times the number $= 5x$

7 added to 5 times the number $= 5x+7$

According to the problem

$5x+7=57$

$5x=50$

$x=10$

Thus, 10 is the required number.

**8.** Let the required number $= x$

$\frac{1}{4}$ th of the number is 3 more than 7

$$\frac{1}{4}x = 7 + 3$$
$$\frac{1}{4}x = 10$$
$$x = \mathbf{40}$$

Thus, 40 is the required number.

**9.** Let the required numbers $= x, 80 - x$

The greater number exceeds twice the smaller by 11 is

$$x = 2(80 - x) + 11$$
$$x = 160 - 2x + 11$$
$$3x = 171$$
$$x = 57$$
$$\text{So, other number} = 80 - 57 = 23$$

Thus, required number is **57 and 23**.

**10.** Let number of boys $= x$

$$\text{number of girls} = \frac{2}{5}x$$
$$\text{Total no. of students} = 35$$
$$x + \frac{2}{5}x = 35$$
$$5x + 2x = 35 \times 5$$
$$7x = 35 \times 5$$
$$x = \frac{35 \times 5}{7}$$
$$x = 25$$
$$\text{Number of girls in class} = \frac{2}{5}x = \frac{2}{5} \times 25 = \mathbf{10}$$

Thus, 10 girls are in class.

**11.** Cost of chair $= ₹ 250$

Cost of table $= ₹ 400$

Let number of chairs purchased by housewife $= x$

According to question,

$$250 \times x + 400 \times 2 = 2800$$
$$250x = 2800 - 800$$
$$250x = 2000$$
$$x = \frac{2000}{250} = \mathbf{8}$$

Thus, she purchased 8 chairs.

**12.** Let Palak's monthly salary $= ₹\, x$

Then, over time payment $= x - 16560$

According to the problem

$$x + x - 16560 = 27840$$
$$2x = 44400$$
$$x = \frac{44400}{2}$$
$$= ₹\, 22200$$

Thus, ₹ 22200 is the monthly salary of Palak.

**13.** Given sides of isosceles triangle are

$$3x - 1, 2x + 2, 2x$$

Two equal sides are

$$3x - 1 = 2x + 2$$
$$3x - 2x = 2 + 1$$
$$\boldsymbol{x = 3}$$

Perimeter of triangle $= 3x - 1 + 2x + 2 + 2x$

$$= 7x + 1$$
$$7(3) + 1 = 22$$

Thus, perimeter of the triangle is **22 units**.

**14.** Let purse contains 10 rupee notes $= x$

50 rupee notes is one less $= x - 1$

According to the problem total amount in purse is $= 550$

$$10x + 50(x - 1) = 550$$
$$10x + 50x - 50 = 550$$
$$60x = 600$$
$$x = 600/60$$
$$x = 10$$

Number of 50 rupee notes $= 10 - 1 = 9$

Thus, number of 50 rupee notes is 9.

**15.** Let breadth $= x$ m

Length of the rectangular $= (3x - 6)$ m

According to the problem perimeter is $= 148$ m

$$2(x + 3x - 6) = 148$$
$$2(4x - 6) = 148$$
$$8x - 12 = 148$$
$$8x = 160$$
$$x = 20$$
$$\text{breadth} = \mathbf{20\ m}$$

Then, length $= 3x - 6 = 3 \times 20 - 6 = \mathbf{54\ m}$

Thus, length is 54 m and breadth is 20 m.

**16.** Let present age $= x$ years

After 12 years $= (x + 12)$ years

3 times as old was 4 years ago

$$x + 12 = 3(x - 4)$$
$$x + 12 = 3x - 12$$
$$2x = 24$$
$$x = 24/2$$
$$x = 12$$

Thus, present age is **12 years**.

**17.** Difference of each angle $= 20°$

Let the angles be $= x$ and $x + 20$

Sum of two complementary angle is $90°$

$$x + x + 20° = 90°$$
$$2x = 90° - 20°$$
$$2x = 70°$$
$$x = 35°$$

One angle is **35°** then other $= 35 + 20 =$ **55°**

Thus, measure of angles is **35° and 55°**.

# 8. Direct and Inverse Variations

## Exercise 8A

**1.** (i) Ratio of 5 kg to 600 g is

$$\frac{5000}{600} = \frac{25}{3} = \mathbf{25 : 3}$$

Thus, ratio of 5 kg to 600 g is 25 : 3

(ii) Ratio of 35 paise to ₹ 6 is

$$\frac{35}{600} = \frac{7}{120} = \mathbf{7 : 120}$$

Thus, ratio of 35 paise to ₹ 6 is 7 : 120.

(iii) Ratio of 300 mL to 2 L is

$$\frac{300}{2000} = \frac{3}{20} = \mathbf{3 : 20}$$

Thus, ratio of 300 mL to 2 L is 3 : 20.

(iv) Ratio of 450 m to 7 km is

$$\frac{450}{7000} = \frac{9}{140} = \mathbf{9 : 140}$$

Thus, ratio of 450 m to 7 km is 9 : 140.

**2.** (i) Do yourself.

(ii)

| $x$ | 7 | 9 | 13 | 21 | 25 |
|---|---|---|---|---|---|
| $y$ | 21 | 27 | 39 | 63 | 75 |

(iii) Do yourself.

**3.**

| Cost (₹) | Stamps |
|---|---|
| 18 ↓ | 15 ↓ |
| 36 ↓ | $x$ ↓ |

It is a direct variation

$$\frac{x}{15} = \frac{36}{18}$$

$$x = \frac{15 \times 36}{18}$$

$$x = \mathbf{30\ stamps}$$

Thus, 30 stamps can be bought for ₹ 36.

**4.**

| Hours | Tools |
|---|---|
| 5 ↓ | 120 ↓ |
| 20 ↓ | $x$ ↓ |

It is a direct variation

$$\frac{x}{120} = \frac{20}{5}$$

$$x = \frac{120 \times 20}{5} = 120 \times 4 = 480$$

$$x = \mathbf{480\ tools}$$

Thus, 480 tools will cut in 20 hours.

**5.**

| Time | Words |
|---|---|
| 30 ↓ | 540 ↓ |
| 6 ↓ | $x$ ↓ |

It is a direct variation

$$\frac{x}{540} = \frac{6}{30}$$

$$x = \frac{540 \times 6}{30}$$

$$x = \mathbf{108\ words}$$

Thus, she would type 108 words in 6 minutes.

**6.**

| Steps | Distance |
|---|---|
| 125 ↓ | 100 ↓ |
| 315 ↓ | $x$ ↓ |

It is a direct variation.

$$\frac{x}{100} = \frac{315}{125}$$

$$\Rightarrow \quad x = \frac{315 \times 100}{125} \Rightarrow \quad x = \mathbf{252\ m}$$

Thus, she would cover 252 m in 315 steps.

**7.** Do yourself.

**8.**

| Plastic sheets | | Cost |
|---|---|---|
| 93 | | 1395 |
| 105 | ↓ | $x$ ↓ |

It is a direct variation

$$\frac{x}{1395} = \frac{105}{93}$$

$$\Rightarrow \quad x = \frac{105 \times 1395}{93} = \mathbf{₹\ 1575}$$

Thus, it would ₹ 1575 to buy 105 m of such plastic sheet.

**9.** (i) 6 : 7 and 8 : 9

$$6 : 7 = \frac{6}{7} \text{ and } 8 : 9 = \frac{8}{9}$$

Both fractions are unlike fractions, so we have to convert them into like fractions. LCM of 7 and 9 is 63.

$$\frac{6}{7} = \frac{6 \times 9}{7 \times 9} = \frac{54}{63} \text{ and } \frac{8}{9} = \frac{8 \times 7}{9 \times 7} = \frac{56}{63}$$

$$\frac{54}{63} < \frac{56}{63}, \text{ since } 54 < 56$$

Hence, $\mathbf{6 : 7 < 8 : 9}$

(ii), (iii) and (iv) Do yourself.

**10.** Ratio of A, B and C = 7 : 9 : 13

Total amount = ₹ 5800

Rational sum = 7 + 9 + 13 = 29

$$\text{A gets} = \frac{7}{29} \times 5800 = \mathbf{₹\ 1400}$$

$$\text{B gets} = \frac{9}{29} \times 5800 = \mathbf{₹\ 1800}$$

$$\text{C gets} = \frac{13}{29} \times 5800 = \mathbf{₹\ 2600}$$

Thus, A, B, C gets money ₹ 1400, ₹ 1800 and ₹ 2600 respectively.

**11.** Do yourself.

## Exercise 8B

**1.** (i) First term = 40, second term = 10, third term = 80,

fourth term $= 20$

Product of extremes $=$ First term $\times$ Fourth term

$= 40 \times 20 = 800$

Product of means $=$ Second term $\times$ Third term

$= 10 \times 80 = 800$

Since, product of extremes = Product of means

Hence, 40, 10, 80, 20 are in proportion.

(ii), (iii) and (iv) Do yourself.

**2.** (i) 30, 40 and $x$ are in continued proportion,

So, $30 : 40 :: 40 : x$

$$\Rightarrow \quad \frac{30}{40} = \frac{40}{x} \Rightarrow \quad 30x = 40 \times 40$$

$$\Rightarrow \quad x = \frac{40 \times 40}{30}$$

$$x = \frac{\mathbf{160}}{\mathbf{3}}$$

(ii), (iii) and (iv) Do yourself.

**3.** (i) Let $x$ be the third proportion to 16 and 32

So, $16 : 32 :: 32 : x$

$$\frac{16}{32} = \frac{32}{x}$$

$$16x = 32 \times 32$$

$$x = \frac{32 \times 32}{16} = \mathbf{64}$$

(ii) and (iii) Do yourself.

(iv) Let $x$ be the third propostional to 0.8 and 0.12.

So, $0.8 : 0.12 :: 0.12 : x$

$$\frac{0.8}{0.12} = \frac{0.12}{x}$$

$$0.8x = 0.12 \times 0.12$$

$$x = \frac{0.12 \times 0.12}{0.8} = 0.018 \text{ or } \frac{18}{1000} = \frac{9}{500}$$

**4.** (i) 16, 6, 24, $y$ are in proportion.

Product of extremes $= 16 \times y = 16y$

Product of means $= 6 \times 24 = 144$

They are in proportion.

So, product of extremes = Product of means

$$16y = 144$$

$$y = \frac{144}{16} = \mathbf{9}$$

Thus, value of $y$ is 9.

(ii) and (iii) Do yourself.

(iv) 40, 30, $y$, 25 are in proportion.

$$\text{Product of extremes} = 40 \times 25 = 1000$$

$$\text{Product of means} = 30 \times y = 30y$$

They are in proportion.

So, product of extremes = Product of means

$$1000 = 30y$$

$$y = \frac{1000}{30}$$

$$y = \frac{\mathbf{100}}{\mathbf{3}}$$

Thus, value of $y$ is $\frac{100}{3}$.

**5.** (i) Let mean proportion of 4 and 25 is $x$

Then, $x^2 = 4 \times 25$

$x^2 = 100 = (10)^2$ $x = 10$

Thus, mean proportion of 4 and 25 is 10.

(ii) and (iii) Do yourself.

(iv) Let mean proportion of 225 and 400 is $x$

Then, $x^2 = 225 \times 400$

$x^2 = 90000 = (300)^2$

$x = 300$

Thus, mean proportion of 225 and 400 is 300.

**6.** Do yourself.

**7.** Do yourself.

**8.** Ratio of copper and aluminium = 3 : 5

Weight of copper = 12.8 kg

Let weight of Aluminium = $x$ kg

Then, 3 : 5 :: 12.8 : $x$

$$\frac{3}{5} = \frac{12.8}{x}$$

$$3x = 12.8 \times 5$$

$$x = \frac{12.8 \times 5}{3} = \mathbf{21.333.\ kg}$$

Thus, weight of aluminium is 21.333 kg.

**9.** Do yourself.

**10.** Scale of map, 2 cm = 50 km

Distance = 7.5 cm

Let actual distance of 7.5 cm = $x$

$$2 : 7.5 = 50 : x$$
$$\frac{2}{7.5} = \frac{50}{x}$$
$$2x = 50 \times 7.5$$
$$x = \frac{50 \times 7.5}{2}$$
$$x = \mathbf{187.5\ km}$$

Thus, actual distance is 187.5 km.

**11.**

| Pumps | Hours |
|---|---|
| 20 ↑ | 12 ↓ |
| 45 | $x$ |

It is inverse variation

$$\frac{x}{12} = \frac{20}{45}$$
$$\Rightarrow \quad x = \frac{20 \times 12}{45} = \frac{4 \times 12}{9}$$
$$x = \frac{16}{3} \Rightarrow x = \mathbf{5\frac{1}{3}\ hours}$$

Thus, 45 such pumps do the same work in $5\frac{1}{3}$ hours.

**12.** Do yourself.

**13.**

| Days | Persons |
|---|---|
| 40 ↑ | 1800 ↓ |
| 24 | $x$ |

It is a inverse variation

$$\frac{x}{1800} = \frac{40}{24}$$
$$\Rightarrow \quad x = \frac{1800 \times 40}{24} = \mathbf{3000\ persons}$$

Thus, 3000 persons are needed.

**14.** Do yourself.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.**

| Sale | Commission |
|---|---|
| 1000 ↓ | 73 ↓ |
| 100 | $x$ |

It is a direct variation

$$\frac{1000}{100} = \frac{73}{x}$$

$$x = \frac{73}{10} = ₹\ \mathbf{7.30}$$

Thus, he will get on ₹ 7.30.

**2.**

| Children | Bottles |
|---|---|
| 5 ↓ | 8 ↓ |
| 40 ↓ | $x$ ↓ |

It is a direct variation

$$\frac{x}{8} = \frac{40}{5}$$

$$\Rightarrow \quad x = \frac{40 \times 8}{5}$$

$$\Rightarrow \quad x = 8 \times 8 = \mathbf{64\ bottles}$$

Thus, 64 bottles would be served.

**3.** Do yourself.

**4.** Ratio of copper and zinc $= 4 : 7$

Total weight of alloy $= 7.7$ kg

Total part of copper and zinc $= 4 + 7 = 11$

Then, weight of copper $= \frac{4}{11} \times 7.7 = \mathbf{2.8\ kg}$

Weight of zinc $= \frac{7}{11} \times 7.7 = \mathbf{4.9\ kg}$

Thus, weight of copper is 2.8 kg and weight of zinc is 4.9 kg.

**5.** to **11.** ; Do yourself.

# 9. Time, Work and Distance

## Exercise 9

**1.** Rahul and Aman one day's work $= \frac{1}{12}$

Aman's one day's work $= \frac{1}{30}$

Rahul's one day's work $= \frac{1}{12} - \frac{1}{30}$

$$= \frac{5-2}{60} = \frac{3}{60} = \frac{1}{20}$$

Rahul alone finish the work in **20 days.**

**2.** $X$'s one hour work $= \frac{1}{12}$

$Y$'s one hour work $= \frac{1}{15}$

$$\text{Both } X \text{ and } Y\text{'s one hour work} = \frac{1}{12} + \frac{1}{15} = \frac{5+4}{60} = \frac{9}{60} = \frac{3}{20}$$

Hence, $X$ and $Y$ together can finish the work in **6 hours 40 minutes.**

**3.** Do yourself.

**4.**

| Persons | | Days |
|---|---|---|
| 50 | ↑ | 18 |
| 75 | ↑ | $x$ ↓ |

It is a inverse variation

$$\frac{x}{18} = \frac{50}{75}$$

$$\Rightarrow \quad x = \frac{50 \times 18}{75} = 2 \times 6 = \textbf{12 days}$$

Thus, 75 persons finish the work in 12 days.

**5.** Do yourself.

**6.**

$$\text{Pipe '}X\text{' can fill the tank} = 4 \text{ hours}$$

$$\text{Work done by pipe '}X\text{' in 1 hour} = \frac{1}{4}$$

$$\text{Pipe '}Y\text{' can empty the tank} = 6 \text{ hours}$$

$$\text{Work done by pipe '}Y\text{' in 1 hour} = \frac{1}{6}$$

$$\text{Total work done by both pipes in 1 hour} = \frac{1}{4} - \frac{1}{6} = \frac{1}{12}$$

So, tank will be fill in = **12 hours**

Thus, if both the pipes are opened it takes **12 hours** to fill the tank.

**7.**

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$= \frac{48(8 \times 60 + 48)}{60} = \frac{4 \times 528}{5}$$

$$= \frac{2112}{5} = \textbf{422.4 km}$$

Thus, distance covered by car is 422.4 km.

**8.** When a train crosses a tree, entire length of the train passes the tree, *i.e.,* a distance of 270 m is covered.

$$\text{Speed} = \frac{40.5 \times 5}{18} \text{ m/s} = \frac{45}{4} \text{ m/s}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\frac{45}{4} = \frac{270}{t}$$

$$\Rightarrow \quad t = \frac{270 \times 4}{45}$$

$$t = \textbf{24 seconds}$$

Thus, train takes 24 seconds to cross the tree.

**9.** $X$'s 1 hour work $= \frac{1}{10}$

$Y$'s 1 hour work $= \frac{1}{15}$

$X$ and $Y$'s 1 hour work $= \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$

So, $X$ and $Y$ together fill the tank in **6 hours.**

**10.**

| Time | Distance |
|---|---|
| 60 | 50 |
| 12 ↓ | $x$ ↓ |

It is a direct variation

$$\frac{x}{50} = \frac{12}{60}$$

$$\Rightarrow \quad 60 \times x = 12 \times 50$$

$$x = \frac{12 \times 50}{60} = \frac{12 \times 5}{6} = 10$$

$$\text{Distance} = \textbf{10 km}$$

Thus, train will travel 10 km in 12 minutes.

**11.** $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

$$= \frac{18 \times 2}{9} = \textbf{4 km/hour}$$

Thus, average speed of cart is 4 km/h.

**12.** $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

$$6 = \frac{19.5}{\text{Time}} \Rightarrow \quad 6 \times \text{Time} = 19.5$$

$$\text{Time} = \frac{195}{6 \times 10}$$

$$\text{Time} = \textbf{3}\,\frac{\textbf{1}}{\textbf{4}}\ \textbf{hours}$$

Thus, cyclist will take $3\frac{1}{4}$ hours in covering a distance of 19.5 km.

**13.** $A$'s 1 day's work $= \frac{1}{8}$

$B$'s 1 day's work $= \frac{1}{12}$

$$C\text{'s 1 day's work} = \frac{1}{15}$$

$$\therefore \quad (A + B + C)\text{'s 1 day's work} = \frac{1}{8} + \frac{1}{12} + \frac{1}{15}$$

$$= \frac{15 + 10 + 8}{120} = \frac{33}{120} = \frac{11}{40}$$

Thus, the complete work finished in $\mathbf{3\frac{7}{11}}$ **days.**

**14.** Do yourself.

**15.** Do yourself.

**16.** $$\text{Length of train} = 450\,\text{m} = 0.45\,\text{km}$$

$$\text{Time taken by train to cross a pole} = 22\frac{1}{2}\,\text{second} = \frac{1}{160}\,\text{h}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{0.45 \times 160}{1} = 72\,\text{km/h}$$

Thus, 72 km/h is the speed of the train.

**17.** $$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$80 = \frac{x}{4.5}$$

$$\Rightarrow \quad 80 = \frac{10 \times x}{45}$$

$$\Rightarrow \quad x = \frac{45 \times 80}{10} = 45 \times 8$$

$$\Rightarrow \quad x = 360\ \text{km}.$$

$$\text{Again Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{360}{3} = \mathbf{120\ km/h}$$

Thus, 120 km/h is the required speed of the train.

**18.** $$\text{Speed} = 55\,\text{km/h} = 55 \times \frac{5}{18}\,\text{m/s} = \frac{275}{18}\,\text{m/s}$$

To cross the platform, the train will have to cover (250 + 520) m

$$= 770\,\text{m}$$

$$\text{Time} = \frac{\text{Distance}}{\text{speed}} = \frac{770 \times 18}{275}$$

$$= \mathbf{50.4\ seconds}$$

Thus, it will cross a platform in 50.4 seconds.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** A's 1 day's work $= \frac{1}{12}$

B's 1 day's work $= \frac{1}{15}$

C's 1 day's work $= \frac{1}{20}$

$\therefore$ Their together 1 days work $= \frac{1}{12} + \frac{1}{15} + \frac{1}{20}$

$= \frac{5+4+3}{60} = \frac{12}{60} = \frac{1}{5}$

$\therefore$ They can do the work in **5 days**.

Thus, they will take 5 days to do it working together.

**2.** A, B and C finish work together in 1 day $= \frac{1}{4}$

A's 1 day's work $= \frac{1}{8}$

B's 1 day's work $= \frac{1}{12}$

$\therefore$ C's 1 day's work $= \frac{1}{4} - \left(\frac{1}{8} + \frac{1}{12}\right) = \frac{6-3-2}{24}$

$= \frac{6-5}{24} = \frac{1}{24}$

$\therefore$ C can finish the work in **24 days**.

Thus, C will take 24 days to finish the work.

**3.** A's 1 day's work $= \frac{1}{6}$

B's 1 day's work $= \frac{1}{8}$

$\frac{1}{6} + \frac{1}{8} = \frac{4+3}{24} = \frac{7}{24}$

$\Rightarrow \frac{24}{7} = \mathbf{3\frac{3}{7}}$ **days**

$\therefore$ They can do the work in $3\frac{3}{7}$ days.

Thus, they will take $3\frac{3}{7}$ days to complete it together.

**4.** First tap 1 hour's work $= \frac{1}{10}$

Second tap 1 hour's work $= \frac{1}{8}$

Third tap 1 hour's work $= \frac{1}{15}$

Their together 1 hour's work,

$$= \frac{1}{10} + \frac{1}{8} - \frac{1}{15}$$

$$= \frac{12 + 15 - 8}{120} = \frac{27 - 8}{120} = \frac{19}{120}$$

$\therefore$ They can fill the cistern in $\frac{120}{19}$ hours $= \mathbf{6\ \frac{6}{19}\ hours}$

Thus, $6\frac{6}{19}$ hours will it take to fill the empty cistern.

**5.** Naman's 1 hour work $= \frac{1}{20}$

Sandeep's 1 hour work $= \frac{1}{25}$

$\therefore$ Their together 1 hour work

$$= \frac{1}{20} + \frac{1}{25} = \frac{5 + 4}{100} = \frac{9}{100}$$

(i) Work done by both in 4 hours

$$= \frac{9}{100} \times 4 = \mathbf{\frac{9}{25}}$$

(ii) Work left after in 4 hours

$$= 1 - \frac{9}{25} = \frac{25 - 9}{25} = \mathbf{\frac{16}{25}}$$

(iii) Sandeep take time $= 25 \times \frac{16}{25} = \mathbf{16\ hours}$

Thus, work done by both in 4 hours is $\frac{9}{25}$, work left after both worked together for 4 hours is $\frac{16}{25}$ and Sandeep takes 16 hours to complete the remaining work.

**6.** A's one day work $= \frac{1}{4}$

B's one day work $= \frac{1}{5}$

(i) They both working in one day

$$= \frac{1}{4} + \frac{1}{5} = \frac{5 + 4}{20} = \mathbf{\frac{9}{20}}$$

(ii) Their 2 days work

$$= \frac{9}{20} \times 2 = \mathbf{\frac{9}{10}}$$

$\therefore$ Work left after 2 days $= 1 - \frac{9}{10} = \frac{10-9}{10} = \mathbf{\frac{1}{10}}$

Thus, $\frac{9}{20}$ part work done in one day and $\frac{9}{10}$ part work done in two days also left part is $\frac{1}{10}$ after they have worked together for 2 days.

**7.** A can do full work in $= \frac{10 \times 3}{1} = 30$ hours

B can do full work in $= \frac{12 \times 5}{2} = 30$ hours

(i) A's 1 hour work $= \mathbf{\frac{1}{30}}$

(ii) B's 1 hour work $= \mathbf{\frac{1}{30}}$

(iii) Both's 1 hour work,

$$= \frac{1}{30} + \frac{1}{30} = \frac{2}{30} = \mathbf{\frac{1}{15}}$$

$\therefore$ Both completed the work in 15 hours.

Thus, A can do $\frac{1}{30}$ work in one hour and B also can do $\frac{1}{30}$ work in one hour also if both work together they both completed the work in 15 hours.

**8.** A's one hour work $= \frac{1}{6}$

B's one hour work $= \frac{1}{9}$

$\therefore$ B's two hour work $= \frac{1}{9} \times 2 = \frac{2}{9}$

(i) A's 1 hour work + B's 2 hours work

$$= \frac{1}{6} + \frac{2}{9} = \frac{3+4}{18} = \mathbf{\frac{7}{18}}$$

(ii) Work left $= 1 - \frac{7}{18} = \frac{18-7}{18} = \mathbf{\frac{11}{18}}$

Thus, work done is $\frac{7}{18}$ part in these 3 hours and $\frac{11}{18}$ part work is still left.

**9.** Virat's 1 day work $= \frac{1}{3}$

Sachin's 1 day work $= \frac{1}{4}$

Both's 1 day work $= \frac{1}{3} + \frac{1}{4} = \frac{4+3}{12} = \frac{7}{12}$

$\therefore$ Both's complete the chair in $\frac{12}{7} = 1\frac{5}{7}$ days

(i) One chair prepare in $= \mathbf{1\frac{5}{7}}$ **days**

(ii) 14 chair prepare in $= \left(\frac{12}{7} \times 14\right) =$ **24 days**

Thus, one chair will be prepare in $1\frac{5}{7}$ days and 14 chairs will be prepare in 24 days.

**10.** Sanjay's 1 day work $= \frac{1}{50}$

Rohit's 1 day work $= \frac{1}{40}$

(i) Sanjay's 20 day work $= \frac{1}{50} \times 20 = \mathbf{\frac{2}{5}}$

(ii) Work left after 20 day $= 1 - \frac{2}{5} = \frac{5-2}{5} = \mathbf{\frac{3}{5}}$

(iii) Rohit take time to complete the remaining work

$= 40 \times \frac{3}{5} =$ **24 days**

Thus, work done by Sanjay in 20 days is $\frac{2}{5}$ and work left after Sanjay has worked on it for 20 days is $\frac{3}{5}$ and Rohit takes 24 days to complete the remaining work.

**11.** $A$ and $B$'s one day work $= \frac{1}{10}$

and $B$'s one day work $= \frac{1}{15}$

$\therefore$ A's one day work $= \frac{1}{10} - \frac{1}{15} = \frac{3-2}{30} = \frac{1}{30}$

Hence, $A$ can do the same work in $=$ **30 days**

Thus, $A$ alone to do same work in 30 days.

# 10. Percentage and Its Applications

## Exercise 10A

**1.** (i) $15\% = \frac{15}{100} =$ **0.15**

(ii), (iii) and (iv) Do yourself.

**2.** (i) $\frac{1}{8} = \frac{1}{8} \times 100\% = \mathbf{12.5\%}$

(ii), (iii) and (iv) Do yourself.

**3.** (i) $27\% = \frac{\mathbf{27}}{\mathbf{100}}$

(ii) and (iii) Do yourself.

(iv) $95\% = \frac{95}{100} = \frac{\mathbf{19}}{\mathbf{20}}$

**4.** (i) $0.08 = 0.08 \times 100\% = \mathbf{8\%}$

(ii), (iii) and (iv) Do yourself.

**5.** (i) 20% of $x$ is ₹ 750

then $\frac{x \times 20}{100} = ₹\,750$

$x = \frac{750 \times 100}{20}$

$x = ₹\,\mathbf{3750}$

Thus, value of $x$ is ₹ 3750.

(ii) 32% of $x$ is 640 kg

then $\frac{x \times 32}{100} = 640$

$x = \frac{100 \times 640}{32}$

$x = \mathbf{2000\ kg}$

Thus, value of $x$ is 2000 kg.

(iii) 70% of $x$ is 56 minutes

then $\frac{x \times 70}{100} = 56$

$x = \frac{56 \times 100}{70}$

$x = \mathbf{80\ minutes}$

Thus, value of $x$ is 80 minutes.

(iv) 55% of $x$ is 44 L

then $\frac{x \times 55}{100} = 44$

$x = \frac{44 \times 100}{55}$

$x = \mathbf{80\ L}$

Thus, value of $x$ is 80 L.

**6.** (i) $8\%\ \text{of}\ 60 = \frac{60 \times 8}{100} = \mathbf{4.8}$

(ii), (iii) and (iv) Do yourself.

**7.** Number of total Shirts in shop = 500

Number of defective shirts = 15

Percentage of defective shirts

$$= \frac{\text{Number of defective shirts}}{\text{Total shirts}} \times 100\%$$

$$= \frac{15}{500} \times 100 = \mathbf{3\%}$$

Thus, 3% shirts are defective.

**8.** Number of total students = 40

Number of absent students = 6

Percentage of absent students

$$= \frac{\text{Number of absent students}}{\text{Total students}} \times 100\%$$

$$= \frac{6}{40} \times 100 = \mathbf{15\%}$$

Thus, 15% students are absent.

**9.** Ratio of calcium, carbon and sand in chalk = 12 : 3 : 10

Sum of the ratio = 12 + 3 + 10 = 25

then, percentage of calcium $= \frac{12}{25} \times 100\% = 48\%$

percentage of carbon $= \frac{3}{25} \times 100\% = \mathbf{12\%}$

percentage of sand $= \frac{10}{25} \times 100\% = \mathbf{40\%}$

Thus, percentage of calcium is 48%, percentage of carbon is 12% and percentage of sand is 40%.

**10.** Number of gold bangles = 20

Number of silver bangles = 10

Sum of gold and silver bangles = 20 + 10 = 30

Percentage of gold bangles $= \frac{20}{30} \times 100\% = \mathbf{66\frac{2}{3}\%}$

Percentage of silver bangles $= \frac{10}{30} \times 100\% = \mathbf{33\frac{1}{3}\%}$

Thus, there are $66\frac{2}{3}\%$ of gold bangles and $33\frac{1}{3}\%$ of silver bangles.

**11.** Total marks = 500

Secured marks = 384

Percentage of secured marks $= \frac{384}{500} \times 100\% = \mathbf{76.8\%}$

Thus, Neeraj secured 76.8% marks.

**12.** Number of parts of zinc in alloy = 7

Number of parts of copper in alloy = 33

Total parts in alloy = 7 + 33 = 40

Then, percentage of copper in alloy = $\frac{33}{40} \times 100 =$ **82.5%**

Thus, 82.5% copper present in alloy.

**13.** Sum of money = ₹ 2500

Let the amount of money each one of them will got are in the form of $2x, 3x$ and $5x$

Then, sum of their parts $= 2x + 3x + 5x = 10x$

Naman will get $= \frac{2x}{10x} \times 2500 =$ ₹ **500**

Virat will get $= \frac{3x}{10x} \times 2500 =$ ₹ **750**

Sachin will get $= \frac{5x}{10x} \times 2500 =$ ₹ **1250**

Also, percentage of money Naman gets $= \frac{500}{2500} \times 100\% =$ **20%**

Percentage of money Virat gets $= \frac{750}{2500} \times 100\% = 30\%$

Percentage of money Sachin gets $= \frac{1250}{2500} \times 100\% = 50\%$

Thus, Naman will get 20% of money which is ₹ 500, Virat will get 30% of money which is ₹ 750 and Sachin will get 50% of money which is ₹ 1250.

**14.** Number of voters $= 120$

Number of persons who voted $= 90$

Number of persons who did not voted $= 120 - 90 = 30$

Percentage of who did not voted $= \frac{30}{120} \times 100 = 25\%$

Thus, 25% voters did not voted.

**15.** Percentage of girls in a office $= 42\%$

Then, percentage of boys in that office $= 100 - 42 =$ **58%**

Thus, percentage of boys employees in office is 58%.

**16.** Do yourself.

## Exercise 10B

**1.** (i) 15% of 250

$\Rightarrow \frac{15}{100} \times 250 = \frac{75}{2} =$ **37.5**

(ii) 25% of 120 L

$\Rightarrow \quad \frac{25}{100} \times 120 = \mathbf{30\ L}$

(iii) 1% of 1 hour

$\Rightarrow \quad \frac{1}{100} \times 3600 = \mathbf{36\ seconds}$

[since, 1 hour = 3600 seconds]

(iv) 75% of 1 kg

$\Rightarrow \quad \frac{75}{100} \times 1000 = \mathbf{750\ g}$ [since, 1 kg = 1000 gm]

(v) 120% of ₹ 250

$\Rightarrow \quad \frac{120}{100} \times 250 = ₹25 \times 12 = ₹\ \mathbf{300}$

(vi) 0.6% of 2 km

$\Rightarrow \quad \frac{0.6}{100} \times 2000 = 0.6 \times 20 = \mathbf{12\ m}$

[since 1 km = 1000 m]

**2.** (i) 12 of 80

Let 12 is the $x$% of 80

then, $\frac{80 \times x}{100} = 12$

$$x = \frac{12 \times 100}{80} = \mathbf{15\%}$$

Thus, 12 is 15% of 80.

(ii) 25 paise of 4 rupee

Since, 1 rupee = 100 paise

So, 4 rupees = 400 paise

Let, 25 paise is $x$% of 400 paise

then, $\frac{400 \times x}{100} = 25$

$$x = \frac{25 \times 100}{400} = 6\frac{1}{4}\%$$

Thus, 25 is $6\frac{1}{4}$% of 4 rupees.

(iii) 300 g of 2 kg

Since, 1 kg = 1000 g

So, 2 kg = 2000 g

Let, 300 g is $x$% of 2000 g

then, $\frac{2000 \times x}{100} = 300$

$$x = \frac{300 \times 100}{2000}$$

$$x = 15\%$$

Thus, 300 g is 15% of 2 kg.

**3.** (i) 20 as a percentage of 50.

$$\text{Required percentage} = \left(\frac{20}{50} \times 100\right)\% = \mathbf{40\%}$$

Thus, required percentage is 40%.

(ii) and (iii) Do yourself.

(iv) 350 g as a percentage of 5.6 kg

Since, $1 \text{ kg} = 1000 \text{ g}$

So, $5.6 \text{ kg} = 1000 \times 5.6 = 5600 \text{ g}$

$$\text{Required percentage} = \left(\frac{350}{5600} \times 100\right)\% = \mathbf{6\frac{1}{4}\%}$$

Thus, required percentage is $6\frac{1}{4}\%$.

**4.** Total number of children in class $= 25$

Percentage of children who like to get wet in rain $= 8\%$

$$\text{Then, number of children who like to get wet in rain} = \frac{25 \times 8}{100} = 2$$

Thus, 2 children like to get wet in rain.

**5.** Number of ice cream cups $= 20$

Number of ice cream cup Geetika ate $= 3$

$$\text{Percentage of icecream cups Geetika ate} = \left(\frac{3}{20} \times 100\right)\% = 15\%$$

Thus, Geetika ate 15% ice cream cup of total.

**6.** Covered area in park $= 30\%$

Then, non covered area of park $= (100 - 30)\% = 70\%$

Non covered area $= 2100$ sq. feet

Let total area of park $= x$ sq. feet

then, $$\frac{x \times 70}{100} = 2100$$

$$x = \frac{2100 \times 100}{70}$$

$$x = 3000 \text{ sq. feet}$$

Covered area = Total area – non covered area

$= 3000$ sq. feet $- 2100$ sq. feet

$= \mathbf{900 \text{ sq. feet}}$

Thus, covered area of park is 900 sq. feet.

**7.** Total marks got by student $= 325$

Failed by $= 35$ marks

So, passing marks $= 325 + 35 = 360$

Minimum percentage of passing marks $= 40\%$

Let maximum marks $= x$

then, $$\frac{x \times 40}{100} = 360$$

$$x = \frac{360 \times 100}{40}$$

$$x = \mathbf{900}$$

Thus, 900 is the maximum marks.

**8.** Price of sugar before increase $= ₹\,28$

Price of sugar after increase $= ₹\,34$

Increase in price $= ₹\,34 - ₹\,28 = ₹\,6$

Let percentage of increase $= x\%$

Then $$\frac{28 \times x}{100} = 6 \; x = \frac{6 \times 100}{28} = 21\frac{3}{7}\%$$

**Alternate Method**

$$\text{Percentage increase} = \left[\frac{\text{increase in price}}{\text{price before increase}} \times 100\right]\%$$

$$= \frac{6}{28} \times 100 = 21\frac{3}{7}\%$$

Thus, $21\frac{3}{7}\%$ is the percentage increase in price of sugar.

**9.** Proceed as Q.No. 8.

**10.** Quantity of chalk $= 2\frac{1}{2}\,\text{kg} = \frac{5}{2}\,\text{kg}$

Percentage of calcium $= 10\%$

Percentage of carbon $= 3\%$

Percentage of oxygen $= 12\%$

Then, percentage of sand $= [100 - (10 + 3 + 12)]\% = 75\%$

Amount of carbon in chalk $= \frac{5 \times 3}{2 \times 100} = 0.075\,\text{kg}$

or $0.075 \times 1000 = \mathbf{75\ g}$

Amount of calcium $= \frac{5 \times 10}{2 \times 100}$

$= 0.25\,\text{kg}$ or $0.25 \times 1000 = \mathbf{250\ g}$

Also, amount of sand $= \frac{5 \times 75}{2 \times 100} = \mathbf{1.875\ kg}$

Thus, amount of carbon in chalk is 75 g, amount of calcium is 250 g and amount of sand is 1.875 kg.

**11.** Proceed as Q.No. 7.

**12.** Saving percentage of Lipika's salary = 22%

Saving amount of salary = ₹ 4400

Let her monthly salary = ₹ $x$

Then, $\frac{x \times 22}{100} = 4400$

$x = \frac{4400 \times 100}{22}$

$x =$ ₹ **20000**

Thus, Lipika's monthly income is ₹ 20000.

**13.** Total number of voters = 15000

Voted percentage = 60%

Then, non voted percentage = (100 – 60)% = 40%

Then, number of person who did not vote = $\frac{15000 \times 40}{100} =$ **6000**

Thus, 6000 voters did not vote.

**14.** Percentage of girls students = 55%

Then, percentage of boys students = (100 – 55)% = 45%

Number of boys = 1800

Let total students = $x$

Then, $\frac{x \times 45}{100} = 1800$

$x = \frac{1800 \times 100}{45} = 4000$

So, total strength of girls = Total students – Boys student

= 4000 – 1800 = **2200**

Thus, total strength of the girls is 2200.

**15.** (i) 25% of it is 9

Let number = $x$

Then, $\frac{x \times 25}{100} = 9$

$x = \frac{9 \times 100}{25} =$ **36**

Thus, 36 is the whole quantity.

(ii), (iii) and (iv) Do yourself.

**16.** Percentage of men population = 40%

Percentage of women population = 39%

Then percentage of children population

= [100 – (40 + 39)]% = 21%

Number of children = 12600

Let total population of town = $x$

Then, $\frac{x \times 21}{100} = 12600$

$$x = \frac{12600 \times 100}{21}$$

$$x = 60000$$

$$\text{Also, number of men} = \frac{60000 \times 40}{100} = 24000$$

Thus, 24000 men are there in town.

**17.** Proceed as Q.No. 10.

**18.** Proceed as Q.No. 12.

**19.** Length of pole = 18 m

Percentage of painted green = 20%

Percentage of painted yellow = 45%

Then, percentage of painted red = [100 – (20 + 45)]% = 35%

$$\text{Length of painted red} = \frac{18 \times 35}{100} = \mathbf{6.3\ m}$$

Thus, 6.3 m length of it is painted red.

**20.** Number of students in class = 60

Percentage of students who like cricket = 40%

Percentage of students who like football = 25%

Then, percentage of students who like hockey

= [100 – (40 + 25)% = 35%

$$\text{So, number of students who like hockey} = \frac{60 \times 35}{100} = 21$$

$$\text{Also, number of students who like football} = \frac{60 \times 25}{100} = 15$$

Thus, 21 students like hockey and 15 students like football.

**21.** Weight of total mangoes bought by fruit seller = 120 kg

Percentage of rotten mangoes = 18%

Then, percentage of good mangoes = (100 – 18)%

= 82%

$$\text{Weight of good mangoes} = \frac{120 \times 82}{100} = \mathbf{98.4\ kg}$$

Thus, weight of good mangoes is 98.4 kg.

**22.** Sum of money which is divided = ₹ 150000

Percentage of share of first person = 32%

$$\text{So, share of first person} = \frac{150000 \times 32}{100} = \text{₹ } \mathbf{48000}$$

Percentage of share of second person = 35%

$$\text{So, share of second person} = \frac{150000 \times 35}{100} = \text{₹ } \mathbf{52500}$$

Remaining percentage of third person

$$= [100 - (32 + 35)]\% = 33\%$$

$$\text{So, share of third person} = \frac{150000 \times 33}{100} = ₹\ \mathbf{49500}$$

Thus, share of each person is ₹ 48000, ₹ 52500 and ₹ 49500 respectively.

**23.** Percentage of the apples, go bad $= 16\%$

Then, percentage of good apples $= (100 - 16)\% = 84\%$

Number of good apples $= 42$

Let total number of apples $= x$

Then, $$\frac{x \times 84}{100} = 42$$

$$x = \frac{42 \times 100}{84}$$

$$x = 50$$

Thus, total number of apples in the basket is 50.

**24.** Percentage of students were present on rainy day $= 94\%$

Then, percentage of students were absent on that day

$$= (100 - 94\%) = 6\%$$

Number of students absent on that day $= 174$

Let total strength of students $= x$

Then, $$\frac{x \times 6}{100} = 174$$

$$x = \frac{174 \times 100}{6} = \mathbf{2900\ students}$$

Thus, 2900 is the total strength of the school.

**25.** Percentage of increase in price $= 15\%$

Amount of increase price $= ₹\ 90$

Let price of watch $= ₹\ x$

Then $$\frac{x \times 15}{100} = 90$$

$$x = \frac{90 \times 100}{15}$$

$$x = ₹\ \mathbf{600}$$

Thus, price of watch is ₹ 600 earlier.

## Exercise 10C

**1.** Do yourself.

**2.** Cost price includes the over head charges also

Therefore, CP of car $= ₹\ (70000 + 5000) = 75000$

SP of car $= 67500$

Since SP < CP

So, there is loss.

$$\text{Loss} = \text{CP} - \text{SP}$$
$$= 75000 - 67500 = ₹\,7500$$
$$\text{Loss \%} = \frac{\text{Loss} \times 100}{\text{CP}} = \frac{7500 \times 100}{75000}$$
$$= \frac{100}{10} = \mathbf{10\%}$$

Thus, Rahul gets 10% loss in this deal.

**3.** Cost price includes the over head charges also

Therefore, CP of book $= ₹\,(15 + 5) = ₹\,20$

SP of book $= ₹\,24$

Since, SP > CP

So, there is profit.

$$\text{Profit} = \text{SP} - \text{CP} = 24 - 20 = 4$$
$$\text{Profit \%} = \frac{\text{Profit} \times 100}{\text{CP}} = \frac{4 \times 100}{20} = \frac{100}{5} = \mathbf{20\%}$$

Thus, bookseller makes a profit of 20% on selling book.

**4.** SP of fan $= ₹\,810$

Profit $= ₹\,60$

Profit $= \text{SP} - \text{CP}$

CP of fan $= 810 - 60 = ₹\,\mathbf{750}$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{60}{750} \times 100 = \mathbf{8\%}$$

Thus, 750 is the CP of fan and 8% is the profit per cent.

**5.** Cost price includes the overhead charges also.

Therefore,

CP of 150 dozen pencils $= ₹\,(150 \times 20 + 200)$
$= ₹\,(3000 + 200) = ₹\,3200$

SP of 150 dozen pencils $= (150 \times 12 \times 2.40) = ₹\,4320$

Since, SP > CP

So, there is profit.

$$\text{Profit} = \text{SP} - \text{CP}$$
$$\text{Profit} = ₹\,(4320 - 3200) = ₹\,1120$$
$$\text{Profit \%} = \frac{1120 \times 100}{3200} = \mathbf{35\%}$$

Thus, sandeep gained 35% profit.

**6.** SP of steel almirah $= ₹\,3906$

Loss $= ₹\,294$

Since, loss $= \text{CP} - \text{SP}$

So, CP of almirah $= ₹294 + ₹3906 = ₹\mathbf{4200}$

$$\text{Loss \%} = \frac{\text{Loss}}{\text{CP}} \times 100 = \frac{294}{4200} \times 100 = \mathbf{7\%}$$

Thus, CP of almirah is ₹ 4200 and loss per cent is 7%.

**7.** Let the CP be ₹ $x$.

Then, SP of table $= ₹990$

$$\text{Profit} = \frac{x \times 10}{100} = \frac{x}{10}$$

$$\text{SP of table} = x + \frac{x}{10} = \frac{11x}{10}$$

$$\frac{11x}{10} = 990$$

$$x = \frac{990 \times 10}{11} = ₹\mathbf{900}$$

Thus, ₹ 900 is the CP of table.

**8.** Proceed as Q.No. 7.

**9.** Proceed as Q.No. 2 or 3.

**10.** CP of T.V. $= ₹10000$

Profit percent $= 20\%$

$$\text{Profit} = \frac{10000 \times 20}{100} = ₹2000$$

Since, profit $= \text{SP} - \text{CP}$

So, SP of T.V. $= 10000 + 2000 = ₹\mathbf{12000}$

Thus, I get ₹ 12000 for it.

**11.** SP of the damaged garments $= ₹7360$

Loss per cent $= 8\%$

Let CP of the damaged garments $= ₹ x$

Then, $$\text{Loss} = \frac{x \times 8}{100} = ₹\frac{2x}{25}$$

Since, $\text{Loss} = \text{CP} - \text{SP}$

So, $$\frac{2x}{25} = x - 7360$$

$$\frac{23x}{25} = 7360$$

$$x = \frac{7360 \times 25}{23}$$

$$x = ₹\mathbf{8000}$$

Thus, CP of the garments is ₹ 8000.

**12.** Proceed as Q.No.2 .

**13.** CP of a flower vase $= ₹120$

Loss per cent $= 10\%$

$$= \frac{120 \times 10}{10} = ₹\,12$$

Since, Loss = CP − SP

So, SP of the flower vase $= 120 - 12 = ₹\,\mathbf{108}$

Thus, ₹ 108 is the SP of flower vase.

**14.** Proceed as Q.No. 11.

**15.** Proceed as Q.No. 7.

**16.** SP of a table = ₹ 3168

Loss per cent = 12%

Let CP of table = ₹ $x$

Then, $\text{Loss} = \frac{x \times 12}{100} = ₹\,\frac{3x}{25}$

Since, Loss = CP − SP

So $\frac{3x}{25} = x - 3168$

$$\frac{22x}{25} = 3168$$

$$x = \frac{3168 \times 25}{22} = ₹\,\mathbf{3600}$$

Now, if SP of table = ₹ 3870

Since, SP > CP

So, there is profit

$$\text{Profit} = \text{SP} - \text{CP}$$

$$= 3870 - 3600 = ₹\,270$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100$$

$$= \frac{270}{3600} \times 100 = \mathbf{7.5\%}$$

Thus, ₹ 3600 is the CP of table and he would gain 7.5% by selling the table for ₹ 3870.

**17.** Proceed as Q.No. 16.

## Exercise 10D

**1.** (i) $P = ₹\,500, R = 12\%, T = 3$ years

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{500 \times 12 \times 3}{100} = ₹\,\mathbf{180}$$

(ii), (iii) Do yourself.

(iv) $P = ₹\,560$, Time $= \frac{73}{365}$ years, S.I. = ₹ 14

$$R = \frac{\text{S.I.} \times 100}{P \times T} = \frac{14 \times 100 \times 365}{560 \times 73}$$

$$= \mathbf{12.5\%}$$

(v) Do yourself.

(vi) $P = ₹\,720, R = 4\%, \text{S.I.} = ₹\,72$

$$\text{Time} = \frac{\text{S.I.} \times 100}{R \times P} = \frac{72 \times 100}{4 \times 720}$$

$$= \frac{100}{40} = \mathbf{2\,\frac{1}{2}\ years}$$

$$\text{Amount} = P + \text{S.I.} = ₹\,720 + ₹\,72 = \mathbf{₹\,792}$$

**2.** (i), (ii) Do yourself.

(iii) $P = ₹\,600, R = 2\%, T = \frac{20}{12} = \frac{5}{3}$ years

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{600 \times 2 \times 5}{3 \times 100} = ₹\,20$$

$$\text{Amount} = P + \text{S.I.} = ₹\,(600 + 20) = \mathbf{₹\,620}$$

**3.** (i), (ii) Do yourself.

(iii) $\text{S.I.} = ₹\,12600$

$R = 18\%$ per annum

$P = 10000$

$$T = \frac{\text{S.I.} \times 100}{P \times R} = \frac{12600 \times 100}{10000 \times 18} = \mathbf{7\ Years.}$$

**4.** $P = ₹\,7200, R = 15\%, T = 4\frac{1}{2}$ years $= \frac{9}{2}$ years

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{7200 \times 15 \times 9}{2 \times 100} = 36 \times 15 \times 9 = 4860$$

$$A = \text{S.I.} + P$$

$$4860 + 7200 = ₹\ \mathbf{12060}$$

Thus, amount is ₹ 12060.

**5.** Do yourself.

**6.** Do yourself.

**7.** Do yourself.

**8.** Let $P$ be $x$, $R = 10\%$, $T = 4$ years, $A = ₹\,2520$

$$A = \text{S.I.} + P$$

$$2520 - x = \text{S.I.}$$

$$= \frac{\text{S.I.} \times 100}{R \times T}$$

$$x = \frac{(2520 - x) \times 100}{10 \times 4}$$

$$4x = 25200 - 10x$$

$$14x = 25200$$

$$\Rightarrow \quad x = \frac{25200}{14} = ₹\ \mathbf{1800}$$

Thus, ₹ 1800 is the principal.

**9.** Do yourself.

**10.** Let $P$ be $x$, $R = 9\%$, S.I. $= 594$, $T = 3$ years

$$P = \frac{\text{S.I.} \times 100}{R \times T} = \frac{594 \times 100}{9 \times 3} = 22 \times 100 = ₹\ \mathbf{2200}$$

Thus, ₹ 2200 is the sum borrowed.

**11.** $P = ₹\ 1500$, $A = ₹\ 2655$, S.I. $= A - P = ₹\ 1155$, $T = \frac{7}{2}$ years

$$R = \frac{\text{S.I.} \times 100}{P \times T} = \frac{1155 \times 100 \times 2}{1500 \times 7} = \frac{2310}{105} = \mathbf{22\%}$$

**12.** Let $P$ be $x$ and amount $= \frac{7x}{4}$

$$\text{S.I.} = \text{Amount} - \text{Principal}$$

$$= \frac{7x}{4} - x = \frac{3x}{4}$$

$$P = x,\ \text{S.I.} = \frac{3x}{4},\ T = 6 \text{ years}$$

$$R = \frac{\text{S.I.} \times 100}{P \times T} = \frac{3x \times 100}{4 \times x \times 6} = \mathbf{12.5\%} \text{ or } \mathbf{12\frac{1}{2}\%}$$

Thus, rate of interest is 12.5% or $\mathbf{12\frac{1}{2}\%}$.

**13.** Let principal is '$P$' and rate of interest is '$R$'

Then,

$$\frac{P \times R \times 2}{100} = 2880 - P \qquad \ldots(\text{i})$$

and $$\frac{P \times R \times 5}{100} = 3600 - P \qquad \ldots(\text{ii})$$

On dividing eq. (ii) by (i)

$$\frac{5}{2} = \frac{3600 - P}{2880 - P}$$

$$14400 - 5P = 7200 - 2P$$

$$3P = 7200 \quad \Rightarrow \quad P = ₹\ 2400$$

Again by eq. (i)

$$\frac{2400 \times R \times 2}{100} = 2880 - 2400$$

$$48R = 480 = \mathbf{10\%}$$

Thus, ₹ 2400 is the sum of money and 10% is the rate of interest.

**14.** Let $P = x$, $A = 2x$, S.I. $= 2x - x = x$, $R = \frac{25}{2}\%$, $T = ?$

$$T = \frac{\text{S.I.} \times 100}{P \times R} = \frac{x \times 100 \times 2}{x \times 25} = \textbf{8 years}$$

Thus, in 8 years sum will become double of itself.

**15.** Proceed as Q.No. 13.

**16.** Let the principal for first part $P_1 = ₹\, x$

Then, principal for second part $P_2 = ₹\, 4200 - x$

Given, $R_1 = 10\%, T_1 = 2.5$ years, $R_2 = 12.5\%, T_2 = 4$ years

According to question

$$\frac{P_1 \times R_1 \times T_1}{100} = \frac{P_2 \times R_2 \times T_2}{100}$$

So,
$$P_1 \times R_1 \times T_1 = P_2 \times R_2 \times T_2$$
$$x \times 10 \times 2.5 = (4200 - x) \times 12.5 \times 4$$
$$25x = (4200 - x) \times 50$$
$$x = (4200 - x) \times 2$$
$$x = 8400 - 2x$$
$$3x = 8400$$
$$x = ₹\, 2800$$

So, $P_1 = ₹\, 2800$ and $P_2 = 4200 - 2800 = ₹\, \textbf{1400}$

Thus, ₹ 2800 and ₹ 1400 is the required part.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** Do yourself.

**2.** Do yourself.

**3.** Do yourself.

**4.** Do yourself.

**5.** Do yourself.

**6.** Do yourself.

**7.** Number of present in a full year = 216

Percentage of attendance = 90%

Let school was opened for $x$ days

Then,
$$\frac{x \times 90}{100} = 216$$
$$x = \frac{216 \times 100}{90} = \textbf{240 days}$$

**8.** Proceed as Q.No. 7.

**9.** Let total salary of Rohit = ₹ $x$

Percentage of spend on food = 30%

$$\text{Amount spend on food} = \frac{x \times 30}{100} = ₹\,\frac{3x}{10}$$

Percentage of donation = 3%

$$\text{Amount spend on donation} = \frac{x \times 3}{100} = ₹\,\frac{3x}{100}$$

According to question

$$\frac{3x}{10} + \frac{3x}{100} = 2310$$

$$\frac{33x}{100} = 2310$$

$$x = \frac{2310 \times 100}{33}$$

$$x = ₹\,\mathbf{7000}$$

Thus, ₹ 7000 is total salary for this month.

**10.** Proceed as Q. No. 7.

**11.** Percentage of annual increase in population = 5%

Total number of increase = 8820

Let the population of the town in 2010 = $x$

$$\text{Then, increase} = \frac{x \times 5}{100} = \frac{x}{20}$$

According to question

$$\frac{x}{20} = 8820$$

$$x = 8820 \times 20$$

$$x = \mathbf{176400}$$

Thus, population of town in 2010 is 176400.

**12.** Proceed as Q. No.11.

**13.** Let Neha's income = ₹ $x$

$$\text{Then, Megha's income} = x + \frac{x \times 60}{100} = ₹\,\frac{8x}{5}$$

Amount of Neha's income is less than from Megha's income

$$= \frac{8x}{5} - x = ₹\,\frac{3x}{5}$$

$$\text{Then, required percentage} = \frac{3x/5}{8x/5} \times 100\% = \frac{3x}{8x} \times 100\% = 37.5\%$$

Thus, Neha's income is 37.5% less than that of Megha's.

**14.** Let the CP be ₹ $x$,

SP of TV = ₹ 10240

$$\text{Loss} = \frac{x \times 20}{100} = ₹\frac{x}{5}$$

$$\text{SP of TV} = x - \frac{x}{5} = ₹\frac{4x}{5}$$

Then, $\frac{4x}{5} = 10240$

or $x = \frac{10240 \times 5}{4} = ₹\ \mathbf{12800}$

Thus, CP of TV is ₹ 12800.

**15.** Winning candidate got votes = 320000

Let the total votes are $x$

Then, $\frac{x \times 40}{100} = 320000$

$$x = \frac{320000 \times 100}{40}$$

$$x = \mathbf{800000}$$

$$\text{His oponent got votes} = \frac{800000 \times 24}{100} = 192000$$

So, number of person who did not vote

$= (800000 - (320000 + 192000)] = \mathbf{288000}$

Thus, total votes are 800000 and 288000 persons did not voted.

**16.** If total number of students is 100, number of girls are = 60

Number of boys = 40

If number of girls = 60, then total number of students = 100

If number of girls = 1, then total number of students $= \frac{100}{60}$

If number of girls = 690, then total number of students

$$= \frac{100}{60} \times 690 = 1150$$

Total number of students = **1150**

Number of boys = 40% of total number of students

$$= \frac{40}{100} \times 1150$$

Number of boys = **460**

Thus, total number of students is 1150 also number of boys are 460.

**17.** Let the CP be ₹ $x$, then

$$\text{SP of bucket} = ₹\,240$$

$$\text{Loss} = \frac{x \times 20}{100} = \frac{x}{5}$$

$$\text{SP of bucket} = x - \frac{x}{5} = \frac{4x}{5}$$

According to question, $\frac{4x}{5} = 240$

$\Rightarrow$ $x = ₹\,300$

$\text{CP} = ₹\,300$ and S.P. $= ₹\,360$

$\text{Profit} = \text{SP} - \text{CP}$

$= ₹\,(360 - 300) = ₹\,60$

$$\text{Profit \%} = \frac{\text{Profit} \times 100}{\text{CP}} = ₹\,\frac{60 \times 100}{300} = \mathbf{20\%}$$

Thus, he would gain 20% profit.

**18.** Proceed as Q. No. 17.

**19.** SP of each calculator $= ₹\,198$, gain on calculator $= 10\%$

Then, $$\text{CP} = \frac{100}{100 + \text{Profit\%}} \times \text{SP}$$

$$= ₹\,\frac{100 \times 198}{110} = ₹\,180$$

For the Second calculator SP $= ₹\,198$,

Loss on second calculator $= 10\%$

$$\text{CP of second calculator} = \frac{100}{100 - \text{Loss\%}} \times \text{SP}$$

$$= \frac{100}{100 - 10} \times ₹\,198 = ₹\,\frac{100 \times 198}{90}$$

$$= ₹\,10 \times 22 = ₹\,220$$

Total SP of both calculator $= ₹\,198 \times 2 = ₹\,396$

CP of both calculator $= ₹\,(180 + 220) = ₹\,400$

Since, CP $>$ SP

So, there is loss.

$\text{Loss} = ₹\,(400 - 396) = ₹\,4$

$$\text{Loss \%} = \frac{\text{Loss} \times 100}{\text{CP}} = \frac{4 \times 100}{400} = \frac{100}{100} = 1$$

$\text{Loss} = \mathbf{1\%}$

So, CP of calculator is ₹ 180 and ₹ 220 and total loss is 1%.

**20.** CP of bicycle $= ₹\,960$, profit $= 5\%$

$$\text{SP of bicycle} = \frac{100 + \text{Profit\%}}{100} \times \text{CP}$$

$$= \frac{100 + 5}{100} \times 960 = \frac{105 \times 960}{100}$$

$$= ₹\,\frac{100800}{100} = ₹\,1008$$

Again Virat sold it to Rahul at a profit of 10%

Now, $\text{SP of bicycle} = \frac{100 + \text{Profit}\%}{100} \times \text{CP}$

$= \frac{100 + 10}{100} \times 1008 = \frac{110 \times 1008}{100}$

$= ₹ \frac{110880}{100} = ₹ \mathbf{1108.80}$

Thus, the money paid by Rahul is ₹ 1108.80.

**21.** $\text{SP of a bed sheet} = 150, \text{Loss } \% = 4\%$

$\text{CP of a bed sheet} = \frac{100}{100 - \text{Loss}\%} \times \text{SP}$

$= \frac{100}{100 - 4} \times 150 = ₹ \frac{100}{96} \times 150$

$= ₹ 156.25$

$\text{Again, SP of a bed sheet} = \frac{100 + \text{Profit}\%}{100} \times \text{CP}$

$\text{SP of a bed sheet} = \frac{100 + 20}{100} \times 156.25$

$= \frac{120 \times 156.25}{100} = ₹ \mathbf{187.50}$

Thus, he should sell it for ₹ 187.50 to gain 20%.

**22.** Do yourself.

**23.** $\text{CP of 100 oranges} = 200, \text{Profit} = 30\%$

$\text{SP of 100 oranges} = \frac{100 + \text{Profit}\%}{100} \times \text{CP}$

$\frac{100 + 30}{100} \times \text{CP} = \frac{130 \times 200}{100} = ₹ 260$

Cost price of 20 orange $= ₹ 20 \times 2 = ₹ 40$

$\text{CP} = 40, \text{Profit} = 5\%$

$\text{SP} = \frac{100 + \text{Profit}\%}{100} \times \text{CP}$

$= \frac{(100 + 5)}{100} \times ₹ 40$

$= ₹ \frac{105 \times 40}{100} = ₹ 10.5 \times 4 = ₹ 42$

$\text{CP of remaining orange} = 80 \times 2 = 160$

$\text{SP of remaining orange} = (260 - 42) = ₹ 218$

$\text{Since, SP} > \text{CP}$

So, there is profit.

$\text{Profit} = ₹ (218 - 160) = ₹ 58$

$$\text{Profit\%} = \frac{\text{Profit} \times 100}{\text{CP}}$$

$$= \frac{58 \times 100}{160} = \mathbf{36.25\%}$$

Thus, required gain per cent is 36.25%.

**24.** to **27.**; Do yourself.

**28.** (i) $\text{SI} = ₹\,36, R = 3\% \text{ and } T = 3 \text{ years}$

$$P = \frac{\text{SI} \times 100}{R \times T}$$

$$= \frac{36 \times 100}{3 \times 3} = ₹\,\mathbf{400}$$

Thus, principal is ₹ 400.

(ii), (iii) Do yourself.

**29.** (i) $P = ₹\,500, \text{S.I.} = ₹\,150, T = 4 \text{ Years}$

$$R = \frac{\text{S.I.} \times 100}{P \times T}$$

$$= \frac{150 \times 100}{500 \times 4} = \frac{30}{4} = \mathbf{7.5\%}$$

Thus, rate of interest is 7.5%.

(ii) Do yourself.

(iii) $P = 700, \text{S.I.} = ₹\,168, T = \frac{16}{12} \text{ years}$

$$R = \frac{\text{S.I.} \times 100}{P \times T}$$

$$= \frac{168 \times 100 \times 12}{700 \times 16} = \mathbf{18\%}$$

Thus, rate of interest is 18%.

**30.** $P = ₹\,4500, T = 1 \text{ year}, A = ₹\,5265$

$$\text{SI} = ₹\,(5265 - 4500) = ₹\,765$$

$$R = ?$$

$$R = \frac{\text{SI} \times 100}{P \times T} = \frac{765 \times 100}{4500 \times 1} = \frac{765}{45} = 17\%$$

For Sachin, $P = ₹\,4500, T = 3, R = 17\%, \text{S.I.} = ?$

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{4500 \times 17 \times 3}{100} = ₹\,2295$$

$$\text{Amount} = \text{Principal} + \text{SI}$$

$$= ₹\,4500 + ₹\,2295 = ₹\,6795$$

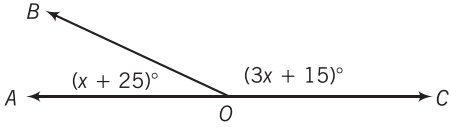
Thus, he will have to pay ₹ 6795.

**31.** Do yourself.

# 11. Lines and Angles

## Exercise 11A

**1.** (i) In the given figure,




We know that

$$(x + 25)^\circ + (3x + 15)^\circ = 180^\circ \qquad (\because \text{straight angle})$$

$$4x + 40 = 180$$

$$x = \frac{140}{4} = \mathbf{35}^\circ$$

Thus, value of $x$ is 35°.

(ii) $\angle AOB = ?$

From the (i) part we know that $x = 35^\circ$

Then value of $\angle AOB = (x + 25)^\circ$

$$= (35 + 25)^\circ = \mathbf{60}^\circ$$

Thus, $\angle AOB = 60^\circ$

(iii) $\angle BOC = ?$

From the (i) part we know that $x = 35^\circ$

$$\angle BOC = 3x + 15$$

$$= 3 \times 35 + 15 = 120^\circ$$

**Alternate**

From (ii) we know $\angle O = 60^\circ$

And we also know

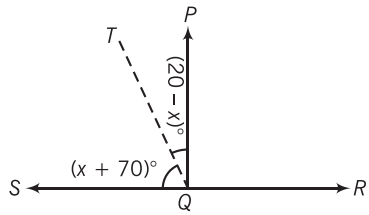
$$\angle AOB + \angle BOC = 180^\circ$$

$$\angle BOC = 180^\circ - \angle AOB$$

$$= 180^\circ - 60^\circ = \mathbf{120}^\circ$$

Thus, $\angle BOC = 120^\circ$.

**2.** In the given figure we know that




$\Rightarrow$ $\angle PQS + \angle PQR = 180^\circ$

$\Rightarrow \quad (x + 70)^\circ + (20 - x)^\circ + \angle PQR = 180^\circ$

$\Rightarrow \quad 90^\circ + \angle PQR = 180^\circ$

$\Rightarrow \quad \angle PQR = 180^\circ - 90^\circ$

$\Rightarrow \quad \angle PQR = \mathbf{90}^\circ$

Thus, $\angle PQR$ is 90°.

**3.** Do yourself.

**4.** Proceed as Q. No. 2.

**5.** Do yourself.

**6.** Do yourself.

**7.** Do yourself.

**8.** If angles $(x + 4)^\circ$ and $(2x - 7)^\circ$ are complementary angles

Then,

$(x + 4)^\circ + (2x - 7)^\circ = 90^\circ$

$\Rightarrow \quad 3x - 3 = 90$

$3x = 93^\circ$

$x = \mathbf{31}^\circ$

**9.** Let the required angles be $2x$ and $7x$

Then, $2x + 7x = 180^\circ$

$\Rightarrow \quad 9x = 180^\circ \Rightarrow \quad x = \dfrac{180^\circ}{9} = 20^\circ$

So, required angle $2x = 2 \times 20 = \mathbf{40}^\circ$

and $7x = 7 \times 20 = \mathbf{140}^\circ$

Thus, 40° and 140° are the required angles.

**10.** (i) Let the two equal angles be $x$ and $x$

Then, according to question

$\Rightarrow \quad x + x = 90^\circ \Rightarrow \quad 2x = 90^\circ \Rightarrow \quad x = \mathbf{45}^\circ$

Thus, 45° is the required angle.

(ii) Let the equal angles be $x$

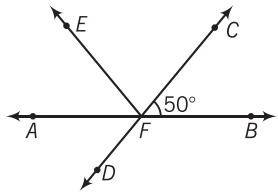
Then, $x + x = 180^\circ$

$\Rightarrow \quad 2x = 180^\circ$

$x = \mathbf{90}^\circ$

Thus, 90° is the required angle.

**11.** In the given figure




Given that $\angle EFA = \angle AFD$

$\angle CFB = 50° = \angle AFD$ (vertically opposite)

Then,

$\angle EFA + \angle EFC + \angle CFB = 180°$ (Linear pair)

$\Rightarrow \quad 50° + \angle EFC + 50° = 180°$

$\Rightarrow \quad \angle EFC = 180° - 100° = \mathbf{80°}$

Thus, measure of $\angle EFC$ is 80°.

**12.** (i) $y = \mathbf{135°}$ (vertically opposite angles)

$y + x = 180°$ (linear pair)

$\Rightarrow \quad x = 180° - 135° = \mathbf{45°}$

$z = x$ (vertically opposite)

$\Rightarrow \quad z = \mathbf{45°}$

Thus, values of $x$, $y$ and $z$ are 45°, 135° and 45° respectively.

(ii) $31° + y = 90°$ (linear pair)

$\Rightarrow \quad y = 90° - 31° = 59°$

$z = y$ (vertically opposite)

$\Rightarrow \quad z = \mathbf{59°}$

$x = \mathbf{31°}$ (vertically opposite)

Thus, values of $x$, $y$ and $z$ are 31°, 59° and 59° respectively.

(iii) Proceed as (i) and (ii).

**13.** (i) $10° + 80° = 90°$

So, pair of angles are complementary.

(ii) and (iii) Do yourself.

(iv) $54° + \frac{2}{5} \times 90° = 54° + 36° = 90°$

So, pair of angles are complementary.

**14.** (i) $139° + 39° = 178°$

So, pair of angles are not supplementary.

(ii) Do yourself.

(iii) $\frac{3}{10} \times 90° + \frac{4}{15} \times 180°$

$27° + 48° = 75°$

So, pair of angles are not supplementary.

(iv) $2x° + 65° + 115° - 2x° = 180°$

So, pair of angles are supplementary.

**15.** Let angles be $2x$, $3x$ and $7x$

According to question,

$2x + 3x + 7x = 180°$

$12x = 180°$

$x = 15$

Then, angles are $2x = 2 \times 15 = \mathbf{30°}$

$$3x = 3 \times 15 = \mathbf{45}^\circ$$
$$7x = 7 \times 15 = \mathbf{105}^\circ$$

Thus, required angles are $30^\circ$, $45^\circ$ and $105^\circ$.

**16.** Given that $(3x + 18^\circ)$ and $(2x + 25^\circ)$ are supplementary.

Then,

$$3x + 18^\circ + 2x + 25^\circ = 180^\circ$$
$$5x + 43^\circ = 180^\circ$$
$$5x = 137^\circ$$
$$x = \mathbf{27.4}^\circ \text{ or } \mathbf{27°24'}$$

Thus, value of $x$ is $27.4^\circ$

**17.** Given that

$$10\% \text{ of } x + 40\% \text{ of } 2x = 90^\circ$$
$$\frac{x \times 10}{100} + \frac{2x \times 40}{100} = 90^\circ$$
$$\frac{x}{10} + \frac{4x}{5} = 90^\circ$$
$$9x = 900^\circ$$
$$x = \mathbf{100}^\circ$$

Thus, value of $x$ is $100^\circ$.

**18.** Let the angles be $x$ and $5x$

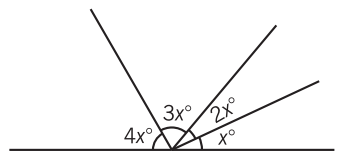
Then,
$$x + 5x = 90^\circ$$
$$6x = 90^\circ$$
$$x = \mathbf{15}^\circ$$

So, angles are $x = 15^\circ$ and $5x = 5 \times 15^\circ = \mathbf{75}^\circ$.

**19.** Do yourself.

**20.** Proceed as Q. No. 17.

**21.** In the given figure




$$x + 2x + 3x + 4x = 180^\circ$$
$$10x = 180^\circ$$
$$x = \mathbf{18}^\circ$$
$$\text{Now its supplement} = 180^\circ - 18^\circ$$
$$= \mathbf{162}^\circ$$

Thus, value of angle $x$ is $18^\circ$ and its supplement is $162^\circ$.

**22.** Do yourself.

**23.** In the given figure,

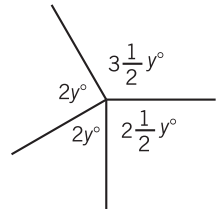
$$2y^\circ + 3\frac{1}{2}y^\circ + 2\frac{1}{2}y^\circ + 2y^\circ = 360^\circ$$
$$10y^\circ = 360^\circ$$
$$y^\circ = 36^\circ$$

So, angles are $2y° = 2 \times 36° = \mathbf{72°}$

$$3\frac{1}{2}y° = \frac{7}{2} \times 36° = \mathbf{63°}$$

$$2\frac{1}{2}y° = \frac{5}{2} \times 36° = \mathbf{90°}$$

$$2y° = 2 \times 36° = \mathbf{72°}$$




Thus, angles are 72°, 63°, 90° and 72°.

**24.** Do yourself.

## Exercise 11B

**1.** (i) $\angle 3$ and $\angle 6$ are interior alternate angles.

(ii) $\angle 2$ and $\angle 4$ are adjacent angles.

(iii) $\angle 3$ and $\angle 7$ are corresponding angles.

(iv) $\angle 2$ and $\angle 7$ are exterior alternate angles.

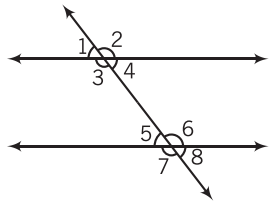
(v) $\angle 4$ and $\angle 6$ are allied or co-interior angles.

(vi) $\angle 1$ and $\angle 8$ are exterior alternate angles.

(vii) $\angle 1$ and $\angle 5$ are corresponding angles.

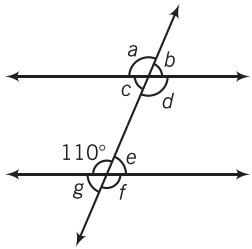
(viii) $\angle 1$ and $\angle 4$ are vertically opposite angles.

(ix) $\angle 5$ and $\angle 7$ are adjacent angles.




**2.** Do yourself.

**3.** $a = d$ (vertically opposite angles)




$d = f$ (corresponding angles)

$f = 110°$ (vertically opposite angles)

$\therefore \quad a = d = f = 110°$

$e + 110° = 180°$ (co-interior angles)

$\therefore \quad e = 180° - 110° = 70°$

$b = c$ (vertically opposite angles)

$b = e$ (corresponding angles)

$e = g$ (vertically opposite angles)

$\therefore \quad b = c = e = g = 70°$

Hence, $a = \mathbf{110}°, b = \mathbf{70}°, c = \mathbf{70}°, d = 110°, e = 70°,$
$f = \mathbf{110}°$ and $g = \mathbf{70}°$

**4.** Proceed as Q. No. 3.

**5.** (i) Given angles are $(2x + 6)°$ and $(3x + 54)°$ are co-interior angles.

We know that pair of parallel lines cut by transversal line, pair of co-interior angles are supplementary

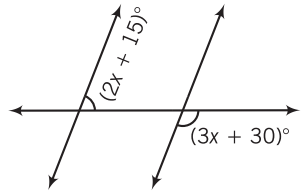
$\therefore 2x + 6 + 3x + 54 = 180°$

$\Rightarrow \quad 5x = 180 - 60 = 120°$

$\Rightarrow \quad x = \frac{120°}{5} = \mathbf{24}°$

Thus, value of $x$ is 24°.

(ii) From the figure $(2x + 15°)$ and $(3x + 30°)$ are co-interior angles.




$\therefore$ Co-interior angles are supplementary.

$2x + 15 + 3x + 30 = 180°$

$\Rightarrow \quad 5x + 45 = 180°$

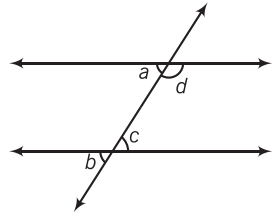
$\Rightarrow \quad 5x = 180° - 45$

$= 135°$

$\Rightarrow \quad x = \frac{135°}{5} = 27°$

Thus, value of $x$ is 27°.

**6.** In the figure (i),




$a = b$ (corresponding angles)

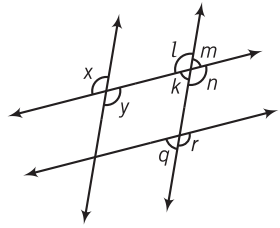
$b = c$ (vertically opposite angles)

$a = c$ (alternate angles)

$\therefore \quad \boldsymbol{a = b = c}$

Thus, $\angle a, \angle b$ and $\angle c$ are equal.

In the figure (ii),




$x = y$ (vertically opposite angles)

$y = l$ (alternate angles)

$x = l$ (corresponding angles)

$l = n$ (vertically opposite angles)

$n = r$ (corresponding angles)

$\therefore \quad x = y = l = n = r$

Again $m = k$ (vertically opposite angles)

$k = q$ (corresponding angles)

$\therefore \quad \boldsymbol{m = k = q}$

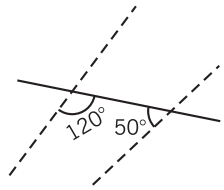
Thus, $\angle m, \angle k$ and $\angle q$ are equal.

**7.** (i) In figure, If lines are parallel, then

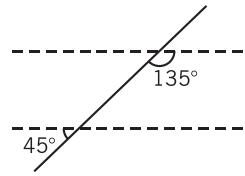
$120° + 50° = 180°$ (Because of co-interior angles)

$\Rightarrow \quad 170° \neq 180°$

**But it is not true.**




(i)




(ii)

Thus, there are not parallel lines.

(ii) In figure (ii)

Let $\angle 1 = 45°$ (vertically opposite angles

and $\angle 2 = 135°$ (co-interior angles)

Lines will be parallel if

$\angle 1 + \angle 2 = 180°$ (Because of co-interior angles)

$45° + 135° = 180°$

$180° = 180°$

**Which is true.**

Thus, there are parallel lines.

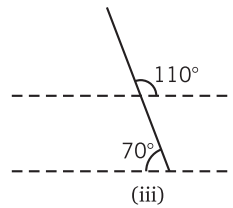
(iii) In figure (iii)

Lines will be parallel if corresponding angles are equal then if

$120° = 130°$

**Which is not true.**

Thus, there are not parallel lines.




(iii)

(iv) In figure (iv),

Let $\angle 1 = 110°$ (vertically opposite angles)

and $\angle 2 = 70°$

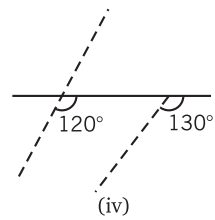
Lines parallel

then, $\angle 1 + \angle 2 = 180°$

(Because of co-interior angles)

$110° + 70° = 180°$

$180° = 180°$




(iv)

**Which is true.**

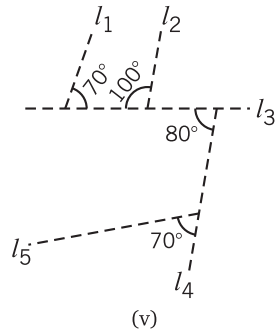
Thus, lines are parallel.

(v) In figure (v),

$\angle 1 + 100° = 180°$

$\angle 1 = 180° - 100°$

$\angle 1 = 80°$ (Linear pair)



(v)

$l_1$ and $l_2$ are parallel if $\angle 1 = 70°$

but $80° = 70°$

**Which is not true.**

Thus, $l_1$ and $l_2$ will be parallel.

Again, $l_3$ and $l_5$ will be parallel if,

$80° = 70°$ (corresponding angles)

**Which is not true.**

Thus, $l_3$ and $l_5$ are not parallel.

But $\angle 1 = 80°$ (Alternate angles)

$\Rightarrow$ $80° = 80°$

Which is true.

Thus, $l_2$ and $l_4$ are parallel.

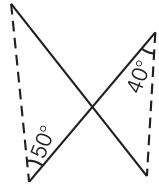
(vi) Lines are parallel

If alternate angles are equal

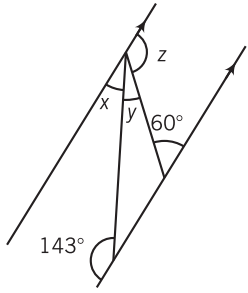
$\Rightarrow$ $50° = 40°$

**Which is not true.**

Thus, lines are not parallel.




**8.** (i) From the figure




$\therefore$ $z + 60° = 180°$

($\because$ co-interior angles are supplementary)

$\Rightarrow$ $z = 180° - 60° = \mathbf{120°}$

$x + y = 60°$

($\because$ Alternate interior angles are equal)

$y + z = 143°$

($\because$ Alternate interior angles are equal)

$\Rightarrow$ $y = 143° - 120° = \mathbf{23°}$

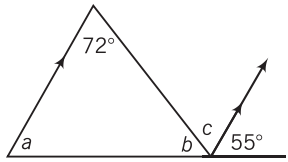
Now $x + y = 60°$

$x + 23° = 60°$

$x = 60° - 23° = \mathbf{37°}$

Thus, measure of angles $x$, $y$ and $z$ are 37°, 23° and 120° respectively.

(ii) From the figure




$\angle a = \mathbf{55°}$ ($\because$ corresponding angles)

In the triangle sum of interior angles

$72° + a + b = 180°$

$72° + 55° + b = 180°$

$b = 180° - 127° = \mathbf{53°}$

Now, $b + c + 55° = 180°$ (Linear pair)

$53° + c + 55° = 180°$

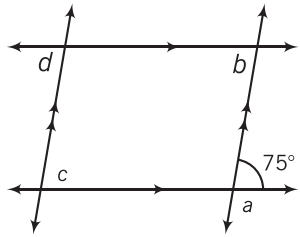
$c + 108° = 180°$

$c = 180° - 108°$

$c = \mathbf{72°}$

Thus, measure of angles $a$, $b$ and $c$ are 55°, 53° and 72° respectively.

(iii) From the figure




$75° + a = 180°$ (Linear pair)

$\Rightarrow$ $a = 180° - 75° = \mathbf{105°}$

$b = \mathbf{75°}$ (Alternate interior angles)

$\therefore$ $d = b = 75°$ (Corresponding angles)

$\therefore$ $d = c = \mathbf{75°}$ (Alternate interior angles)

**9.** Proceed as Q. No. 7.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

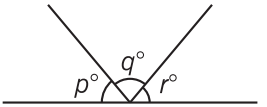
**1.** Let, $p^\circ = q^\circ = r^\circ = x^\circ$

Then, $x^\circ + x^\circ + x^\circ = 180^\circ$ (linear pair)

$\Rightarrow \quad 3x^\circ = 180^\circ$

$\Rightarrow \quad x^\circ = \mathbf{60}^\circ$

Thus, measure of angle $p$, $q$ and $r$ is $60^\circ$ each.




**2.** Let the smaller angle be $x$.

So, longer angle is $(x + 44)$

Then,

$$x + (x + 44)^\circ = 180^\circ$$
$$2x + 44^\circ = 180^\circ$$
$$2x = 180^\circ - 44^\circ = 136^\circ$$
$$x = \frac{136^\circ}{2} = 68^\circ$$

Then, angle $x = \mathbf{68}^\circ$

and $(x + 44)^\circ = 68^\circ + 44^\circ$

$= \mathbf{112}^\circ$

Thus, measure of angles are $68^\circ$ and $112^\circ$.

**3.** Let the adjacent angles be $5x$ and $3x$

Sum of the adjacent angles $= 128^\circ$

Then, $5x + 3x = 128^\circ$

$\Rightarrow \quad 8x = 128^\circ$

$\Rightarrow \quad x = \frac{128^\circ}{8} = 16^\circ$

Therefore, the adjacent angles are $(5 \times 16^\circ)$

$= \mathbf{80}^\circ$ and $(3 \times 16^\circ) = \mathbf{48}^\circ$.

Thus, angles are $80^\circ$ and $48^\circ$.

**4.** Let the measure of the required angle be $x$

$\therefore$ Complement of angle $= 90 - x$

Then, $x = \frac{90^\circ - x}{2}$

$\Rightarrow \quad 2x = 90^\circ - x$

$\Rightarrow \quad 2x + x = 90^\circ$

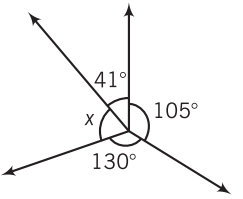
$\Rightarrow \quad 3x = 90^\circ$

$\Rightarrow \quad x = \frac{90^\circ}{3} = \mathbf{30}^\circ$

Therefore, the required angles are $30^\circ$ and $(90^\circ - 30^\circ) = \mathbf{60}^\circ$.

Thus, required angles are $30^\circ$ and $60^\circ$.

**5.** (i) We know that




$41° + 105° + 130° + x° = 360°$

$x° = 360° - 276°$

$x° = \mathbf{84°}$

(ii) and (iii) Do yourself.

**6.** (i) Let the supplement of given angle is $x$

Then, $x + 100 = 180°$

$x = 180° - 100° = \mathbf{80°}$

Thus, supplement for given angle is 80°.

(ii) and (iii) Do yourself.

(iv) Let the supplement of given angle is $y$

Then, $y + (x + 35)° = 180°$

$y = 180° - (x + 35)°$

$y = \mathbf{(145 - x)°}$

Thus, supplement for given angle is $(145 - x)°$.

**7.** (i) Let the complement of given angle is $x$

Then, $x + 25° = 90°$

$x = 90° - 25°$

$= \mathbf{65°}$

Thus, complement for given angle is 65°.

(ii) and (iii) Do yourself.

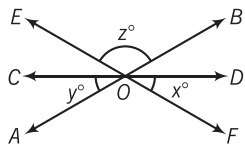
(iv) Let the complement of given angle is $y$

Then, $y + (x + 5)° = 90°$

$y = 90° - (x + 5)°$

$y = \mathbf{(85 - x)°}$

**8.** (i) From the figure




$\angle COA + \angle DOF + \angle AOF = 180°$ (Linear pair)

$y° + z° + x° = 180°$

$[\because \angle EOB = \angle AOF]$ Vertically opposite

$45° + 90° + x° = 180°$ (Given)

$x° = 180° - 135° = \mathbf{45°}$

Thus, value of $x$ is 45°.

(ii) Given that $x = 3a, y = 5x = 5 \times 3a = 15a$

and $z = 6x = 6 \times 3a = 18a$

$\therefore \quad x + y + z = 180°$

$\Rightarrow \quad 3a + 15a + 18a = 180°$

$36a = 180°$

$a = 5°$

Thus, value of $a$ is 5°.

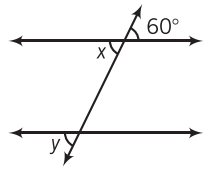
**9.** Do yourself.

**10.** (i) $x = 60°$

($\because$ Vertically opposite angles)

$\boldsymbol{x = y = 60°}$

($\because$ Corresponding angles)



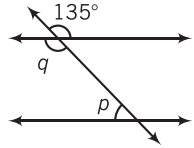

Thus, value of $x$ and $y$ is 60° each.

(ii) $q = \mathbf{135°}$

($\because$ Vertically opposite angles)

$q + p = 180°$

($\because$ $a$ paw of co-interior angles are supplementary)




$\Rightarrow \quad 135° + p = 180° \quad \Rightarrow \quad p = 180° - 135° = \mathbf{45°}$

(iii) $a = \mathbf{70°}$

($\because$ Alternative interior angles are equal)

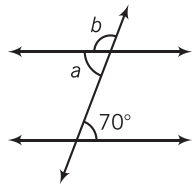
$a + b = 180°$

($\because$ linear pair)

$\Rightarrow \quad 70° + b = 180°$

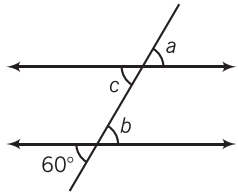
$\Rightarrow \quad b = 180° - 70°$

$= \mathbf{110°}$




Thus, value of $a$ and $b$ are 70° and 110°.

**11.** (i) From figure




$b = 60°$ (Vertically opposite angles)

Also $b = a = 60°$ (Alternate angles)

and $a = c = 60°$ (Vertically opposite angles)

So, $\boldsymbol{a = b = c = 60°}$

Thus, measure of angles $a$, $b$ and $c$ are 60° each.

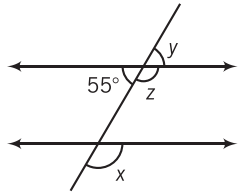
(ii) From figure

$y = \mathbf{55°}$

(Vertically opposite angles)

Also, $z + 55° = 180°$ (Linear pair)

$\Rightarrow \quad z = 180° - 55°$

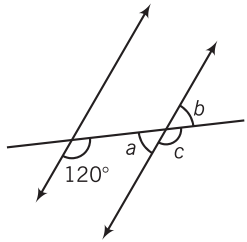


$\Rightarrow$ $z = 125°$

$\boldsymbol{z = x = 125°}$ (Alternate angles)

Thus, measure of angles $x$, $y$ and $z$ are 125°, 55° and 125° respectively.

(iii) From figure




$c = \boldsymbol{120°}$ (Alternate angles)

Also, $c + a = 180°$ (Linear pair)

$\Rightarrow$ $120° + a = 180°$

$a = 180° - 120° = 60°$

and $\boldsymbol{a = b = 60°}$ (Vertically opposite angles)

Thus, measure of angles $a$, $b$ and $c$ are 60°, 60° and 120° respectively.

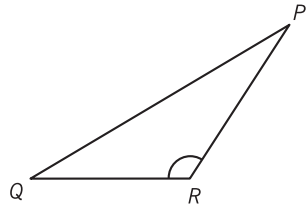
# 12. Triangle and Its Properties

**1.** (i) $R$

(ii) $PR$

(iii) $\angle P$

(iv) $PQ$




**2.** Do yourself.

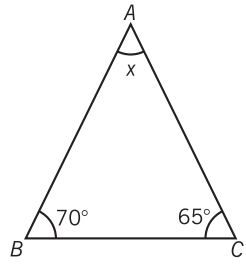
**3.** (i) We know that sum of all the three angles of a triangle is 180°

$x + 70° + 65° = 180°$

$x = 180 - 135°$

$x = \boldsymbol{45°}$

Thus, measure of $\angle x$ is 45°.




(ii), (iii), (iv), (v) and (vi) Do yourself.

**4.** Do yourself.

**5.** Do yourself.

**6.** Measure of the acute angle = 58°

Since, triangle is right angle then measure of one angle is 90°.

Then, measure of other acute angle = 180° – (90° + 58°) = **32°**

Thus, measure of other acute angle is 32°.

**7.** Do yourself.

**8.** Do yourself.

**9.** Third angle of a triangle = 70°

Let equal angle of triangle = $x$

Then, sum of all the angles of a triangle will be 180°

$$x + x + 70° = 180°$$
$$2x + 70° = 180°$$
$$2x = 180° - 70° = 110°$$
$$x = \mathbf{55°}$$

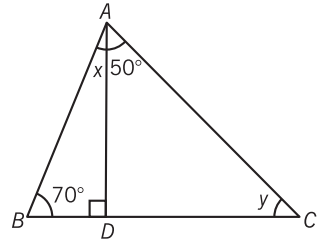
Thus, measure of equal angles are 55°.

**10.** In $\Delta ADB$

$$\angle B = 70°,\ \angle A = x° \text{ and } \angle D = 90°$$

Then, by the angle sum property

$$x + 70° + 90° = 180°$$
$$x + 160° = 180°$$
$$x = 180° - 160°$$
$$x = \mathbf{20°}$$




Again in $\Delta ADC$

$$\angle A = 50°,\ \angle D = 90°$$

and $\angle C = y°$

Then, by the angle sum property

$$50° + 90° + y° = 180°$$
$$y = 180° - 140°$$
$$y = 40°$$

Thus, value of $x$ and $y$ is 20° and 40° respectively.

**11.** Since, triangle is an isosceles triangle, so two angles will be same from base

Let the measure of base angle = $x°$

Then the measure of vertical angle = $2x°$

Then, by the angle sum property

$$x° + x° + 2x° = 180°$$
$$4x° = 180°$$
$$x = \mathbf{45°}$$

So, angles will be = $x$ =45° and vertical angle

$$= 2x$$
$$= 2 \times 45° = \mathbf{90°}$$

Thus, measure of each angle is 45°, 45° and 90°.

**12.** Let the angles are $x$, $2x$ and $2x$

Then, by the angle sum property

$$x + 2x + 2x = 180°$$

$$5x = 180°$$
$$x = \mathbf{36°}$$
So, angles are $= x = 36°, 2x = 2 \times 36 = \mathbf{72°}$

Thus, angles are 36°, 72° and 72°.

**13.** Given that in a triangle

$$3\angle A = 4\angle B = 6\angle C$$

Let $3\angle A = 4\angle B = 6\angle C = K$

Then, $\angle A = \frac{K}{3}, \angle B = \frac{K}{4}$ and $\angle C = \frac{K}{6}$

By the angle sum property

$$\angle A + \angle B + \angle C = 180°$$
$$\frac{K}{3} + \frac{K}{4} + \frac{K}{6} = 180°$$
$$\frac{4K + 3K + 2K}{12} = 180°$$
$$\frac{9K}{12} = 180°$$
$$K = \frac{180° \times 12}{9}$$
$$K = 240°$$

Then, angle $\angle A = \frac{K}{3}$

$$= \frac{240°}{3} = \mathbf{80°}$$
$$\angle B = \frac{K}{4}$$
$$= \frac{240°}{4} = \mathbf{60°}$$
$$\angle C = \frac{K}{6} = \frac{240°}{6} = \mathbf{40°}$$

Thus, measure of angles $A$, $B$ and $C$ are 80°, 60° and 40° respectively.

**14.** Given that in $\Delta ABC$

$$\angle A = \angle B = 62°, \angle C = ?$$

Let measure of $\angle C = x$

Then, by the angle sum property

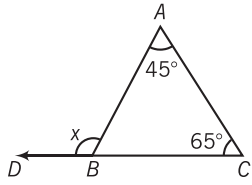
$$62° + 62° + x = 180°$$
$$x = 180° - 124° = \mathbf{56°}$$

Thus, measure of angle $C$ is 56°.

**15.** Proceed as Question 9.

## Exercise 12B

**1.** (i) In the given figure




$\angle A = 45°$ and $\angle C = 65°$

$\angle ABD = \angle A + \angle C$

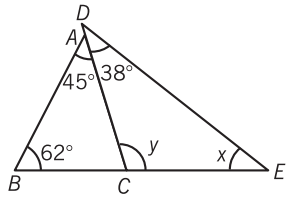
(Exterior angle property)

$\therefore \quad \angle ABD = 45° + 65° = \mathbf{110°}$

Thus, value of $x$ is 110°.

(ii) and (iii) Proceed as (i).

**2.** (i) In triangle $ABC$ by the angle sum property




$45° + 62° + \angle C = 180°$

$\angle C = 180° - 107°$

$\angle C = 73°$

Again in $\Delta DCE$

$73° = 38° + x$ (Exterior angle property)

$x = 73° - 38° = \mathbf{35°}$

Again in $\Delta DCE$ by the angle sum property

$38° + 35° + y = 180°$

$y = 180° - 73° = \mathbf{107°}$

Thus, value of $x$ and $y$ are 35° and 107° respectively.

(ii) In $\Delta ABD$

$120° = x + 50°$ (Exterior angle property)

$x = 120° - 50°$

$x = \mathbf{70°}$

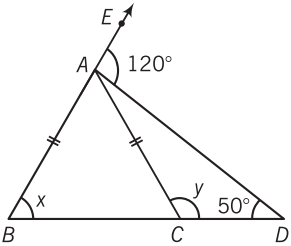
Also $AB = AC$

Then $\angle ABC = \angle ACB = 70°$

and $\angle A + \angle B + \angle C = 180°$

$\angle A + 70° + 70° = 180°$

$\angle A = 180° - 140° = 40°$




Now

$\angle EAD + \angle DAC + \angle CAB = 180°$ (Linear pair)

$$120° + \angle DAC + 40° = 180°$$
$$\angle DAC = 180° - 160° = 20°$$

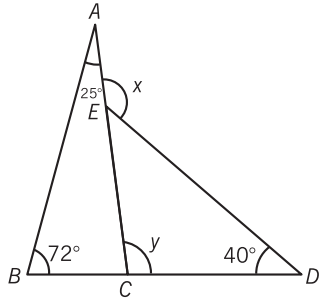
In $\Delta ACD$ by the angle sum property

$$\angle A + \angle C + \angle D = 180°$$
$$20° + y + 50° = 180°$$
$$y = 180° - 70° = \mathbf{110}°$$

Thus, value of $x$ and $y$ is 70° and 110°.

(iii) In $\Delta ABC$ by the angle sum property

$$25° + 72° + \angle C = 180°$$
$$\angle C = 180° - 97°$$
$$\angle C = 83°$$




In $\Delta ECD$

$$83° = 40° + \angle E$$

(Exterior angle property)

$$\angle E = 83 - 40° = 43°$$

Also,

$$43° + 40° + y = 180°$$ (sum of angles of a triangle)
$$y = 180° - 83 = \mathbf{97}°$$

and $40° + y = x$ (Exterior angle property)

$$40° + 97° = x$$
$$x = 137°$$

Thus, value of $x$ and $y$ are 137° and 97° respectively.

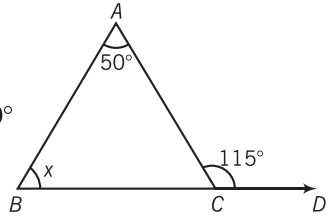
**3.** (i) In $\Delta ABC$

$$50° + x = 115°$$

(Exterior angle property)

$$x = 115° - 50°$$
$$x = \mathbf{65}°$$

Thus, value of $x$ is 65°.



(ii) In $\Delta ABC$

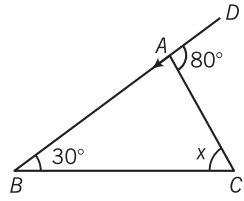
$$30° + x = 80°$$

(Exterior angle property)

$$x = 80° - 30°$$

$$x = \mathbf{50°}$$

Thus, value of $x$ is 50°.




(iii) In $\Delta ABC$

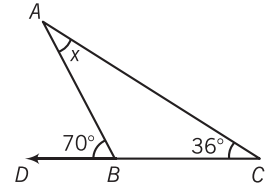
$$36° + x = 70°$$

(Exterior angle property)

$$x = 70° - 36°$$

$$x = \mathbf{34°}$$

Thus, value of $x$ is 34°.



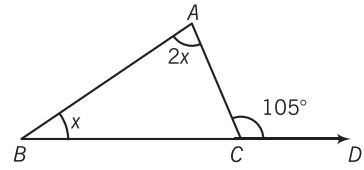

**4.** (i) In $\Delta ABC$

$$2x + x = 105°$$

$$3x = 105°$$

$$x = \mathbf{35°}$$

Thus, value of $x$ is 35°.




(ii) and (iii) Do yourself.

**5.** Measure of exterior angle = 100°

Given that its interior opposite angles are equal

Let its interior opposite angle = $x$

Then

$$x + x = 100° \text{ (Exterior angle property)}$$

$$2x = 100°$$

$$x = \mathbf{50°}$$

Let third interior angle of triangle = $y$

Then, $50° + 50° + y = 180°$

(sum of interior angles of a triangle)

$$100° + y = 180°,$$

$$y = 180° - 100° = \mathbf{80°}$$

Thus, measure of each interior angle of the triangle is 50°, 50° and 80°.

**6.** Measure of an exterior angle of a triangle = 130°

Ratio between its interior opposite angles = 7 : 6

Let its interior opposite angles be $7x$ and $6x$

Then, $7x + 6x = 130°$

$$13x = 130°$$

$$x = 10°$$

So, angles $7x = 7 \times 10 = \mathbf{70°}$ and $6x = 6 \times 10 = \mathbf{60°}$

Also, let third angle of triangle be $y$

Then $70° + 60° + y° = 180°$ (sum of interior angles of triangle)

$130° + y = 180°$ $y = 180° - 130° = 50°$

Thus, measure of each angles are 70°, 60° and 50°.

**7.** Do yourself.

**8.** Measure of one angle of a triangle = 60°

Ratio of other two angles = 2 : 3

Let other two angles be $2x$ and $3x$

Then, $60° + 2x + 3x = 180°$ (sum of interior angles of triangle)

$5x = 180° - 60°$

$5x = 120°$

$x = 24°$

So angles, $2x = 2 \times 24 = \mathbf{48}°$ and $3x = 3 \times 24 = \mathbf{72}°$

Thus, measure of other angles are 48° and 72°.

**9.** Do yourself.

## Exercise 12C

**1.** (i) 8 cm, 9 cm, 10 cm

The sum of two smaller side = 8 + 9 = 17

17 cm > 10 cm (Third side)

Since, the sum of two smaller sides is greater than third side, the triangle is possible to draw.

(ii), (iii) and (iv) Do yourself.

**2.** Do yourself.

**3.** Length of third side must be greater than the difference of given length *i.e.,* (8.3 − 5.9) cm *i.e.,* 2.4 cm. Also the length of third side must be less than the sum of given lengths *i.e.,* (8.3 + 5.9) cm *i.e.,* 14.2 cm.

Thus, the length of the third side of the triangle must greater than **2.2** cm and less than **14.2** cm

**4.** As $\Delta PQR$ is an isosceles triangle with $PQ = PR$

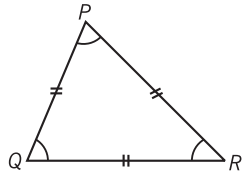
$\angle Q = \angle R$ (Angles opposite equal sides are equal)

$\angle Q = \angle R = \mathbf{45}°$

Then,

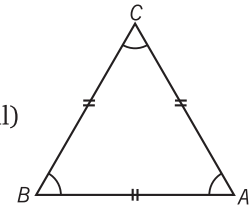
$\angle P + 45° + 45° = 180°$ (Sum of interior angles of a triangle)

$\angle P = 180° - 90° = \mathbf{90}°$




Thus, measure of angle $Q$ and $R$ is 45° and 90° respectively.

**5.** In $\Delta ABC$




Since, $CB = CA$

So, $\angle B = \angle A$

(Angles opposite equal sides are equal)

Thus, $\angle \boldsymbol{A} = \angle \boldsymbol{B}$

**6.** Do yourself.

**7.** Proceed as Q. No. 5.

**8.** Given that

ratio between angles $= 1 : 2 : 1$

Let angles be $x$, $2x$ and $x$

Then, $x + 2x + x = 180°$

(Sum of interior angles of a triangle)

$4x = 180°$

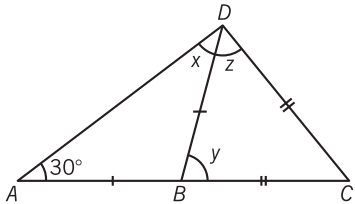
$x = 45°$

So, angles $x = \mathbf{45°}$, $2x = 2 \times 45 = \mathbf{90°}$ and $x = \mathbf{45°}$

Thus, the triangle with angle 45°, 90° and 45° will be isosceles and right angled triangle.

**9.** (i) In $\Delta DBA$

Since, $DB = AB$ (Given)




So, $\angle A = \angle D = \mathbf{30°}$

(Angles opposite equal sides are equal)

Thus, value of $x$ is 30°.

(ii) In $\Delta DAB$

$x + 30° = y$ (Exterior angle property)

$30° + 30° = y$

$\Rightarrow \quad y = \mathbf{60°}$

Thus, value of $y$ is 60°.

(iii) In $\Delta DBC$

Since, $CD = CB$

So, $\angle B = \angle D$

(Angles opposite equal sides are equal)

or $y = z = \mathbf{60°}$

Thus, value of $z$ is 60°.

**10.** Both base angles are equal because isosceles triangle

Let $x$ = Base angle

$y$ = Vertical angle

Given, Base angle = 4 × Vertical angle

$\Rightarrow \quad x = 4y$

Sum of angles in triangle = 180°

$$x + x + y = 180°$$
$$4y + 4y + y = 180°$$
$$9y = 180°$$
$$y = \mathbf{20°}$$

So, angles are $y = 20°$, $x = 4y = 4 \times 20° = \mathbf{80°}$

$x = 4y = 4 \times 20° = \mathbf{80°}$

Thus, angles are 20°, 80° and 80°.

**11.** In $\Delta PQR$

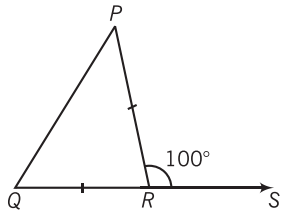
Since, $PR = RQ$

So, $\angle PQR = \angle RPQ$

(Angles opposite equal sides are equal)

Now

$\angle PQR + \angle RPQ = 100°$ (Exterior angle property)




$$\angle PQR + \angle PQR = 100°$$
$$2\angle PQR = 100°$$
$$\angle PQR = \frac{100°}{2} = \mathbf{50°}$$

Again in $\Delta PQR$

$\angle PQR + \angle RPQ + \angle PRQ = 180°$ (sum of interior angles of a triangle)

$$50° + 50° + \angle PRQ = 180°$$
$$\angle PRQ = 180° - 100°$$
$$\angle PRQ = \mathbf{80°}$$

Thus, value of $\angle PRQ$ and $\angle PQR$ are 80° and 50° respectively.

**12.** Do yourself.

## Exercise 12D

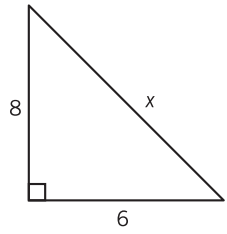
**1.** (i) $a = 1.5$ cm, $b = 2$ cm

Let '$c$' is the hypotenuse, then

$$c^2 = a^2 + b^2$$
$$c^2 = (1.5)^2 + (2)^2$$
$$= 2.25 + 4$$
$$c^2 = \mathbf{6.25\ cm}$$

(ii), (iii), (iv) and (v) Do yourself.

**2.** (i) In the triangle

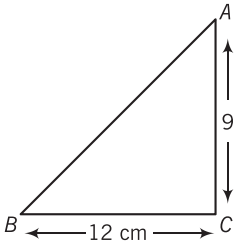



$$x^2 = 8^2 + 6^2$$
$$x^2 = 64 + 36 = 100$$
$$x^2 = (10)^2$$
$$x = 10$$

Thus, value of $x$ is 10.

(ii) and (iii) Do yourself.

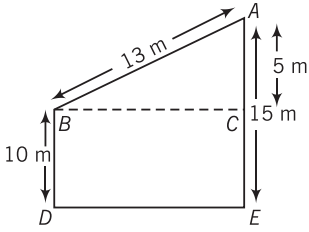
**3.** In $\Delta ABC$, $AC = 9$ cm, $BC = 12$ cm




By the Pythagoras theorem

$$AB^2 = BC^2 + CA^2$$
$$AB^2 = (12)^2 + (9)^2$$
$$AB^2 = 144 + 81$$
$$= 225$$
$$AB^2 = (15)^2$$
$$AB = \mathbf{15\ cm}$$

**4.** In $\Delta ABC$, $AB = 13$ m, $AC = 5$ m




By the Pythagoras theorem

$$AB^2 = BC^2 + AC^2$$
$$(13)^2 = BC^2 + (5)^2$$
$$169 = BC^2 + 25$$
$$BC^2 = 169 - 25 = 144$$
$$BC^2 = (12)^2$$
$$BC = \mathbf{12\ m}$$

Thus, horizontal distance between poles 12 m.

**5.** Hypotenuse of an isosceles right triangle is $= 200\ \text{cm}^2$

Since, triangle is isosceles right triangle, so base and perpendicular will be of equal length

Let length of the base $= x$ cm

Then, lenth of the perpendicular also $= x$ cm

By Pythagoras theorem

$$(200)^2 = x^2 + x^2$$
$$2x^2 = 200$$
$$x^2 = 100$$
$$x = (10)^2$$
$$x = \mathbf{10\ cm}$$

Thus, length of base and perpendicular is 10 cm.

**6.** Proceed as Q. No. 4.

**7.** Measure of hypotenuse $= 25$ cm

Length of one side $= 24$ cm

Let length of other side $= x$ cm

Then,

$$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$$

$$(25)^2 = (\text{Base})^2 + (24)^2$$

$$(\text{Base})^2 = 625 - 576$$

$$(\text{Base})^2 = 49$$

$$(\text{Base})^2 = (7)^2$$

$$\text{Base} = \mathbf{7\ cm}$$

Thus, length of other side is 7 cm.

**8.** Length of window from the ground = 12 m

Length of ladder from window = 13 m

Then,

$$(\text{Length of ladder from window})^2 = (\text{Length of window from the ground})^2 + (\text{Length of ladder from the wall})^2$$

$$(13)^2 = (12)^2 + (\text{Length of ladder from the wall})^2$$

$$(\text{Length of ladder from the wall})^2 = 169 - 144 = 25$$

$$(\text{Length of ladder from the wall})^2 = (5)^2$$

$\therefore$ Length of ladder from the wall = **5 m**

Thus, 5 m is the length of ladder from the wall.

**9.** Proceed as Q. No. 8.

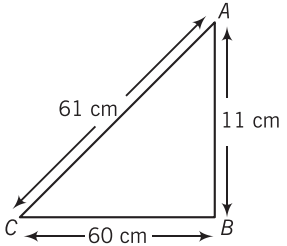
**10.** Do yourself.

**11.** In $\Delta ABC$ given that

$AB = 11$ cm,

BC $= 60$ cm

and $AC = 61$ cm




By the construction of triangle it is clear that $\angle B = 90°$

Also

$$AC^2 = AB^2 + BC^2$$

Thus, $\Delta$ ***ABC*** **is a right triangle and** $\angle$ ***B*** $= 90°$**.**

**12.** Do yourself.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** Do yourself.

**2.** Do yourself.

**3.** (i) If $x°$, $x°$, $x°$ are the angles of a triangle

Then, $x° + x° + x° = 180°$

(sum of all interior angles of a triangle)

$3x° = 180°$

$x° = \mathbf{60°}$

Thus, value of $x$ is 60°.

(ii) and (iii) Do yourself.

**4.** (i) Given measure of the angles of a triangle.

55°, 55° and 80°

A triangle can have together the above angles, if the sum of the given angles will be 180°, so

$55° + 55° + 80° = 180°$

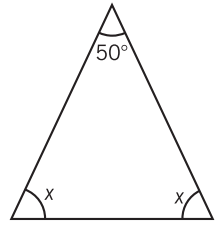
$190 \neq 180°$

Thus, a triangle is not possible with given angles.

(ii) and (iii) Do yourself.

**5.** (i) In the figure given angles

50°, $x$ and $x$, then




$50° + x + x = 180°$

(sum of the interior angles of a triangle)

$50° + 2x = 180°$

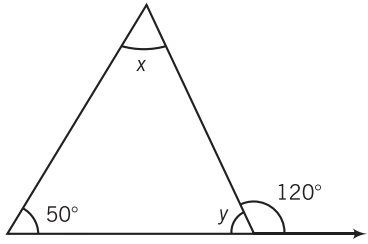
$2x = 180° - 50° = 130°$

$x = \frac{130°}{2} = 65°$

Thus, value of $x$ is 65°.

(ii) and (iii) Do yourself.

**6.** (i) In the given triangle




$50° + x = 120°$ (Exterior angle property)

$x = 120° - 50° = 70°$

$x = \mathbf{70°}$

Again in triangle

$50° + 70° + y = 180°$

(sum of the interior angles of a triangle)

$120° + y = 180°$

$y = 180° - 120°$

$y = \mathbf{60°}$

Thus, values of $x$ and $y$ are 70° and 60° respectively.

(ii) In the given triangle

$x = \mathbf{60°}$ (vertically opposite angle)

Again in the triangle

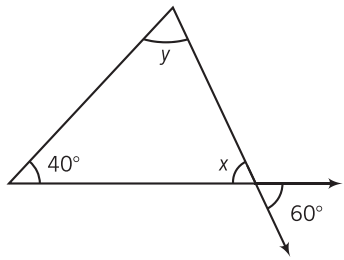
$40° + 60° + y = 180°$

(sum of interior angles of a triangle)

$100° + y = 180°$

$y = 180° - 100°$

$= \mathbf{80°}$




Thus, value of $x$ and $y$ are 60° and 80° respectively.

(iii) Do yourself.

**7.** Do yourself.

**8.** Measure of angle of a triangle = 80°

Given that other two angles are equal

Let the unknown angle be $x$, then

$x + x + 80° = 180°$ (Sum of interior angles of a triangle)

$2x = 180° - 80°$

$2x = 100°$

$x = \mathbf{50°}$

Thus, measure of each of the equal angle is 50°.

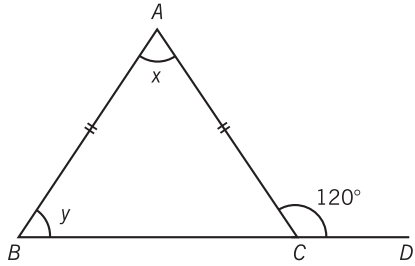
**9.** (i) In the given triangle

$\angle ACB + \angle ACD = 180°$ (Linear pair)

$\angle ACB + 120° = 180°$

$\angle ACB = 180° - 120°$

$= 60°$




Again in $\Delta ABC$

$$\angle y = \angle ACB = 60°$$

(Angles opposite equal sides are equal)

Now $x + y + 60° = 180°$

(Sum of the interior angles of a triangle)

$$x + 60° + 60° = 180°$$
$$x + 120° = 180°$$
$$x = 180° - 120° = \mathbf{60°}$$

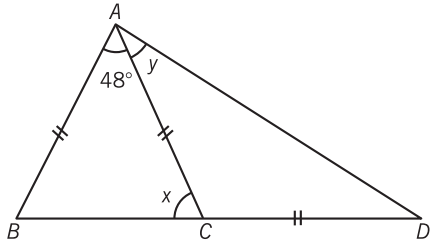
Thus, values of $x$ and $y$ is $\mathbf{60°}$ each.

(ii) Proceed as above.

(iii) In the given triangle $ABC$

$$\angle ABC = x$$

(Angles opposite equal sides are equal)




Again in $\Delta ABC$

$$x + x + 48° = 180°$$

(Sum of the interior angles of a triangle)

$$2x + 48° = 180°$$
$$2x = 180° - 48° = 132°$$
$$x = \frac{132°}{2} = \mathbf{66°}$$

Now in $\Delta ACD$

$$\angle ACD + x = 180°$$ (Linear pair)
$$\angle ACD + 66° = 180°$$
$$\angle ACD = 180° - 66°$$
$$\angle ACD = 114°$$

Again in $\Delta ACD$

$\angle ADC = y$

(Angles opposite equal sides are equal)

Then,

$y + y + 114° = 180°$

(Sum of the interior angles of a triangle)

$2y + 114° = 180°$

$2y = 180° - 114°$

$2y = 66°$

$y = \mathbf{33°}$

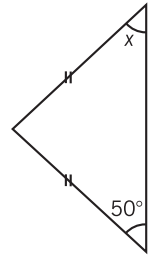
Thus, value of $x$ and $y$ are 66° and 33° respectively.

**10.** (i) In the given triangle

$x = \mathbf{50°}$

(Angles opposite equal sides are equal)

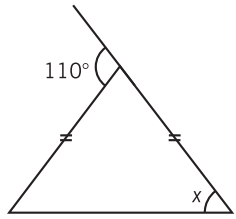
Thus, value of $x$ is 50°.




(ii) In the given $\Delta ABC$

$\angle ABC = x$

(Angles opposite equal sides are equal)




Then,

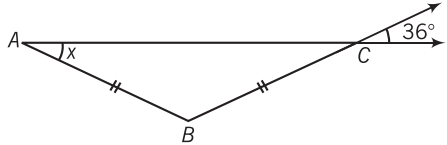
$x + x = 110°$ [Exterior angle property]

$2x = 110°$ $x = \mathbf{55°}$

Thus, value of $x$ is 55°.

(iii) In $\Delta ABC$

$\angle ACB = 36°$ (vertically opposite angle)




Again in $\Delta ABC$

Since $BC = BA$

So, $x = \angle ACB = 36°$

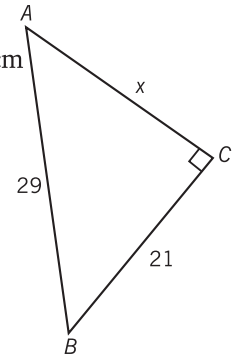
(Angles opposite equal sides are equal)

Thus, value of $x$ is 36°.

**11.** (i) Given that

Hypotenuse $= 29$ cm, base $= 21$ cm

and perpendicular $= x$ cm



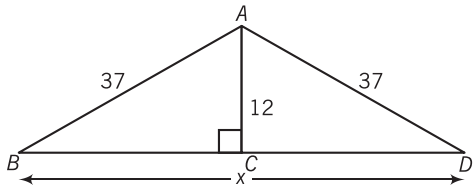

By the Pythagoras theorem

$$AB^2 = BC^2 + AC^2$$
$$(29)^2 = (21)^2 + x^2$$
$$x^2 = 841 - 441 = 400$$
$$x^2 = (20)^2$$
$$x = \mathbf{20\ cm}$$

Thus, value of $x$ is 20 cm.

(ii) In given $\Delta ABC$

By the Pythagoras theorem




$$AB^2 = BC^2 + AC^2$$
$$(37)^2 = BC^2 + (12)^2$$
$$BC^2 = 1369 - 144 = 1225$$
$$BC = 35$$

Similarly by the $\Delta ACD$

$$CD = 35$$
$$BD = BC + CD = 35 + 35 = \mathbf{70\ cm}$$

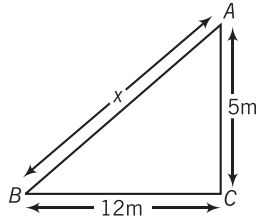
Thus, value of $x$ is 70 cm.

(iii) Do yourself.

**12.** In $\Delta ABC$

By the Pythagoras theorem

$$x^2 = (12)^2 + (5)^2$$
$$x^2 = 144 + 25$$
$$x^2 = 169$$
$$x = 13 \text{ m}$$




Then, total height of the tree = 13 m + 5 m = **18 m**

Thus, total height of the tree is 18 m.

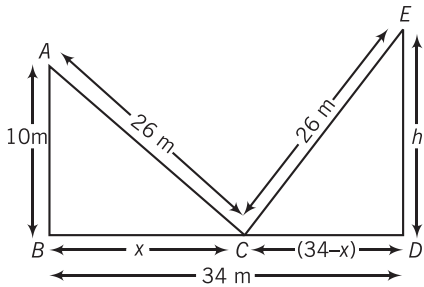
**13.** Length of ladder = 26 m

Height of top of a house from ground = 10 m

Let the height of the top of other house is '$h$'

Then in $\Delta ABC$

By the Pythagoras theorem




$$(26)^2 = (10)^2 + x^2$$
$$x^2 = 676 - 100$$
$$= 576$$
$$x^2 = (24)^2$$
$$x = 24 \text{ m}$$

Now in $\Delta ECD$

By the Pythagoras theorem

$$(26)^2 = h^2 + (34 - x)^2$$

but $x = 24$ m Then,

$$(26)^2 = h^2 + (34 - 24)^2$$
$$676 = h^2 + 100$$
$$h^2 = 676 - 100$$
$$h^2 = 576 = (24)^2$$
$$h = \mathbf{24\ m}$$

Thus, height of other house's top is 24 m.

# 13. Congruence of Triangles

## Exercise 13A

**1.** If $\Delta ABC \cong \Delta DEF$

Under the correspondence $ABC \leftrightarrow FED$

Then, $\overline{AB} = \overline{FE}, \overline{BC} = \overline{ED}, \overline{AC} = \overline{FD}$

$\angle A = \angle F, \angle B = \angle E, \angle C = \angle D$

**2.** If $\Delta DEF \cong \Delta BCA$ the parts of $\Delta BCA$ correspondence to

(i) $\angle E = \angle C$ (ii) $\overline{EF} = \overline{CA}$

(iii) $\angle F = \angle A$ (iv) $\overline{DF} = \overline{BA}$

**3.** Do yourself.

**4.** Do yourself.

**5.** In $\Delta DEF$ and $\Delta XYZ$

$DE = XY$ and $DF = YZ$

Then for SAS congruence,

There must be $\angle D = \angle Y$ or $D \leftrightarrow Y$

**6.** (i) In $\Delta PQR$ and $\Delta XYZ$

$\overline{PQ} = \overline{XZ}$ or $\overline{PQ} \leftrightarrow \overline{XZ}$

$\overline{QR} = \overline{YZ}$ or $\overline{QR} \leftrightarrow \overline{YZ}$

$$\angle Q = \angle Z \quad \text{or} \quad Q \leftrightarrow Z$$

By *SAS* congruency

$$\Delta PQR \cong \Delta XYZ$$

(ii) In $\Delta ABC$ and $\Delta FDE$

$$\overline{AC} \neq \overline{DE} \quad \overline{BC} \neq \overline{EF}$$

$$\angle A \neq \angle D \quad \text{or} \quad A \leftrightarrow F$$

So, they are **not congruent**.

(iii),(iv), (v) and (vi) Do yourself.

**7.** (i)

$$\overline{AB} = \overline{DE}$$

$$\overline{AC} = \overline{DF}, \quad \angle A \neq \angle D$$

$\therefore$ Triangles are not congruents.

(ii)

$$\overline{AC} = \overline{RP}$$

$$\overline{BC} = \overline{PQ}, \quad \angle C = \angle P$$

By SAS congruency

$$\Delta \boldsymbol{ABC} \cong \Delta \boldsymbol{PQR}$$

(iii)

$$\overline{DF} = \overline{PQ}$$

$$\overline{EF} = \overline{QR}$$

$$\Rightarrow \quad \angle F = \angle Q$$

By SAS congruency

$$\Delta \boldsymbol{DEF} \cong \Delta \boldsymbol{PQR}$$

(iv)

$$\overline{AB} = \overline{PQ}$$

$$\overline{BC} = \overline{QR}$$

$\angle B = \angle R$ (But they are not congruent, So given triangles are not show congruency)

**8.** Given that,

$$PQ = FE \text{ and } RP = DF$$

For *SAS* congruency

These must be $\angle \boldsymbol{P} = \angle \boldsymbol{F}$

**9.** (i) In $\Delta ABC$ and $\Delta DEF$

$\angle A = \angle F \Rightarrow \angle C = \angle E \Rightarrow AC = FE$

By *ASA* congruency

$$\Delta \boldsymbol{ABC} \cong \boldsymbol{FDE}$$

(ii) Do yourself.

(iii) In $\Delta DPQ$ and $\Delta DSR$

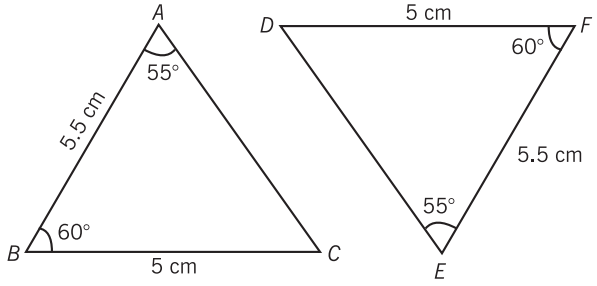
$\angle D = \angle D$ Common vertex

$\angle P \neq \angle S, \quad QD = RD$

So, they are not congruent.

(iv),(v) and (vi) Do yourself.

**10.** By the Fig. Given that




$$\angle A = \angle E = 55°$$
$$\angle B = \angle F = 60°$$

Now, in $\Delta ABC$ and $\Delta EFD$
by *ASA* congruence condition, third pair of corresponding parts.

$$\boldsymbol{AB} = \boldsymbol{EF}$$

**11.** $\Delta DEF \cong \Delta MND$
Given that $\angle D = \angle M$ and $\angle F = \angle P$
Using *ASA* rule of congruence to establish the congruence
There must be $\boldsymbol{DF} = \boldsymbol{MP}$

**12.** Do yourself. **13.** Do yourself. **14.** Do yourself.

**15.** $\Delta RAT \cong \Delta WON$

**16.** (i) Yes, By ASA congruency (ii) No, Not congruent
(iii) No, Not congruent

**17.** Do yourself.

## Exercise 13B

**1.** (i) In $\Delta ABC$ and $\Delta FDE$

$$AB = FD \Rightarrow BC = DE \Rightarrow CA = EF$$

By SSS congreuency

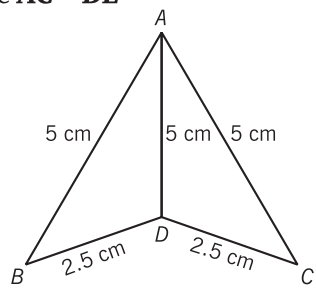
$$\Delta \boldsymbol{ABC} \cong \Delta \boldsymbol{FDE}$$

(ii), (iii), (iv), (v), (vi) and (vii) Do yourself.

**2.** In $\Delta ABC$ and $\Delta DEF$
Given that $AB = DF$ and $BC = EF$
For the SSS congruency, there must be $\boldsymbol{AC} = \boldsymbol{DE}$

**3.** (i) In $\Delta ADB$ and $\Delta ADC$

$$\overline{AB} = \overline{AC}$$
$$\overline{AD} = \overline{AD}$$
$$\overline{BD} = \overline{CD}$$




(ii) By SSS Triangle congruency

$$\Delta ADB \cong \Delta ADC$$

(iii) $\angle B = \angle C$ ($\because$ Corresponding congruency)
Because of corresponding parts of congruent triangles.

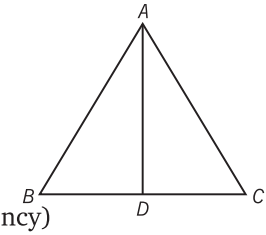
**4.** Proceed as Q. No. 2.

**5.** Proceed as Q. No. 2.

**6.** (i) $\overline{AB} = \overline{AC}$

$$\overline{AD} = \overline{AD}$$
$$\overline{BD} = \overline{CD}$$

($\because D$ is the mid point of $BC$)




(ii) By SSS Triangle congruency

$$\Delta ADB \cong \Delta ADC$$

(iii) $\angle B = \angle C$ ($\because$ Corresponding congruency)

**7.** (i) In $\Delta ABC$ and $\Delta FDE$

$$\angle B = \angle D \Rightarrow BC = DE \Rightarrow AC = FE$$

By RHS congruency $\Delta \boldsymbol{ABC} \cong \Delta \boldsymbol{FDE}$

(ii), (iii), (iv), (v) and (vi) Do yourself.

**8.** In $\Delta ABC$ and $\Delta XYZ$

Given that $\angle B = \angle X = 90° \Rightarrow BC = XZ$

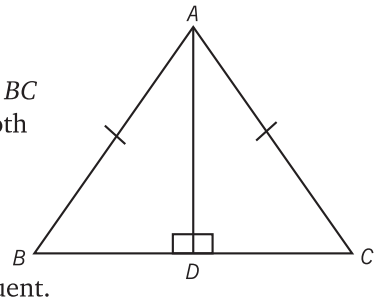
For RHS congruence condition, there must be $\boldsymbol{AC = YZ}$

**9.** Do yourself.

**10.** (i) In $\Delta ABD$ and $\Delta ACD$

Given that $AB = AC$ and $AD$ is the altitude from $A$ to side $BC$

Then, $AD$ is common for both triangles




$$AB = BC$$
$$AD = AD$$
$$\angle D = \angle D = 90°$$

So, both triangles are congruent.

$$\Delta ABD \cong \Delta ACD$$

(ii) See (i) part for answer.

(iii) Yes, $BD = DC$ because $\Delta ABD \cong \Delta ACD$

**11.** Do yourself.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** Do yourself.

**2.** In $\Delta ABC$

Given that $AB = AC$

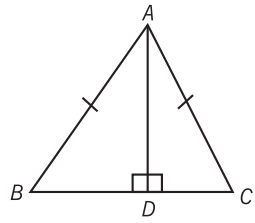
and line segment $AD$ bisects $\angle A$

and meets the base $BC$ at $D$

Now in $\Delta ADB$ and $\Delta ADC$

$$AB = AC$$

and $\angle BAD = \angle CAD$



For the *SAS* congruency third pair of corresponding parts must be,

$$\boldsymbol{AD = AD}$$

Since, $\Delta ADB \cong \Delta ADC$

So, we can say that $BD = DC$.

**3.** Proceed as Q. No. 2.

**4.** Proceed as Q. No. 2.

**5.** (i) In $\Delta ABC$ and $ABD$ three pair of equal parts are

$$AB = DC \Rightarrow \angle B = \angle C \Rightarrow BC = CB$$

(ii) $\Delta ABC \cong \Delta ABD$, because of SAS congruency.

(iii) $BC = BD$, Yes it is true because of parts of congruent triangles.

(iv) $\angle C = \angle D$, Yes it is true because of parts of congruent triangles.

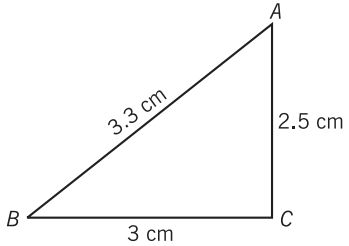
**6.** In the $\Delta ABC$ and $\Delta ACD$

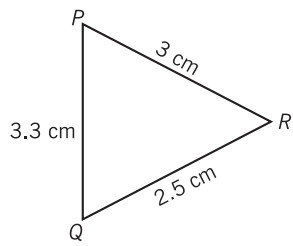
Given that $\angle CAD = \angle BAD$ and $\angle CDA = \angle BDA$

For the *ASA* congruence condition third pair of corresponding parts must be $\boldsymbol{AD = AD}$

**7.** Proceed as Q. No. 5.

**8.** (i)




In $\Delta ABC$ and $\Delta QPR \Rightarrow BC = PR \Rightarrow AB = PQ \Rightarrow AC = QR$

By *SSS* congruency $\Delta ABC \cong \Delta QPR$

(ii) Do yourself.

**9.** Do yourself. **10.** Do yourself.

# 14. Practical Geometry

Do yourself.

# 15. Symmetry

Do yourself.

# 16. Visualizing Solid Shapes

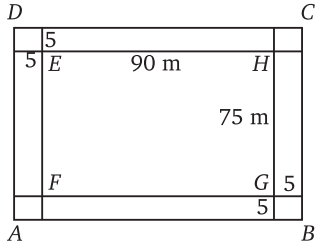
Do yourself.

# 17. Perimeter and Area

**1.** Length width of garden = 75 m

$AB = 90 + 10 = 100$ m

$BC = 75 + 10 = 85$ m




Area of the path = (Area of rectangle $ABCD$ – Area of rectangle $EFGH$)

$= (100 \times 85 - 90 \times 75)\ m^2$

$= \mathbf{1750\ m^2}$

Thus, area of the path is 1750 $m^2$.

**2.** Proceed as Q. No. 1.

**3.** Proceed as Q. No. 1.

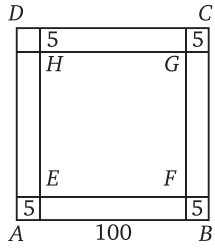
**4.** Side of square park = 100 m

Width of path = 5 m

Area of path = (Area of square $ABCD$ – Area of square $EFGH$)

$= (100 \times 100 - 90 \times 90)\ m^2$

$= 10000 - 8100 = \mathbf{1900\ m^2}$




Thus, 1900 $m^2$ is the area of path.

**5.** (i) Length of the square garden = 30 m

$AB = BC = 30$ m

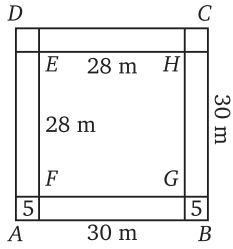
$EF = FG = 28$ m

Area of the path = (Area of square $ABCD$ – Area of square $EFGH$)

$= [(30)^2 - (28)^2]\ m^2$

$= [30 \times 30 - 28 \times 28]\ m^2$

$= [900 - 784]\ m^2 = \mathbf{116\ m^2}$




Thus, 116 $m^2$ is the total area of path.

(ii) Area of remaining portion of the garden

$= (\text{Side})^2 = (28)^2 = 784\ m^2$

Cost of planting grass = ₹ 2.40 per $m^2$

Total cost = Total Area × Cost of per $m^2$

$= 784 \times 2.40 =$ ₹ **1881.60**

Thus, ₹ 1881.60 is the total cost of planting grass in the remaining portion of the garden.

**6.** Cost of fencing a square field = ₹ 3.20 per m

Total cost of fencing = ₹ 6400

Total cost of fencing = Perimeter of square field × cost of fencing per m

$$\text{Perimeter of square field} = \frac{6400}{3.20} = 2000\,\text{m}$$

Perimeter of square field = 4 × side

$$\text{Side} = \frac{2000}{4} = 500\,\text{m}$$

So, area of square field = $(\text{side})^2 = (500\,\text{m})^2$

$= 250000\,\text{m}^2$

We know that $100\,\text{m}^2 = 1$ are

$250000\,\text{m}^2 = 2500$ are

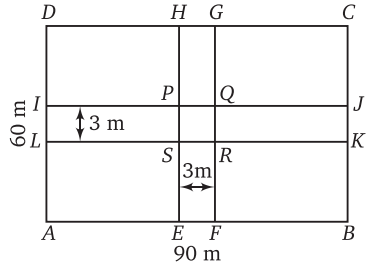
Cost of levelling the field = ₹ 85 per are

Total cost of levelling = 2500 × 85 = ₹ **212500**

Thus, total cost of levelling the field is ₹ 212500.

**7.** (i) Length of rectangular field = 90 m

Width of rectangular field = 60 m




Width of each road = 3 m

Area of total path = (Area of *IJKL* + Area of *EFGH* – Area of *PQRS*)

$= (90 \times 3 + 60 \times 3 - 3 \times 3)\,\text{m}^2$

$= (270 + 180 - 9)\,\text{m}^2 =$ **441 m²**

Thus, 441 $\text{m}^2$ is the total area of the path.

(ii) Cost of constructing the roads = 110 per $\text{m}^2$

Total cost of constructing the roads = 441 × 110 = ₹ **48510**

Thus, total cost of constructing the roads is ₹ 48510.

**8.** Length of room = 12 m

Width of room = 9 m

Area of room = 12 × 9 = 108 $\text{m}^2$

Cost of covering the room with a carpet = ₹ 320 per $\text{m}^2$

Total cost of covering the room = 108 × 320 = ₹ **34560**

Thus, ₹ 34560 is the total cost of covering the room.

**9.** Proceed as Q. No. 7.

**10.** One side of a rectangular garden = 48 m

Let width of garden = $x$

then in $\Delta CBA$, we know that

$$(\text{Hypotenuse})^2 = (\text{base})^2 + (\text{Perpendicular})^2$$

$$(50)^2 = (48)^2 + x^2$$

$$x^2 = 2500 - 2304$$

$$= 196$$

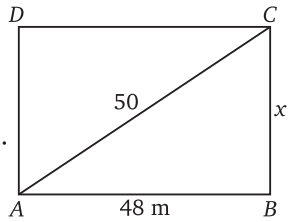
$$x^2 = (14)^2$$

$$x = 14 \text{ m}$$

Width of garden = 14 m

Area of garden = $48 \times 14 =$ **672 m²**

Thus, 672 m² is the total area of garden.




**11.** Length of floor = 18 m

Width of floor = 12 m

Area of floor = $18 \times 12 = 216 \text{ m}^2$

Size of square tile = 12 cm × 12 cm

Area of square tile = 144 cm²

or area of square tile = $\frac{144}{100 \times 100} \text{ m}^2 = 0.0144 \text{ m}^2$

Then, number of tiles required to pave the floor

$$= \frac{\text{Area of floor}}{\text{Area of one square tile}}$$

$$= \frac{216}{0.0144} = 15000 \text{ tiles}$$

Rate of tile = ₹ 80 per tile

Total cost of flooring = $15000 \times 80 =$ ₹ **1200000**

Thus, 15000 tiles are required to pave the floor and ₹ 1200000.

**12.** Area of floor walls of a room = 154 m²

Length of the room = 13 m

Width of the room = 9 m

We know that surface area of cuboid

$$= 2(lb + bh + hl) = 2h(l + b)$$

Then $2h(l + b) = 154$

$2h(13 + 9) = 154$

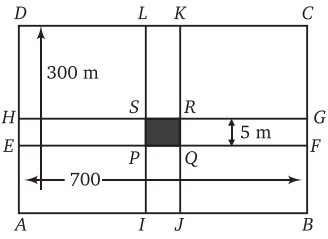
$$h = \frac{154}{2 \times 22} = \mathbf{3.5 \text{ m}}$$

Thus, height of the room is 3.5 m.

**13.** Area of the cross road *EFGH* parallel to the length of the park

$= 700\,\text{m} \times 5\,\text{m}$

$= 3500\,\text{m}^2$




Area of the cross road *IJKL* and parallel to the breadth of the park.

$= 300 \times 5 = 1500\,\text{m}^2$

From the figure, we observe that the shaded area. *PQRS* has been included in both the cross road. But it should some once only.

Area of *PQRS* $= 5\,\text{m} \times 5\,\text{m} = 25\,\text{m}^2$

Area of road = Area of *EFGH* + Area of *IJKL* – Area of *PQRS*

$= (3500 + 1500 - 25) =$ **4975 m²**

Cost of constructing the roads $= 4975 \times 105 =$ **₹ 522375**

Thus, 4975 $\text{m}^2$ is total area of road and ₹ 522375 is the total cost of constructing the roads.

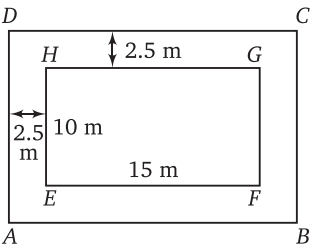
**14.** Width of verandah $= 2.5\,\text{m}$

Length of hall $= 15\,\text{m}$

Width of hall $= 10\,\text{m}$

Area of hall $= 15 \times 10$

$= 150\,\text{m}^2$




Now, length of verandah *AB*

$= 15 + 2.5 + 2.5$

$= 20\,\text{m}$

Width of verandah *AD* $= 10 + 2.5 + 2.5 = 15\,\text{m}$

Area of verandah $= 20 \times 15 = 300\,\text{m}^2$

So, area of floor of verandah = Area of verandah – Area of hall

$= (300 - 150)\,\text{m}^2 = 150\,\text{m}^2$

Cost of cementing the floor = ₹ 16 per square metre

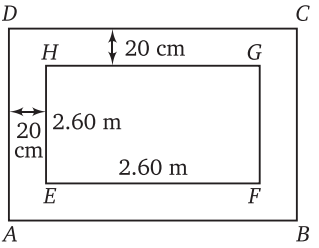
Total cost of cementing the floor $= 150 \times 16 =$ **₹ 2400**

Thus, ₹ 2400 is the total cost of cementing the floor of verandah.

**15.** Side of a square flower-bed $= 2.60\,\text{m}$

Area of square flower-bed

$= (2.60\,\text{m})^2 = 6.76\,\text{m}^2$




On enlarged it by 20 cm

Side of a square flower-bed

$= (2.60 + 0.2 + 0.2)\,\text{m}$

$= 3\,\text{m}$

Enlarged area of the flower-bed

$= (\text{side})^2 = (3\,\text{m})^2 = 9\,\text{m}^2$

Also increase in the area

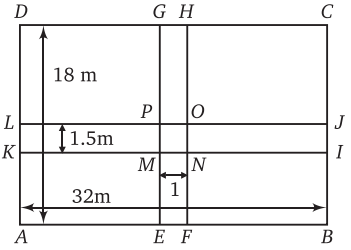
$$= 9\ m^2 - 6.76\ m^2 = \mathbf{2.24\ m^2}$$

Thus, $9\ m^2$ is the area of the enlarged flower-bed also $2.24\ m^2$ is the increase in the area.

**16.** Proceed as Q. No. 14.

**17.** Proceed as Q. No. 9.

**18.** Length of rectangular lawn = 32 m




Width of rectangular lawn = 18 m

Area of total paths = (Area of *LKIJ* + Area of *EFGH*

– Area of *PMNO*)

$= (32 \times 1.5 + 18 \times 1 - 1.5 \times 1)\ m^2$

$= \mathbf{64.5\ m^2}$

Thus, $64.5\ m^2$ is the total area of paths.

**19.** Do yourself. **20.** Do yourself. **21.** Do yourself.

## Exercise 17B

**1.** (i) Length of base = 8 cm

Height of parallelogram = 4.5 cm

Area of parallelogram = base × height = $8 \times 4.5$

$= \mathbf{36\ cm^2}$

Thus, area of parallelogram is $36\ cm^2$.

(ii) and (iii) proceed as above.

**2.** Area of parallelogram = $200\ cm^2$

Side of parallelogram = 12 cm

Area of parallelogram = base × height

$200 = 12 \times$ height

$$\text{height} = \frac{200}{12} = \mathbf{16.66\ cm}$$

Thus, height of parallelogram is 16.66 cm.

**3.** Let the height of parallelogram = $x$

then, the base of parallelogram = $2x$

Area of parallelogram = base × height

$$288 = x \times 2x$$
$$2x^2 = 288$$
$$x^2 = 144$$
$$x^2 = (12)^2$$
$$x = 12$$

Then, height $= 12$ cm

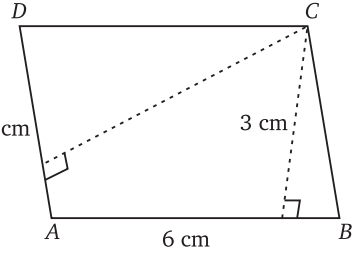
base $= 2x = 2 \times 12 =$ **24 cm**

Thus, base is 24 cm and height of parallelogram is 12 cm.

**4.** (i) On taking 6 cm is the base of the parallelogram, its height is 3 cm

$\therefore$ Area of parallelogram $= (6 \times 3)\,\text{cm}^2 =$ **18 cm$^2$**

Thus, area of parallelogram is 18 cm$^2$.




(ii) Let $x$ can be the distance between the shorter sides, then

Area of the parallelogram $= (4 \times x)\,\text{cm}^2$

$\Rightarrow \quad 4x = 18$

$\Rightarrow \quad x = \dfrac{18}{4} =$ **4.5 cm**

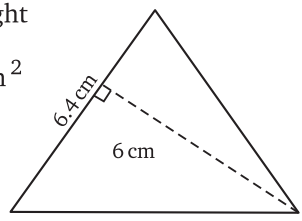
Thus, 4.5 cm is the height corresponding to the base *AD*.

**5.** (i) Area of triangle $= \dfrac{1}{2} \times \text{base} \times \text{height}$

$= \left(\dfrac{1}{2} \times 6.4 \times 6\right)\text{cm}^2$

$=$ **19.2 cm$^2$**

Thus, area of triangle is 19.2 cm$^2$

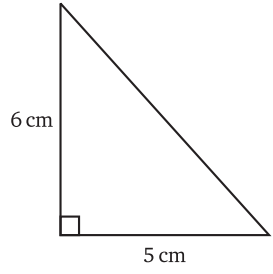



(ii) Area of triangle

$= \left(\dfrac{1}{2} \times 5 \times 6\right)\text{cm}^2$

$=$ **15 cm$^2$**

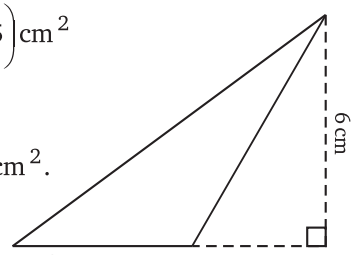
Thus, area of triangle is 15 cm$^2$.



(iii) Area of triangle $= \left(\frac{1}{2} \times 6 \times 4.5\right) \text{cm}^2$

$= \mathbf{13.5\ cm^2}$

Thus, area of triangle is 13.5 $\text{cm}^2$.




**6.** Do yourself.

**7.** Area of triangle $= 120\ \text{cm}^2$

Height of triangle $= 24\ \text{cm}$

Then,

$$\text{Area of triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$120 = \frac{1}{2} \times \text{base} \times 24$$

$$\text{base} = \frac{120 \times 2}{24} = \mathbf{10\ cm}$$

Thus, base of triangle is 10 cm.

**8.** Proceed as Q. No. 7.

**9.** Ratio between base and height of a triangle = 4 : 3

Let the base be $4x$ and height be $3x$

$$\text{Area of triangle} = 150\ \text{cm}^2$$

$$\text{Area of triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$150 = \frac{1}{2} \times 4x \times 3x$$

$$6x^2 = 150$$

$$x^2 = 25$$

$$x^2 = (5)^2$$

$$x = 5\ \text{cm}$$

Then, $\text{base} = 4x = 4 \times 5 = \mathbf{20\ cm}$

$\text{height} = 3x = 3 \times 5 = \mathbf{15\ cm}$

Thus, base and height of a triangle are 20 cm and 15 cm respectively.

**10.** Side of an equilateral triangle $= 6\ \text{cm}$

$$\text{Area of an equilateral triangle} = \frac{\sqrt{3}}{4} a^2$$

$$= \frac{\sqrt{3}}{4} \times (6)^2 = \frac{\sqrt{3}}{4} \times 36$$

$$= 9\sqrt{3}\ \text{cm}^2$$

$= (9 \times 1.732)\,\text{cm}^2 \quad [\because \sqrt{3} = 1.732]$

$= \mathbf{15.588\ cm^2}$

Thus, area of equilateral triangle is 15.588 $\text{cm}^2$.

**11.** In $\Delta ABC$

Given that $BC = 4$ cm,

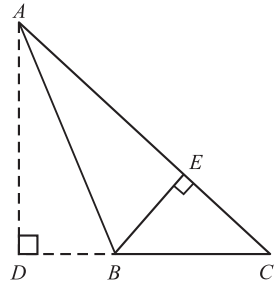
$AD = 7$ cm

and $BE = 5$ cm

Area of triangle $ABC = \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 4 \times 7$

$= \mathbf{14\ cm^2}$




Again in $\Delta BAC$

base $= AC$, height $= BE$

Area of triangle $= \frac{1}{2} \times AC \times BE$

$14 = \frac{1}{2} \times AC \times 5$

$AC = \frac{14 \times 2}{5} = \mathbf{5.6\ cm}$

Thus, length of $AC$ is 5.6 cm.

**12.** (i) Area of $\Delta ABC = \frac{1}{2} \times \text{base} \times \text{height}$

$= \left(\frac{1}{2} \times 9 \times 6\right)\text{cm}^2$

$= \mathbf{27\ cm^2}$

Thus, 27 $\text{cm}^2$ is the area of triangle.

(ii) In $\Delta ABC$, $AB$ = base = 7.5 m and height = $EC$

Area of $\Delta ABC = \frac{1}{2} \times AB \times EC$

$\Rightarrow \quad 27 = \frac{1}{2} \times 7.5 \times EC$

$\Rightarrow \quad 7.5\ EC = 27 \times 2$

$\Rightarrow \quad EC = \frac{54}{7.5} = \mathbf{7.2\ m}$

Thus, the height $CE$ from $C$ to $AB$ is 7.2 cm.

**13.** Area of $\Delta ABC$,

$\frac{1}{2} \times \text{Base} \times \text{height} = \frac{1}{2} \times BC \times AB$

$= \frac{1}{2}(8 \times 6)\,\text{cm}^2$

$$= \frac{1}{2} \times 48\,\text{cm}^2 = 24\,\text{cm}^2$$

let the hypotenuse $= AC$

By Pythagoras law,

$$AC^2 = AB^2 + BC^2$$

$$\Rightarrow \quad AC^2 = (6)^2 + (8)^2$$

$$\Rightarrow \quad AC^2 = 36 + 64 = 100$$

$$\Rightarrow \quad AC = \sqrt{100}$$

$$= 10\,\text{cm}$$

Now, In $\Delta ABC$, $AC$ = Base $= 10$ cm and height $= BN$

$$\therefore \quad \text{Area of triangle} = \frac{1}{2} \times 10 \times BN$$

$$\Rightarrow \quad 24 = \frac{1}{2} \times 10 \times BN$$

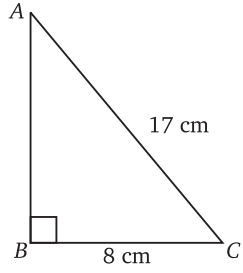
$$\Rightarrow \quad 5BN = 24$$

$$BN = \frac{24}{5}$$

$$= \mathbf{4.8\ cm}$$

Thus, 4.8 cm is the length of perpendicular $BN$ on the side $AC$.

**14.** Let $\Delta ABC$ be a right-angled triangle, at $B$ *i.e.,* $\angle B = 90°$ and its base $BC = 8$ cm and hypotenuse AC = 17 cm




From $\Delta ABC$, by Pythagoras law, we get

$$AC^2 = BC^2 + AB^2$$

$$\Rightarrow \quad (17)^2 = (8)^2 + AB^2$$

$$\Rightarrow \quad AB^2 = (17)^2 - (8)^2$$

$$\Rightarrow \quad AB^2 = 289 - 64 = 225$$

$$\Rightarrow \quad AB = \sqrt{225} = 15\,\text{cm}$$

$$\text{Area of } \Delta ABC = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \left(\frac{1}{2} \times 8 \times 15\right)\text{cm}^2 = \mathbf{60\ cm^2}$$

Thus, 60 $\text{cm}^2$ is the required area.

## Exercise 17C

**1.** (i) Given, diameter of circle $= d = 7$ cm

Circumference of circle $= \pi d = \left(\frac{22}{7} \times 7\right)\text{cm} = \mathbf{22\ cm}$

Thus, 22 cm is the circumference of circle

(ii) Given, diameter of circle = 21 cm

Circumference of circle $= \pi d = \left(\frac{22}{7} \times 21\right)$ cm $=$ **66 cm**

Thus, 66 cm is the circumference of circle

(iii) Given diameter of circle = 28 m

Circumference of circle $= \pi d = \left(\frac{22}{7} \times 28\right)$ mm $=$ **88 m**

Thus, 88 m is the circumference of circle.

(iv) Given diameter of circle = 3.5 cm

Circumference of circle $= \pi d = \left(\frac{22}{7} \times \frac{35}{10}\right)$ cm $= \frac{110}{10} =$ **11 cm**

Thus, 11 cm is the circumference of circle.

**2.** (i) Area of circle $= \pi r^2$ ($r$ = radius)

Radius of circle $= 14$ mm

$\pi r^2 = \left(\frac{22}{7} \times 14 \times 14\right)$ mm

$= 44 \times 14 =$ **616 mm$^2$**

Thus, area of circle is 616 mm$^2$.

(ii) Diameter of circle $= 49$ m

$\therefore$ radius of circle $= \left(\frac{1}{2} \times 49\right) = \frac{49}{2}$ m

Area of circle $= \pi r^2 = \frac{22}{7} \times \left(\frac{49}{2}\right)^2$

$= \frac{22}{7} \times \frac{49}{2} \times \frac{49}{2} =$ **1886.5 m$^2$**

Thus, area of circle is 1886.5 m$^2$.

(iii) diameter of circle $= 9.8$ m

$\therefore$ radius of circle $= \frac{98}{2 \times 10} = 4.9$ m

$\therefore$ Area of circle $= \frac{22}{7} \times \frac{49}{10} \times \frac{49}{10}$

$= \frac{22 \times 7 \times 49}{100} = \frac{7546}{100} =$ **75.46 m$^2$**

Thus, area of circle is 75.46 m$^2$.

(iv) Radius of circle = 5 cm

Area of circle $= \frac{22}{7} \times 5 \times 5$

$= \frac{22 \times 25}{7} =$ **$\frac{550}{7}$ cm$^2$**

Thus, area of circle is $\frac{550}{7}$ cm$^2$.

**3.** Radius of tower clock = length of minute hand = 1.4 m

$\therefore$ Circumference of tower clock = distance cover by minute hand

$$= 2\pi r = 2 \times \frac{22}{7} \times \frac{14}{10} = \frac{88}{10} = \mathbf{8.8\ m}$$

Thus, radius of the circle is 8.8 m.

**4.** Circumference of circle exceeds diameter by 30 cm.

$$\therefore \quad 2\pi r = d + 30$$
$$\Rightarrow \quad 2\pi r = 2r + 30$$
$$\Rightarrow \quad 2\pi r - 2r = 30$$
$$\Rightarrow \quad 2r(\pi - 1) = 30$$
$$\Rightarrow \quad 2r\left(\frac{22}{7} - 1\right) = 30$$
$$\Rightarrow \quad 2r\left(\frac{22-7}{7}\right) = 30$$
$$2r \times \frac{15}{7} = 30$$
$$r = \frac{30 \times 7}{15 \times 2} = \mathbf{7\ cm}$$

Thus, radius of the circle is 7 cm.

**5.** Radius of circle $= 20\,\text{cm}$

Circumference of circle $= 2\pi r = 2 \times 3.14 \times 20 = 125.6\ \text{cm}$

Area of circle $= \pi r^2 = 3.14 \times 20 \times 20 = \mathbf{1256\ cm^2}$

Thus, 125.6 cm is the circumference of circle and 1256 $\text{cm}^2$ is the area of circle.

**6.** Area of circle $= 144\pi\,\text{cm}^2$

Then, $\pi r^2 = 144\pi$

$r^2 = 144$

$r^2 = (12)^2 = \mathbf{12\ cm}$

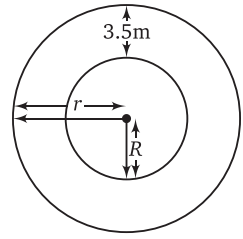
Circumference of circle $= 2\pi r = 2 \times 12\ \text{cm} = \mathbf{24\ \pi\ cm}$

Thus, radius and circumference of circle is 12 cm and $24\pi$ cm.

**7.** Outer circumference of circular park = 396 m

Let '$r$' is the radius of circular park with path then $2\pi r = 396$

$$2 \times \frac{22}{7} \times r = 396$$
$$r = \frac{396 \times 7}{22 \times 2} = 63\ \text{cm}$$




Let '$R$' is the radius of circular park

then, $r = R + 3.5$

$63 = R + 3.5$

$R = 63 - 3.5 = 59.5\,\text{cm}$

$$\text{Area of park} = \pi R^2 = \frac{22}{7} \times (59.5)^2$$

$$= \frac{22}{7} \times 59.5 \times 59.5 = 11126.5\,\text{m}^2$$

Now, area of park with path

$$= \pi r^2 = \frac{22}{7} \times (63)^2$$

$$= \frac{22}{7} \times 63 \times 63 = 12474\ \text{m}^2$$

$$\text{Area of path} = \text{Area of park with path} - \text{Area of park}$$

$$= 12474\,\text{m}^2 - 11126.5\,\text{m}^2$$

$$= 1347.50\,\text{m}^2$$

Cost of gravelling the path $= ₹\,4.15$ per $\text{m}^2$

Total cost of gravelling the path $= 4.15 \times 1347.50 =$ **₹ 5592.13**

Thus, area of path is 1347.50 $\text{m}^2$ and total cost of gravelling the path is ₹ 5592.13.

**8.** Number of revolutions made by truck wheel = 12000

Distance covered in 12000 revolution = 26.4 km or 26400 m

Distance covered in 1 revolution

$$= \frac{\text{Total distance covered by truck}}{\text{Number of revolution}}$$

$$= \frac{26400}{12000} = 2.2\ \text{m}$$

Circumference of truck wheel = Distance covered in 1 revolution

$$2\pi r = 2.2$$

$$2 \times \frac{22}{7} \times r = 2.2$$

$$r = \frac{2.2 \times 7}{2 \times 22} = 0.35\,\text{m or } 35\ \text{cm}$$

Diameter of truck wheel $= 2 \times$ radius $= 2 \times 35 =$ **70 cm**

Thus, diameter of truck wheel is 70 cm.

**9.** Proceed as Q. No. 6.

**10.** Circumference of the circle $= 44$ cm

$\therefore \quad 2\pi r = 44$

$\Rightarrow \quad \pi r = \frac{44}{2} = 22$

$\Rightarrow \quad \frac{22}{7} \times r = 22 \quad \Rightarrow \quad r = 7$ cm

Diameter of circle $= 2 \times$ radius $= 2 \times 7 =$ **14 cm**

Thus, 14 cm is the length of diameter.

**11.** Diameter of the wheel $= 56$ cm

$\therefore$ radius $= \frac{56}{2} = 28$ cm

$\therefore$ Circumference $= 2\pi r$

$= 2 \times \pi \times 28 = 2 \times \frac{22}{7} \times 28$

$= 8 \times 22 = 176$ cm

No. of rotations $= \frac{\text{distance covered by car}}{\text{distance covered in 1 rotation}}$

$= \frac{88 \times 10^3 \times 10^2}{176} =$ **50000**

Thus, number of rotation is 50000.

**12.** Diameter of the wheel of car $= 84$ cm

Then radius of the wheel of car $= \frac{84}{2}$ cm $= 42$ cm

Circumference of wheel $= 2\pi r = 2 \times \frac{22}{7} \times 42$

$= 264$ cm

Distance covered in 1 revolution = Circumference of wheel

$= 264$ cm

Then, distance covered in 1500 revolution

$= 1500 \times 264$

$= 396000$ cm or **3.96 km**

Thus, it will go 3.96 km in 1500 revolution.

**13.** Length of wire $= 18.7$ cm

Width of wire $= 14.3$ cm

Diameter of rectangle $= 2(l + b) = 2(18.7 + 14.3) = 66$ cm

Circumference of circle = Perimeter of rectangle

$\Rightarrow \quad 2\pi r = 66 \quad \Rightarrow \quad r = \frac{66}{2\pi}$

$\Rightarrow \quad r = \frac{66 \times 7}{2 \times 22} = \frac{21}{2}$

$\Rightarrow \quad r = 10.5$ cm

Thus, 10.5 cm is the radius of the circle.

**14.** Side of equilateral triangle $= 4.4$ cm

$\therefore$ Perimeter of triangle $= 3 \times 4.4 = 13.2$ cm

$\therefore$ Perimeter of circle = Perimeter of equilateral triangle

$\Rightarrow \quad 2\pi r = 13.2 \quad \Rightarrow \quad r = \frac{13.2 \times 7}{2 \times 22}$

$\Rightarrow \quad r = 2.1$ cm

Then, area of circle $= \pi r^2 = \frac{22}{7} \times (2.1)^2$

$= \frac{22}{7} \times 2.1 \times 2.1 =$ **13.86 cm²**

Thus, radius and circumference of circle are 2.1 cm and 13.86 $cm^2$ respectively.

**15.** Proceed as Q. No. 7.

**16.** Radius of circular card sheet $= 14$ cm

Then, area of circular card sheet $= \pi r^2 = \frac{22}{7} \times (14)^2$

$= \frac{22}{7} \times 14 \times 14 = 616\ cm^2$

Radius of circles $= 3.5$ cm

Then, area circle $= \pi r^2 = \frac{22}{7} \times (3.5)^2 = 38.5\ cm^2$

Length of rectangle $= 3$ cm

Width of rectangle $= 1$ cm

Area of rectangle $= l \times b = 3 \times 1 = 3\ cm^2$

Area of the remaining sheet = Area of circular card sheet

$-$ (2 $\times$ Area of circle + Area of rectangle)

$= 616 - (2 \times 38.5 + 3)$

$= 616 - 80 =$ **536 cm²**

Thus, area of the remaining sheet is 536 $cm^2$.

**17.** Wire is bent in the form of square of side = 27.5 cm

Perimeter of square = length of wire

$= 4 \times 27.5 = 110$ cm

Now, some wire bent in the shape of circle length of wire

= Perimeter of circle

$110 = 2\pi r \quad \Rightarrow \quad r = \frac{110 \times 7}{2 \times 22}$

$\Rightarrow \quad r = \frac{35}{2} = 17.5$ cm

$\therefore$ Area of circle $= \frac{22}{7} \times 17.5 \times 17.5 =$ **962.5 cm²**

Thus, area of circle is 962.5 $cm^2$.

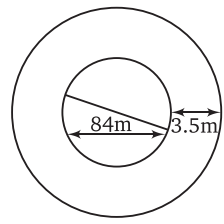
**18.** Diameter of a circular park = 84 m

Radius of a circular park $= \frac{84}{2}$ m $= 42$ m

Area of circular park $= \pi r^2 = \frac{22}{7} \times (42)^2$

$= \frac{22}{7} \times 42 \times 42$

$= 5544\ m^2$



Radius of circular park with road $= 42 + 3.5 = 45.5$ m

Area of circular park with road $= \pi r^2$

$$= \frac{22}{7} \times (45.5)^2$$

$$= \frac{22}{7} \times 45.5 \times 45.5$$

$$= 6506.5$$

Area of road = Area of circular park with road − Area of circular park

$$= 6506.5 - 5544 = 962.5 \text{ m}^2$$

Cost of constructing the road = ₹ 240 per $\text{m}^2$

Then, total cost of constructing the road

$$= 240 \times 962.5 = \textbf{₹ 231000}$$

Thus, ₹ 231000 is the total cost of constructing the road.

**19.** Radius of the outer circle $= 21$ cm

Area of outer circle $= \pi r^2$

$$= \left(\frac{22}{7} \times 21 \times 21\right) \text{cm}^2$$

$$= 1386 \text{ cm}^2$$

Area enclosed between concentric circles $= 770 \text{ cm}^2$

So, area of inner circle $= 1386 - 70 = 616 \text{ cm}^2$

Area of inner circle $= \pi r^2$

$$\Rightarrow \quad \pi r^2 = 616 \quad \Rightarrow \quad r^2 = \frac{616}{\pi}$$

$$\Rightarrow \quad r^2 = \frac{616}{22} \times 7$$

$$\Rightarrow \quad r^2 = 28 \times 7 = 196$$

$$r^2 = (14)^2 \quad \Rightarrow \quad r = \textbf{14 cm}$$

Thus, radius of the inner circle is 14 cm.

**20.** Diameter of the garden $= 21$ m

Then, radius of the garden $= \frac{21}{2} = 10.5$ m

Circumference of the garden $= 2\pi r = 2 \times \frac{22}{7} \times 10.5 = 66$ m

So, length of rope required $= 66 \times 2 = \textbf{132 m}$

Also cost of the rope = ₹ 4 per m

$\therefore$ Total cost of the rope $= 4 \times 132 = \textbf{₹ 528}$

Thus, required length of rope is 132 m and total cost of the rope is ₹ 528.

**21.** Circumference of circle $= 31.4$ cm

$$2\pi r = 31.4 \Rightarrow 2 \times 3.14 \times r = 31.4$$

$$r = \frac{31.4}{2 \times 3.14} \Rightarrow r = 5 \text{ cm}$$

Area of circle $= \pi r^2 = 3.14 \times (5)^2$

$= 3.14 \times 5 \times 5 =$ **78.5 cm$^2$**

Thus, radius and area of circle are 5 cm and 78.5 cm$^2$ respectively.

**22.** Circle with maximum area diameter $d = 21$ cm

Shaded area = Square area – Circle area

$$= (21)^2 - \pi\left(\frac{21}{2}\right)^2$$

$$= 441 - \frac{22}{7} \times \frac{441}{4}$$

$$= 441\left(1 - \frac{22}{28}\right) = 441\left(\frac{28 - 22}{28}\right)$$

$$= 441 \times \frac{6}{28} = \mathbf{94.5\ cm^2}$$

Thus, area of cardboard is 94.5 cm$^2$.

**23.** Do yourself.

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** Perimeter of a square park $= 440$ m

$$4 \times \text{side} = 440 \Rightarrow \text{side} = \frac{440}{4} = 110 \text{ m}$$

Then, area of park $= (\text{side})^2 = (110)^2$

$= 110 \times 110 = 12100$ m$^2$

Cost of growing grass = ₹ 2.15 per sq. m

Total cost of growing grass $= 2.15 \times 12100 =$ ₹ **26015**

Thus, 12100 m$^2$ is the area of park and ₹ 26015 is the total cost of growing grass on it.

**2.** Side of a square $= 20$ cm

Area of square $= (\text{side})^2 = (20)^2 = 400$ cm$^2$

Now, wire is rebent into a rectangle of length 22 cm

Then,

Perimeter of square = Perimeter of rectangle

$4 \times \text{side} = 2(l + b)$

$$4 \times 20 = 2(22 + b)$$
$$22 + b = \frac{4 \times 20}{2} = 40$$
$$b = 40 - 22 = 18\,\text{cm}$$
$$\text{So, area of rectangle} = l \times b = 22 \times 18 = 396\,\text{cm}^2$$
$$396 < 400$$

So, square encloses more area.

**3.** Ratio of length and width $= 4 : 3$

Let the length and width be $4x$ and $3x$ respectively

$$\text{Area of rectangular garden} = 4800\,\text{m}^2$$
$$4x \times 3x = 4800$$
$$12x^2 = 4800 \Rightarrow x^2 = 400$$
$$x^2 = (20)^2 \Rightarrow x = 20$$
$$\text{So, length} = 4x = 4 \times 20 = 80\,\text{m}$$
$$\text{Width} = 3x = 3 \times 20 = 60\,\text{m}$$
$$\text{Perimeter of rectangular garden} = 2(l + b)$$
$$= 2(80 + 60) = 280\,\text{m}$$

Cost of fencing it with wire four times $= 280 \times 4 \times 1.75 = ₹\,1960$

Thus, ₹ 1960 is the total cost of fencing.

**4.**
$$\text{Length of room} = 12\,\text{m}$$
$$\text{Width of room} = 8\,\text{m}$$
$$\text{Height of room} = 4\,\text{m}$$

So,
$$\text{area of four walls} = 2 \times (l + b) \times h$$
$$= 2 \times (12 + 8) \times 4\,\text{m}^2$$
$$= 160\,\text{m}^2$$
$$\text{Area of two doors} = 2 \times (2.2 \times 1.6) = 7.04\,\text{m}^2$$
$$\text{Area of two windows} = 2 \times (2.4 \times 2.2) = 10.56\,\text{m}^2$$
$$\text{Area of walls} = \text{area of room} - \text{Area of door} - \text{Area of windows}$$
$$= 160 - 7.04 - 10.56$$
$$= 160 - 17.6$$
$$\text{Area of walls} = 142.4\,\text{m}^2$$

Cost of white washing of walls $= 142.4 \times 7.7 =$ ₹ **1096.48.**

**5.**
$$\text{Area of four walls} = 420\,\text{m}^2$$
$$\text{Length of room} = 2 \times \text{width of room}$$
$$\text{Height of room} = 5\,\text{m}$$

Let
$$\text{Width of room} = x$$
$$\text{Length of room} = 2x$$

Area of four walls $= 2 \times (l + b) \times h$

$420 = 2 \times (x + 2x) \times 5$

$420 = 2 \times (3x) \times 5$

$420 = 30x \Rightarrow x = 14$ m

Thus, Width of room = **14 m**

Length of room = **28 m**

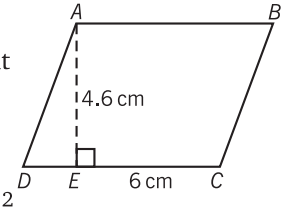
**6.** Find the area of following :

(i) Area of given figure = base × height

$= DC \times AE$

$= 6 \times 4.6$

$= \mathbf{27.6\ cm^2}$



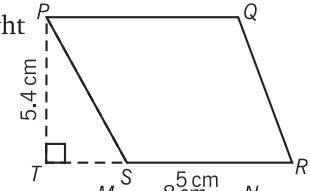

Thus, Area of given figure = 27.6 $cm^2$.

(ii) Area of given figure = base × height

$= SR \times PT$

$= 5 \times 5.4$

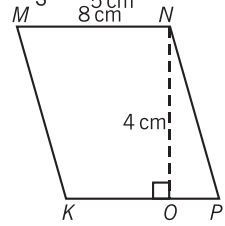
$= \mathbf{27\ cm^2}$




(iii) Area of given figure = base × height

$= MN \times NO$

$= 8 \times 4 = \mathbf{32\ cm^2}$




**7.** $PQ = 12$ cm

$QR = 8$ cm

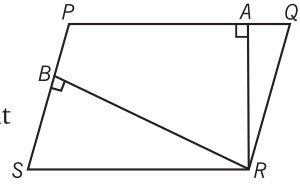
$AR = 9$ cm

Area of parallelogram = base × height

$= PQ \times AR$

$= 12 \times 9$

$= \mathbf{108\ cm^2}$




Let, length of $RB = x$

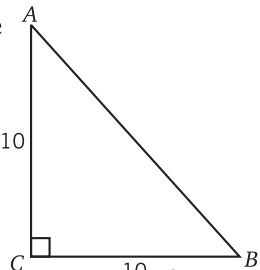
Area of parallelogram = base × height

$108 = SR \times RB = QR \times RB$ $(\because QR = SR)$

$108 = 8 \times RB$

Thus, $RB = \mathbf{13.5\ cm.}$

**8.** Area of an isosceles right angled triangle whose each of equal sides 10 cm.




$$\text{Area of triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times 10 \times 10 = 50\ \text{cm}^2$$

**9.** Base of triangular $= BC$

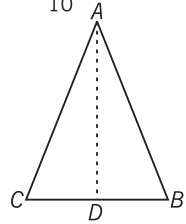
height of triangular $= AD$

Let height $= x$

base of triangular $= 3 \times$ altitude (height)

base of triangular $= 3 \times x$

$$\text{Area of triangular} = \frac{1}{2} \times \text{base} \times \text{height}$$




$$1\ \text{hm} = 100\ \text{m}$$

$$\frac{1012.50 \times 100}{75} = \frac{1}{2} \times 3x \times x$$

$$x = 300\ \text{m}$$

Thus, height of triangular $=$ **300 m**

base of triangular $= 900\ \text{m}$

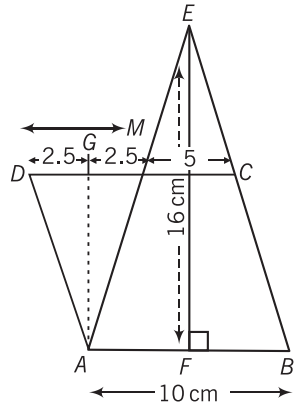
**10.** Area of $\Delta ABE$ = Area of $\square ABCD$

$$\text{Area of } \Delta ABE = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times AB \times EF$$

$$= \frac{1}{2} \times 10 \times 16$$

$$= 80\ \text{cm}^2$$




then,

Area of $\square ABCD = 80\ \text{cm}^2$

base $\times$ height $= 80$

$10 \times$ height $= 80$

height $= 8\ \text{cm}$

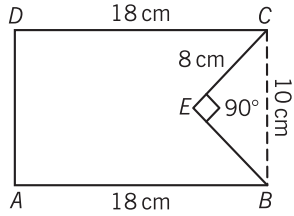
Length of altitude of $ABCD = 8\ \text{cm}$

$$\text{Area of } \Delta AMD = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times DM \times AG = \frac{1}{2} \times 5 \times 8$$

$$= 20\ \text{cm}^2$$

**11.** By theorem




$$BC^2 = EC^2 + EB^2$$
$$100 = 64 + EB^2$$
$$EB^2 = 36$$
$$EB = 6$$

Area of rectangle of size = length × width
$= 18 \times 10 = 180\,\text{cm}^2$

$$S = \frac{a+b+c}{2} = 12$$

Area of triangular $= \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{12\,(2)\,(4)\,(6)} = 6 \times 4 = 24\,\text{cm}^2$

Area of shaded region = Area of rectangular − Area of triangular
$= 180 - 24 =$ **156 cm²**

**12.** (i) radius $(r) = 14$ cm

Circumference of the circle $= 2\pi r$
$= 2 \times \frac{22}{7} \times 14 =$ **88 cm**

(ii) radius $(r) = 21$ dm

Circumference of the circle $= 2\pi r$
$= 2 \times \frac{22}{7} \times 21 =$ **132 dm**

(iii) radius $(r) = 35$ cm

Circumference of the circle $= 2\pi r$
$= 2 \times \frac{22}{7} \times 35 =$ **220 cm**

(iv) radius $(r) = 56$ dm

Circumference of circle $= 2\pi r$
$= 2 \times \frac{22}{7} \times 56 =$ **352 dm**

**13.** (i) diameter of circle $= 14$ cm

radius of circle $= \frac{14}{2} = 7$ cm

Area of circle $= \pi r^2$
$= \frac{22}{7} \times (7)^2 = \frac{22}{7} \times 7 \times 7 =$ **154 cm²**

(ii) diameter of circle $= 56$ cm

radius of circle $= \frac{56}{2} = 28$ cm

Area of circle $= \pi r^2$

$= \frac{22}{7} \times (28)^2$

$= \frac{22}{7} \times 28 \times 28 =$ **2464 cm²**

(iii) diameter of circle $= 63$ dm

radius of circle $= \frac{63}{2} = 31.5$ dm

Area of circle $= \pi r^2$

$= \frac{22}{7} \times (31.5)^2 = \frac{22}{7} \times 31.5 \times 31.5$

$=$ **3118.5 dm²**

(iv) diameter of circle $= 84$ dm

radius of circle $= \frac{84}{2} = 42$ dm

Area of circle $= \pi r^2$

$= \frac{22}{7} \times (42)^2$

$= \frac{22}{7} \times 42 \times 42 =$ **5544 dm²**

**14.** Radius of a circular park $= 56$ m

Circumference of park $= 2\pi r = 2 \times \frac{22}{7} \times 56 = 352$ m

The cost of circular park $= 352 \times 3.85 =$ ₹ 1355.2

The cost of wire $= 2 \times$ cost of circular park

$= 2 \times 1355.2 =$ ₹ **2710.4**

**15.** Circumference of circular garden $= 308$ m

$2\pi r = 308 \quad \Rightarrow \quad r = 49$ m

Area of circular garden $= \pi r^2$

$= \frac{22}{7} \times (49)^2 = \frac{22}{7} \times 49 \times 49 = 7546$ m²

The cost of grassing $= 7546 \times 4.85 =$ ₹ 36598.10

**16.** The ratio of radius of two circle $= r_1 : r_2 = 4 : 9$

Ratio of circumference of two circle $= 2\pi r_1 : 2\pi r_2$

$= 2\pi(4) : 2\pi(9) = 4 : 9$

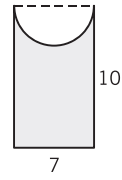
**17.** (i) Length of boundary

$=$ semi circle length $+ 10 + 7 + 10$

$= \frac{2\pi r}{2} + 27$

$= \frac{22}{7} \times \frac{7}{2} + 27$

$= 27 + 11 =$ **38 cm**



Area of shaded region = Rectangle area – Semi circle area

$$= 10 \times 7 - \frac{\pi r^2}{2}$$

$$= 10 \times 7 - \frac{22}{7} \times \frac{7 \times 7}{2 \times 4}$$

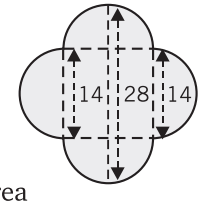
$$= 70 - 19.25 = \mathbf{50.75\ cm^2}$$

(ii) Perimeter of figure $= 4 \times \frac{2\pi r}{2}$

$= 4 \times \pi r$

$= 4 \times \frac{22}{7} \times 7$

$= 88$ cm




Area of shaded region $= 4 \times$ Semicircle Area + Area of Rectangle

$$= 4 \times \frac{\pi r^2}{2} + 14 \times 14$$

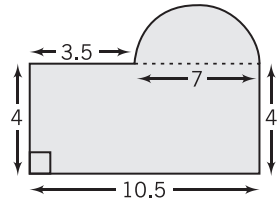
$$= 4 \times \frac{22}{7} \times \frac{7 \times 7}{2} + 196$$

$$= 308 + 196 = 504\ \text{cm}^2$$

**18.** (i) Perimeter of semicircle $= \frac{2\pi r}{2} = \pi r$

$= \frac{22}{7} \times \frac{7}{2}$

$= 11$ m




Perimeter of region $= 10.5 + 3.5 + 4 + 4 + 11 = 33$ cm

Area of shaded region = Rectangle Area + Semicircle Area

$$= 10.5 \times 4 + \frac{\pi r^2}{2}$$

$$= 42 + \frac{22}{7} \times \frac{7}{2 \times 2} \times \frac{7}{2}$$

$$= 42 + \frac{77}{4} = \frac{245}{4} = 61.25\ \text{cm}^2$$

(ii) Perimeter of given region

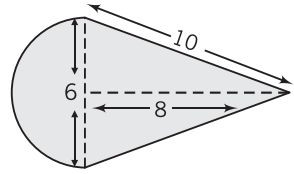
$$= 2\pi r + 10 + 10$$

$$= \frac{2\pi r}{2} + 20$$

$$= \frac{22}{7} \times 6 + 20$$

$$= \frac{132 + 140}{7}$$

Perimeter $= \frac{272}{7} = 38\frac{6}{7}$ cm



Area of given region = Area of triangle + Area of Semicircle

$$= \frac{1}{2} \times \text{base} \times \text{height} + \frac{\pi r^2}{2}$$

$$= \frac{1}{2} \times 12 \times 8 + \frac{22}{7} \times \frac{6 \times 6}{2}$$

$$= 48 + \frac{396}{7} = \frac{336 + 396}{7}$$

$$= \frac{732}{7} = 104\frac{4}{7}\text{ cm}^2$$

# 18. Data Handling

## Exercise 18A

**1.** Do yourself.

**2.** 12, 0, 5, 6, 8, 10, 10, 5, 12, 20, 20, 1, 2, 5, 6, 8, 10, 12, 14, 19

$$\text{Mean} = \frac{12 + 0 + 5 + 6 + 8 + 10 + 10 + 5 + 12 + 20 + 20 + 1 + 2 + 5 + 6 + 8 + 10 + 12 + 14 + 19}{20}$$

$$\text{Mean} = \frac{185}{20} = \mathbf{9.25}$$

**3.**

| **Daily wages ($x_i$)** | **Number of workers $f_i$** | $f_i x_i$ |
|---|---|---|
| 100 | 4 | 400 |
| 150 | 3 | 450 |
| 200 | 2 | 400 |
| 250 | 15 | 3750 |
| 300 | 5 | 1500 |
| 400 | 4 | 1600 |
| 500 | 2 | 1000 |
| | $\Sigma x_i = 35$ | $\Sigma f_i x_i = 9100$ |

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma x_i} = \frac{9100}{35} = \text{₹ } \mathbf{260}$$

**4.** First ten natural number

1, 2, 3, 4, 5, 6, 7, 8, 9, 10

$$\text{Mean} = \frac{1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10}{10}$$

Mean = 5.5

**5.** Weight 4 student of class $= 32$

Sum of 4 student $= 32 \times 4 = 128\,\text{kg}$

Weight of fourth student $= 128 - 36 - 28 - 20 =$ **44 kg**

**6.** $\text{Mean} = \dfrac{12 + 14 + 15 + 10 + 6 + 8 + 5 + 18 + 13 + 19}{10}$

$= \dfrac{120}{10}$

Mean = **12 years**

**7.** First seven odd natural number

1, 3, 5, 7, 9, 11, 13

$\text{Mean} = \dfrac{1+3+5+7+9+11+13}{7} = \dfrac{49}{7}$

Mean = **7**

**8.** First seven prime number

2, 3, 5, 7, 11, 13, 17

$\text{Mean} = \dfrac{2+3+5+7+11+13+17}{7} = \dfrac{58}{7}$

Mean = **8.28**

**9.** 12, 14, $x$, 40, 32 of mean = 28

$$\text{Mean} = \frac{12 + 14 + x + 40 + 32}{5} = 28$$

$x =$ **42**

**10.** (i) 8, 12, 15, 7, 6, 5, 4, 8, 10, 12

Median : 4, 5, 6, 7, 8, 8, 10, 12, 12, 15

$\because$ if number is even.

$$\text{Median marks} = \frac{1}{2}\left[\left(\frac{10^{\text{th}}}{2}\right) + \left(\frac{10^{\text{th}}}{2} + 1\right)\right]$$

$$= \frac{1}{2}[5^{\text{th}} + 6^{\text{th}}] = \frac{1}{2}[8 + 8] = \frac{1}{2} \times 16$$

Median = **8**

(ii) 6, 8, 7, 5, 12, 15, 16, 18, 40, 20, 22

Arrange in Ascending 5, 6, 7, 8, 12, 15, 16, 18, 20, 22, 40

$\because$ if number is odd.

$$\text{Median} = \frac{11^{\text{th}} + 1}{2} = \frac{12^{\text{th}}}{2} = 6^{\text{th}}$$

Median = **15**

**11.** 12, 11, 10, 5, 6, 6, 10, 12, 11, 18, 12, 12, 19, 20, 12, 10, 5, 12, 15, 13, 16, 12

Mode = Occurs maximum number of times

Mode = **12**

**12.**

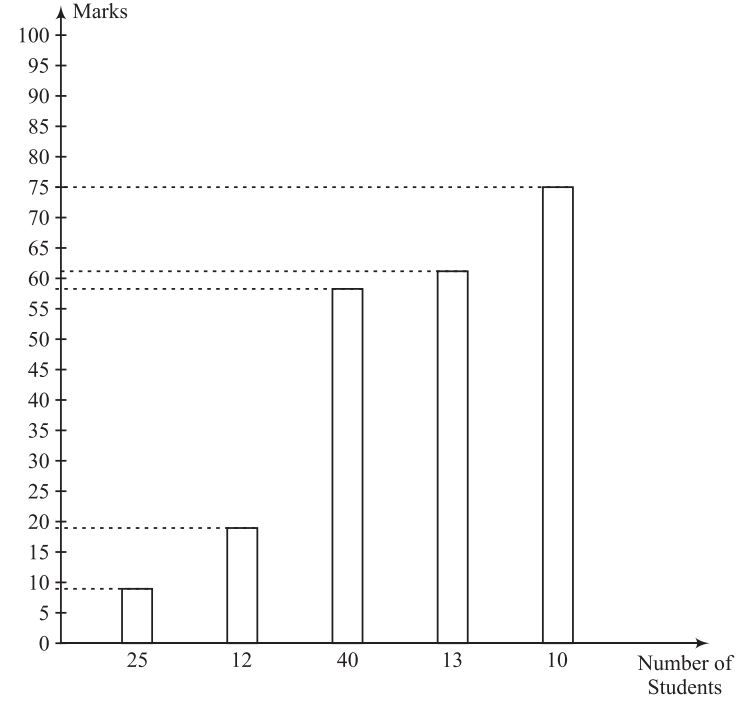
| Height $x_i$ | Number of children $f_i$ | $f_i x_i$ |
|---|---|---|
| 140 | 4 | 560 |
| 145 | 11 | 1595 |
| 150 | 20 | 3000 |
| 155 | 8 | 1240 |
| 158 | 5 | 790 |
| 160 | 2 | 320 |
| | $\Sigma x_i = 50$ | $\Sigma f_i x_i = 7505$ |

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma x_i} = \frac{7505}{50}$$

Mean = **150.10 cm**

## Exercise 18B

**1.**



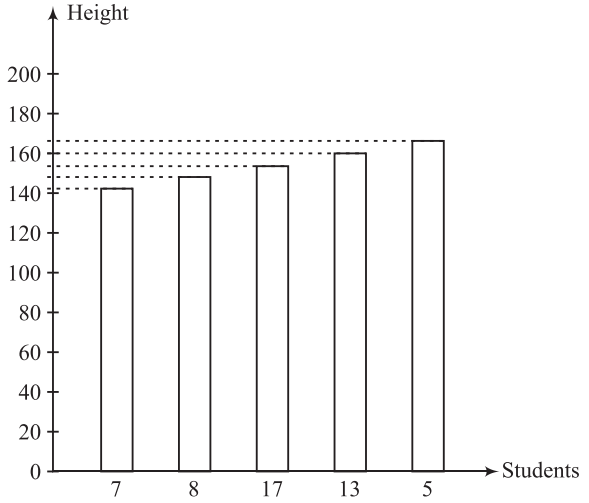

(i) Highest marks of students = 10

Money required = 10 × 10 = ₹ 100

(ii) Lowest marks of students $= 25$

Number of problems $= 25 \times 5 = 125$

**2.**




(i) Percent of total number of student have their more than 150 cm

$$\text{Percentage of student} = \frac{35}{50} \times 100$$

$$\text{Percentage of student} = 35 \times 2 = 70\%$$

(ii) Number of student above 150 but below 160 cm student $= 30$

**3.** 4, 3, 2, 6, 4, 3, 2, 1, 5, 3, 2, 3, 4, 3, 5, 1, 6, 1, 3, 4, 2, 3, 4, 3, 5

(i) Arrange the above data in ascending order

$= 1, 1, 1, 2, 2, 2, 3, 3, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 5, 5, 5, 6, 6$

(ii) Range of data = Maximum value – Minimum value

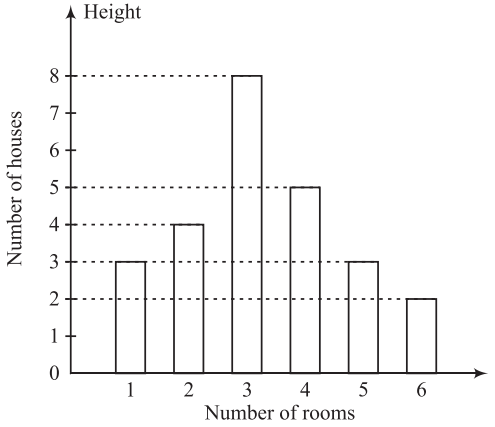
$= 6 - 1 = 5$

(iii) Frequency distribution table for the above data :

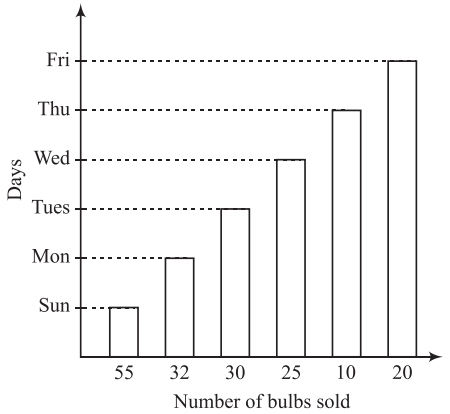
| Number of Rooms | Tally marks | Number of House |
|---|---|---|
| 1 | \|\|\| | 3 |
| 2 | \|\|\|\| | 4 |
| 3 | 𝍸 \|\|\| | 8 |
| 4 | 𝍸 | 5 |
| 5 | \|\|\| | 3 |
| 6 | \|\| | 2 |
| | | Total = 25 |

(iv) Number of houses which have 4 or more than 4 rooms $= 10$

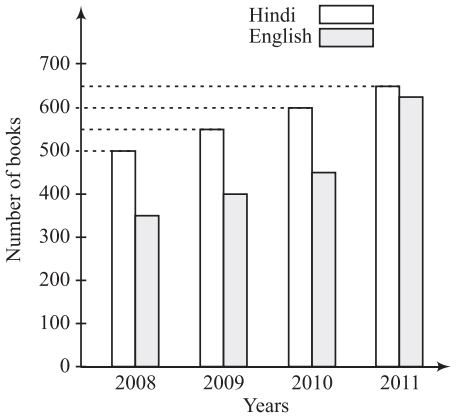
(v) Draw bar graph to repesent data :




**4.** Draw a bar graph to represent :




**5.** Draw double bar graph to represent :



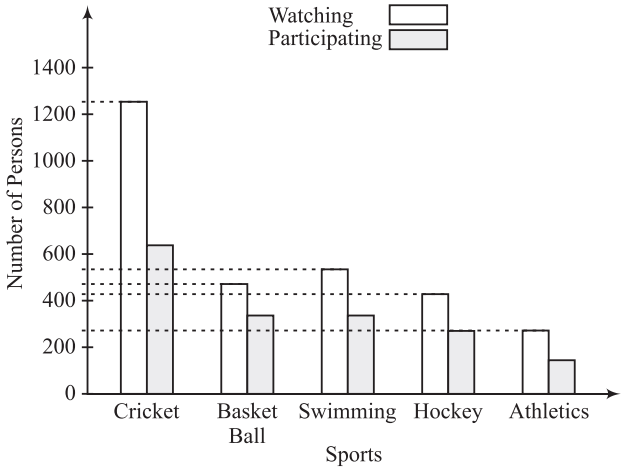

(i) The difference scales of two language books least year =2011

(ii) Yes

Increases in sale of English books = 620 – 350 = 270

Increases in sale of Hindi books = 650 – 500 = 150

**6.** Draw a double bar graph :




(i) Most popular sport = Cricket

(ii) More preferred = Watching

**7.** (i) Books were sold in 2008 by given graph :

In 2008 = 140

In 2009 = 360

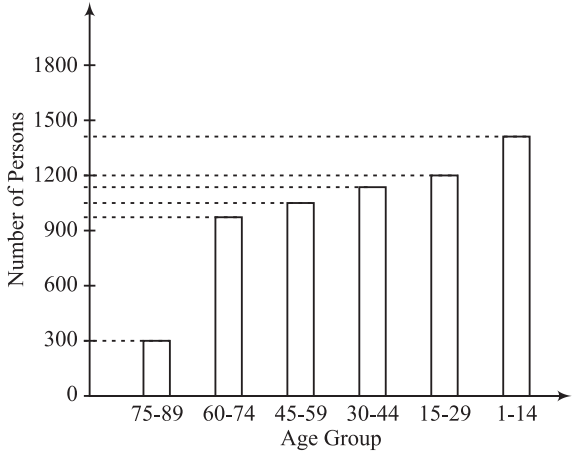
In 2011 = 180

(ii) 475 books are sold = In 2012

225 books are sold = In 2010

**8.** Do it yourself.

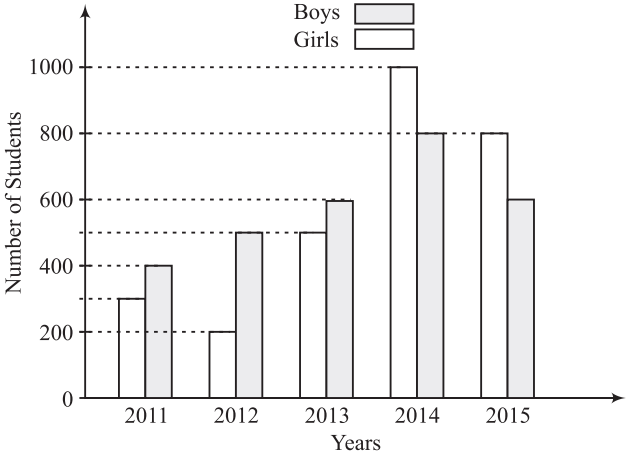
**9.**



(i) Percentage of youngest age group persons over those in oldest age group $= \frac{1400}{300} \times 100 = 466\frac{2}{3}\%$

(ii) Population of the town in all these age groups
$= 1400 + 1200 + 1100 + 1000 + 950 + 300 = 5950$

**10.** A double bar graph to represent data :




**11.** (i) Maximum fruit is sold = Apples
(ii) Boxes of cherries are sold = 50
(iii) Boxes of pears are sold = 70
(iv) Total number of sold boxes = 90 + 70 + 80 + 50 = 290

## Exercise 18C

**1.** Two unbiased coins are tossed :

$$1 - H = H/T = \frac{1}{2} + \frac{1}{2} = \frac{1}{4}$$

$$1 - T = T/H = \frac{1}{2} + \frac{1}{2} = \frac{1}{4}$$

$$\text{Probability} = \frac{1}{4} + \frac{1}{4} = \mathbf{\frac{1}{2}}$$

**2.** (i) Probability for drawing a marble with number 5

$$P(5) = \frac{\text{No. of favourable event}}{\text{Total no. of event}}$$

$$P(5) = \mathbf{\frac{1}{6}}$$

(ii) Probability of drawing a marble with number 2

$$P(2) = \frac{\text{No. of favourable event}}{\text{Total no. of event}}$$

$$P(2) = \frac{\mathbf{1}}{\mathbf{6}}$$

**3.** Two dice are thrown :

(i) An even number as the sum :

Formula = (1,1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)
(1, 3), (3, 1), (1, 5), (5, 1), (2, 4), (4, 2)
(2, 6), (6, 2), (3, 5), (5, 3), (4, 6),(6, 4)

Total outcomes = 36

$$\text{Probability} = \frac{18}{36} = \frac{\mathbf{1}}{\mathbf{2}}$$

(ii) A total of at least 10 :

Formula = (4, 6), (6, 4), (5, 5), (6, 6), (5, 6), (6, 5)

Total outcomes = 36

$$P = \frac{6}{36} = \frac{\mathbf{1}}{\mathbf{6}}$$

(iii) Some number of box dice :

Formula = (1,1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)

$$P = \frac{6}{36} = \frac{\mathbf{1}}{\mathbf{6}}$$

(iv) A multiple of 3 as the sum :

$$P = \frac{12}{36} = \frac{1}{3}$$

**4.** Given :

A coin is flipped to decide which team starts the game.

Probability that your team start :

$$P = \frac{\mathbf{1}}{\mathbf{2}}$$

**5.** A card is drawn from a well-shuffled pack of 52 playing

(i) Probability a red card $= \frac{26}{52} = \frac{\mathbf{1}}{\mathbf{2}}$

(ii) Probability a king $= \frac{4}{52} = \frac{\mathbf{1}}{\mathbf{13}}$

(iii) Probability a card of spades $= \frac{13}{52} = \frac{\mathbf{1}}{\mathbf{4}}$

**6.** A dice is tossed once.

(i) find a number less than 3 :

formula = (1, 2, 3, 4, 5, 6)

$$P = \frac{2}{6} = \frac{\mathbf{1}}{\mathbf{3}}$$

(ii) A prime number :

Formula = (1, 2, 3, 4, 5, 6)

$$P = \frac{3}{6} = \frac{\mathbf{1}}{\mathbf{2}}$$

(iii) A number greater than 2.

$$P = \frac{4}{6} = \frac{2}{3}$$

**7.** Given : 3 defective mangoes
21 good mangoes

(i) Probability a defective mango $= \frac{3}{24}$

$$P = \frac{\mathbf{1}}{\mathbf{8}}$$

(ii) Probability a good mango $= \frac{21}{24}$

$$P = \frac{\mathbf{7}}{\mathbf{8}}$$

## Multiple Choice Questions

Do yourself.

## Revision Exercise

**1.** 12, 10, 12, 14, 8, 15, 8, 9, 6, 5

$$\text{Mean} = \frac{\text{Sum of total number}}{\text{Total number}}$$

$$= \frac{12 + 10 + 12 + 14 + 8 + 15 + 8 + 9 + 6 + 5}{10}$$

$$= \frac{99}{10}$$

Mean $= \mathbf{9.9}$

**2.** (i) 11, 2, 7, 3, 5, 9, 9, 10, 2

1. Arrange in ascending order
2, 2, 3, 5, 7, 9, 9, 10, 11
2. Find no. odd/even

$\rightarrow$ no. is odd
then $n = 9$

$$\text{Median} = \frac{1}{2}(n+1)^{\text{th}} = \frac{1}{2}(9+1)^{\text{th}} = \frac{10^{\text{th}}}{2} = 5^{\text{th}}$$

Median $= \mathbf{7}$

(ii) 16, 8, 21, 22, 15, 6, 18, 25, 9

1. Arrange in ascending order
6, 8, 9, 15, 16, 18, 21, 22, 25
2. no. is odd ($n = 9$)

$$\text{Median} = \frac{1}{2}(n+1)^{\text{th}} = \frac{1}{2}(9+1)^{\text{th}} = \frac{10^{\text{th}}}{2} = 5^{\text{th}}$$

Median $= \mathbf{16}$

(iii) 22, 21, 8, 15, 16, 6, 9, 25, 20, 18, 13

1. Arrange in ascending order
6, 8, 9, 13, 15, 16, 18, 20, 21, 22, 25

2. no. is odd ($n = 11$)

$$\text{Median} = \frac{1}{2}(n+1)^{\text{th}} = \frac{1}{2}(11+1)^{\text{th}} = \frac{12^{\text{th}}}{2} = 6^{\text{th}}$$

Median = **16**

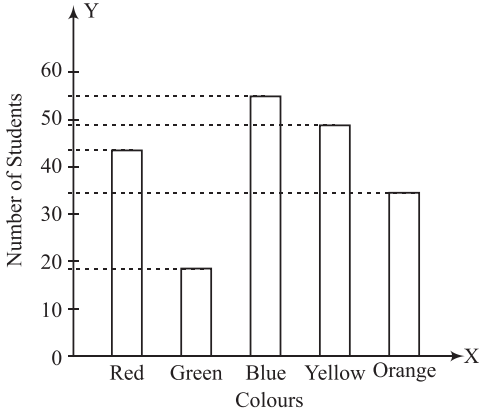
**3.** (i) 9, 5, 7, 6, 7, 11, 8, 10, 7
7 occurs maximum no. of times
Hence, mode = 7

(ii) 21, 72, 15, 21, 62, 43, 21, 14, 16, 73
21 occurs maximum no. of times
Hence, mode = 21

**4.** 10, 9, 8, 7, 6, 9, 9, 8, 8, 8, 10, 7, 7, 6, 5, 10, 8, 8, 9, 7, 6, 8, 8, 10, 8, 5, 6, 8
8 occurs maximum no. of times
Hence, mode of size = 8

**5.** Three ways of collecting data.
(i) Use of questionnaire (ii) Through observations
(iii) Through interviews

**6.** Bar graph of data given :




(i) Most preferred colour = Blue
(ii) Least preferred colour = Green
(iii) There are five colours.
Red, Green, Blue, Yellow and Orange

**7.** Do it yourself.

**8.** Mean of first five multiples of 7.
7, 14, 21, 28, 35

$$\text{Mean} = \frac{\text{Sum of total number}}{\text{Total number}}$$

$$\text{Mean} = \frac{105}{5} = \mathbf{21}$$

**9.** Median of first 15 odd number.

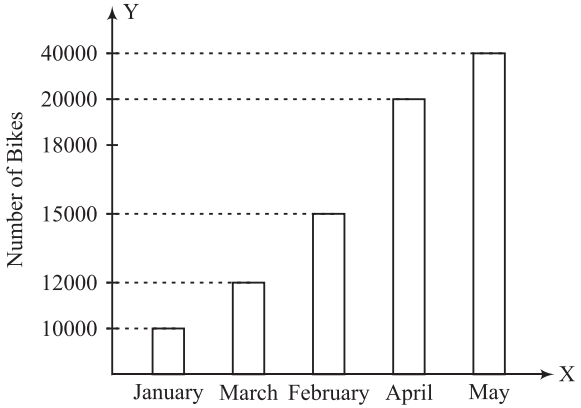
1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29

No. is odd ($n = 15$)

$$\text{Median} = \frac{1}{2}(n+1)^{\text{th}} = \frac{1}{2}(15+1)^{\text{th}} = \frac{16^{\text{th}}}{2} = 8^{\text{th}}$$

Median = 15

**10.**




Bar graph of given data.

**11.** An unbiased dice is thrown.

(i) Probability of an even number or a multiple of

$$= \frac{2+2}{6} = \frac{4}{6}$$

$$P = \mathbf{\frac{2}{3}}$$

(ii) Probability of an even number and a multiple of 3 :

$$P = \frac{1+1}{6} = \frac{2}{6}$$

$$P = \mathbf{\frac{1}{3}}$$

(iii) Probability of an odd number $= \dfrac{\text{no. of odd no.}}{\text{Total number}}$

$$P = \frac{3}{6}$$

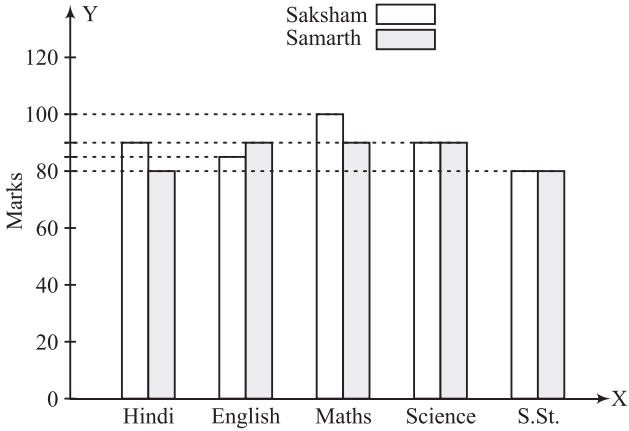
$$P = \mathbf{\frac{1}{2}}$$

(iv) Probability of a number greater them 3 :

$$P = \frac{\text{Greater than 3 no.}}{\text{Total number}} = \frac{3}{6}$$

$$P = \mathbf{\frac{1}{2}}$$

**12.** Bar graph of given data.




**13.** One card is drawn from a pack of 52 cards, each of the 52 cards being equally likely to be drawn.

(i) Probability of an ace $= \frac{4}{52} \Rightarrow P = \mathbf{\frac{1}{13}}$

(ii) Probability of red $= \frac{26}{52} \Rightarrow P = \mathbf{\frac{1}{2}}$

(iii) Probability of either red or black $= \frac{28}{52}$

$$P = \mathbf{\frac{7}{13}}$$

(iv) Probability of 10 of a black suit $= \frac{2}{52}$

$$P = \mathbf{\frac{1}{26}}$$

**14.** (i) Number of newspapers read :

In Hindi = 800
In Punjabi = 400
In Urdu = 200
In Marathi = 300
In Tamil = 100

(ii) The excess of number of newspapers read in Hindi over those of English = 800 – 500 = 300

(iii) Language in which the least number of newspapers are read = Tamil

(iv) The number of copies of news papers read in different language in increases order.

Tamil = 100, Urdu = 200, Marathi = 300
Punjabi = 400, English = 500, Hindi = 800

**15.** Do it yourself.