

# CHAPTER 13

# PROFIT, LOSS AND DISCOUNT

To understand the concept of profit and loss, students must be aware about the following terms and formulae.

**Cost Price (CP)** The price at which a person buys an article is called the Cost Price (CP) of the article.

**Selling Price (SP)** The price at which an article is sold, is called the Selling Price (SP) of the article.

**Marked Price (MP)** The list price of an article is the price at which the article is sold.

## **Profit or Gain**

Whenever a person sells an article at price greater than the cost price he is said to have made a profit or gain.

(i) Profit or Gain = SP - CP [here, SP > CP]

$$(ii) \text{ Profit per cent} = \frac{\text{Profit}}{\text{CP}} \times 100$$

$$(iii) SP = CP \times \frac{100 + Profit\%}{100}$$

## Loss

When SP of an article is less than, then there is a net loss.

$$(i) \text{Loss} = CP - SP \quad [\text{here, } CP > SP]$$

$$(ii) \text{Loss \%} = \frac{\text{Loss}}{\text{CP}} \times 100 \%$$

$$(iii) SP = CP \times \frac{100 - \text{Loss \%}}{100}$$

**Example 1.** Find the SP, When CP is ₹80 and loss is 20%.



**Sol. (2)** Given, CP = ₹ 80 and loss = 20%

$$\therefore SP = \left( \frac{100 - \text{Loss \%}}{100} \right) \times CP$$

$$= \left( \frac{100 - 20}{100} \right) \times 80 = 8 \times 8 = ₹ 64$$

**Example 2.** Find the CP, when SP is ₹40 and gain is 15%.



**Sol. (3)** Given, SP = ₹ 40 and gain = 15%

$$\begin{aligned}\therefore \quad & 40 = CP \times \frac{100+15}{100} \\ \Rightarrow \quad & 40 = CP \times \frac{115}{100} \Rightarrow 40 = CP \times \frac{23}{20} \\ \Rightarrow \quad & CP = \frac{40 \times 20}{23} = ₹ 34.78\end{aligned}$$

**Example 3.** Rajendra sells a radio in ₹ 510 and bears a loss of 15%. At what price should radio be sold to gain a profit of 15%?



$$\text{Sol. (4)} \because CP \times \frac{100 - \text{Loss \%}}{100} = SP$$

$$CP \times \frac{100 - 15}{100} = 510$$

$$CP \times \frac{510 \times 100}{85} = ₹ 600$$

$$\text{Required selling price} = \text{CP} \times \frac{100 + \text{Profit \%}}{100}$$

$$= 600 \times \frac{100+115}{100}$$

$$= 600 \times \frac{115}{100} = ₹ 690$$

**Example 4.** Ranu buys a toy for ₹150 and sells it for ₹165. Find her profit per cent.



**Sol. (1)** Cost price = ₹ 150  
Selling price = ₹ 165

As  $SP \geq CP$  so a net profit

Profit amount =  $165 - 150 = ₹ 15$

$$\therefore \text{Profit per cent} = \frac{\text{Profit}}{\text{CP}} \times 100$$

$$= \frac{15}{150} \times 100 =$$

**Example 5.** Yash purchased a saree for ₹ 2000 and sells it for ₹ 1500. Find his loss per cent.



**Sol. (4)** Cost price (CP) = ₹ 2000

Selling price (SP) = ₹ 1500

As. CP > SP

$$\text{Loss amount} = 2000 - 1500 = \text{₹ } 500$$

$$\therefore \text{Loss per cent} = \frac{\text{Loss}}{\text{CP}} \times 100$$

$$= \frac{500}{2000} \times 100$$

$$= 25\%$$

**Example 6.** A shopkeeper sold a radio in ₹ 810 and bears 10% loss. If he sells the same radio in ₹ 1035, then how much per cent profit he gains?



**Sol. (4)** Here, SP = ₹ 810, Loss = 10 %

$$\Rightarrow \text{CP} \times \frac{100-10}{100} = 810$$

$$\Rightarrow CP \times \frac{90}{100} = 810$$

$$\Rightarrow CP = 810 \times \frac{100}{90}$$

$$= ₹ 900$$

$$\begin{aligned} \text{Now, SP} &= 1035 \\ \text{So, profit} &= \text{SP} - \text{CP} = 1035 - 900 = ₹ 135 \\ \therefore \text{Profit per cent} &= \frac{\text{Profit}}{\text{CP}} \times 100 \\ &= \frac{135}{900} \times 100 \\ &= 15\% \end{aligned}$$

## Discount

It is an offer made by the seller to buyer for reduction in price to be paid.

- (i) Discount = MP - SP
  - (ii) Selling price  
= Marked price  $\times \left( \frac{100 - \text{Rate of discount}}{100} \right)$
  - (iii) Marked price =  $\frac{100 \times \text{Selling price}}{100 - \text{Rate of discount}}$

**Example 7.** A dealer offers 20% discount. If the selling price of the article is 216 then what is the marked price of the article?



**Sol. (1)** Here, SP = 216

Discount = 20%

$$\Rightarrow \frac{MP \times \frac{100 - 20}{100}}{100} = 216$$

$$\Rightarrow MP \times \frac{80}{100} = 216$$

$$\Rightarrow MP = \frac{216 \times 100}{80} = ₹ 270$$

# **Entrance Corner**

- 17.** Find the loss per cent, if CP = ₹ 300, SP = ₹ 250. [ JNV 2000]  
 (1)  $16\frac{2}{3}$       (2) 50  
 (3) 33      (4)  $33\frac{1}{3}$
- 18.** Calculate the gain per cent, if a watch bought for ₹ 450 was sold for ₹ 500. [ JNV 1999]  
 (1) 5      (2)  $11\frac{1}{9}$       (3)  $10\frac{2}{3}$       (4) 15
- 19.** By selling the bicycle for ₹ 1200, David gets 20% profit. Find the cost price of the bicycle. [ JNV 1999]  
 (1) ₹ 900      (2) ₹ 1000  
 (3) ₹ 800      (4) ₹ 700
- 20.** A man bought a bicycle for ₹ 550 for how much should he sell the bicycle so as to gain 10%? [ JNV 1998]  
 (1) ₹ 605      (2) ₹ 610      (3) ₹ 615      (4) ₹ 620
- 21.** Find the profit per cent, if CP = ₹ 500, SP = ₹ 550. [ JNV 1998]  
 (1) 8      (2) 9      (3) 10      (4) 11
- 22.** A man loses 10% by selling an article for ₹ 270. Find the cost price of the article. [ JNV 1998]  
 (1) ₹ 400      (2) ₹ 350      (3) ₹ 420      (4) ₹ 300
- 23.** A man loses 10% by selling his watch for ₹ 450. Find the cost price of the watch. [ JNV 1997]  
 (1) ₹ 400      (2) ₹ 140  
 (3) ₹ 500      (4) ₹ 600
- 24.** A article is sold for ₹ 10 which is a 10% profit of CP, find the CP. [ JNV 1997]  
 (1) ₹ 9.09      (2) ₹ 10  
 (3) ₹ 11      (4) ₹ 10.09
- 25.** The selling price of a fountain pen costing ₹ 6.20 sold at a loss of 10% is [ JNV 1997]  
 (1) ₹ 6.92      (2) ₹ 5.58  
 (3) ₹ 6      (4) ₹ 5.92
- 26.** A merchant lost ₹ 51 by selling 17 bags of the rice for ₹ 1020. What was the cost price per bag? [ JNV 1997]  
 (1) ₹ 61      (2) ₹ 62  
 (3) ₹ 63      (4) ₹ 64
- 27.** A person buys a book for ₹ 27 and sell it at a profit of 10% of SP. Find the SP. [ JNV 1996]  
 (1) ₹ 29.70      (2) ₹ 30  
 (3) ₹ 33      (4) ₹ 39
- 28.** An article is bought for ₹ 180 and sold at a gain of 20%. The selling price of the article is [ JNV 1996]  
 (1) ₹ 108      (2) ₹ 110  
 (3) ₹ 112      (4) ₹ 216
- 29.** If an article is sold at loss of 50%, find the cost price in terms of selling price. [ JNV 1995]  
 (1) 1/2      (2) 2  
 (3) 2.5      (4) None of these
- 30.** The selling price of a fountain pen costing ₹ 10 sold at a loss of 10% is [ JNV 1995]  
 (1) ₹ 7      (2) ₹ 7.50  
 (3) ₹ 8      (4) ₹ 9

**Answers**

1. (2)	2. (4)	3. (3)	4. (3)	5. (3)	6. (1)	7. (1)	8. (4)	9. (2)	10. (2)
11. (1)	12. (4)	13. (4)	14. (2)	15. (3)	16. (3)	17. (1)	18. (2)	19. (2)	20. (1)
21. (3)	22. (4)	23. (3)	24. (1)	25. (2)	26. (3)	27. (1)	28. (4)	29. (2)	30. (4)

## Hints and Solutions

1. We know that  $\text{Loss} = \text{CP} - \text{SP}$

$$= \text{CP} - 500 (\text{SP} = 500 \text{ given})$$

When,  $\text{SP} = 700$  then,  $\text{Gain} = \text{SP} - \text{CP}$   
 $= 700 - \text{CP}$  ( $\text{SP} = 700$  given)

According to question,  $\text{Gain} = 3 \times \text{Loss}$

$$700 - \text{CP} = 3(\text{CP} - 500)$$

$$\Rightarrow 700 - \text{CP} = 3 \times \text{CP} - 1500$$

$$\Rightarrow 700 + 1500 = 3 \times \text{CP} + \text{CP}$$

$$\Rightarrow 2200 = 4(\text{CP})$$

$$\Rightarrow \text{CP} = \frac{2200}{4} = ₹ 550$$

2. Seller buys 2 lemons in ₹ 1

$$\text{Cost price of 1 lemon (CP)} = \frac{1}{2} \quad \dots(i)$$

Seller sells 5 lemon = ₹ 3

$$\text{Selling price of 1 lemon (SP)} = \frac{3}{5} \quad \dots(ii)$$

$$\text{But, profit \%} = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100 = \frac{\frac{3}{5} - \frac{1}{2}}{\frac{1}{2}} \times 100 \\ = \frac{\frac{6-5}{10}}{\frac{1}{2}} \times 100 = \frac{2}{10} \times 100 = 20\%$$

3. Total cost price of TV = ₹ (18200 + 1800)

$$= ₹ 20000 \text{ Profit} = ₹ 3000 \text{ [given]}$$

We know that,

$$\begin{aligned} \text{Selling price} &= \text{Cost price} + \text{Profit} \\ &= 20000 + 3000 \\ &= ₹ 23000 \end{aligned}$$

4. Cost price = 30 - 10 = ₹ 20

$$\begin{aligned} \text{Percentage profit} &= \frac{\text{Profit} \times 100}{\text{Cost price}} \\ &= \frac{10 \times 100}{20} = 50\% \end{aligned}$$

5. Selling price of washing machine = ₹ 13489

Discount allowed = 18%

Let marked price of washing machine be ₹ x.

$$\therefore x - \frac{18x}{100} = 13489$$

$$\frac{82x}{100} = 13489$$

$$\Rightarrow x = \frac{13489 \times 100}{82} = 16450$$

∴ Marked price of washing machine is ₹ 16450.

6. The profit on cell phone = SP - CP

$$= 1650 - 1500 = ₹ 150$$

$$\text{Then, required per cent profit} = \frac{\text{Profit} \times 100}{\text{CP}} \\ = \frac{150 \times 100}{1500} = 10\%$$

7. Cost price of the book = ₹ 150

Selling price of the book = ₹ 180

$$\text{Profit} = 180 - 150 = ₹ 30$$

$$\therefore \text{Profit percentage} = \frac{30}{150} \times 100 = 20\%$$

8. Cost price of radio = 680 + 120 = ₹ 800

$$\therefore \text{Selling price} = 800 + 120 = ₹ 920$$

9. Cost price is ₹ 200.

$$\text{Profit} = 5\%$$

$$\text{SP} = 200 + 200 \times \frac{5}{100} = ₹ 210$$

10. Let the cost price = 100% = ₹ 750

Then, profit percentage = (100 + 18) = 118%

$$\text{The selling price} = \frac{118 \times 750}{100} = ₹ 885$$

11. Cost price of 15 tables = 500 × 15 = ₹ 7500

Cost price of 20 chairs = 300 × 20 = ₹ 6000

Expenditure on transportation = ₹ 40

Total cost price = 7500 + 6000 + 40

(Including expenditure on transportation)

$$= ₹ 13540$$

$$\text{Selling price} = 380 \times 35 = ₹ 13300$$

$$\text{Loss} = 13540 - 13300 = ₹ 240$$

12. ∵ CP of radio = ₹ 900, SP of radio = ₹ 1200

$$\therefore \text{Profit} = 1200 - 900 = ₹ 300$$

$$\therefore \text{Profit percentage} = \frac{\text{Profit} \times 100}{\text{CP}} \\ = \frac{300 \times 100}{900} = \frac{100}{3} = 33\frac{1}{3}\%$$

13. ∵ The CP of 2 dozen brushes = 2 × 10 = ₹ 20

$$\text{SP of 1 brush} = ₹ 1$$

$$\text{SP of 2 dozen or 24 brushes} = 1 \times 24 = ₹ 24$$

$$\therefore \text{Profit} = 24 - 20 = ₹ 4$$

14. CP of 1 dozen oranges = ₹ 21

CP of 60 oranges or 5 dozen oranges

$$= 21 \times 5 = ₹ 105 [\because 1 \text{ dozen} = 12]$$

$$\text{SP of 1 dozen oranges} = ₹ 24$$

$$\text{SP of 5 dozen oranges} = 24 \times 5 = ₹ 120$$

$$\therefore \text{Profit} = \text{SP} - \text{CP} = 120 - 105 = ₹ 15$$

15. Total CP of the table =  $180 + 20 = ₹ 200$   
 Profit = 20%  
 $\therefore \text{SP of the table} = \frac{\text{CP} \times (100 + \text{Profit percent})}{100}$   
 $= \frac{200 \times 120}{100} = ₹ 240$

16. Profit =  $100 - 80 = ₹ 20$   
 Profit percentage =  $\frac{20}{80} \times 100 = 25\%$   
 17. Loss =  $300 - 250 = ₹ 50$   
 Loss percentage =  $\frac{50}{300} \times 100 = \frac{50}{3} = 16\frac{2}{3}\%$   
 18. Gain =  $500 - 450 = ₹ 50$   
 Gain percentage =  $\frac{50}{450} \times 100 = \frac{100}{9} = 11\frac{1}{9}\%$

19. Let the cost price of bicycle be ₹  $x$ . Then,  
 $x + 20\% \text{ of } x = 1200$   
 $\Rightarrow x + \frac{20x}{100} = 1200$   
 $\Rightarrow 120x = 1200 \times 100$   
 $\Rightarrow x = \frac{1200 \times 100}{120} = ₹ 1000$

20. CP = ₹ 550  
 Gain = 10%  
 $= 100 + 10 = 110\%$   
 $\therefore \text{When CP is ₹ 100, SP} = ₹ 110$   
 $\therefore \text{When CP is ₹ 1, SP} = ₹ \frac{110}{100}$   
 $\therefore \text{When CP is ₹ 550, SP} = \frac{110 \times 550}{100} = ₹ 605$

21. Profit =  $550 - 500 = ₹ 50$   
 Profit percentage =  $\frac{50}{500} \times 100 = 10\%$   
 22. Loss = 10%  
 SP = ₹ 270  
 Let the cost price is ₹  $x$ .  
 Then

$$x - 10\% \text{ of } x = 270$$

$$\begin{aligned} &\Rightarrow x - \frac{10x}{100} = 270 \\ &\Rightarrow 90x = 270 \times 100 \\ &\Rightarrow x = \frac{270 \times 100}{90} = ₹ 300 \end{aligned}$$

23. Loss = 10%  
 SP = ₹ 450  
 Let be the cost price is ₹  $x$ .  
 $x - 10\% \text{ of } x = 450$   
 $\Rightarrow x - \frac{10x}{100} = 450$   
 $\Rightarrow 90x = 450 \times 100$   
 $\Rightarrow x = \frac{450 \times 100}{90} = ₹ 500$

24. SP = ₹ 10 = CP + 10% of CP = 110% of CP  
 $CP = \frac{100 \times 10}{110} = ₹ 9.09$

25. CP = ₹ 6.20  
 Loss = 10%  
 $SP = 6.20 \times \frac{90}{100} = ₹ 5.58$

26. Per bag loss =  $\frac{51}{17} = ₹ 3$   
 SP of per bag price =  $\frac{1020}{17} = ₹ 60$   
 Cost price =  $60 + 3 = ₹ 63$  per bag

27. Profit = 10%  
 CP = ₹ 27  
 $SP = 27 \times \frac{110}{100} = 27 \times 1.1 = ₹ 29.70$

28. SP = 120% of 180 =  $\frac{120}{100} \times 180 = ₹ 216$

29. Let CP = 100  
 Loss = 50%  
 $SP = 100 - 50 = 50\%$   
 $\Rightarrow SP = 50\% \text{ of CP}$   
 $\Rightarrow CP = 200\% \text{ of SP}$   
 $\Rightarrow CP = 2 \times SP$

30. CP = ₹ 10  
 Loss = 10%  
 $SP = 10 \times \frac{90}{100} = ₹ 9$

## Practice Exercise

1. A person buys 10 dozen pens at the rate of ₹ 24 per dozen and sells them at the rate of ₹ 36 a dozen. What is his profit or loss?  
(1) ₹ 100, profit      (2) ₹ 100, loss  
(3) ₹ 120, loss      (4) ₹ 120, profit
2. A man purchased a machine for ₹ 7500 and later sold it at a profit of ₹ 750. How much additional profit he would get if he had sold the machine for ₹ 8500?  
(1) ₹ 250      (2) ₹ 500  
(3) ₹ 750      (4) ₹ 1000
3. A basket of oranges was purchased for ₹ 250. At what price should it be sold to earn a profit of ₹ 25?  
(1) ₹ 225      (2) ₹ 240  
(3) ₹ 260      (4) ₹ 275
4. A person buys a book for ₹ 85 and sells it for ₹ 98.60. Find his profit per cent.  
(1) 8      (2) 12  
(3) 16      (4) 18
5. A farmer buys a tractor for ₹ 65000 and sells it for ₹ 58500. Find his loss per cent.  
(1) 10      (2) 10.25  
(3) 10.5      (4) 10.75
6. A person buys a radio for ₹ 1030 and he spent ₹ 50 on its repairs. If he sold it for ₹ 1200, find the profit per cent.  
(1)  $10\frac{1}{3}$       (2)  $11\frac{1}{9}$   
(3)  $12\frac{1}{2}$       (4) None of these
7. By selling an article for ₹ 285 a man loses 5%. For how much should he sell to gain 5%?  
(1) ₹ 315      (2) ₹ 308      (3) ₹ 305      (4) ₹ 302
8. By selling an article for ₹ 3375 a person loses 10%. Find his profit or loss per cent, if he sells it for ₹ 4500.  
(1) 18      (2) 24  
(3) 28      (4) None of these
9. A pen was purchased for ₹ 20. At what price should it be sold to get a profit of 20%?  
(1) ₹ 16      (2) ₹ 18  
(3) ₹ 24      (4) ₹ 40
10. A table was sold for ₹ 180 at a loss of ₹ 20. What was the cost price of that table?  
(1) ₹ 144      (2) ₹ 160  
(3) ₹ 200      (4) ₹ 216
11. A person earns 15% profit on the sale of an article. If the sale price of that article is ₹ 23. Then, its cost price is  
(1) ₹ 8      (2) ₹ 15  
(3) ₹ 20      (4) ₹ 22
12. A man purchases 2 dozen of oranges at the rate of ₹ 24 a dozen sells them at the rate of ₹ 3 per orange what is profit or loss?  
(1) ₹ 12, profit      (2) ₹ 12, loss  
(3) ₹ 24, profit      (4) ₹ 24, loss
13. A person sells 20 books for ₹ 1300 and gets a profit of ₹ 180. What is the cost price of all the books?  
(1) ₹ 56      (2) ₹ 180  
(3) ₹ 1120      (4) ₹ 1480
14. A man earns 10% profit by selling an article. If the sale price of the article is ₹ 385, then its cost price will be  
(1) ₹ 350      (2) ₹ 375  
(3) ₹ 395      (4) ₹ 423.50
15. A person purchases 60 oranges at the cost of ₹ 21 each dozen and sells them at the cost of ₹ 24 each dozen. He gets  
(1) ₹ 3, profit      (2) ₹ 15, profit  
(3) ₹ 15, loss      (4) ₹ 180, profit
16. By selling a dozen pencil at the cost of ₹ 30, the shopkeeper gains ₹ 10. His percentage of profit was  
(1) 20      (2) 35  
(3) 50      (4) 66
17. A watch maker purchased an old watch for ₹ 87. He spends ₹ 10 on its repairing and again he sold the watch for ₹ 105. The profit or loss is  
(1) ₹ 8, profit      (2) ₹ 8, loss  
(3) ₹ 13, profit      (4) ₹ 13, loss
18. A shopkeeper bought 2 dozen of brushes at the rate of ₹ 10 per dozen. If he sells them at ₹ 1 per brush, what profit he will earn?  
(1) ₹ 9      (2) ₹ 7      (3) ₹ 6      (4) ₹ 4

## Answers

<b>1.</b> (4)	<b>2.</b> (1)	<b>3.</b> (4)	<b>4.</b> (3)	<b>5.</b> (1)	<b>6.</b> (2)	<b>7.</b> (1)	<b>8.</b> (4)	<b>9.</b> (3)	<b>10.</b> (3)
<b>11.</b> (3)	<b>12.</b> (3)	<b>13.</b> (3)	<b>14.</b> (1)	<b>15.</b> (2)	<b>16.</b> (3)	<b>17.</b> (1)	<b>18.</b> (4)	<b>19.</b> (4)	<b>20.</b> (3)

## Hints and Solutions

- 1.** Cost price =  $24 \times 10 = ₹ 240$   
 Sale price =  $36 \times 10 = ₹ 360$   
 Profit =  $360 - 240 = ₹ 120$

**2.** Sale price of the machine =  $7500 + 750 = ₹ 8250$   
 $\therefore$  The additional profit if he had sold the machine for ₹ 8500 =  $8500 - 8250 = ₹ 250$

**3.** Cost price of oranges = ₹ 250  
 Profit = ₹ 25  
 Sale price = Cost price + Profit  
 $= 250 + 25 = ₹ 275$

**4.** Profit per cent =  $\left( \frac{\text{Profit}}{\text{CP}} \times 100 \right)$   
 $= \left( \frac{98.60 - 85}{85} \times 100 \right) = 16\%$

**5.** CP = ₹ 65000, SP = ₹ 58500  
 Loss = CP - SP =  $65000 - 58500 = ₹ 6500$   
 $\therefore$  Loss per cent  
 $= \frac{\text{Loss}}{\text{CP}} \times 100 = \frac{6500}{65000} \times 100 = 10\%$

**6.** Total cost =  $1030 + 50 = ₹ 1080$   
 SP = ₹ 1200  
 $\therefore$  Profit per cent =  $\frac{1200 - 1080}{1080} \times 100$   
 $= \frac{120}{1080} \times 100 = 11\frac{1}{9}\%$

**7.** Given, SP = ₹ 285 and loss = 5%, let CP = ₹ x  
 $\Rightarrow 285 = \frac{95x}{100} \Rightarrow x = \left( \frac{285 \times 100}{95} \right) = ₹ 300$   
 Now, CP = ₹ 300 and profit = 5%  
 $SP = \left( \frac{105}{100} \times 300 \right) = ₹ 315$

**8.** SP = ₹ 3375, loss = 10%  
 Then,  $3375 = \frac{90}{100} \times CP$   
 $\Rightarrow CP = \left( \frac{3375 \times 100}{90} \right) = ₹ 3750$   
 Now, CP = ₹ 3750, SP = ₹ 4500  
 Profit = SP - CP  
 $4500 - 3750 = ₹ 750$   
 Profit per cent =  $\left( \frac{\text{Profit}}{\text{CP}} \times 100 \right)$   
 $= \frac{750}{3750} \times 100 = 20\%$

**9.** CP of the pen = ₹ 20  
 Profit = 20%  
 $SP \text{ of the pen} = \frac{(100 + 20)}{100} \times 20$   
 $= \frac{120}{100} \times \frac{20}{1}$   
 $= ₹ 24$

**10.** SP of the table = ₹ 180, Loss = ₹ 20  
 CP of the table = SP + Loss  
 $= 180 + 20 = ₹ 200$

**11.** SP of the article = ₹ 23, Profit = 15%  
 $Cost \text{ price} = \frac{SP \times 100}{100 + \text{Profit per}}$   
 $= \frac{23 \times 100}{(100 + 15)}$   
 $= \frac{23 \times 100}{115} = ₹ 20$

**12.** CP of 2 dozen or 24 oranges = ₹ 24  
 SP of 24 oranges at the rate of ₹ 3 p  
 $= 24 \times 3 = ₹ 72$   
 $\therefore$  Profit =  $72 - 48 = ₹ 24$

**13.** Sale price = ₹ 1300

$$\text{Profit} = ₹ 180$$

$$\therefore \text{Cost price} = 1300 - 180 = ₹ 1120$$

- 14.** SP of the article = ₹ 385

$$\text{Profit} = 10\%$$

$$\Rightarrow \text{CP} = \frac{\text{SP} \times 100}{100 + \text{Profit per cent}}$$

$$= \frac{385 \times 100}{(100 + 10)} = \frac{385 \times 100}{110} = ₹ 350$$

- 15.** 60 oranges =  $\frac{60}{12} = 5$  dozen oranges

$$\therefore \text{Cost price of 1 dozen orange} = ₹ 21$$

$$\therefore \text{Cost price of 5 dozen oranges} = 21 \times 5 = ₹ 105 \\ \text{and the sale price of 5 dozen oranges}$$

$$= 24 \times 5 = ₹ 120$$

$$\therefore \text{Profit} = 120 - 105 = ₹ 15$$

- 16.** Cost price =  $(30 - 10) = ₹ 20$

$$\text{Profit percent} = \frac{\text{Profit} \times 100}{\text{CP}}$$

$$= \frac{10 \times 100}{20} = 50\%$$

- 17.** Cost price of watch = ₹ 87

$$\text{Expense on repairing} = ₹ 10$$

$$\text{Total CP} = 87 + 10 = ₹ 97$$

$$\text{The sale price} = ₹ 105$$

$$\therefore \text{SP} > \text{CP}$$

$$\therefore \text{Profit} = \text{Sale price} - \text{Cost price} \\ = 105 - 97 = ₹ 8$$

- 18.** Cost price of 2 dozen brushes at the rate of ₹ 10 per dozen =  $2 \times 10 = ₹ 20$

$$\text{As, 24 brushes cost price} = ₹ 20$$

$$1 \text{ brush sale price} = ₹ 1$$

$$\therefore 24 \text{ brushes sale price} = 1 \times 24 = ₹ 24$$

$$\therefore \text{Profit} = 24 - 20 = ₹ 4$$

- 19.** Let the cost price be ₹  $x$ . Then,

$$\text{loss} = \text{CP} - \text{SP} = x - 500$$

Again,

$$\therefore \text{Profit} = \text{SP} - \text{CP} = 800 - x$$

According to the question,

$$3 \times \text{Profit} = \text{Loss}$$

$$3 \times (800 - x) = x - 500$$

$$\Rightarrow 2400 - 3x = x - 500$$

$$\Rightarrow 2400 + 500 = 4x$$

$$\Rightarrow x = \frac{2900}{4} = ₹ 725$$

- 20.** Cost price of 1 pencil = ₹  $\frac{10}{11}$

$$\text{and selling price of 1 pencil} = ₹ \frac{11}{10}$$

$$\therefore \text{Profit on 1 pencil} = \frac{11}{10} - \frac{10}{11} = \frac{21}{110}$$

$$\therefore \text{Percentage of profit} = \frac{21/110}{10/11} \times 100$$

$$= \frac{21}{110} \times \frac{11}{10} \times 100 = 21\%$$

## Self Practice

- The cost price of a machine is ₹ 180. It was sold at the loss of 10%. Its sale price is  
(1) ₹ 162      (2) ₹ 168      (3) ₹ 170      (4) ₹ 156
- A person purchased 10 eggs for ₹ 4 and sold 8 eggs for ₹ 4. The profit or loss in the bargain will be  
(1) 25%, profit      (2) 25%, loss      (3) 20% loss      (4) 10%, profit
- A pen was bought for ₹ 20. At what price it must be sold to get the profit of 20%?  
(1) ₹ 16      (2) ₹ 18      (3) ₹ 24      (4) ₹ 40
- A fruitseller purchased 60 oranges at the rate of 12 for ₹ 10. He sold them at the rate of 10 for ₹ 12. What is his profit or loss?  
(1) ₹ 22.00, profit      (2) ₹ 22.00, loss      (3) ₹ 2.00, profit      (4) ₹ 2.00, loss
- A shopkeeper bought a watch for ₹ 280 and sold it for ₹ 315. What is his percentage of profit?  
(1) 15      (2)  $10\frac{1}{2}$       (3)  $12\frac{1}{2}$       (4) 20
- A man bought 75 m of cloth at ₹ 20 per m. At what rate per metre should he sell the cloth so as to gain ₹ 200?  
(1) ₹ 85      (2) ₹ 75      (3) ₹ 65      (4) None of these
- Ajay purchased an old scooter for ₹ 10000. He paid ₹ 150 for road tax and ₹ 100 as licence fee. What price must he sell it to gain 20%?  
(1) ₹ 12300      (2) ₹ 10300      (3) ₹ 12000      (4) ₹ 13000
- 4 dozen of bananas were bought at the rate of ₹ 15 per dozen and sold at the rate of ₹ 2 per banana. Profit or loss is  
(1) ₹ 60, loss      (2) ₹ 96, profit      (3) ₹ 156, loss      (4) ₹ 36, profit
- A man bought a radio for ₹ 195 and got it repaired at a cost of ₹ 45. For how much should he sell it in order to gain ₹ 50?  
(1) ₹ 290      (2) ₹ 200      (3) ₹ 100      (4) ₹ 240
- A chair was sold for ₹ 60 at a profit of 20%. What was the cost price of the chair?  
(1) ₹ 72      (2) ₹ 50      (3) ₹ 48      (4) ₹ 40
- A shopkeeper bought 60 eggs for ₹ 90, 10 eggs were found to be broken. He sold the remaining eggs at the rate of ₹ 2 per egg. What is profit per cent?  
(1) 10      (2) 9      (3)  $11\frac{1}{9}$       (4) 11
- A table was sold at 15% loss for ₹ 1700. CP is  
(1) ₹ 1,685      (2) ₹ 1,715      (3) ₹ 2,000      (4) ₹ 2,100
- 25 pens were bought for ₹ 300 and sold at 25% profit. The selling price of a pen is  
(1) ₹ 15      (2) ₹ 375      (3) ₹ 315      (4) ₹ 20

## Answers

1. (1)	2. (1)	3. (3)	4. (1)	5. (3)	6. (4)	7. (1)	8. (4)	9. (1)	10. (2)
11. (3)	12. (3)	13. (1)							

# CHAPTER 14

# SIMPLE INTEREST

## Interest

A borrower borrow money from a bank or some other person. Then the borrower pays a certain amount for the use of this money. This certain money or amount paid is known as interest.

## Simple Interest

If the interest on a certain sum borrowed for a certain period is calculated uniformly, then it is called simple interest and it is denoted by SI. The interest is always calculated only on the principal borrowed money.

## Principal

The amount of loan or borrowing involved in the transaction is called the principal and it is denoted by  $P$ .

## Amount

The sum of principal and interest is called amount and it is denoted by  $A$ .

$$\therefore \text{Amount } (A) = \text{Principal} + \text{Simple interest}$$

## Rate of Interest

It is the rate at which the interest is charged on principal. It is always specified in percentage term.

## Time Period

The time or interval for which principal is borrowed is known as time period and it is denoted by  $T$ .

### Important Formulae

$$\text{Simple interest (SI)} = \frac{P \times R \times T}{100}$$

$$\text{Principal (P)} = \frac{\text{SI} \times 100}{R \times T}$$

$$\text{Rate (R)} = \frac{\text{SI} \times 100}{P \times T}$$

$$\text{Time (T)} = \frac{\text{SI} \times 100}{P \times R}$$

**Example 1.** What would be the simple interest obtained on an amount of ₹ 6535 at the rate of 10% per annum after 6 yr?

- (1) ₹ 3912 (2) ₹ 3921 (3) ₹ 4040 (4) ₹ 3900

$$\text{Sol. (2) Simple interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$
$$= \frac{6535 \times 10 \times 6}{100} = ₹ 3921$$

**Example 2.** Veena obtained an amount of ₹ 8376 as simple interest on a certain amount at 8% per annum after 6 yr. What is the amount invested by Veena?

- (1) ₹ 17450 (2) ₹ 17540 (3) ₹ 17550 (4) ₹ 17000

**Sol. (1)** Let the amount invested by Veena be ₹  $x$ .

$$\therefore \text{Principal} = \frac{\text{SI} \times 100}{\text{Time} \times \text{Rate}} = \frac{8376 \times 100}{6 \times 8} = ₹ 17450$$

**Example 3.** The interest earned on ₹ 15000 in 3 yr at simple interest is ₹ 5400. Find the rate per cent per annum.

- (1) 10% (2) 15% (3) 12% (4) 13%

$$\text{Sol. (3) Required rate} = \frac{5400 \times 100}{15000 \times 3} = 12\%$$

## Entrance Corner

1. What sum will amount to ₹ 6600 in 4 yrs at 8% per annum simple interest? [JNV 2019]  
 (1) ₹ 6000 (2) ₹ 5000 (3) ₹ 4000 (4) ₹ 6200
2. In what time ₹ 3500 will become ₹ 4130 when annual rate of interest is 6%.  
 [JNV 2018]  
 (1) 4 yr (2) 3 yr (3) 6 yr (4) 5 yr
3. A person borrowed a sum of ₹ 20000 for 2 yr on simple interest. He had to repay ₹ 24800 including interest after 2 yr. The rate of interest per annum was?  
 [JNV 2017, 2009]  
 (1) 48% (2) 24% (3) 12% (4) 6%
4. What will be the rate of simple interest, at which ₹ 17500 will become ₹ 19250 in 2 yr?  
 [JNV 2016]  
 (1)  $12\frac{1}{2}\%$  (2) 10% (3)  $7\frac{1}{2}\%$  (4) 5%
5. At 25% per annum interest in how many years the simple interest on a sum of money triple itself?  
 [JNV 2015]  
 (1) 4 (2) 6 (3) 8 (4) 10
6. In what time ₹ 4250 amounts to ₹ 5610 at the rate 8 % per annum?  
 [JNV 2014]  
 (1) 8 yr (2) 5 yr (3) 6 yr (4) 4 yr
7. What is the rate of interest for ₹ 2500 at simple interest to become ₹ 3300 in 4 yr?  
 [JNV 2013]  
 (1) 5% (2) 6% (3) 8% (4) 10%
8. What is the simple interest on ₹ 500 at 2% per annum for 4 yr?  
 [JNV 2012]  
 (1) ₹ 60 (2) ₹ 40 (3) ₹ 75 (4) ₹ 80
9. What is simple interest on ₹ 1800 for 10 yr at the rate of 10% per annum? [JNV 2011]  
 (1) ₹ 3600 (2) ₹ 1000  
 (3) ₹ 360 (4) ₹ 1800
10. A man borrow ₹ 20000 for the house maintenance which is given by him in 2 yr at 10% per annum. What is the total amount paid by him after 2 yr? [JNV 2010]  
 (1) ₹ 21000 (2) ₹ 22000  
 (3) ₹ 24000 (4) ₹ 4000
11. Find the simple interest of ₹ 700 at 4% per year for 3 yr.  
 [JNV 2008]  
 (1) ₹ 15 (2) ₹ 36  
 (3) ₹ 54 (4) ₹ 84
12. A sum amounted to ₹ 2486 with the interest of 13% per annum, then what is the sum?  
 [JNV 2007]  
 (1) ₹ 2300 (2) ₹ 2150  
 (3) ₹ 2000 (4) ₹ 2200
13. A man borrows ₹ 600 from his friend. He agrees to pay it back after 8 months together with simple interest at 8% per annum. What amount will he pay back?  
 [JNV 2005]  
 (1) ₹ 32 (2) ₹ 384  
 (3) ₹ 984 (4) ₹ 632
14. The simple interest on ₹ 300 at the rate of 6% fer annum in  $2\frac{1}{2}$  yr will be [JNV 2004]  
 (1) ₹ 18 (2) ₹ 36 (3) ₹ 40 (4) ₹ 45
15. In how many years will ₹ 500 amount to ₹ 600 at the rate of 5% per annum at simple interest?  
 [JNV 2003]  
 (1) 3 yr (2) 4 yr  
 (3) 5 yr (4) 6 yr
16. A person lends ₹ 1500 from a bank. If the bank fixes the rate of interest at 11% per annum, then the amount he has to pay back after 2 yr will be? [JNV 2001]  
 (1) ₹ 330 (2) ₹ 1830 (3) ₹ 1860 (4) ₹ 1900
17. In how many years will interest on ₹ 3000 at 5% per annum be ₹ 600? [JNV 2000]  
 (1) 1.5 yr (2) 4 yr (3) 6 yr (4)  $4\frac{1}{2}$  yr
18. What sum of money will amount ₹ 1800 in 4 yr at 10%? [JNV 2000]  
 (1) ₹ 1285.71 (2) ₹ 1300 (3) ₹ 1500 (4) ₹ 1600
19. What sum of money lent for 3 yr at 4% per year will amount to ₹ 392 ? [JNV 1999]  
 (1) ₹ 400 (2) ₹ 300 (3) ₹ 325 (4) ₹ 350
20. Find the simple interest on ₹ 600 for 6 yr at 10% per annum. [JNV 1999]  
 (1) ₹ 300 (2) ₹ 350 (3) ₹ 360 (4) ₹ 380
21. Find the amount on ₹ 500 for 4 yr at 4% per year [JNV 1999]  
 (1) ₹ 600 (2) ₹ 580 (3) ₹ 700 (4) ₹ 800
22. The sum which produce ₹ 143 interest in  $3\frac{1}{4}$  yr at  $2\frac{1}{2}$  is [JNV 1998]  
 (1) ₹ 1760 (2) ₹ 1360  
 (3) ₹ 1860 (4) ₹ 1960

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 (1) ₹ 18 (2) ₹ 36 (3) ₹ 40 (4) ₹ 45
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 [JNV 2003]  
 (1) 3 yr (2) 4 yr  
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 (1) ₹ 300 (2) ₹ 350 (3) ₹ 360 (4) ₹ 380
21. Find the amount on ₹ 500 for 4 yr at 4% per year [JNV 1999]  
 (1) ₹ 600 (2) ₹ 580 (3) ₹ 700 (4) ₹ 800
22. The sum which produce ₹ 143 interest in  $3\frac{1}{4}$  yr at  $2\frac{1}{2}$  is [JNV 1998]  
 (1) ₹ 1760 (2) ₹ 1360  
 (3) ₹ 1860 (4) ₹ 1960

23. SI on ₹ 5000 for 5 yr at 10% per annum is equal to [JNV 1998]  
 (1) ₹ 250 (2) ₹ 2000 (3) ₹ 2500 (4) ₹ 2800
24. What is the simple interest on ₹ 8000 for 7 yr at the rate of 8% per annum? [JNV 1998]  
 (1) ₹ 5000 (2) ₹ 5200 (3) ₹ 5600 (4) ₹ 4480
25. What principal will yield ₹ 120 as SI at 6% per annum in 10 yr? [JNV 1997]  
 (1) ₹ 100 (2) ₹ 125 (3) ₹ 150 (4) ₹ 200
26. SI on ₹ 10000 for 5 yr at 20% per annum is equal to [JNV 1997]  
 (1) ₹ 10000 (2) ₹ 8000  
 (3) ₹ 7000 (4) ₹ 6000
27. If SI on ₹ 5000 in 2 yr is ₹ 500, the amount is [JNV 1997]  
 (1) ₹ 4500 (2) ₹ 5500 (3) ₹ 5575 (4) ₹ 6000
28. In what time will the interest on ₹ 5000 amount to ₹ 800 at 5% per annum? [JNV 1997]  
 (1) 4 yr (2)  $3\frac{1}{2}$  yr (3)  $3\frac{1}{5}$  yr (4) 5 yr
29. Gita deposited ₹ 400 in a bank and at the end of 5 yr received ₹ 80 as interest. What is the rate? [JNV 1996]  
 (1) 2% (2) 3% (3) 4% (4) 5%
30. If in 10 yr, ₹ 200 amounts ₹ 300, find the rate of interest. [JNV 1996]  
 (1) 10% (2) 11% (3) 15% (4) 18%

### Answers

1. (2)	2. (2)	3. (3)	4. (4)	5. (3)	6. (4)	7. (3)	8. (2)	9. (4)	10. (3)
11. (4)	12. (4)	13. (4)	14. (4)	15. (2)	16. (2)	17. (2)	18. (1)	19. (4)	20. (3)
21. (2)	22. (1)	23. (3)	24. (4)	25. (4)	26. (1)	27. (2)	28. (3)	29. (3)	30. (1)

### Hints and Solutions

1. Given,

$$\text{Amount } (A) = ₹ 6600$$

$$\text{Time } (T) = 4 \text{ yr}$$

$$\text{Rate } (R) = 8\%$$

By using, Simple Interest

$$= \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\text{SI} = \frac{P \times R \times T}{100}$$

$$\Rightarrow \text{SI} = \frac{P \times 4 \times 8}{100}$$

...(i)

$$\text{But, Amount } (A) = P + \text{SI}$$

From Eq. (i),

$$A = P + \frac{P \times 4 \times 8}{100}$$

$$\Rightarrow 6600 = P + \frac{8P}{25}$$

$$\Rightarrow 6600 = \frac{33P}{25}$$

$$\Rightarrow P = 200 \times 25$$

$$\therefore P = ₹ 5000$$

2. Simple interest =  $4130 - 3500 = 630$

$$\text{We know that, SI} = \frac{P \times R \times T}{100}$$

where,  $P$  = Principal,  $R$  = Rate,  $T$  = Time

$$630 = \frac{3500 \times 6 \times T}{100}$$

$$T = \frac{630}{35 \times 6} = \frac{630}{210} = 3 \text{ Yr}$$

3.  $\because$  Amount = ₹ 24800

$$\text{Principal} = ₹ 20000$$

$$\therefore \text{SI} = \text{Amount} - \text{Principal}$$

$$= 24800 - 20000 = ₹ 4800$$

$$\text{Rate of interest} = \frac{\text{SI} \times 100}{P \times T} = \frac{4800 \times 100}{20000 \times 2} = 12\%$$

4. Let the rate of simple interest =  $R\%$

$$\therefore \text{SI} = \frac{P \times T \times R}{100}$$

$$19250 - 17500 = \frac{17500 \times r \times 2}{100}$$

(Here, SI = Compound amount – Principal amount)

$$\Rightarrow 1750 = \frac{17500 \times R \times 2}{100}$$

$$\Rightarrow R = \frac{1750 \times 100}{17500 \times 2}$$

$$R = 5\%$$

5. Suppose principal amount = ₹  $P$ , then amount

$$= ₹ 3P$$

$$\therefore \text{Simple interest} = 3P - P = ₹ 2P$$

$$\therefore \text{Simple interest} = \frac{P \times R \times T}{100}$$

$$\Rightarrow 2P = \frac{P \times 25 \times T}{100} \Rightarrow T = \frac{100 \times 2}{25} = 8 \text{ yr}$$

6. Time =  $T$  yr, Principal = ₹ 4250

$$R = 8\% ; \text{ Amount} = ₹ 5610$$

$$\text{Amount} = \text{Principal} + \text{Interest}$$

$$5610 = 4250 + \text{Interest}$$

$$\text{Interest} = 5610 - 4250 = ₹ 1360$$

Simple Interest

$$= \frac{\text{Time} \times \text{Principal} \times \text{Rate of interest}}{100}$$

$$\Rightarrow 1360 = \frac{T \times 4250 \times 8}{100} \Rightarrow T = \frac{1360 \times 100}{4250 \times 8}$$

$$\therefore \text{Time} = 4 \text{ yr}$$

7. Given, principal amount ( $P$ ) = ₹ 2500

$$\text{Time} (T) = 4 \text{ yr}$$

$$\text{Amount} (A) = ₹ 3300$$

$$\text{We know that, simple interest} = \frac{P \times R \times T}{100}$$

$$\Rightarrow 3300 - 2500 = \frac{2500 \times R \times 4}{100} \quad [\because \text{SI} = A - P]$$

$$\Rightarrow 800 = \frac{2500 \times R \times 4}{100} \Rightarrow R = \frac{800 \times 100}{2500 \times 4}$$

$$\therefore R = 8\%$$

8. Simple interest =  $\frac{P \times R \times T}{100} = \frac{500 \times 2 \times 4}{100} = ₹ 40$

9.  $\text{SI} = \frac{P \times R \times T}{100} = \frac{1800 \times 10 \times 10}{100} = ₹ 1800$

10. Simple interest =  $\frac{P \times R \times T}{100}$   
 $= \frac{20000 \times 10 \times 2}{100} = ₹ 4000$

$$\therefore \text{Amount after } 2 \text{ yr} = 20000 + 4000 = ₹ 24000$$

11.  $\text{SI} = \frac{700 \times 4 \times 3}{100} = ₹ 84$

12. Let the sum is 100%, then sum amounted with 13% per annum interest =  $(100 + 13)\% = 113\%$

$$\therefore 113\% = 2486$$

$$\therefore 100\% = \frac{100 \times 2486}{113} = ₹ 2200$$

13. Principal = ₹ 600, Time =  $\frac{8}{12}$  yr, Rate = 8%

$$\text{Simple interest} = \frac{600 \times 8 \times 8}{12 \times 100} = ₹ 32$$

$$\text{Total amount paid} = 600 + 32 = ₹ 632$$

14. Interest =  $\frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$$= \frac{300 \times 6 \times 5}{100 \times 2} = ₹ 45$$

15. Given,  $P = ₹ 500$ ;  $A = ₹ 600$ ;  $R = 5\%$

$$\text{SI} = (\text{Amount} - \text{Principal})$$

$$= 600 - 500 = ₹ 100$$

$$\text{Time} (T) = \frac{\text{SI} \times 100}{P \times R} = \frac{100 \times 100}{500 \times 5} = 4 \text{ yr}$$

16. Given,  $P = ₹ 1500$ ,  $R = 11\%$ ,  $T = 2 \text{ yr}$

$$\text{SI} = \frac{P \times R \times T}{100} = \frac{1500 \times 11 \times 2}{100} = ₹ 330$$

$$\text{Amount}, A = P + \text{SI} = 1500 + 330 = ₹ 1830$$

17. Time =  $\frac{\text{SI} \times 100}{P \times R} = \frac{600 \times 100}{5 \times 3000} = 4 \text{ yr}$

18. Time = 4 yr, Rate = 10%

Let principal be ₹ 100.

Then,  $\text{SI} = \frac{P \times R \times T}{100}$

$$\text{SI} = \frac{100 \times 4 \times 10}{100} = ₹ 40$$

$$\text{Amount} = 100 + 40 = ₹ 140$$

$$\therefore \text{When amount is ₹ 140, principal} = ₹ 100$$

$$\therefore \text{When amount is ₹ 1800,}$$

$$\text{Principal} = \frac{100}{140} \times 1800 = ₹ 1285.71$$

19. Time = 3 yr, Rate = 4%

Let principal be ₹ 100. Then

$$\text{SI} = \frac{100 \times 4 \times 3}{100} = ₹ 12$$

$$\text{Amount} = 100 + 12 = ₹ 112$$

$$\therefore \text{When amount is ₹ 112, principal} = ₹ 100$$

$$\therefore \text{When amount is ₹ 392,}$$

$$\text{Principal} = \frac{100 \times 392}{112} = ₹ 350$$

20.  $\text{SI} = \frac{P \times R \times T}{100} = \frac{600 \times 10 \times 6}{100} = ₹ 360$

21.  $\text{SI} = \frac{500 \times 4 \times 4}{100} = ₹ 80$

$$\text{Amount} = 500 + 80 = ₹ 580$$

22.  $P = \frac{100 \times \text{SI}}{R \times T} = \frac{100 \times 143}{\frac{5}{2} \times \frac{13}{4}}$

$$= \frac{100 \times 143 \times 4 \times 2}{13 \times 5} = ₹ 1760$$

23.  $\text{SI} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$$= \frac{5000 \times 5 \times 10}{100} = ₹ 2500$$

24.  $\text{SI} = \frac{8000 \times 8 \times 7}{100} = ₹ 4480$

$$25. \text{ Principal} = \frac{\text{SI} \times 100}{\text{Time} \times \text{Rate}} = \frac{120 \times 100}{10 \times 6} = ₹ 200$$

$$26. \frac{10000 \times 5 \times 20}{100} = ₹ 10000$$

**27.** Amount  $\equiv 5000 + 500 \equiv ₹ 5500$

28.  $P = ₹ 5000$ ,  $R = 5\%$ ,  $SI = ₹ 800$

$$T = \frac{100 \times 800}{5000 \times 5} = \frac{16}{5} = 3\frac{1}{5} \text{ yr}$$

**29.**  $P = ₹ 400$ ,  $T = 5$  yr,  $SI = ₹ 80$

$$R = \frac{100 \times SI}{P \times T}$$

$$\Rightarrow R = \frac{100 \times 80}{400 \times 5} = 4\%$$

$$30. \text{ Interest} = 300 - 200 = ₹ 100$$

Time = 10 yr P = 200

$$R = \frac{SI \times 100}{T \times P} = \frac{100 \times 100}{10 \times 200} = 10\%$$

# Practice Exercise

1. Find the SI on ₹ 16000 for 3 yr 3 months at  $4\frac{1}{2}\%$  per annum.

(1) ₹ 5200      (2) ₹ 1800  
 (3) ₹ 2340      (4) None of these

2. Find the SI on ₹ 12000 for 8 yr 4 months at 3% per annum?

(1) ₹ 2000      (2) ₹ 15000  
 (3) ₹ 3000      (4) None of these

3. On what sum of money will the SI for 7 yr 6 months at 5% per annum be ₹ 450?

(1) ₹ 11000      (2) ₹ 1200  
 (3) ₹ 13000      (4) ₹ 12000

4. The SI on the certain sum of money for 2 yr at 8% per annum is ₹ 2560. What is the sum?

(1) ₹ 16000      (2) ₹ 15000  
 (3) ₹ 13000      (4) None of these

5. In what time will the SI on ₹ 4000 at 7.5% be ₹ 1050?

(1)  $2\frac{1}{2}$  yr      (2)  $5\frac{1}{2}$  yr  
 (3)  $3\frac{1}{2}$  yr      (4) None of these

6. If the simple interest on ₹ 500 for 2 yr at a certain rate is ₹ 100, then what is the interest for 5 yr on the same amount at the same rate?

(1) ₹ 110      (2) ₹ 150      (3) ₹ 250      (4) ₹ 300

7. An amount becomes double in 10 yr when it is given on simple interest. The rate of interest per annum is

(1) 10%      (2) 20%      (3) 50%      (4) 100%

8. The monthly simple interest on ₹ 1000 is ₹ 15. What is the rate of interest per annum?

(1) 12%      (2) 15%      (3) 18%      (4) 30%

9. An amount of ₹ 10000 is given on simple interest at rate of 18% per annum. What is its interest per month?

(1) ₹ 100      (2) ₹ 120      (3) ₹ 150      (4) ₹ 180

10. What is simple interest on ₹ 1800 for 10 yr at the rate of 10% per annum is

(1) ₹ 3600      (2) ₹ 1800  
 (3) ₹ 360      (4) ₹ 180

11. Simple interest on ₹ 500 for 4 yr at the rate of 8% per annum is

(1) ₹ 10      (2) ₹ 32  
 (3) ₹ 40      (4) ₹ 160

12. A woman borrows a sum of ₹ 3000 from a friend. She promises to return the amount after 1 yr with simple interest of 8% per annum. The total amount required to return will be

(1) ₹ 3008      (2) ₹ 3024  
 (3) ₹ 3240      (4) ₹ 3420

13. A person borrowed a sum of ₹ 20000 for 2 yr on simple interest. He had to repay ₹ 24800 including interest after 2 yr. The rate of interest per annum was

(1) 48%      (2) 24%  
 (3) 12%      (4) 6%

14. Simple interest on ₹ 650.00 for 6 months is ₹ 32.50. The percentage rate of interest per annum is

(1) 5      (2) 10  
 (3) 15      (4) 20

15. A person took a loan of ₹ 4000 for 2 yr on the simple interest at 16% per annum. What amount he had to pay back at the end of 2 yr?

(1) ₹ 4080      (2) ₹ 4600  
 (3) ₹ 4640      (4) ₹ 5280

## Answers

<b>1.</b> (3)	<b>2.</b> (3)	<b>3.</b> (2)	<b>4.</b> (1)	<b>5.</b> (3)	<b>6.</b> (3)	<b>7.</b> (1)	<b>8.</b> (3)	<b>9.</b> (3)	<b>10.</b> (2)
<b>11.</b> (4)	<b>12.</b> (3)	<b>13.</b> (3)	<b>14.</b> (2)	<b>15.</b> (4)	<b>16.</b> (2)	<b>17.</b> (2)	<b>18.</b> (2)	<b>19.</b> (4)	<b>20.</b> (3)

## Hints and Solutions

- 1.** Given,  $P = ₹ 16000$ ,

$$T = 3 \text{ yr } 3 \text{ months} = 3 \frac{1}{4} \text{ yr} = \frac{13}{4} \text{ yr}, R = 4 \frac{1}{2}\% = \frac{9}{2}\%$$

$$\therefore \text{Simple interest} = \frac{PRT}{100} = \frac{16000 \times 9 \times 13}{100 \times 2 \times 4}$$

$$= ₹ 2340$$

**2.** Here,  $P = ₹ 12000$ ,  $R = 3\%$  per annum,

$$T = 8 \text{ yr } 4 \text{ months} = 8 \frac{1}{3} \text{ yr} = \frac{25}{3} \text{ yr}$$

$$\therefore \text{SI} = \frac{PRT}{100} = \frac{12000 \times 3 \times 25}{100 \times 3} = ₹ 3000$$

**3.** Given,  $SI = ₹ 450$ ,  $R = 5\%$  per annum,

$$T = 7 \text{ yr } 6 \text{ months} = 7 \frac{1}{2} \text{ yr} = \frac{15}{2} \text{ yr}$$

According to the formula,

$$\text{SI} = \frac{PRT}{100}$$

$$P = \frac{\text{SI} \times 100}{RT} = \frac{450 \times 100 \times 2}{5 \times 15} = ₹ 1200$$

**4.** Given,  $T = 2 \text{ yr}$ ,  $R = 8\%$  per annum,

$$\text{SI} = ₹ 2560, P = ?$$

$$\text{SI} = \frac{PRT}{100} \Rightarrow P = \frac{\text{SI} \times 100}{RT}$$

$$= \frac{2560 \times 100}{8 \times 2} = ₹ 16000$$

**5.**  $\text{SI} = ₹ 1050$ ,  $P = ₹ 4000$ ,  $R = 75\%$ ,  $T = ?$

$\therefore \text{SI} = \frac{PRT}{100}$

$$\therefore T = \frac{\text{SI} \times 100}{PR} = \frac{1050 \times 100}{4000 \times 7.5} = 3 \frac{1}{2} \text{ yr}$$

**6.**  $\therefore \text{SI} = ₹ 100$ ,  $T = 2 \text{ yr}$ ,  $P = ₹ 500$ ,  $R = ?$

$$\text{Rate} = \frac{\text{SI} \times 100}{P \times T} = \frac{100 \times 100}{500 \times 2} = 10\%$$

Principal = ₹ 500, Time = 5 yr,  
Rate = 10%

$$\text{SI} = \frac{P \times R \times T}{100} = \frac{500 \times 10 \times 5}{100} = ₹ 250$$

**7.** Let principal = ₹ 100  
Amount = ₹ 200  
 $\text{SI} = 200 - 100 = ₹ 100$   
Time = 10 yr  
 $\text{Rate} = \frac{\text{SI} \times 100}{P \times T} = \frac{100 \times 100}{100 \times 10} = 10\%$

**8.** Principal = ₹ 1000  
 $\text{SI}$  per month = ₹ 15  
 $\text{SI}$  per year =  $(15 \times 12) = ₹ 180$   
 $\text{Rate}$  per cent =  $\frac{\text{SI} \times 100}{T \times P} = \frac{180 \times 100}{1 \times 1000}$   
= 18%

**9.** Principal = ₹ 10000  
Rate = 18% per annum  
Time = 1 yr

$$SI = \frac{10000 \times 18 \times 1}{100} = ₹ 1800$$

$$SI \text{ per month} = \frac{1800}{12} = ₹ 150$$

$$10. SI = \frac{P \times R \times T}{100} = \frac{1800 \times 10 \times 10}{100} = ₹ 1800$$

$$11. SI = \frac{P \times R \times T}{100} = \frac{500 \times 4 \times 8}{100} = ₹ 160$$

12. Principal = ₹ 3000, Time = 1 yr, Rate = 8%

$$SI = \frac{P \times R \times T}{100} = \frac{3000 \times 1 \times 8}{100} = ₹ 240$$

$$\text{Amount} = (P + SI) = 3000 + 240 = ₹ 3240$$

13. ∵ Amount = ₹ 24800

Principal = ₹ 20000

$$\therefore SI = \text{Amount} - \text{Principal} \\ = 24800 - 20000 = ₹ 4800$$

$$\text{Rate of interest} = \frac{SI \times 100}{P \times T} = \frac{4800}{20000} \times \frac{100}{2} = 12\%$$

14. Time = 6 months or  $\frac{6}{12}$  yr

$$\text{Rate} = \frac{SI \times 100}{P \times T} = \frac{32.50 \times 100 \times 12}{650 \times 6} = 10\%$$

$$15. SI = \frac{P \times R \times T}{100} = \frac{4000 \times 16 \times 2}{100} = ₹ 1280$$

$$\text{Amount} = (P + SI) = 4000 + 1280 = ₹ 5280$$

16.  $SI = ₹ 750, P = ₹ 2500, T = 3 \text{ yr}, R = ?$

$$\because SI = \frac{PRT}{100}$$

$$\therefore R = \frac{SI \times 100}{PT} = \frac{750 \times 100}{2500 \times 3} = 10\%$$

17. Amount =  $P + SI = ₹ 3300$

$$T = 2 \text{ yr } 6 \text{ months} = 2 \frac{1}{2} \text{ yr}$$

$R = 15\%$  per annum

Now,

$$A = P + SI$$

$$3300 = P + \frac{P \times 15 \times 5}{100 \times 2}$$

$$\Rightarrow 3300 = P + \frac{3}{8}P \Rightarrow 3300 = \frac{11}{8}P$$

$$\Rightarrow P = \frac{3300 \times 8}{11} = ₹ 2400$$

18. Here,  $A = 2P$

$$\therefore SI = A - P = 2P - P = P$$

$R = 5\%, T = ?$

$$\text{Now, } SI = \frac{PRT}{100}$$

$$P = \frac{P \times 5 \times T}{100}$$

$$\Rightarrow T = \frac{100}{5} = 20 \text{ yr}$$

19. ∵  $A = 4P$

$$\therefore SI = A - P = 4P - P = 3P$$

$T = 15 \text{ yr}, R = ?$

$$\text{Now, } SI = \frac{PRT}{100}$$

$$3P = \frac{P \times R \times 15}{100}$$

$$\Rightarrow R = \frac{3 \times 100}{15} = 20\%$$

20. Interest =  $31000 - 25000 = ₹ 6000$

$$\text{Rate} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}} = \frac{6000 \times 100}{25000 \times 2} = 12\%$$

# **Self Practice**



## Answers

<b>1.</b> (1)	<b>2.</b> (3)	<b>3.</b> (2)	<b>4.</b> (2)	<b>5.</b> (2)	<b>6.</b> (2)	<b>7.</b> (1)	<b>8.</b> (1)	<b>9.</b> (2)	<b>10.</b> (3)
<b>11.</b> (2)	<b>12.</b> (4)	<b>13.</b> (1)	<b>14.</b> (2)	<b>15.</b> (3)					

# CHAPTER 15

# RATIO AND PROPORTION

## Ratio

The ratio of two quantities in the same units is the fractions that one quantity is of the other.

Or

It is a tool to compare two or more numbers of same quantities. Thus, the ratio  $a$  to  $b$  is the fraction  $\frac{a}{b}$  written as  $a : b$ .

**Note** In the ratio  $a : b$ , the first term  $a$  is antecedent and second term  $b$  is consequent.

## Properties of Ratio

- (i) The value of a ratio remains unchanged, if each one of its term is multiplied or divided by a same non-zero number.
  - (ii)  $a^2 : b^2$  is the duplicate ratio of  $a : b$ .
  - (iii)  $a^3 : b^3$  is the triplicate ratio of  $a : b$ .

**Example 1.** If  $p:q = 3:4$  and  $q:r = 8:9$ . Find the ratio of  $p:q:r$ .

- (1) 2:4:3    (2) 9:6:8    (3) 6:8:9    (4) 9:8:6

$$\text{Sol. (3)} \quad \frac{P}{q} = \frac{3}{4} \quad \text{and} \quad \frac{q}{r} = \frac{8}{9}$$

$$\Rightarrow \quad \frac{P}{q} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8} \quad \text{and} \quad \frac{q}{r} = \frac{8}{9}$$

$$\therefore p : q : r = 6 : 8 : 9$$

**Example 2.** If  $A:B = 3:4$ ,  $B:C = 5:6$  and  $C:D = 11:9$ , then find the ratio of  $A:D$  is

- (1) 55:72    (2) 73:55    (3) 11:9    (4) 55:73

$$\text{Sol. (1)} \quad \frac{A}{D} = \left( \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D} \right) = \left( \frac{3}{4} \times \frac{5}{6} \times \frac{11}{9} \right) = \frac{55}{72}$$

$$\Rightarrow A:D = 55:72$$

## Proportion

The equality of two ratios is called proportion.

Let  $a, b, c$  and  $d$  are four quantities, then the proportional are  $a : b :: c : d$  or  $\frac{a}{b} = \frac{c}{d}$ .

## Properties of Proportion

- (i) Third proportional of  $a$  and  $b$ ;  $\frac{b^2}{a}$
  - (ii) Mean proportional between  $a$  and  $b$  is  $\sqrt{ab}$ .
  - (iii) Fourth proportional of  $a, b$  and  $c$  =  $\frac{bc}{a}$ .

**Example 3**  $x : 75 :: 15 : 45$ . Find the value of  $x$ .



$$\text{Sol. (2)} \quad \frac{x}{75} = \frac{15}{45} \Rightarrow x = \frac{15 \times 75}{45} \Rightarrow x = 25$$

**Example 4.** Find the ratio in between 20 paise and ₹ 3.



Sol. (3) ₹ 3 = 300 paise

$$\therefore \text{Required ratio} = \frac{20}{300} = \frac{1}{15} = 1 : 15$$

**Example 5.** Salaries of Vivek and Vimal are ₹ 1400 and ₹ 1600. Find out the ratio of their salaries.



$$\text{Sol. (1)} \text{ Ratio} = \frac{\text{Vivek's salary}}{\text{Vimal's salary}} = \frac{1400}{1600} = \frac{14}{16} = \frac{7}{8}$$

∴ Ratio = 7 : 8

# **Entrance Corner**

1. Two numbers are in the ratio 2 : 3. If 9 is added to each, they will be in the ratio 3 : 4 the numbers are [JNV 2017, 2009]  
 (1) 12, 28 (2) 18, 27 (3) 8, 12 (4) 10, 15

2. A, B and C divide an amount of ₹ 9861 amongst themselves in the ratio of 3 : 11 : 5, respectively. What is the B's share in the amount?  
 (1) ₹ 4671 (2) ₹ 5709 (3) ₹ 6228 (4) ₹ 7266

3. If  $a:b = 5:14$  and  $b:c = 7:3$ , then find  $a:b:c$ . [JNV 2012]  
 (1) 7 : 3 : 6 (2) 5 : 14 : 6  
 (3) 8 : 3 : 5 (4) 5 : 6 : 9

4. What must be added to each term of the ratio 49 : 68, so that it becomes 3 : 4?  
 [JNV 2000]  
 (1) 8 (2) 9 (3) 10 (4) 11

5.  $2:5 :: 8:x$ . Find the value of  $x$ . [JNV 2000]  
 (1) 15 (2) 17 (3) 20 (4) 11

6. If  $a:b = 2:3$  and  $b:c = 4:5$ , the ratio  $a:b:c$  is equal to [JNV 1999]  
 (1) 8 : 13 : 17 (2) 8 : 14 : 16  
 (3) 8 : 13 : 18 (4) 8 : 12 : 15

7. Divide ₹ 4000 among A, B and C, so that their shares may be in the ratio of 5 : 7 : 8  
 (1) ₹ 1000, ₹ 1400, ₹ 1600 [JNV 1999]  
 (2) ₹ 3000, ₹ 6000, ₹ 9000  
 (3) ₹ 2000, ₹ 4000, ₹ 6000  
 (4) ₹ 1000, ₹ 2000, ₹ 3000

8. If  $A:B = 6:7$  and  $B:C = 8:9$ , then find  $A:C$ . [JNV 1998]  
 (1) 13 : 15 (2) 16 : 21 (3) 13 : 14 (4) 18 : 21

9.  $1:9 :: 9:x$ . Find the value of  $x$ . [JNV 1998]  
 (1) 80 (2) 81 (3) 84 (4) 85

10.  $3:5 :: 60:x$ , find the value of  $x$ . [JNV 1997]  
 (1) 100 (2) 120 (3) 140 (4) 160

11. If  $0.75:x :: 5:8$ , then find  $x$ . [JNV 1997]  
 (1) 1.5 (2) 1.8 (3) 1.2 (4) 1.4

12. The ratio of number of boys and girls in a school is 4 : 3. If there are 480 boys in the school, find the number of girls in the school. [JNV 1996]  
 (1) 300 (2) 320 (3) 340 (4) 360

13. What is the mean proportional of 9 and 16?  
 (1) 12 (2) 16 (3) 25 (4) 7

14. In a ratio which is equal to 3 : 7, if the antecedent is 33, what is the consequent?  
 [JNV 1995]  
 (1) 75 (2) 76 (3) 80 (4) 77

15. Speed of one bus is 80 km/h and other is 60 km/h. What is the ratio of the speeds of two buses? [JNV 1995]  
 (1) 3 : 4 (2) 4 : 3 (3) 5 : 6 (4) 6 : 5

16. The prices of a cycle and a scooter are the ratio of 9 : 5. If a cycle costs ₹ 4200 more than a scooter, what is the price of scooter?  
 [JNV 1995]  
 (1) ₹ 5160 (2) ₹ 5250 (3) ₹ 6000 (4) ₹ 6230

17. The ratio of two numbers is 3 : 8 and their difference is 116. What is the largest number?  
 [JNV 1994]  
 (1) 181 (2) 182 (3) 183 (4) 184

18. What is ratio in between 7 months and 7 yr?  
 [JNV 1994]  
 (1) 1 : 12 (2) 1 : 13 (3) 1 : 14 (4) 1 : 15

19. What must be subtracted from each term of the ratio 3 : 2. So, that the ratio becomes 2 : 5?  
 [JNV 1993]  
 (1)  $\frac{1}{2}$  (2)  $\frac{1}{3}$  (3)  $\frac{1}{4}$  (4)  $\frac{1}{5}$

20. If  $A:B = 3:4$ ,  $B:C = 5:6$  and  $C:D = 11:9$ , then  $A:D$  is [JNV 1993]  
 (1) 55 : 72 (2) 55 : 74 (3) 55 : 84 (4) 55 : 71

21. If  $p:q = 3:4$  and  $q:r = 8:9$ . Find  $p:q:r$ .  
 [JNV 1993]  
 (1) 6 : 7 : 8 (2) 6 : 8 : 9  
 (3) 6 : 9 : 10 (4) 7 : 9 : 11

## Answers

## Hints and Solutions

1. Let numbers be  $2x$  and  $3x$ .

$$\text{Then, } \frac{2x+9}{3x+9} = \frac{3}{4}$$

$$\Rightarrow 4(2x+9) = 3(3x+9)$$

$$\Rightarrow 8x+36 = 9x+27$$

$$\Rightarrow 9x-8x = 36-27$$

$$\Rightarrow x = 9$$

$$\therefore \text{Numbers} = 2x = 2 \times 9 = 18$$

$$\text{and } 3x = 3 \times 9 = 27$$

2. B's share in the amount

$$\begin{aligned} &= \frac{\text{Ratio term for } B}{\text{Total sum of ratios}} \times \text{Total amount} \\ &= \frac{9861 \times 11}{(3+11+5)} \\ &= \frac{9861 \times 11}{19} = ₹ 5709 \end{aligned}$$

3.  $a:b = 5:14$

$b:c = 7:3$  or  $b:c = 7 \times 2 : 3 \times 2$

$\therefore a:b:c = 5:14:3 \times 2$

$= 5:14:6$

4. Let  $x$  is to be added. Then

$$\frac{49+x}{68+x} = \frac{3}{4}$$

$$\Rightarrow 196 + 4x = 204 + 3x$$

$$\Rightarrow 4x - 3x = 204 - 196$$

$$\Rightarrow x = 8$$

$\therefore$  The number is 8.

$$5. \frac{2}{5} = \frac{8}{x}$$

$$\therefore x = \frac{8 \times 5}{2} = 20$$

$$6. \frac{a}{b} = \frac{2}{3} \text{ and } \frac{b}{c} = \frac{4}{5}$$

$$\text{or } \frac{a}{b} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12} \text{ and } \frac{b}{c} = \frac{4 \times 3}{5 \times 3} = \frac{12}{15}$$

$$\therefore a:b:c = 8:12:15$$

7. Total money = ₹ 4000

Ratio of A, B and C = 5:7:8

$$\text{Total} = 5 + 7 + 8 = 20$$

$$\therefore \text{Share of } A = \frac{5}{20} \times \frac{4000}{1} = ₹ 1000$$

$$\therefore \text{Share of } B = \frac{7}{20} \times 4000 = ₹ 1400$$

$$\therefore \text{Share of } C = \frac{8}{20} \times 4000 = ₹ 1600$$

$$8. \frac{A}{C} = \left( \frac{A}{B} \times \frac{B}{C} \right) = \frac{6}{7} \times \frac{8}{9} = \frac{16}{21} = 16:21$$

$$9. \frac{1}{9} = \frac{9}{x} \Rightarrow x = \frac{9 \times 9}{1} = 81$$

10. 3:5::60:x

$$\Rightarrow \frac{3}{5} = \frac{60}{x}$$

$$\Rightarrow x = \frac{60 \times 5}{3} = 100$$

11. 0.75:x::5:8

$$\Rightarrow \frac{0.75}{x} = \frac{5}{8}$$

$$\Rightarrow x = \frac{0.75 \times 8}{5} = 12$$

12. Let the number of girls is  $x$ . Then

$$4:3 = 480:x$$

$$\Rightarrow \frac{4}{3} = \frac{480}{x}$$

$$\Rightarrow x = \frac{480 \times 3}{4} = 360 \text{ girls}$$

13. Here,  $a = 9$ ,  $b = 16$

we know that, the mean proportional of  $a$  and  $b$

$$= \sqrt{ab}$$

$$= \sqrt{9 \times 16} = 3 \times 4 = 12$$

14.  $\frac{3}{7} = \frac{33}{x}$ , where  $x$  is the consequent.

$$\therefore x = \frac{7 \times 33}{3} = 77$$

$$15. \text{Ratio} = \frac{80}{60} = \frac{4}{3} = 4:3$$

16. The cost of cycle = ₹ 9x

The cost of scooter = ₹ 5x

According to the question,

$$\Rightarrow 9x - 5x = 4200$$

$$\Rightarrow 4x = 4200$$

$$\Rightarrow x = \frac{4200}{4} = 1050$$

$$\therefore \text{Cost of scooter} = 5 \times 1050 = ₹ 5250$$

17. Let numbers be  $3x$  and  $8x$ .

According to the question,

$$8x - 3x = 115$$

$$\Rightarrow 5x = 115$$

$$\Rightarrow x = \frac{115}{5} = 23$$

$$\therefore \text{Largest number} = 8 \times 23 = 184$$

- 18.**  $7 \text{ yr} = 7 \times 12 \text{ months} = 84 \text{ months}$

$\therefore \text{Ratio} = \frac{7}{84} = \frac{1}{12} = 1 : 12$

**19.** Let  $x$  is to be subtracted. Then

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

$$\Rightarrow 15 - 5x = 14 - 2x \Rightarrow 15 - 14 = 5x - 2x$$

$$\Rightarrow 1 = 3x \Rightarrow x = \frac{1}{3}$$

**20.**  $\therefore \text{The number is } \frac{1}{3}.$

**20.**  $\frac{A}{D} = \left( \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D} \right) = \left( \frac{3}{4} \times \frac{5}{6} \times \frac{11}{9} \right) = \frac{55}{72}$

**21.**  $\frac{p}{q} = \frac{3}{4}$  and  $\frac{q}{r} = \frac{8}{9}$

$\frac{p}{q} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8}$  and  $\frac{q}{r} = \frac{8}{9}$

$\therefore p : q : r = 6 : 8 : 9$

## Practice Exercise

- 1.** Write the ratio in the simplest form  $25 : 35$ .  
 (1)  $5 : 7$       (2)  $7 : 5$   
 (3)  $25 : 35$       (4) None of these

**2.** The ratio between the 1h to 1 day  
 (1)  $1 : 6$       (2)  $1 : 1$   
 (3)  $1 : 24$       (4)  $24 : 1$

**3.** If  $A, B, C$  and  $D$  are four numbers such that  $A : B = 2 : 3, B : C = 4 : 5, C : D = 5 : 8$ . Then,  $A : D$  is equal to  
 (1)  $1 : 3$       (2)  $3 : 1$   
 (3)  $2 : 3$       (4)  $3 : 2$

**4.** The sum of the squares of three numbers is 116 and their ratio is  $2 : 3 : 4$ . The numbers are  
 (1)  $2, 3, 4$       (2)  $4, 9, 16$   
 (3)  $4, 6, 8$       (4)  $8, 12, 6$

**5.** If  $\frac{a}{b} = \frac{7}{9}$  and  $\frac{b}{c} = \frac{3}{5}$ . Then, the value of  $a : b : c$  is  
 (1)  $7 : 9 : 15$       (2)  $7 : 9 : 5$   
 (3)  $21 : 35 : 45$       (4)  $7 : 3 : 15$

**6.** What must be added to each term of the ratio  $7 : 13$ . So, that the ratio becomes  $2 : 3$ ?  
 (1) 5      (2) 1  
 (3) 2      (4) 3

**7.** A sum of money is to be distributed between Ajay and Sanjay in the proportion of  $7 : 11$ , respectively. Sanjay gets ₹ 6000 more than Ajay. How much did Ajay get?  
 (1) ₹ 3818.18  
 (2) ₹ 8400  
 (3) ₹ 10500  
 (4) Cannot be determined

**8.** The ratio between boys and girls in a school is  $4 : 6$ , respectively. If the number of boys is increased by 200 the ratio becomes  $5 : 6$ , respectively. How many girls are there in the school?  
 (1) 1200      (2) 800  
 (3) 1000      (4) Cannot be determined

**9.** The total number of students in a school is 1224. If the number of girls in the school is 600, then what is the respective ratio of the total number of boys to the total number of girls in the school?  
 (1)  $26 : 25$       (2)  $21 : 17$   
 (3)  $18 : 13$       (4)  $5 : 4$

**10.** A bag contains ₹ 102 in the form of rupee, 50 paise and 10 paise coins in the ratio  $3 : 4 : 10$ . The number of 10 paise coins is  
 (1) 340      (2) 60  
 (3) 80      (4) 170

**11.** I have ₹ 1 coins, 50 paise coins and 25 paise coins. The number of coins are in the ratio of  $2.5 : 3 : 4$ . If the total amount is ₹ 210. The number of ₹1 coin is  
 (1) 90      (2) 85      (3) 100      (4) 105

**12.** What is the fourth proportional of 3, 4 and 6?  
 (1) 8      (2) 9      (3) 12      (4) 2

**13.** If  $x : 3 :: 12 : 4$ , then value of  $x$  is  
 (1) 9      (2) 16  
 (3) 12      (4) 18

**14.**  $A : B = 5 : 7$  and  $B : C = 6 : 1$ . So,  $A : B : C$  is  
 (1)  $5 : 7 : 6$       (2)  $5 : 7 : 1$   
 (3)  $30 : 7 : 42$       (4)  $30 : 42 : 7$

15. An amount of ₹ 450 is shared by A and B in the ratio 4 : 5. The shares of A and B will be  
 (1) ₹ 400, ₹ 50      (2) ₹ 50, ₹ 400  
 (3) ₹ 250, ₹ 200      (4) ₹ 200, ₹ 250
16. The two numbers are in ratio 11 : 9. If sum of these two numbers is 40, then product of these two numbers is  
 (1) 396      (2) 432  
 (3) 440      (4) 384

17. The ratio of copper and zinc is 11 : 6. How much zinc is there in 850 kg of brass?  
 (1) 510 kg      (2) 200 kg  
 (3) 300 kg      (4) 550 kg
18. Which of the following is smallest?  
 (1) 1 : 3      (2) 3 : 5  
 (3) 7 : 9      (4) 10 : 12

### Answers

1. (1)	2. (3)	3. (1)	4. (3)	5. (1)	6. (1)	7. (3)	8. (1)	9. (1)	10. (4)
11. (4)	12. (1)	13. (1)	14. (4)	15. (4)	16. (1)	17. (3)	18. (1)		

### Hints and Solutions

1.  $\because 25 : 35 = \frac{25}{35} = \frac{5}{7}$  or 5 : 7

2.  $\because$  One day = 24 h

$$\therefore 1 \text{ h} : 24 \text{ h} = 1 : 24$$

3. Given,  $\frac{A}{B} = \frac{2}{3}, \frac{B}{C} = \frac{4}{5}, \frac{C}{D} = \frac{5}{8}$

$$\therefore \frac{A}{D} = \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D} = \frac{2 \times 4 \times 5}{3 \times 5 \times 8} = \frac{1}{3}$$

4. Let the numbers be  $2x, 3x$  and  $4x$ .

$$\therefore (2x)^2 + (3x)^2 + (4x)^2 = 116$$

$$\Rightarrow 4x^2 + 9x^2 + 16x^2 = 116$$

$$\Rightarrow 29x^2 = 116 \Rightarrow x^2 = 4$$

$$\Rightarrow x = 2$$

( $\because x$  cannot be negative)

Hence, required numbers are 4, 6 and 8.

5.  $a : b = 7 : 9$

$$b : c = 3 : 5 = 9 : 15$$

$$\therefore a : b : c = 7 : 9 : 15$$

6. Let the number to be added to each term be  $x$ .

Then

$$\frac{7+x}{13+x} = \frac{2}{3}$$

$$\Rightarrow 3(7+x) = 2(13+x)$$

$$\Rightarrow 21+3x = 26+2x$$

$$\Rightarrow 3x - 2x = 26 - 21$$

$$\therefore x = 5$$

7. Let Ajay and Sanjay get ₹  $7x$  and ₹  $11x$ , respectively. Then

$$11x - 7x = 6000$$

$$\Rightarrow 4x = 6000$$

$$\therefore x = 1500$$

$$\therefore \text{Ajay's share} = 7x = 1500 \times 7 = ₹ 10500$$

8. Let the number of boys and girls be  $4x$  and  $6x$ , respectively.

$$\text{According to the question, } \frac{4x+200}{6x} = \frac{5}{6}$$

$$\Rightarrow 5x = 4x + 200$$

$$\Rightarrow x = 200$$

Therefore, number of girls

$$= 6x = 6 \times 200 = 1200$$

9. Total number of students in the school = 1224

Number of girls = 600

$$\therefore \text{Number of boys} = 1224 - 600 = 624$$

$$\therefore \text{Required ratio} = 624 : 600 = 26 : 25$$

10. Ratio of the number of coins = ₹ 1 : 50 paise : 10 paise = 3 : 4 : 10

∴ Ratio of total values of coins of ₹ 1 : 50 paise : 10 paise =  $(100 \times 3) : (50 \times 4) : (10 \times 10)$

$$= 300 : 200 : 100 = 3 : 2 : 1$$

Total value of 10 paise coins in ₹ 102

$$= \frac{1}{3+2+1} \times 102 = \frac{102}{6} = ₹ 17 = 1700 \text{ paise}$$

$$\therefore \text{Number of 10 paise coins} = \frac{1700}{10} = 170$$

- 11.** Let number of ₹ 1, 50 paise and 25 paise coins be  $2.5x$ ,  $3x$  and  $4x$ , respectively.

$$\text{Value of ₹ 1 coins} = 1 \times 2.5x = 2.5x$$

$$\text{Value of 50 paise coins} = 0.50 \times 3x = 1.5x$$

$$\text{Value of 25 paise coins} = 0.25 \times 4x = 1x$$

$$\text{Total value} = ₹ 210$$

$$\therefore 2.5x + 1.5x + 1x = 210$$

$$5x = 210 \Rightarrow x = 42$$

$$\text{Thus, number of ₹ 1 coins} = 2.5x$$

$$= 2.5 \times 42 = 105$$

- 12.** Here,  $a = 3$ ,  $b = 4$ ,  $c = 6$

$\because$  Fourth proportional of  $a$ ,  $b$  and  $c$

$$= \frac{bc}{a} = \frac{4 \times 6}{3} = 8$$

- 13.**  $\because$  First  $\times$  Fourth = Second  $\times$  Third

$$\Rightarrow x = \frac{3 \times 12}{4} = 9$$

- 14.**  $A : B = 5 : 7$  or  $\frac{A}{B} = \frac{5}{7}$

$$\text{and } B : C = 6 : 1 \text{ or } \frac{B}{C} = \frac{6}{1}$$

$$\text{Now, } \frac{A}{B} = \frac{5 \times 6}{7 \times 6} = \frac{30}{42}$$

$$\text{and } \frac{B}{C} = \frac{6 \times 7}{1 \times 7} = \frac{42}{7}$$

$$\text{So, } A : B : C = 30 : 42 : 7$$

[ $\because B = 42$  in both ratios]

- 15.**  $A$ 's share =  $\frac{\text{Ratios terms of } A}{\text{Total sum of Ratios}} \times \text{Total amount}$

$$= \frac{4}{5+4} \times 450 = \frac{4}{9} \times 450 = ₹ 200$$

Similarly,  $B$ 's share

$$= \frac{5}{5+4} \times 450 = \frac{5}{9} \times 450 = ₹ 250$$

- 16.** Let the two numbers are  $11x$  and  $9x$ .

According to the question,

$$11x + 9x = 40$$

$$\Rightarrow 20x = 40$$

$$\therefore x = \frac{40}{20} = 2$$

$$\text{Product of numbers} = 11x \times 9x = 99x^2$$

$$= 99 \times (2)^2 = 99 \times 4 = 396$$

- 17.** Zinc =  $\frac{6}{17} \times 850 = 300$  kg

- 18.** Given ratios can be written as

$$1 : 3 = \frac{1}{3}, 3 : 5 = \frac{3}{5}, 7 : 9 = \frac{7}{9}$$

$$\text{and } 10 : 12 = \frac{10}{12}$$

$$\text{Now, } \frac{1}{3} = 0.33\dots, \frac{3}{5} = 0.6$$

$$\frac{7}{9} = 0.77\dots, \frac{10}{12} = 0.83\dots$$

So,  $\frac{1}{3}$  or  $1 : 3$  is smallest ratio.

## Self Practice



## Answers

- 1.** (2)    **2.** (2)    **3.** (2)    **4.** (3)    **5.** (2)    **6.** (4)    **7.** (4)    **8.** (2)    **9.** (2)    **10.** (2)

**CHAPTER****16****SPEED, DISTANCE  
AND TIME****Speed**

Speed is defined as the distance covered per unit time. It is the rate at which the distance is covered. Generally, we measured the speed in km/h.

- (i) To convert speed from km/h to m/s multiply the speed by  $\frac{5}{18}$ .
- (ii) To convert speed from m/s to km/h multiply the speed by  $\frac{18}{5}$ .

**Example 1.** Convert 18 km/h into m/s.

- (1) 6 m/s                          (2) 18 m/s  
(3) 5 m/s                           (4) 8 m/s

Sol. (3)  $18 \text{ km/h} = 18 \times \frac{5}{18} \text{ m/s} = 5 \text{ m/s}$

**Example 2.** Convert 10 m/s into km/h.

- (1) 36 km/h (2) 33 km/h (3) 13 km/h (4) 8 km/h

Sol. (1)  $10 \text{ m/s} = 10 \times \frac{18}{5} \text{ km/h} = 36 \text{ km/h}$

**Time**

The duration in hours, minutes or seconds spent to cover a certain distance is called the **time**.

**Distance**

The length of the path travelled by any object or a person between two places is known as **distance**.

**Relation between Speed,  
Time and Distance**

The speed of a moving body is the distance travelled by it in unit time.

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}} \quad \text{or} \quad \text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{or} \quad \text{Distance} = \text{Speed} \times \text{Time}$$

- Units of speed, time and distance should be in the same metric system.

**Example 3.** A car travels at the speed of 85 km/h and reaches its destination in 5 h. What is distance covered by the car?

- (1) 425 km (2) 550 km (3) 452 km (4) 450 km

Sol. (1) Required distance = Speed  $\times$  time  
 $= 85 \times 5 = 425 \text{ km}$

**Example 4.** A car covers a distance of 816 km in 12 h. What is the speed of the car?

- (1) 78 km/h (2) 68 km/h (3) 62 km/h (4) 75 km/h

Sol. (2) Speed of the car

$$= \frac{\text{Distance covered}}{\text{Time taken}} = \frac{816}{12} = 68 \text{ km/h}$$

**Average Speed**

The ratio of total distance covered to the total time of journey is said to be average speed.

$$\text{Average speed} = \frac{\text{Total distance covered}}{\text{Total time of journey}}$$

- (i) If a person covers a same distance at a speed of  $a$  km/h and comes back same distance at a speed of  $b$  km/h, then average speed

$$= \frac{2ab}{a+b}$$

**Example 5.** Deepak covers a certain distance by car driving at 25 km/h and he returns back to the starting point riding on a scooter by 15 km/h. Find the average speed for the whole journey.

- (1) 16 km/h                          (2) 18.75 km/h  
 (3) 20 km/h                          (4) 24.75 km/h

Sol. (2) Here,

$$a = 25 \text{ km/h}, b = 15 \text{ km/h}$$

$$= \frac{2 \times 25 \times 15}{25+15} = \frac{50 \times 15}{40} = 18.75 \text{ km/h}$$

$$\therefore \text{Average speed} = \frac{2ab}{a+b}$$

#### Alternate Method

Let the distance covered from one side =  $x$  km

The time taken with 25 km/h =  $\frac{x}{25}$

The time taken with 15 km/h =  $\frac{x}{15}$

$$\begin{aligned} \text{Average speed} &= \frac{\text{Total distance}}{\text{Total time taken}} \\ &= \frac{x+x}{\frac{x}{25} + \frac{x}{15}} = \frac{2x}{\frac{3x+5x}{75}} \\ &= \frac{2x \times 75}{8x} = 18.75 \text{ km/h} \end{aligned}$$

## Problems Related to Train

- If a train of length ' $l$ ' passes a pole, it travels a distance equal to its own length, i.e.,  $l$ .
- If a train passes a stationary object (bridge, platform etc.) having some length, then the distance covered by train is equal to the sum of the length of train and that particular stationary object which it is passing.

## Relative Speed

- If two bodies are moving in the same direction at  $x$  km/h and  $y$  km/h, where ( $x > y$ ), then their relative speed is given by  $(x - y)$  km/h.
- If two bodies are moving in opposite direction at  $x$  km/h and  $y$  km/h, then their relative speed is given by  $(x + y)$  km/h.
- If the ratio of speed of  $A$  and  $B$  is  $x:y$ , then the ratio of time taken by them to cover the same distance is given by  $\frac{1}{x} : \frac{1}{y}$  i.e.  $y:x$ .

**Example 6.** A 360 m long train crosses a signal post in 18 s. What is the speed (in km/h) of the train?

- (1) 26                          (2) 66                          (3) 27                          (4) 72

Sol. (4) When a train crosses a signal post it travels its own length.

$$\therefore \text{Speed} = \frac{360}{18} = 20 \text{ m/s}$$

$$= \left( 20 \times \frac{18}{5} \right) = 72 \text{ km/h}$$

## Entrance Corner

1. If a man travels at a speed of 30 km/h, he reaches his destination 10 min late and if he travels at a speed of 42 km/h, he reaches his destination 10 min early. The distance travelled is [JNV 2019]

- (1) 36 km                          (2) 35 km  
 (3) 40 km                          (4) 42 km

2. A passenger train, running at a speed of 80 km/h leaves a railway station 6 h after a goods train leaves and overtakes it in 4 h. What is the speed of the goods train? [JNV 2019]

- (1) 32 km/h                          (2) 48 km/h  
 (3) 60 km/h                          (4) 50 km/h

3. A person covered  $47\frac{1}{2}$  km in one day. If he covered  $29\frac{1}{3}$  km by scooter,  $8\frac{5}{6}$  km by bicycle and rest of the distance on foot. Find the distance covered on foot? [JNV 2018]

- (1)  $8\frac{1}{3}$                                   (2)  $10\frac{1}{3}$   
 (3)  $9\frac{1}{3}$                                   (4)  $12\frac{2}{3}$

4. A train is running at a uniform speed of 75 km/h. How much time does it take to cover a distance of 350 km? [JNV 2017, 2009]

- (1) 4 h                                  (2) 5 h  
 (3) 4 h 30 min                          (4) 4 h 40 min

## Answers

<b>1.</b> (2)	<b>2.</b> (1)	<b>3.</b> (3)	<b>4.</b> (4)	<b>5.</b> (3)	<b>6.</b> (4)	<b>7.</b> (3)	<b>8.</b> (2)	<b>9.</b> (2)	<b>10.</b> (3)
<b>11.</b> (3)	<b>12.</b> (2)	<b>13.</b> (3)	<b>14.</b> (1)	<b>15.</b> (4)	<b>16.</b> (1)	<b>17.</b> (3)	<b>18.</b> (3)	<b>19.</b> (1)	<b>20.</b> (4)
<b>21.</b> (1)	<b>22.</b> (2)	<b>23.</b> (1)	<b>24.</b> (3)	<b>25.</b> (2)					

## Hints and Solutions

1. According to the question, speed = 30 km/h,

$$\text{time} = \left(t + \frac{10}{60}\right) \text{ h} = \left(t + \frac{1}{6}\right) \text{ h}$$

By using, Speed =  $\frac{\text{Distance}}{\text{Time}}$

$$\text{Distance } (S) = 30 \times \left(t + \frac{1}{6}\right) \quad \dots(\text{i})$$

According to the question,

Speed = 42 km/h

$$\text{Time} = \left(t - \frac{10}{60}\right) \text{ h} = \left(t - \frac{1}{6}\right) \text{ h}$$

$$\Rightarrow \text{Distance } (S) = 42 \times \left(t - \frac{1}{6}\right) \quad \dots(\text{ii})$$

From Eqs. (i) and (ii),

$$\text{Distance } (S) = 30\left(t + \frac{1}{6}\right) = 42 \times \left(t - \frac{1}{6}\right)$$

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

$$\Rightarrow 5t + \frac{5}{6} = 7t - \frac{7}{6}$$

$$\Rightarrow 2t = \frac{12}{6}$$

$$\therefore t = 1 \text{ h}$$

$$\text{Hence, distance } (S) = 30\left(t + \frac{1}{6}\right)$$

$$= 30\left(1 + \frac{1}{6}\right) = 30 \times \frac{7}{6} = 35 \text{ km}$$

2. According to the question,

Speed of passenger train = 80 km/h

Time taken by passenger train = 4 h

Let, speed of goods train =  $v$

Time taken by goods train =  $6 + 4 = 10$  h

$\because$  Distance covered by both the trains is same.

Now, by using, Speed =  $\frac{\text{Distance}}{\text{Time}}$

Distance = Speed  $\times$  Time

$$\text{Distance} = 80 \times 4 = v \times 10 \Rightarrow v = 32 \text{ km/h}$$

$$3. \text{ Total distance} = 47\frac{1}{2} \text{ km} = \frac{95}{2} \text{ km}$$

$$\text{Distance covered by scooter} = 29\frac{1}{3} \text{ km} = \frac{88}{3} \text{ km}$$

$$\text{Distance covered by bicycle} = 8\frac{5}{6} = \frac{53}{6} \text{ km}$$

$$\text{Now, distance covered on foot} = \frac{95}{2} - \frac{88}{3} - \frac{53}{6}$$

$$= \frac{95}{2} - \frac{88}{3} - \frac{53}{6} = \frac{285 - 176 - 53}{6} = \frac{56}{6}$$

$$= \frac{28}{3} \text{ km} = 9\frac{1}{3} \text{ km}$$

$$4. \because \text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\therefore \text{Time} = \frac{350}{75} = \frac{14}{3} = 4\frac{2}{3} \text{ h} = 4 \text{ h } 40 \text{ min}$$

5. Let the total journey be  $x$  km.

Then,  $\frac{x}{3}$  is covered at 25 km/h,  $\frac{x}{4}$  is at 30 km/h.

$$\begin{aligned} \text{Rest of the distance} &= x - \frac{x}{3} - \frac{x}{4} \\ &= \frac{12x - 4x - 3x}{12} = \frac{5x}{12} \end{aligned}$$

which cover in the speed of 50 km/h.

$$\begin{aligned} \therefore \text{Total time of journey} &= \frac{x}{75} + \frac{x}{120} + \frac{5x}{12 \times 50} \\ &= \frac{8x + 5x + 5x}{600} \\ &= \frac{18x}{600} = \frac{3x}{100} \text{ h} \end{aligned}$$

$$\therefore \text{Average speed} = \frac{x}{\frac{3x}{100}} = \frac{100}{3} = 33\frac{1}{3} \text{ km/h}$$

6. B, runs 36 m in 18 s

$$B \text{ will run 1000 m in} = \frac{18}{36} \times 1000 \text{ s} = 500 \text{ s}$$

So, taken time by A for complete the race  
 $= 500 - 18 = 482 \text{ s.}$

7. Relative speed =  $4 + 6 = 10$  km/h

$$\therefore \text{Time taken to cover 25 km distance} = \frac{25}{10} = 2 \text{ h } 30 \text{ min}$$

$\therefore$  Required time = 7 : 30 + 2 : 30 = 10 : 00 am

$$8. \text{Average speed of the bus} = \frac{400}{8} = 50 \text{ km/h}$$

9. Total distance = 600 m = 0.6 km

$$\text{Time} = 5 \text{ min} = \frac{5}{60} \text{ h}$$

$$\therefore \text{Required speed} = \frac{\text{Distance}}{\text{Time}} = \frac{0.6}{\frac{5}{60}} = 7.2 \text{ km/h}$$

$$10. \text{Speed of the train} = 54 \text{ km/h} = 54 \times \frac{5}{18} \text{ m/s}$$

$$= 15 \text{ m/s}$$

Length of the platform = 90 m

$$\text{Hence, required time} = \frac{90}{15} = 6 \text{ s}$$

11. Man's per day walk =  $\frac{45}{3} = 15 \text{ km}$

$\therefore$  Required number of days to walk 75 km  
 $= \frac{75}{15} = 5 \text{ days}$

12.  $360 \text{ km/h} = 360 \times \frac{5}{18} \text{ m/s} = 100 \text{ m/s}$

13.  $36 \text{ km/h} = 36 \times 1000 \text{ m} / 60 \times 60 \text{ s}$   
 $= \frac{36 \times 1000}{60 \times 60} = 36 \times \frac{5}{18} \text{ m/s} = 10 \text{ m/s}$

14.  $60 \text{ m/s} = 60 \times \frac{18}{5} \text{ km/h} = 12 \times 18 = 216 \text{ km/h}$

15. Distance = Speed  $\times$  Time  
 $= 3.5 \times \frac{12}{60} = \frac{7}{10} \text{ km} = \frac{7}{10} \times 1000 \text{ m}$   
 $= 700 \text{ m}$  [12 min =  $\frac{12}{60} \text{ h}$ ]

16. Time =  $\frac{\text{Distance}}{\text{Speed}} = \frac{124}{45} \text{ h} = 2 \text{ h } 45 \text{ min (approx.)}$

17. Speed of the train =  $40.5 \text{ km/h}$   
 $= \left(40.5 \times \frac{5}{18}\right) \text{ m/s} = \frac{45}{4} \text{ m/s}$   
Length of the train = 270 m  
 $\therefore$  Time taken by the train =  $\frac{\text{Distance}}{\text{Speed}}$   
 $= \left(\frac{270}{45/4}\right) = 24 \text{ s}$

18. Speed =  $20 \text{ m/s} = \left(20 \times \frac{18}{5}\right) \text{ km/h} = 72 \text{ km/h}$

Time = 3 h

Distance = Speed  $\times$  Time =  $72 \times 3 = 216 \text{ km}$

19. Speed =  $0.25 \text{ m/s} = \left(0.25 \times \frac{18}{5}\right) \text{ km/h}$

= 0.9 km/h and distance = 0.9 km  
 $\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{0.9}{0.9} = 1 \text{ h}$

20. Speed =  $45 \text{ km/h} = \left(45 \times \frac{5}{18}\right) \text{ m/s}$   
 $= \frac{25}{2} \text{ m/s}$   
Time = 6 s

$\therefore$  Distance = Speed  $\times$  Time  
 $= \frac{25}{2} \times 6 = 75 \text{ m}$

21.  $72 \text{ km/h} = \left(72 \times \frac{5}{18}\right) \text{ m/s} = 20 \text{ m/s}$

22.  $15 \text{ m/s} = \left(15 \times \frac{18}{5}\right) \text{ km/h} = 54 \text{ km/h}$

23. Speed =  $54 \text{ km/h} = \left(54 \times \frac{5}{18}\right) \text{ m/s} = 15 \text{ m/s}$

Length of the train = 315 m

$\therefore$  Time =  $\frac{\text{Distance}}{\text{Speed}} = \frac{315}{15} = 21 \text{ s}$

24. Speed =  $5 \text{ m/s} = \left(5 \times \frac{18}{5}\right) \text{ km/h} = 18 \text{ km/h}$

25. Distance covered =  $3.32 \text{ km}$   
 $= (3.32 \times 1000) \text{ m}$   
 $= 3320 \text{ m}$

Time taken = 10 s

Now, Speed =  $\frac{\text{Distance}}{\text{Time}} = \frac{3320}{10} \text{ m/s} = 332 \text{ m/s}$

## Practice Exercise

- Speed of 1 km/h is equal to  
(1)  $\frac{60}{1000} \text{ m/s}$       (2)  $\frac{3600}{1000} \text{ m/s}$   
(3)  $\frac{1000}{3600} \text{ m/s}$       (4)  $\frac{1000}{60} \text{ m/s}$
- A train covers a distance of 300 km in 5 h, then the speed of train is  
(1) 10 km/h      (2) 20 km/h  
(3) 60 km/h      (4) 70 km/h
- Ram covers the distance of 154 km in 2 h by car, then the speed of car is  
(1) 77 km/h      (2) 72 km/h  
(3) 74 km/h      (4) 70 km/h
- A car covers the first 35 km of its journey in 45 min and covers the remaining 69 km in 75 min. What is the average speed of the car?  
(1) 42 km/h      (2) 50 km/h      (3) 52 km/h      (4) 60 km/h
- A student rides on bicycle at 8 km/h and reaches his school 2.5 min late. The next day he increases his speed to 10 km/h and reaches school 5 min early. How far is the school from his house?  
(1)  $\frac{5}{8} \text{ km}$       (2) 8 km  
(3) 5 km      (4) 10 km

6. With a uniform speed, a car covers the distance in 8 h. Had the speed been increased by 4 km/h, the same distance could have been covered in  $7\frac{1}{2}$  h. What is the distance covered?  
 (1) 640 km  
 (2) 480 km  
 (3) 420 km  
 (4) Cannot be determined
7. A car is running from A to B at a speed of 40 km/h. It covered half of the total distance in 2 h. Then, distance between A and B is  
 (1) 40 km  
 (2) 80 km  
 (3) 120 km  
 (4) 160 km
8. A person covered a distance of 180 km in 3 h by a car. How much additional time will he require to cover a further distance of 120 km at the same speed?  
 (1)  $1\frac{1}{2}$  h  
 (2) 2 h  
 (3)  $2\frac{1}{2}$  h  
 (4)  $2\frac{1}{4}$  h
9. If a cyclist covers a distance of 50 km in 5 h. Then, his average speed is  
 (1) 250 km/h  
 (2) 50 km/h  
 (3) 10 km/h  
 (4) 5 km/h
10. A bus is running at a speed of 60 km/h. The distance covered by that bus in 4 h and 30 min will be  
 (1) 30 km  
 (2) 240 km  
 (3) 270 km  
 (4) 200 km
11. A bus started from town A to town B at a speed of 50 km/h. It covered one-third of the total distance in 6 h. The distance between A and B is  
 (1) 150 km  
 (2) 300 km  
 (3) 600 km  
 (4) 900 km
12. A bus covers 60 km in 2 h. In 30 min it will cover  
 (1) 2 km  
 (2) 7.5 km  
 (3) 15 km  
 (4) 30 km
13. A cyclist covers the distance of 1.2 km in 3 min, the speed of the cyclist is  
 (1) 24 km/h  
 (2) 24 m/h  
 (3) 24 m/s  
 (4) 26 km/h
14. A train covers a distance of 3 km in 2 min. How much distance will it cover in 6 h?  
 (1) 180 km  
 (2) 240 km  
 (3) 540 km  
 (4) 1080 km
15. A train starts at 10:50 am from New Delhi at a speed of 80 km/h, then at what time will it cover the distance of 120 km?  
 (1) 11 : 50 am  
 (2) 12 : 50 pm  
 (3) 12 : 20 pm  
 (4) 1 : 50 pm
16. A train is 200 m long. If it crosses an electric pole in 10 s, then its speed is  
 (1) 72 km/h  
 (2) 27 km/h  
 (3) 35 km/h  
 (4) 52 km/h
17. A train is 125 m long. If the train takes 30 s to cross a tree by the railway line, then the speed of the train is  
 (1) 14 km/h  
 (2) 15 km/h  
 (3) 16 km/h  
 (4) 12 km/h
18. A 250 m long train crosses a pole in 15 s. What is its speed (in km/h)?  
 (1) 90  
 (2) 45  
 (3) 70  
 (4) 60
19. A train running at the speed of 90 km/h crosses a 250 m long platform in 22 s. What is the length of the train?  
 (1) 280 m  
 (2) 260 m  
 (3) 250 m  
 (4) 300 m
20. A train travelling with a speed 60 km/h catches another train travelling in the same direction and then leaves it 120 m behind in 18 s. The speed of the second train is  
 (1) 26 km/h  
 (2) 35 km/h  
 (3) 36 km/h  
 (4) 63 km/h

**Answers**

<b>1.</b> (3)	<b>2.</b> (3)	<b>3.</b> (1)	<b>4.</b> (3)	<b>5.</b> (3)	<b>6.</b> (2)	<b>7.</b> (4)	<b>8.</b> (2)	<b>9.</b> (3)	<b>10.</b> (3)
<b>11.</b> (4)	<b>12.</b> (3)	<b>13.</b> (2)	<b>14.</b> (3)	<b>15.</b> (3)	<b>16.</b> (1)	<b>17.</b> (2)	<b>18.</b> (4)	<b>19.</b> (4)	<b>20.</b> (3)

## Hints and Solutions

1.  $1 \text{ km/h} = \frac{1000 \text{ m}}{60 \times 60 \text{ s}} = \frac{1000}{3600} \text{ m/s}$

2. Speed =  $\frac{300}{5} \text{ km/h} = 60 \text{ km/h}$

3. Speed of car =  $\frac{\text{Distance}}{\text{Time}} = \frac{154}{2} \text{ km/h} = 77 \text{ km/h}$

4. Total distance =  $35 + 69 = 104 \text{ km}$

Total time =  $45 + 75 = 120 \text{ min} = 2 \text{ h}$

$\therefore$  Average speed =  $\frac{104}{2} = 52 \text{ km/h}$

5. Let  $x \text{ km}$  be the required distance.

Difference in time =  $2.5 + 5 = 7.5 \text{ min}$

$$= \frac{75}{60} \text{ h} = \frac{1}{8} \text{ h}$$

Now,  $\frac{5x - 4x}{40} = \frac{1}{8} \Rightarrow x = \frac{40}{8} = 5 \text{ km}$

6. Let the distance be  $x \text{ km}$  and original speed of the car be  $y \text{ km/h}$ .

Case I  $\frac{x}{y} = 8 \Rightarrow x = 8y$  ... (i)

Case II  $\frac{x}{y+4} = \frac{15}{2}$

$\Rightarrow \frac{8y}{y+4} = \frac{15}{2}$  [From Eq. (i)]

$\Rightarrow 16y = 15y + 60 \Rightarrow y = 60$

$\therefore$  From Eq. (i), we get

$x = 8 \times 60 = 480$

$\therefore$  Required distance =  $480 \text{ km}$

7. Speed of the car =  $40 \text{ km/h}$

In  $2 \text{ h}$  it will cover =  $40 \times 2 = 80 \text{ km}$

Given,  $80 \text{ km} = \frac{1}{2}$  of the total distance

$\therefore$  Total distance between  $A$  to  $B = 80 \times \frac{2}{1} = 160 \text{ km}$

8. In  $3 \text{ h}$ , he covers =  $180 \text{ km}$

$\therefore$  Speed =  $\frac{180}{3} = 60 \text{ km/h}$

New distance (additional) =  $120 \text{ km}$

Time =  $\frac{\text{Distance}}{\text{Speed}} = \frac{120}{60} = 2 \text{ h}$

9. Average speed =  $\frac{\text{Total distance}}{\text{Total time}}$

$$= \frac{50 \text{ km}}{5 \text{ h}} = 10 \text{ km/h}$$

10.  $\because$  Speed =  $\frac{\text{Distance}}{\text{Time}}$

Speed =  $60 \text{ km/h}$

Time =  $4 \text{ h } 30 \text{ min} = 4.5 \text{ h}$

$\therefore$  Distance = Speed  $\times$  Time  
=  $60 \times 4.5 = 270 \text{ km}$

11. Speed =  $50 \text{ km/h}$

It covered in  $6 \text{ h} = 50 \times 6 = 300 \text{ km}$

Total distance =  $x$

Now,  $\frac{x}{3} = 300$

$\therefore x = 300 \times 3 = 900 \text{ km}$

12.  $\because$  Speed =  $\frac{\text{Distance}}{\text{Time}}$

$\therefore$  Speed =  $\frac{60}{2} = 30 \text{ km/h}$

$\therefore$  Distance covered in  $30 \text{ min}$  or  $\frac{1}{2} \text{ h}$   
= Speed  $\times$  Time =  $30 \times \frac{1}{2} = 15 \text{ km}$

14. In  $2 \text{ min}$  it covers =  $3 \text{ km}$

In  $1 \text{ h}$  or  $60 \text{ min}$  it covers =  $\frac{3}{2} \times 60 = 90 \text{ km}$

In  $6 \text{ h}$  it covers =  $90 \times 6 = 540 \text{ km}$

16. Distance travel by the train =  $200 \text{ m}$

Time =  $10 \text{ s}$

$\therefore$  Speed =  $\frac{200}{10} = 20 \text{ m/s} = 20 \times \frac{18}{5} = 72 \text{ km/h}$

17. Speed =  $\frac{\text{Distance}}{\text{Time}} = \frac{125}{30} = 4.17$

$$= 4.16 \text{ m/s} = 4.17 \times \frac{18}{5} = 15 \text{ km/h (approx.)}$$

18. Speed of train =  $\frac{250}{15} = \frac{50}{3} \text{ m/s}$

$$= \frac{50}{3} \times \frac{18}{5} \text{ km/h} = 60 \text{ km/h}$$

19.  $90 \text{ km/h} = 90 \times \frac{5}{18} = 25 \text{ m/s}$

Distance travelled by train in  $22 \text{ s}$

$$= 22 \times 25 = 550 \text{ m}$$

$\therefore$  Length of the train

$$= 550 - 250 = 300 \text{ m}$$

20. Let speed of another train =  $x \text{ km/h}$

$\therefore (60 - x) = \frac{120}{18} \times \frac{18}{5}$

$$\Rightarrow 60 - x = 24$$

$$\therefore x = 60 - 24 = 36 \text{ km/h}$$

## Self Practice

1. 72 km/h can be written as  
(1) 20 m/s      (2) 36 m/s      (3) 10 m/s      (4) 24 m/s
2. 63 km/h can be expressed into m/s as  
(1) 17.5 m/s      (2) 16.5 m/s      (3) 16 m/s      (4) 17 m/s
3. 12.5 m/s can be expressed into km/h as  
(1) 40 km/h      (2) 45 km/h      (3) 50 km/h      (4) 55 km/h
4. A car completes a journey in 6 h with a speed of 50 km/h. At what speed must it travel to complete the journey in 5 h?  
(1) 60 km/h      (2) 55 km/h      (3) 45 km/h      (4) 61 km/h
5. A train passes a telegraph post in 40 s moving at a rate of 36 km/h. Then, the length of the train is  
(1) 400 m      (2) 500 m      (3) 450 m      (4) 395 m
6. A cyclist covers 12 km in 1 h. What is his speed?  
(1) 100 m/min      (2) 2000 m/min      (3) 200 m/min      (4) 300 m/min
7. An autorickshaw goes with a speed of 14 km/h. How much distance will it go in 2 h 15 min?  
(1) 31.5 km      (2) 30.5 km      (3) 32.5 km      (4) 32 km
8. Manu runs at a speed of 2 m/s in a 5 km race. How much time will she take to complete the race?  
(1) 41 min 40 s      (2) 40 min      (3) 41 min      (4) 42 min 40 s
9. An aircraft flies 8 km/min. What is its speed?  
(1) 408 km/h      (2) 480 km/h      (3) 460 km/h      (4) 406 km/h
10. A train is running at 36 km/h. If it crosses a pole in 25 s. Its length is  
(1) 240 m      (2) 250 m      (3) 200 m      (4) 300 m
11. How much time will a train 60 m long, take to cross a bridge 40 m long, if it is running at a speed of 20 m/s?  
(1) 10 s      (2) 8 s      (3) 4 s      (4) 5 s
12. A car is travelling at a speed of 50 km/h. How much distance will it cover in 12 min?  
(1) 12 km      (2) 6 km      (3) 10 km      (4) 8 km
13. A train is 180 m long. If it runs at a speed of 90 km/h, how long will it take to pass an electric pole?  
(1) 0.002 h      (2) 0.003 h      (3) 0.004 h      (4) 0.02 h
14. A train 100 m in length is running at a speed of 72 km/h. What is the time taken by the train to cross a bridge of length 525 m?  
(1) 0.087 h      (2) 0.0087 h      (3) 0.75 h      (4) 0.075 h

## Answers

1. (1)	2. (1)	3. (2)	4. (1)	5. (1)	6. (3)	7. (1)	8. (1)	9. (2)	10. (2)
11. (4)	12. (3)	13. (1)	14. (2)						

# CHAPTER 17

# AREA, PERIMETER AND VOLUME

## Area

It is the space enclosed by the boundary of a plane figure. It is measured in square unit i.e. the area of a room is equal to its floor.

## Perimeter

The sum of all the sides of any enclosed plane figure is called the perimeter of that figure.

## Area and Perimeter of Different Plane Figures

It is the measurement of shapes having length and breadth in nature i.e. rectangle, square, parallelogram etc.

### Rectangle

The figure formed by joining four points, in which opposite sides are equal and parallel and each angle is a right angle i.e.  $90^\circ$ , is called rectangle.

In figure,  $ABCD$  is a rectangle, in which

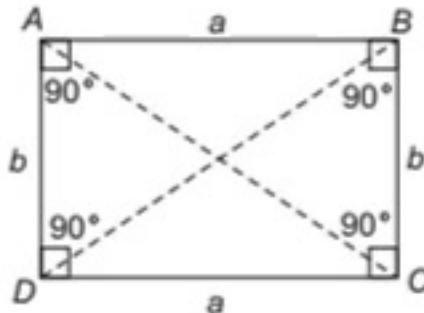
$$AB = CD = a \quad (\text{say})$$

$$\text{and} \quad AD = BC = b \quad (\text{say})$$

$$\text{and} \quad \angle A = \angle B = \angle C = \angle D \\ = 90^\circ$$

$$AC = BD,$$

where,  $AC$  and  $BD$  are diagonals.



$$(i) \text{ Area of rectangle} = \text{Length} \times \text{Breadth} = a \times b$$

$$(ii) \text{ Perimeter of rectangle}$$

$$= 2 \times (\text{Length} + \text{Breadth}) = 2 \times (a + b)$$

$$(iii) \text{ Diagonal}$$

$$= \sqrt{(\text{Length})^2 + (\text{Breadth})^2} = \sqrt{a^2 + b^2}$$

**Example 1.** The length of a rectangular plot of land is twice the breadth. If the perimeter of the plot be 210 m. Find its area.

$$(1) 2450 \text{ m}^2 \quad (2) 2110 \text{ m}^2$$

$$(3) 1520 \text{ m}^2 \quad (4) 1620 \text{ m}^2$$

**Sol. (1)** Let the breadth of the plot be  $x$  m.

Then, its length =  $2x$  m

$$\therefore \text{Its perimeter} = 2(\text{Length} + \text{Breadth}) \\ = 2(2x + x) = 6x \text{ m}$$

Given, Perimeter of the plot = 210

$$\therefore 6x = 210 \Rightarrow x = \frac{210}{6} = 35 \text{ m}$$

$$\therefore \text{Breadth} = 35 \text{ m}$$

$$\text{and} \quad \text{length} = 2 \times 35 = 70 \text{ m}$$

$$\therefore \text{Area of the plot} = (70 \times 35) = 2450 \text{ m}^2$$

**Example 2.** Find the area of a rectangle whose length is 8 m and diagonal 10 m.

- (1)  $24 \text{ m}^2$       (2)  $48 \text{ m}^2$   
 (3)  $56 \text{ m}^2$       (4)  $36 \text{ m}^2$

$$\begin{aligned}\text{Sol. (2)} \quad \text{Breadth} &= \sqrt{(\text{Diagonal})^2 - (\text{Length})^2} \\ &= \sqrt{(10)^2 - (8)^2} \\ &= \sqrt{36} = 6 \text{ m} \\ \text{Area} &= lb = 8 \times 6 \\ &= 48 \text{ m}^2\end{aligned}$$

### Square

The figure formed by joining four points, in which all four sides are equal and each angle is a right angle, i.e.,  $90^\circ$ , is called square.

In figure,  $ABCD$  is a square in which

$$AB = BC = CD = AD = a \text{ (say)}$$

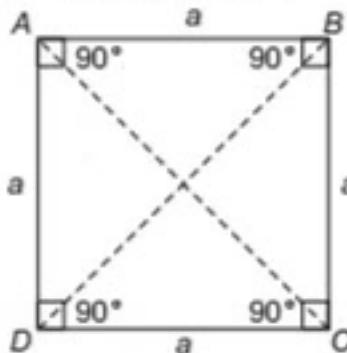
and

$$\angle A = \angle B = \angle C = \angle D = 90^\circ$$

and

$$AC = BD$$

where,  $AC$  and  $BD$  are diagonals.



$$(i) \text{ Perimeter of square} = 4 \times \text{Side} = 4a$$

$$\text{Area of square} = (\text{Side})^2 = a^2$$

$$\text{Diagonal} = \sqrt{2} \times \text{Side} = \sqrt{2}a$$

**Example 3.** Find the least number of square tiles and their size needed for flooring a hall 20 m long and 16 m wide.

- (1) 25      (2) 16  
 (3) 13      (4) 20

**Sol. (4)** For the number of tiles to be the least, their size must be largest square in shape.

Side of the largest possible square tile

$$\begin{aligned}&= \text{HCF of length and width of the hall} \\ &= \text{HCF of } 20 \text{ and } 16 = 4 \text{ m}\end{aligned}$$

$$\text{Area of each square tile} = 4 \times 4 = 16 \text{ m}^2$$

$$\text{Area of the floor of the hall} = 20 \times 16 = 320 \text{ m}^2$$

$$\therefore \text{Number of tiles needed} = \frac{320}{16} = 20$$

### Volume and Surface Area

It is the study of three dimensional (3D) figures (solid figures). The main characteristic of three dimensional figure is that it have length, breadth and depth or height or thickness. The object in three dimension (3D) may be solid or hollow.

#### Volume

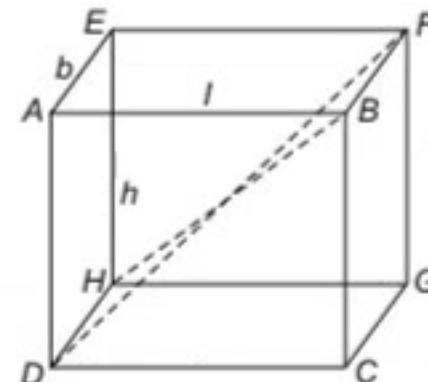
The amount of space occupied by the three dimensional object is called its volume. Its unit of measurement is  $\text{m}^3$ ,  $\text{cm}^3$ , inches $^3$  etc.

It is the measurement of solid shapes having length, breadth and depth or height. Hence, these figures are known as three dimensional figures. Some of the popular three dimensional figures are as cube, cuboid, room and box etc.

#### Cuboid

The figure formed by joining 6 faces, in which each face is a rectangle and opposite faces are equal and parallel, is called cuboid.

In figure,  $AB$  is length,  $AE$  is breadth and  $AD$  is height of the cuboid and face  $ABCD = EFGH$ ,  $AEHD = BFGC$  and  $AEFB = DHGC$ , face  $DHGC$  is called base and other faces are called lateral face.  $BH$ ,  $DF$ ,  $AG$  and  $EC$  are called diagonals.



If  $l$  is length,  $b$  is breadth and  $h$  is height, then

$$\text{Volume of cuboid} = \text{Length} \times \text{Breadth} \times \text{Height}$$

$$V = l \times b \times h$$

**Example 4.** Find the volume of cuboid whose length is 15 cm, breadth 10 cm and height 8 cm.

- (1)  $1100 \text{ cm}^3$       (2)  $1500 \text{ cm}^3$   
 (3)  $1200 \text{ cm}^3$       (4)  $1100 \text{ cm}^3$

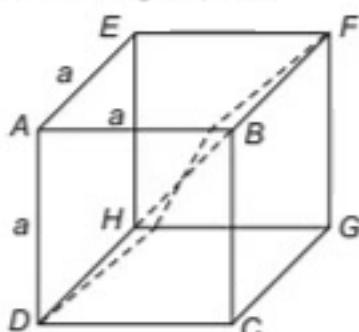
**Sol. (3)** Here,  $l = 15 \text{ cm}$ ,  $b = 10 \text{ cm}$ ,  $h = 8 \text{ cm}$

$$\begin{aligned}\therefore \text{Volume of cuboid} &= l \times b \times h \\ &= 15 \times 10 \times 8 = 1200 \text{ cm}^3\end{aligned}$$

**Cube**

A cuboid, in which each face is a square and length, breadth and height are equal, is called cube.

In figure, all sides are equal, i.e.,



$$\begin{aligned}AB &= BC = CD = DA = EF = FG = GH = EH = AE \\&= BF = CG = DH\end{aligned}$$

and all faces are equal, i.e.,

$$\begin{aligned}ABCD &= EFGH = AEHD = BFGC = AEFB = DHGC \\AG, EC, BH \text{ and } DF \text{ are called diagonals.}\end{aligned}$$

If 'a' is a side of cube, then

$$\text{Volume of cube} = (\text{Side})^3 = a^3$$

**Example 5.** The volume of cube is  $1000 \text{ cm}^3$ . Find its total surface area.

- (1)  $500 \text{ cm}^2$       (2)  $600 \text{ cm}^2$   
 (3)  $200 \text{ cm}^2$       (4)  $300 \text{ cm}^2$

$$\text{Sol. (2)} \quad \text{Volume of cube} = 1000 \text{ cm}^3$$

$$\therefore \text{Edge} = \sqrt[3]{1000} = 10 \text{ cm}$$

$$\begin{aligned}\text{Total surface area} &= 6(\text{Edge})^2 \\&= 6(10)^2 = 6 \times 100 = 600 \text{ cm}^2\end{aligned}$$

## Entrance Corner

1. Two solid cubes of side 10 cm each are joined end to end. What is the volume of the resulting cuboid? [JNV 2019]

- (1)  $500 \text{ cm}^3$       (2)  $2000 \text{ cm}^3$   
 (3)  $1000 \text{ cm}^3$       (4)  $10000 \text{ cm}^3$

2. The length of a rectangular plot of land is twice its breadth. A square swimming pool of side 8 m, occupies one-eighth part of the plot. The length of the plot is [JNV 2019]

- (1) 64 m      (2) 32 m  
 (3) 16 m      (4) 12 m

3. How many rectangular slabs of  $10 \text{ cm} \times 8 \text{ cm}$  are required to cover the floor of a hall of  $12 \text{ m} \times 10 \text{ m}$ ? [JNV 2019]

- (1) 12000      (2) 15000  
 (3) 10000      (4) 18000

4. A rectangular plot has sides  $100 \text{ m} \times 80 \text{ m}$ . Find the length of wire to surround it three times. [JNV 2018]

- (1) 180 m      (2) 1080 m  
 (3) 360 m      (4) 720 m

5. A fish tank length, breadth and height is 40 cm, 60 cm and 50 cm, respectively. It contains 50 litre of water. How much water is needed to fill it completely. [JNV 2018]

- (1) 50 L      (2) 60 L  
 (3) 70 L      (4) 120 L

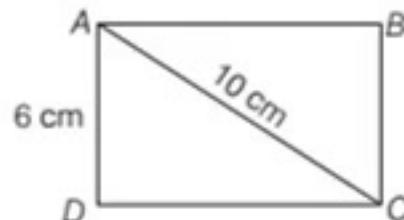
6. The area of square, whose perimeter is 48 m, is [JNV 2017, 2009, 2004]

- (1)  $48 \text{ m}^2$       (2)  $144 \text{ m}^2$   
 (3)  $1152 \text{ m}^2$       (4)  $2304 \text{ m}^2$

7. What is the volume of a box whose each edge measures 3 m in length? [JNV 2017, 2009]

- (1) 54 cu m      (2) 27 cu m      (3) 18 cu m      (4) 9 cu m

8. Find the length of  $AB$  in the given figure of a rectangle  $ABCD$ . [JNV 2016]

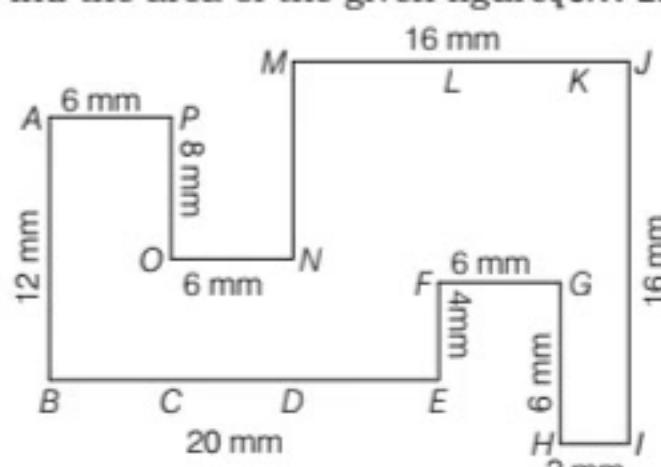


- (1) 8 cm      (2) 10 cm      (3) 12 cm      (4) 16 cm

9. The dimensions of a wall are  $20 \text{ m} \times 12 \text{ m}$ . How many square shaped tiles, with 4 m side, will be required to cover the floor? [JNV 2016]

- (1) 10      (2) 15      (3) 24      (4) 12

10. Find the area of the given figure [JNV 2016]



- (1)  $240 \text{ mm}^2$       (2)  $280 \text{ mm}^2$   
 (3)  $300 \text{ mm}^2$       (4)  $440 \text{ mm}^2$

- 21.** How much is the area of the shaded portion in the following figure? [JNV 2005]

(1) 11 sq cm      (2) 9 sq cm  
 (3) 11 cu cm      (4) 9 cu cm

**22.** A room floor is 192 sq m in area. If its length is 16 m. Then, its perimeter is [JNV 1993]  
 (1) 12 m      (2) 28 m      (3) 56 m      (4) 64 m

**23.** The number of 15 cm square tiles required to lay a floor of size 3.6 m × 4.5 m is [JNV 2004]  
 (1) 720      (2) 360  
 (3) 10800      (4) 5400

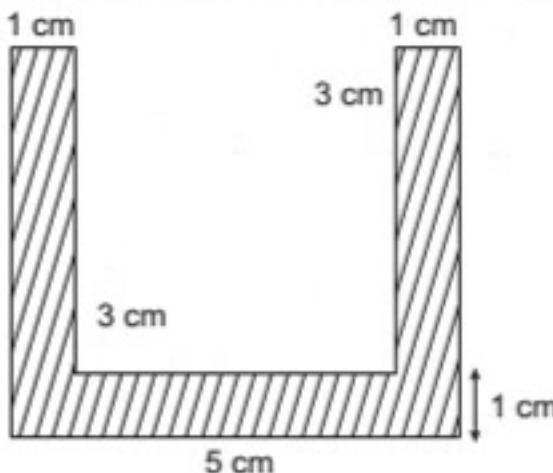
**24.** How many rectangular plots of dimensions 40 m multiply 60 m can be made from a rectangular field of dimensions 120 m multiply 160 m? [JNV 2003]  
 (1) 2      (2) 3  
 (3) 4      (4) 8

**25.** The perimeter of a square courtyard is 200 m, its area will be [JNV 2001]  
 (1) 800 m      (2) 2500 m  
 (3) 800 sq m      (4) 2500 sq m

**26.** The volumes of a cube and a cuboid are equal. If the dimensions of the cuboid are 18 cm, 12 cm and 8 cm the edge of the cube is [JNV 2001]  
 (1) 8 cm      (2) 10 cm  
 (3) 12 cm      (4) 16 cm

**27.** Area of a square kitchen garden is 729 sq m. Find its perimeter. [JNV 2000]  
 (1) 64 m      (2) 27 m  
 (3) 108 m      (4) 100 m

**28.** Perimeter of a square field is 36 m. Find its area. [JNV 2000]  
 (1) 81 sq m      (2) 16 sq m  
 (3) 36 sq m      (4) 100 sq m



## Answers

1. (2)	2. (3)	3. (2)	4. (2)	5. (3)	6. (2)	7. (2)	8. (1)	9. (2)	10. (3)
11. (2)	12. (1)	13. (2)	14. (1)	15. (4)	16. (3)	17. (2)	18. (1)	19. (3)	20. (2)
21. (1)	22. (3)	23. (1)	24. (4)	25. (4)	26. (3)	27. (3)	28. (1)	29. (4)	30. (1)
31. (3)	32. (2)	33. (2)	34. (1)	35. (4)					

## Hints and Solutions

1. According to the question,  
Side of a cube = 10 cm  
When, two cubes are joined end to end  
Length of a cuboid ( $l$ ) = 20 cm, breadth ( $b$ ) = 10 cm,  
height ( $h$ ) = 10 cm  
By using, volume of a cuboid =  $l \times b \times h$   
 $= 20 \times 10 \times 10 = 2000 \text{ cm}^3$

$$B^2 = 64 \times 4 = 256$$

Hence, length of the plot =  $2 \times 16 = 32$  m.

3. According to the question,  
Size of a rectangular slab = Length × Breadth  
= 10 cm × 8 cm  
Size of a hall = Length × Breadth = 12 m × 10 m  
= 1200 cm × 1000 cm [ $\because$  1 m = 100 cm]  
Total number of slabs

$$= \frac{\text{Size of a hall}}{\text{Size of a rectangular slab}}$$

$$= \frac{1200 \times 1000}{10 \times 8} = 15000$$

$\therefore$  Total number of rectangular slabs = 15000

4. Given,  
length of rectangular plot = 100m  
Breadth of rectangular plot = 80 m  
As we know that,  
perimeter of plot = 2 (length + Breadth)

$$\text{Perimeter} = 2(100+80)$$

$$= 2 \times 180 = 360 \text{ m}$$

length of wire to surround it three times

$$= 3 \times 360 = 1080 \text{ m}$$

5. Amount of water stored in the tank = Volume of the tank

$\therefore$  Volume of tank

$$= \text{length} \times \text{breadth} \times \text{Height}$$

$$\therefore V = 40 \times 60 \times 50$$

$$V = 120000 \text{ cm}^3$$

As  $1000 \text{ cm}^3$  1 is equal to litre

$$\therefore V = 120 \text{ L}$$

As tank already stored 50 liters of water.

$\therefore$  Amount of water to fill the tank completely

$$= 120 - 50 = 70 \text{ L}$$

6. Side of the square  $= \frac{\text{Perimeter}}{4} = \frac{48}{4} = 12 \text{ m}$

$\therefore$  Area of the square = Side  $\times$  Side

$$= 12 \times 12 = 144 \text{ m}^2$$

7. Volume of the box  $= 3 \times 3 \times 3 = 27 \text{ cu m}$

8. Here,  $AD = BC = 6 \text{ cm}$

Now In  $\triangle ABC$ ,  $AC$  (Diagonal)  $= 10 \text{ cm}$ ,

$BC$  (Breadth)  $= 6 \text{ cm}$

So, by Pythagoras Theorem,

$$(\text{Length})^2 = \sqrt{(\text{Diagonal})^2 - (\text{Breadth})^2}$$

$$\Rightarrow AB^2 = AC^2 - BC^2$$

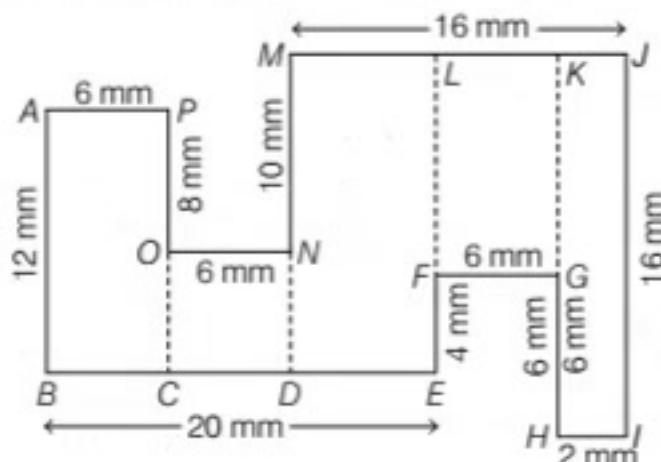
$$AB = \sqrt{10^2 - 6^2} = \sqrt{100 - 36}$$

$$= \sqrt{64} = 8 \text{ cm}$$

9. The required number of tiles

$$= \frac{\text{Area of Hall}}{\text{Area of one Tile}} = \frac{20 \times 12}{4 \times 4} = 15$$

10. According to the condition and direction of question the diagram will be as follows



Area of figure = Area of  $(ABCP + OCDN)$

$$+ DMLE + FLKG + KHL)$$

$$= AB \times AP + OC \times ON + DE \times DM + FG \times GK$$

$$+ HI \times JI$$

$$= 12 \times 6 + (12 - 8) \times 6 + (20 - 12)$$

$$\times (10 + 12 - 8) + 6 \times (16 - 6) + 2 \times 16$$

$$\left\{ \begin{array}{l} OC = AB - PO, \\ DE = BE - (AP + ON) \\ \text{and } GK = JI - HG \end{array} \right\}$$

$$= 72 + 4 \times 6 + 8 \times 14 + 6 \times 10 + 32$$

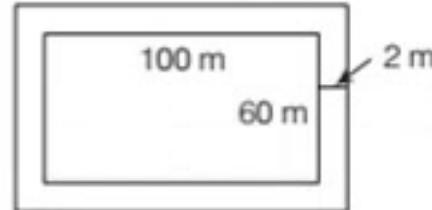
$$= 72 + 24 + 112 + 60 + 32 = 300 \text{ mm}^2$$

11. Area of the hall  $= (4.8 \times 3.6) \text{ m}^2$

$$\text{Area of the square tiles} = (1.2 \times 1.2) \text{ m}^2$$

$$\therefore \text{Required number of tiles} = \frac{4.8 \times 3.6}{1.2 \times 1.2} = 12$$

- 12.



$\therefore$  Area of the rectangular park

$$= 100 \times 60 = 6000 \text{ m}^2$$

Area of the rectangular park with path width

$$= (100 + 2 \times 2) \times (60 + 2 \times 2)$$

$$= 104 \times 64 = 6656 \text{ m}^2$$

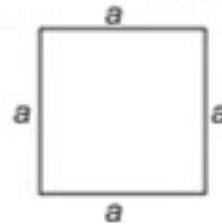
$$\therefore \text{Area of the path} = 6656 - 6000 = 656 \text{ m}^2$$

13. Given, side of the square park  $= 100 \text{ m}$

$\therefore$  Perimeter of the square park  $= 4 \times \text{Side}$

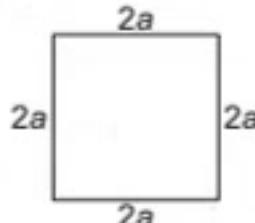
$$= 4 \times 100 = 400 \text{ m}$$

- 14.



$$\text{Perimeter} = 4a$$

After doubled the side,



$$\text{Perimeter} = 4 \times 2a = 8a$$

$$\text{Hence, resultant perimeter } 8a = 2 \times (4a)$$

$$= 2 \text{ times} \times \text{Original perimeter}$$

Thus, the perimeter will be doubled.

15. Given, perimeter of the square park  $= 72 \text{ m}$

Suppose, side of the square park =  $x$  m

$$\text{Then, } 4x = 72 \Rightarrow x = 18 \text{ m}$$

$$\text{Hence, area of the square park} = (18)^2 = 324 \text{ m}^2$$

16. Area of room = Length  $\times$  Breadth

$$363 = 33 \times \text{Breadth}$$

$$\therefore \text{Breadth} = \frac{363}{33} = 11 \text{ m}$$

17. Given, length of the rectangle = 25 m

$$\therefore \text{Breadth of the rectangle} = 25 \times \frac{3}{5} = 15 \text{ m}$$

$$\therefore \text{Perimeter of the rectangle} = 2(l + b) \\ = 2(25 + 15) = 80 \text{ m}$$

18. Area of rectangle = Length  $\times$  Breadth

$$= 12 \times 6.5 = 78 \text{ cm}^2$$

19. Maximum a square is formed in a rectangle.

$$\therefore \text{Perimeter of square} = 100 \text{ cm}$$

$$4 \times a = 100 \quad (a = \text{Side}) \Rightarrow a = \frac{100}{4} = 25 \text{ cm}$$

$$\therefore \text{Area of rectangle} = \text{Area of square}$$

$$= 25 \times 25 = 625 \text{ cm}^2$$

20. When, 60 cubes in each row, then

$$\text{Length of 60 cubes of 1 cm (l)} = 20 \text{ cm}$$

$$\text{Breadth of 60 cubes of 1 cm (b)} = 1 \text{ cm}$$

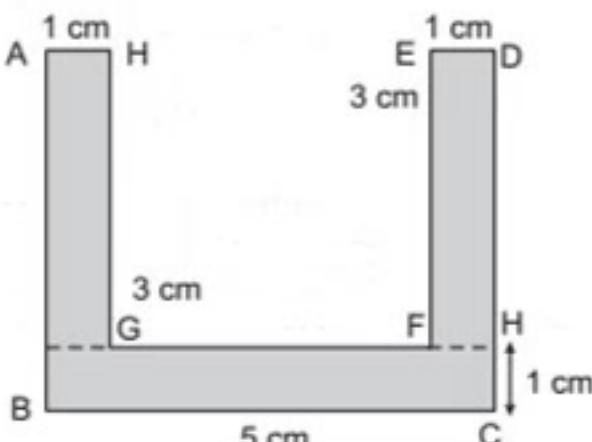
$$\text{Height of 60 cubes of 1 cm (h)} = 3 \text{ cm}$$

$$\therefore \text{Volume of cuboid} = l \times b \times h = 20 \times 1 \times 3 \\ = 60 \text{ cm}^3$$

21. Area of the shaded portion

$$= FE \times ED + BC \times CH + GH \times AH$$

$$= 3 \times 1 + 5 \times 1 + 3 \times 1 = 3 + 5 + 3 = 11 \text{ cm}^2$$



22. Area of the floor = 192 m<sup>2</sup>

$$\text{Length} = 16 \text{ m}$$

$$\text{Breadth} = \frac{192}{16} = 12 \text{ m}$$

$$\therefore \text{Perimeter} = 2(l + b) = 2(16 + 12) \\ = 2(28) = 56 \text{ m}$$

23. Number of tiles required =  $\frac{\text{Area of floor}}{\text{Area of 1 tile}}$

$$= \frac{3.6 \times 4.5}{0.15 \times 0.15} = \frac{36}{10} \times \frac{45}{10} \times \frac{100}{15} \times \frac{100}{15} = 720$$

24. The area of rectangular field = 120  $\times$  160

$$= 19200 \text{ sq m}$$

$$\text{The area of 1 rectangular plot} = 40 \times 60$$

$$= 2400 \text{ sq m}$$

$$\therefore \text{Number of rectangular plots} = \frac{19200}{2400} = 8$$

25. The side of square =  $\frac{\text{Perimeter}}{4}$

$$\therefore \text{The side of the given square} = \frac{200}{4} = 50 \text{ m}$$

$$\therefore \text{Area} = \text{Side} \times \text{Side} \\ = 50 \times 50 = 2500 \text{ sq m}$$

26. Volume of cuboid =  $l \times b \times h$

$$= 18 \times 12 \times 8 \text{ cu cm}$$

$$\text{Volume of cube} = \text{Volume of cuboid}$$

$$\text{Given,} \quad = 18 \times 12 \times 8$$

$$\therefore \text{Edge of cube} = \sqrt[3]{18 \times 12 \times 8} = 12 \text{ cm}$$

27. Side of a square =  $\sqrt{\text{Area of the square}}$

$$\therefore \text{Side of the square} = \sqrt{729} = 27 \text{ m}$$

$$\therefore \text{Perimeter of a square} = 4 \times \text{Side}$$

$$\therefore \text{Perimeter of a square} = 4 \times 27 = 108 \text{ m}$$

28. Perimeter of square =  $4 \times \text{Side}$

$$36 = 4 \times x \Rightarrow x = 9$$

$$\therefore \text{Area} = (9)^2 = 81 \text{ sq m}$$

29. Area =  $(26)^2 = 676 \text{ m}^2$

30. Area of the ground = 12500 m<sup>2</sup>

$$\text{Length} = 125 \text{ m}$$

$$\text{Breadth} = \frac{\text{Area}}{\text{Length}} = \frac{12500}{125} = 100 \text{ m}$$

$$\therefore \text{Perimeter} = 2(l + b) = 2(125 + 100) \\ = 2(225) = 450 \text{ m}$$

31. Let length and breadth be  $(x + 1)$  cm and  $x$  cm.

$$\text{Perimeter} = 2(l + b) = 2(x + 1 + x) = 4x + 2$$

$$4x + 2 = 14 \Rightarrow 4x = 12 \Rightarrow x = 3$$

$$\text{Length} = 3 + 1 = 4 \text{ cm}, \text{ Breadth} = 3 \text{ cm}$$

$$\therefore \text{Area of the rectangle} = l \times b = 4 \times 3 = 12 \text{ cm}^2$$

32. Area of 4 walls =  $2(l + b) \times h = 2(6 + 5) \times 4$

$$= 2(11) \times 4$$

$$= 22 \times 4 = 88 \text{ m}^2$$

33. Breadth =  $\frac{\text{Area}}{\text{Length}} = \frac{1053}{39} = 27 \text{ m}$

34. According to the question, Length = 40 m

$$\text{Breadth} = 20 \text{ m}$$

$$\text{Then,} \quad \text{area} = 40 \times 20 = 800 \text{ m}^2$$

35. Area of a rectangular = Long  $\times$  Wide

$$= 20 \times 16 = 320 \text{ m}^2$$

## Practice Exercise

1. If side of a square is doubled, how many times its area will be increased?  
 (1) 5      (2) 2      (3) 4      (4) 3
2. The total cost of flooring a room at ₹ 12.50 per sq m is ₹ 400. If the length of the room is 8 m, its breadth is  
 (1) 6 m      (2) 8 m  
 (3) 4 m      (4) 9 m
3. The perimeter of the floor of a room is 18 m. What is the area of the walls of the room, if the height of the room is 3 m?  
 (1)  $21\text{ m}^2$       (2)  $42\text{ m}^2$       (3)  $54\text{ m}^2$       (4)  $108\text{ m}^2$
4. Find the number of bricks each of dimensions  $25\text{ cm} \times 12.5\text{ cm} \times 7.5\text{ cm}$  to make a wall of dimensions  $5\text{ m} \times 3\text{ m} \times 20\text{ m}$ .  
 (1) 1200      (2) 1350      (3) 128000      (4) 1400
5. What would be the diagonal of a square whose area is  $25\text{ sq cm}$ ?  
 (1) 7 cm      (2)  $\sqrt{60}\text{ cm}$   
 (3) 9 cm      (4) 5 cm
6. The ratio between length and breadth of a rectangular plot is  $5 : 3$ , respectively and its perimeter is 48 m. What will be its area (in sq m)?  
 (1) 120      (2) 116      (3) 115      (4) 135
7. A table measures 2 m long and 1.5 m broad. What is the length of tape required once to engirdle the table?  
 (1) 3.0 m      (2) 3.5 m  
 (3) 6.0 m      (4) 7.0 m
8. The perimeter of a square is 144 m. Its area is  
 (1)  $12\text{ sq m}$  (2)  $72\text{ sq m}$  (3)  $1296\text{ sq m}$  (4)  $1728\text{ sq m}$
9. What is the area of a rectangle whose breadth is 5 m and its length is double to its breadth?  
 (1)  $10\text{ m}^2$       (2)  $15\text{ m}^2$   
 (3)  $30\text{ m}^2$       (4)  $50\text{ m}^2$
10. Area of a rectangle measuring 6 m long is  $30\text{ m}^2$ . Its width is  
 (1) 5 m      (2) 6 m      (3) 24 m      (4) 180 m
11. The area of a square is equal to the area of rectangle measuring 16 cm length and 9 cm breadth. The perimeter of the square will be  
 (1) 24 cm      (2) 25 cm      (3) 48 cm      (4) 50 cm
12. A floor of room measures  $(5\text{ m} \times 4\text{ m})$ . How many tiles will be required to cover the floor if each tile measures  $80\text{ cm} \times 50\text{ cm}$ ?  
 (1) 20      (2) 40  
 (3) 50      (4) 200
13. What is the volume of a box whose length is 3 m, breadth is 2 m and height is 2 m?  
 (1)  $12\text{ m}^2$       (2)  $10\text{ m}^3$       (3)  $12\text{ m}^3$       (4)  $10\text{ m}^2$
14. A 20 m long and 10 m wide rectangular tank contains water upto the depth of 2 m. The water was transferred to another rectangular tank measuring 10 m long and 5 m wide. In the new tank the water will measure upto a depth of  
 (1) 8 m      (2) 6 m  
 (3) 4 m      (4) 2 m
15. A tank is 6 m long, 4 m wide and  $1\frac{1}{2}$  m high. The volume of water in the tank is  
 (1) 24 cu m      (2) 36 cu m  
 (3)  $11\frac{1}{2}$  cu m      (4) 16 cu m
16. If the volume of a cube is  $729\text{ cm}^3$ , what is the length of its diagonal?  
 (1)  $9\sqrt{2}\text{ cm}$       (2)  $9\sqrt{3}\text{ cm}$   
 (3) 18 cm      (4)  $18\sqrt{3}\text{ cm}$
17. The capacity of a cuboid tank of water is 50000 L. Find the breadth of the tank, if its length and depth are 2.5 m and 10 m, respectively.  
 (1) 2 m      (2) 4 m      (3) 9 m      (4) 6 m

## Answers

1. (3)	2. (3)	3. (3)	4. (3)	5. (4)	6. (4)	7. (4)	8. (3)	9. (4)	10. (1)
11. (3)	12. (3)	13. (3)	14. (1)	15. (2)	16. (2)	17. (1)			

## Hints and Solutions

1. Let original side of the square be  $a$ .  
Then, original area =  $a^2$   
New side =  $2a$   
New area =  $(2a)^2 = 4a^2$   
Thus, area will be 4 times the original area.
2. Area =  $\frac{\text{Total cost}}{\text{Rate}} = \left(\frac{400}{1250}\right) = 32 \text{ m}^2$   
Area =  $32 \text{ m}^2$ , Length = 8 m  
 $\therefore$  Breadth =  $\frac{\text{Area}}{\text{Length}} = \left(\frac{32}{8}\right) = 4 \text{ m}$
3. Area of 4 walls of a room  
= 2 (Length + Breadth)  $\times$  Height  
= Perimeter of floor  $\times$  Height =  $18 \times 3 = 54 \text{ m}^2$
4. Number of bricks =  $\frac{\text{Volume of wall}}{\text{Volume of a brick}}$   
=  $\frac{500 \times 300 \times 2000}{25 \times 125 \times 75} = 128000$
5. Diagonal of square =  $\sqrt{\text{Area}} = \sqrt{25} = 5 \text{ cm}$
6. Perimeter =  $2(\text{Length} + \text{Breadth})$   
 $48 = 2(5x + 3x) \Rightarrow x = \frac{48}{16} = 3$   
 $\therefore$  Area =  $(5 \times 3) \times (3 \times 3) = 15 \times 9 = 135 \text{ m}^2$
7. Length of the table = 2 m  
Breadth of the table = 1.5 m  
Length of the tape required to engirdle the table  
=  $2(2 + 1.5) = 2 \times 3.5 = 7 \text{ m}$
8. Perimeter of square = 144 m  
 $\therefore$  One side of the square =  $\frac{144}{4} = 36 \text{ m}$   
 $\therefore$  Area of the square =  $36 \times 36 = 1296 \text{ sq m}$
9.  $\because$  Breadth of rectangle = 5 m  
Length (double the breadth) =  $2 \times 5 = 10 \text{ m}$   
 $\therefore$  Area = Length  $\times$  Breadth =  $10 \times 5 = 50 \text{ m}^2$
10. Width =  $\frac{\text{Area}}{\text{Length}} = \frac{30}{6} = 5 \text{ m}$
11. Area of the rectangle =  $16 \times 9 \text{ sq cm}$   
Area of the square =  $16 \times 9 \text{ sq cm}$

- $\therefore$  One side of the square =  $\sqrt{16 \times 9}$   
=  $4 \times 3 = 12 \text{ cm}$   
 $\therefore$  Perimeter of the square =  $4 \times 12 = 48 \text{ cm}$
12. Area of the floor =  $5 \times 4 \text{ sq m}$   
=  $500 \times 400 \text{ sq cm} = 200000 \text{ sq cm}$   
Area of 1 tile =  $80 \times 50 = 4000 \text{ sq cm}$   
 $\therefore$  The number of tiles required  
=  $\frac{\text{Area of the floor}}{\text{Area of 1 tile}}$   
=  $\frac{200000}{4000} = 50 \text{ tiles}$
13. Volume of the box = Length  $\times$  Breadth  $\times$  Height  
=  $3 \times 2 \times 2 = 12 \text{ m}^3$
14.  $\because$  Volume of water in the first tank  
=  $20 \times 10 \times 2 = 400 \text{ m}$   
Given, volume of water in the first tank  
= Volume of water in the second tank  
 $\therefore 400 = \text{Length} \times \text{Width} \times \text{Depth}$   
 $\therefore$  Depth of other tank =  $\frac{400}{\text{Length} \times \text{Width}}$   
=  $\frac{400}{10 \times 5} = 8 \text{ m}$
15. Volume of water in the tank  
= Length  $\times$  Breadth  $\times$  Height  
=  $6 \times 4 \times \frac{3}{2} = 36 \text{ cu m}$
16. Volume of cube =  $(\text{Side})^3$   
 $\therefore 729 = a^3$   
 $\Rightarrow a = 9 \text{ cm}$   
 $\therefore$  Diagonal of cube = Side  $\times \sqrt{3}$   
=  $9 \times \sqrt{3} = 9\sqrt{3} \text{ cm}$
17. Capacity of tank =  $50000 \text{ L} = 50 \text{ m}^3$   
 $\left[\because 1 \text{ L} = \frac{1}{1000} \text{ m}^3\right]$   
 $\therefore$  Breadth =  $\frac{50}{2.5 \times 10} = 2 \text{ m}$

## Self Practice

1. Area of rectangular ground is  $12500 \text{ m}^2$ . Its length is 125 m. Its perimeter is  
(1) 450 m      (2) 100 m      (3) 900 m      (4) 1250 m
2. The ratio of length and breadth of a room is 3 : 2. If the sum of length and breadth is 40 m, then its breadth is  
(1) 24 m      (2) 18 m      (3) 16 m      (4) 14 m
3. A rectangular solid measuring  $8 \text{ cm} \times 4 \text{ cm} \times 2 \text{ cm}$  is melted and cast in the form of a cube. The side of the cube formed is  
(1) 64 m      (2) 32 m      (3) 8 cm      (4) 4 cm
4. How many 5 cm cubes can be cut from a cube whose edge is 20 cm?  
(1) 100      (2) 64      (3) 32      (4) 4
5. The perimeter of a square is 48 m. Its area is  
(1) 121 sq m      (2) 148 sq m      (3) 144 sq m      (4) 192 sq m
6. The ratio of length and breadth of a rectangle is 5 : 4. If the length is 25 m, the breadth is  
(1) 15 m      (2) 20 m      (3) 10 m      (4) 12 m
7. The length of a room is 11 m, breadth is 8 m and height is 2 m. What will be the area of the walls of the room?  
(1) 88 sq m      (2) 176 sq m      (3) 38 sq m      (4) 76 sq m
8. The length and breadth of a rectangle is 80 m and 40 m, respectively. If the length increases by 5% and the breadth decreases by 5%. What will be the difference in perimeter?  
(1) 20 m      (2) 12 m      (3) 15 m      (4) 4 m
9. The perimeter of a rectangle is equal to the perimeter of a square. If the length and breadth of rectangle is 20 m and 10 m, respectively. Find the area of the square.  
(1) 300 sq m      (2) 225 sq m      (3) 250 sq m      (4) 325 sq m
10. The area of a square is 100 sq m. Its perimeter is  
(1) 40 m      (2) 100 m      (3) 140 m      (4) 400 m
11. The length of a rectangular field is double its width. If the width is 100 m, what will be its area?  
(1) 200 sq m      (2) 20000 sq m      (3) 200000 sq m      (4) 2000 sq m
12. The area of a square court is 196 sq m. The perimeter is  
(1) 40 m      (2) 60 m      (3) 50 m      (4) 56 m
13. What will be the cost of fencing a square park of side 210 m, if the cost of fencing is ₹ 5.50 per m?  
(1) ₹ 4620      (2) ₹ 4000      (3) ₹ 4680      (4) ₹ 840
14. The height of a cuboid is 2 m. Its breadth and length are 2 times and 3 times its height, respectively. The volume of the cuboid is  
(1)  $48 \text{ m}^3$       (2)  $7 \text{ m}^3$       (3)  $12 \text{ m}^3$       (4)  $24 \text{ m}^3$

## Answers

1. (2)	2. (3)	3. (4)	4. (2)	5. (3)	6. (2)	7. (4)	8. (4)	9. (2)	10. (1)
11. (2)	12. (4)	13. (1)	14. (1)						