4

Profit and Loss

Let us review the basics of profit and loss.

Some definitions

1. The price at which a buyer purchases an article is called the cost price (CP) of the article for the buyer.
2. The price at which a seller sells an article is called the selling price (SP) of the article for the seller.
3. (i) If the SP of an article is more than its CP, there is a profit for the seller.

$$\text{Profit} = \text{SP} - \text{CP}, \quad \text{profit \%} = \frac{\text{profit}}{\text{CP}} \times 100$$

(ii) If the CP of an article is more than its SP, there is a loss for the seller.

$$\text{Loss} = \text{CP} - \text{SP}, \quad \text{loss \%} = \frac{\text{loss}}{\text{CP}} \times 100$$

(iii) If there is a profit of r%, SP = CP + profit = CP + r% of CP $= \text{CP} + \frac{r}{100} \times \text{CP}$.

$$\therefore \quad \text{SP} = \left(1 + \frac{r}{100}\right)\text{CP}$$

(iv) If there is a loss of r%, SP = CP − loss = CP − r% of CP $= \text{CP} - \frac{r}{100} \times \text{CP}$.

$$\therefore \quad \text{SP} = \left(1 - \frac{r}{100}\right)\text{CP}$$

4. Overhead expenses are the additional expenses borne by a buyer on things such as transportation, rent, repair, salaries, tax and commission. These additional expenses are also called overhead charges. Overhead expenses are added to the cost price to determine the final cost price.

Example Manish buys a cooler for Rs 7000 and spends Rs 150 on its transportation.

So, his cost price = Rs 7000 + Rs 150 = Rs 7150.

Solved Examples

EXAMPLE 1 **A man buys a watch for Rs 565 and sells it for Rs 678. Find his profit and profit percentage.**

Solution Profit = SP − CP = Rs 678 − Rs 565 = Rs 113.

$\therefore$ profit percentage $= \frac{\text{profit}}{\text{CP}} \times 100 = \frac{113}{565} \times 100 = \frac{1}{5} \times 100 = 20.$

EXAMPLE 2 **Tabu bought a pencil box for Rs 25 and sold it for Rs 21. Find her loss and loss percentage.**

Solution Loss = CP − SP = Rs 25 − Rs 21 = Rs 4.

$\therefore$ loss percentage $= \frac{\text{loss}}{\text{CP}} \times 100 = \frac{4}{25} \times 100 = 16.$

EXAMPLE 3 **A shopkeeper bought toffees at the rate of 6 for Rs 5 and sold them at the rate of 5 for Rs 6.**

(i) What was his profit percentage?

(ii) How many toffees would he have to sell to earn a profit of Rs 55?

Solution (i) CP of 6 toffees = Rs 5, so CP of 1 toffee = Re $\frac{5}{6}$.

Also, SP of 5 toffees = Rs 6, so SP of 1 toffee = Rs $\frac{6}{5}$.

Profit on the sale of 1 toffee = Rs $\frac{6}{5}$ − Re $\frac{5}{6}$ = Re $\frac{11}{30}$.

$\therefore$ profit percentage $= \frac{\text{profit}}{\text{CP}} \times 100 = \frac{\frac{11}{30}}{\frac{5}{6}} \times 100 = \frac{11}{30} \times \frac{6}{5} \times 100 = 44.$

(ii) A profit of Re $\frac{11}{30}$ is earned on the sale of 1 toffee.

$\therefore$ a profit of Re 1 is earned on the sale of $\frac{30}{11}$ toffees.

$\therefore$ a profit of Rs 55 will be earned on the sale of $\frac{30}{11} \times 55$ toffees, i.e., 150 toffees.

Hence, he would have to sell 150 toffees to earn a profit of Rs 55.

EXAMPLE 4 **Salma sells 18 eggs at the price for which she buys 20 eggs. Find her profit or loss percentage.**

Solution The SP of 18 eggs = the CP of 20 eggs.

$\therefore$ the SP of 1 egg = the CP of $\frac{20}{18}$ eggs = the CP of $\frac{10}{9}$ eggs.

Let the CP of 1 egg = Rs x. Then, the SP of 1 egg = the CP of $\frac{10}{9}$ eggs = Rs $\frac{10}{9}x$.

$\because$ SP > CP, there is a profit.

Profit on the sale of 1 egg = SP − CP = Rs $\frac{10}{9}x$ − Rs x = Rs $\frac{1}{9}x$.

$\therefore$ profit percentage $= \dfrac{\text{profit}}{\text{CP}} \times 100 = \dfrac{\frac{1}{9}x}{x} \times 100 = \dfrac{100}{9} = 11\dfrac{1}{9}$.

Hence, she made a profit of $11\dfrac{1}{9}\%$.

EXAMPLE 5 **Aryan bought some erasers at the rate of Rs 30 per dozen and sold them at a profit of 30%. Find the selling price of an eraser.**

Solution

The CP of 1 dozen erasers = Rs 30.

Profit = 30% of CP = 30% of Rs 30 $= \dfrac{30}{100} \times$ Rs 30 = Rs 9.

$\therefore$ the SP of 1 dozen erasers = CP + profit = Rs 30 + Rs 9 = Rs 39.

$\therefore$ the SP of an eraser = Rs $\dfrac{39}{12}$ = Rs 3.25.

EXAMPLE 6 **A shopkeeper sells 24 pencils and earns a profit equal to the selling price of 8 pencils. Find his profit percentage.**

Solution

Let the SP of 1 pencil = Rs x. Then the SP of 24 pencils = Rs $24x$.

Given, profit on the sale of 24 pencils = SP of 8 pencils = Rs $8x$.

$\therefore$ CP of 24 pencils = SP − profit = Rs $24x$ − Rs $8x$ = Rs $16x$.

$\therefore$ profit percentage $= \dfrac{\text{profit}}{\text{CP}} \times 100 = \dfrac{8x}{16x} \times 100 = 50$.

EXAMPLE 7 **A cellphone was bought for Rs 2575. Find its selling price if it is sold at a (i) profit of 12%, (ii) loss of 16%.**

Solution

(i) Given, CP = Rs 2575 and profit = 12%, i.e., $r = 12$.

$\therefore$ SP $= \left(1 + \dfrac{r}{100}\right)\text{CP} = \left(1 + \dfrac{12}{100}\right) \times$ Rs 2575 $= \dfrac{28}{25} \times$ Rs 2575 = Rs 2884.

(ii) Given, loss = 16%, i.e., $r = 16$.

$\therefore$ SP $= \left(1 - \dfrac{r}{100}\right)\text{CP} = \left(1 - \dfrac{16}{100}\right) \times$ Rs 2575 $= \dfrac{21}{25} \times$ Rs 2575 = Rs 2163.

EXAMPLE 8 **A man sold a toy for Rs 315 at a profit of 5%. What did the toy cost him?**

Solution

We have, SP $= \left(1 + \dfrac{r}{100}\right)$CP. Here, SP = Rs 315, $r = 5$.

$\therefore$ Rs 315 $= \left(1 + \dfrac{5}{100}\right)\text{CP} = \dfrac{21}{20}$CP.

$\therefore$ CP $= \dfrac{20}{21} \times$ Rs 315 = Rs 300.

Hence, the toy cost him Rs 300.

Unitary method

Let the CP of the toy = Rs 100. Then, profit = 5% of CP = Rs 5.

$\therefore$ SP = CP + profit = Rs 100 + Rs 5 = Rs 105.

Now, when the SP = Rs 105 then the CP = Rs 100.

$\therefore$ when the SP = Re 1 then the CP = Re $\dfrac{100}{105}$.

$\therefore$ when the SP = Rs 315 then the CP = Rs $\frac{100}{105} \times 315$ = Rs 300.

$\therefore$ the CP of the toy = Rs 300.

EXAMLE 9 **By selling a calculator for Rs 629, a dealer incurs a loss of 15%. What was the cost price of the calculator for him?**

Solution We have, SP = $\left(1 - \frac{r}{100}\right)$ CP. Here, SP = Rs 629, r = 15.

$\therefore$ Rs 629 = $\left(1 - \frac{15}{100}\right)$ CP = $\frac{17}{20}$ CP.

$\therefore$ CP = $\frac{20}{17} \times$ Rs 629 = Rs 740.

Hence, the CP of the calculator = Rs 740.

Unitary method

Let the CP of the calculator = Rs 100. Then, loss = 15% of CP = Rs 15.

$\therefore$ SP = CP – loss = Rs 100 – Rs 15 = Rs 85.

When the SP = Rs 85 then the CP = Rs 100.

$\therefore$ when the SP = Re 1 then the CP = Rs $\frac{100}{85}$.

$\therefore$ when the SP = Rs 629 then the CP = Rs $\frac{100}{85} \times 629$ = Rs 740.

EXAMPLE 10 **Rita sold two printers for Rs 2100 each. On one of the printers she made a profit of 20% and on the other she incurred a loss of 20%. Find the total loss or gain and also the net loss or gain per cent.**

Solution For the first printer, SP = Rs 2100, profit = 20%, i.e., r = 20.

Now, SP = $\left(1 + \frac{r}{100}\right)$ CP or Rs 2100 = $\left(1 + \frac{20}{100}\right)$ CP or Rs 2100 = $\frac{6}{5}$ CP.

So, CP = $\frac{5}{6} \times$ Rs 2100 = Rs 1750.

For the second, printer, SP = Rs 2100, loss = 20%, i.e., r = 20.

Now, SP = $\left(1 - \frac{r}{100}\right)$ CP or Rs 2100 = $\left(1 - \frac{20}{100}\right)$ CP or Rs 2100 = $\frac{4}{5}$ CP.

So, CP = $\frac{5}{4} \times$ Rs 2100 = Rs 2625.

Thus, the total CP = Rs 1750 + Rs 2625 = Rs 4375, and

the total SP = Rs 2100 + Rs 2100 = Rs 4200.

$\because$ CP > SP, there is a loss. Loss = CP – SP = Rs 4375 – Rs 4200 = Rs 175.

Loss per cent = $\frac{\text{loss}}{\text{CP}} \times 100 = \frac{175}{4375} \times 100 = 4$.

Hence, there is a loss of Rs 175 and the loss per cent = 4.

EXAMPLE 11 **If a man incurs a loss of 20% by selling an article for Rs 1000, at what price should he sell it to make a profit of 16%?**

Solution First case: SP = Rs 1000, loss = 20%, i.e., r = 20.

Now, SP = $\left(1 - \frac{r}{100}\right)$ CP or Rs 1000 = $\left(1 - \frac{20}{100}\right)$ CP or Rs 1000 = $\frac{4}{5}$ CP.

So, CP $= \frac{5}{4} \times$ Rs 1000 = Rs 1250.

Second case: Profit = 16% of CP = 16% of Rs 1250 $= \frac{16}{100} \times$ Rs 1250 = Rs 200.

$\therefore$ SP = CP + profit = Rs 1250 + Rs 200 = Rs 1450.

Hence, he should sell the article for Rs 1450 for a profit of 16%.

EXAMPLE 12 **If a man makes a profit of 10% by selling a camera for Rs 4400, at what price should he sell it to make a profit of 27%?**

Solution

First case: SP = Rs 4400, profit = 10%, i.e., $r = 10$.

Now, SP $= \left(1 + \frac{r}{100}\right)$ CP or Rs 4400 $= \left(1 + \frac{10}{100}\right)$ CP or Rs 4400 $= \frac{11}{10}$ CP.

$\therefore$ CP $= \frac{10}{11} \times$ Rs 4400 = Rs 4000.

Second case: CP = Rs 4000, profit = 27%, i.e., $r = 27$.

$\therefore$ SP $= \left(1 + \frac{r}{100}\right)$ CP $= \left(1 + \frac{27}{100}\right) \times$ Rs 4000 $= \frac{127}{100} \times$ Rs 4000 = Rs 5080.

Hence, he should sell the camera for Rs 5080.

EXAMPLE 13 **Vikas sold a laptop at a profit of 20%. Had he sold it for Rs 1500 more, he would have made a profit of 25%. Find the cost price of the laptop.**

Solution

Let the CP of the laptop = Rs x.

When profit = 20%, i.e., $r = 20$, SP $= \left(1 + \frac{r}{100}\right)$ CP $= \left(1 + \frac{20}{100}\right) \times$ Rs x = Rs $\frac{6}{5}x$.

When profit = 25%, i.e., $r = 25$, SP = Rs $\left(\frac{6}{5}x + 1500\right)$.

But, SP $= \left(1 + \frac{r}{100}\right)$ CP, so $\frac{6}{5}x + 1500 = \left(1 + \frac{25}{100}\right)x$ or $\frac{6}{5}x + 1500 = \frac{5}{4}x$

or $\frac{5}{4}x - \frac{6}{5}x = 1500$ or $\frac{x}{20} = 1500$. $\therefore$ $x = 20 \times 1500 = 30{,}000$.

Hence, the CP of the laptop = Rs 30,000.

EXAMPLE 14 **A dealer sold a motorcycle at a loss of 10%. If he had sold it for Rs 4500 more, he would have made a profit of 5%. Find the selling price of the motorcycle.**

Solution

Let the SP of the motorcycle = Rs x.

When loss = 10%, i.e., $r = 10$, SP $= \left(1 - \frac{r}{100}\right)$ CP or Rs $x = \left(1 - \frac{10}{100}\right)$ CP

$\therefore$ CP = Rs $\frac{10}{9}x$.

Now, a profit of 5% = 5% of CP = 5% of Rs $\frac{10}{9}x$

$= \frac{5}{100} \times$ Rs $\frac{10}{9}x$ = Rs $\frac{1}{18}x$.

$\therefore$ SP = CP + profit = Rs $\frac{10}{9}x$ + Rs $\frac{1}{18}x$ = Rs $\frac{7}{6}x$.

Given that Rs $\frac{7}{6}x$ = Rs x + Rs 4500 or $\frac{7}{6}x - x = 4500$

or $\frac{x}{6} = 4500$ $\therefore$ $x = 6 \times 4500 = 27{,}000$.

Hence, the selling price of the motorcycle = Rs 27,000.

EXAMPLE 15 **Anil sold a pen to Arjun at a profit of 10%. Arjun sold it to Arpita for Rs 66 at a profit of 20%. Find the cost price of the pen for Anil.**

Solution

For Arjun: SP = Rs 66, gain = 20%, i.e., $r = 20$.

Now, $SP = \left(1 + \frac{r}{100}\right) CP$ or $Rs\ 66 = \left(1 + \frac{20}{100}\right) CP$ or $Rs\ 66 = \frac{6}{5} CP$.

$\therefore$ $CP = \frac{5}{6} \times Rs\ 66 = Rs\ 55$.

$\therefore$ Anil's SP = Arjun's CP = Rs 55.

For Anil: SP = Rs 55, gain = 10%, i.e., $r = 10$.

Now, $SP = \left(1 + \frac{r}{100}\right) CP$ or $Rs\ 55 = \left(1 + \frac{10}{100}\right) CP$ or $Rs\ 55 = \frac{11}{10} CP$.

$\therefore$ $CP = \frac{10}{11} \times Rs\ 55 = Rs\ 50$.

Hence, the CP of the pen for Anil = Rs 50.

Remember These

1. (i) Profit = SP – CP (ii) Loss = CP – SP
2. (i) Profit percentage $= \frac{\text{profit}}{CP} \times 100$ (ii) Loss percentage $= \frac{\text{loss}}{CP} \times 100$
3. (i) If there is a profit of r% then $SP = \left(1 + \frac{r}{100}\right) CP$.

   (ii) If there is a loss of r% then $SP = \left(1 - \frac{r}{100}\right) CP$.

EXERCISE 4A

1. (i) Find the profit and profit percentage when a toy is bought for Rs 800 and sold for Rs 848.
   (ii) A cellphone is bought for Rs 6250 and sold for Rs 6750. Find the profit and the profit percentage.
   (iii) A camera is bought for Rs 5400 and sold for Rs 5850. Find the profit per cent.
2. (i) An article costing Rs 240 is sold for Rs 210. Find the loss and loss percentage.
   (ii) A computer costing Rs 28,560 is sold for Rs 24,276. Find the loss per cent.
   (iii) A book costing Rs 320 is sold for Rs 284. Find the loss and the loss per cent.
3. Shanti bought lemons at 7 for Rs 6 and sold them at 6 for Rs 7.
   (i) Find her profit percentage.
   (ii) How many lemons would she have to sell to earn a profit of Rs 65?

4. If the selling price of 10 mangoes is equal to the cost price of 12 mangoes, find the profit percentage.

5. If the selling price of 25 balls is equal to the cost price of 15 balls, find the profit or loss percentage.

6. A trader bought some eggs at the rate of Rs 36 per dozen and sold them at a profit of 40%. Find the selling price of an egg.

7. A trader sold 40 erasers and earned a profit equal to the selling price of 12 erasers. Find his profit percentage.

8. A dealer bought an air conditioner for Rs 25,000. What was the selling price if he sold it at a (i) profit of 15%, (ii) loss of 4%?

9. (i) A man sold an article for Rs 540 and incurred a loss of 10%. Find the cost price of the article.

   (ii) A shopkeeper sold a dressing table for Rs 7512.75 at a profit of $19\frac{1}{4}$%. What was the cost price?

10. A dealer sold two books for Rs 700 each. On one of the books, he made a profit of 25% and on the other he incurred a loss of 20%. Find his profit or loss and also the profit or loss percentage.

11. A man bought two articles for 3500 and Rs 2500. He sold the first article at a profit of 20% and sold the second at a loss of 4%. Find the profit or loss percentage on the total transaction.

12. By selling a pen for Rs 289, a shopkeeper incurs a loss of 15%. At what price should he sell it to earn a profit of 35%?

13. Salim makes a profit of 15% by selling a cycle at Rs 4140. At what price should he sell it to make a profit of 18%?

14. Raman sold a toy at a loss of 20%. Had he sold it for Rs 100 more, he would have made a profit of 30%. Find the cost price of the toy.

15. A shopkeeper sold a watch at a profit of 12%. If he had sold it for Rs 144 more, he would have made a profit of 18%. Find the cost price of the watch.

16. A dealer sells a toy at a loss of 4%. If he had sold it for Rs 180 more, he would have made a profit of 16%. Find the cost price of the toy.

17. A sells an article to B at a profit of 20% and B sells it to C at a loss of 10%. If C pays Rs 216 for the article, find the cost price for A.

18. A sold an article to B at a loss of 20% and B sold it to C at a profit of 20%. If A had sold the article for the price C paid, what would have been his loss or gain per cent?

ANSWERS

1. (i) Rs 48, 6 (ii) Rs 500, 8 (iii) $8\frac{1}{3}$ **2.** (i) Rs 30, $12\frac{1}{2}$ (ii) 15 (iii) Rs 36, $11\frac{1}{4}$

3. (i) $36\frac{1}{9}$ (ii) 210 **4.** 20 **5.** 40% loss **6.** Rs 4.20

7. $42\frac{6}{7}$ **8.** (i) Rs 28,750 (ii) Rs 24,000 **9.** (i) Rs 600 (ii) Rs 6300

10. (i) Loss of Rs 35, $2\frac{18}{41}$ % loss **11.** 10% profit **12.** Rs 459
13. Rs 4248 **14.** Rs 200 **15.** Rs 2400 **16.** Rs 900
17. Rs 200 **18.** Loss of 4%

Discount

Sometimes shops offer things at a reduced price to get rid of old stocks or for other reasons. We say that the things are being sold at a discount.

Marked price

The marked price (MP) or listed price of an article is the price printed on the article itself or on the packaging or a slip attached to the article. In general, the dealer sells articles to the buyer at this price.

Discount

When a dealer sells an article for a price that is lower than the MP, the difference between the marked price (MP) and the selling price (SP) is called discount.

$$\text{Discount} = \text{MP} - \text{SP}, \quad \text{SP} = \text{MP} - \text{discount}, \quad \text{MP} = \text{SP} + \text{discount}$$

Discount may be offered as a sum of money or a percentage of the MP. If a dealer allows a discount of d% on the MP,

$$\text{SP} = \text{MP} - \text{discount} = \text{MP} - d\% \text{ of MP} = \text{MP} - \frac{d}{100} \times \text{MP}.$$

$$\therefore \quad \text{SP} = \left(1 - \frac{d}{100}\right) \times \text{MP}$$

Sometimes a dealer allows a discount of d_1% on the marked price and then d_2% on the reduced price. We say that successive discounts of d_1% and d_2% are available and the SP is calculated by the following formula.

$$\text{SP} = \left(1 - \frac{d_1}{100}\right)\left(1 - \frac{d_2}{100}\right) \times \text{MP}$$

Solved Examples

EXAMPLE 1 **The marked price of a pair of shoes is Rs 1600.**

(i) If it is sold for Rs 1472, find the discount and the discount per cent.

(ii) If it is sold at a discount of 12%, find the discount and the selling price.

Soluton

(i) Discount = MP – SP = Rs 1600 – Rs 1472 = Rs 128.

$$\therefore \quad \text{discount per cent} = \frac{\text{discount}}{\text{MP}} \times 100 = \frac{128}{1600} \times 100 = 8.$$

(ii) Discount = 12% of the MP = 12% of Rs 1600 = $\frac{12}{100}$ of Rs 1600 = Rs 192.

Here, the rate of discount = 12%, i.e., $d = 12$.

$\therefore$ SP = $\left(1 - \frac{d}{100}\right) \times$ MP = $\left(1 - \frac{12}{100}\right) \times$ Rs 1600 = $\frac{22}{25} \times$ Rs 1600 = Rs 1408.

Note SP can be calculated by SP = MP – discount = Rs 1600 – Rs 192 = Rs 1408.

EXAMPLE 2 **A dealer sold a toy for Rs 1044 after allowing a discount of 13% on its marked price. Find the marked price.**

Solution

Given, SP = Rs 1044 and $d = 13$.

Now, SP = $\left(1 - \frac{d}{100}\right) \times$ MP or Rs 1044 = $\left(1 - \frac{13}{100}\right) \times$ MP or Rs 1044 = $\frac{87}{100} \times$ MP.

So, MP = $\frac{100}{87} \times$ Rs 1044 = Rs 1200.

EXAMPLE 3 **The marked price of a toy is Rs 700. The shopkeeper offers a discount of 8% and still makes a profit of 15%. Find the selling price and the cost price.**

Solution

Given, MP = Rs 700 and $d = 8$.

$\therefore$ SP = $\left(1 - \frac{d}{100}\right) \times$ MP = $\left(1 - \frac{8}{100}\right) \times$ Rs 700 = $\frac{23}{25} \times$ Rs 700 = Rs 644.

Now, SP = Rs 644, profit = 15%, i.e., $r = 15$.

But, SP = $\left(1 + \frac{r}{100}\right) \times$ CP or Rs 644 = $\left(1 + \frac{15}{100}\right) \times$ CP or Rs 644 = $\frac{23}{20} \times$ CP.

So, CP = $\frac{20}{23} \times$ Rs 644 = Rs 560.

Hence, the SP = Rs 644 and the CP = Rs 560.

EXAMPLE 4 **A dealer purchased a toy train for Rs 4500 and marked it 20% above the cost price. If he allows a discount of 10%, find the (i) marked price, (ii) selling price, (iii) profit and (iv) profit percentage.**

Solution

(i) MP = CP + 20% of CP = Rs 4500 + $\frac{20}{100}$ of Rs 4500

= Rs 4500 + Rs 900 = Rs 5400.

(ii) Discount = 10%, i.e., $d = 10$.

$\therefore$ SP = $\left(1 - \frac{d}{100}\right) \times$ MP = $\left(1 - \frac{10}{100}\right) \times$ Rs 5400 = $\frac{9}{10} \times$ Rs 5400 = Rs 4860.

(iii) Profit = SP – CP = Rs 4860 – Rs 4500 = Rs 360.

(iv) Profit percentage = $\frac{\text{profit}}{\text{CP}} \times 100 = \frac{360}{4500} \times 100 = 8$.

EXAMPLE 5 **The cost price of a carpet is Rs 4000 which is 20% below the marked price. The trader allows a discount of 8%. Find the (i) marked price, (ii) selling price, (iii) profit and (iv) profit percentage.**

Solution

(i) CP = MP – 20% of MP $\Rightarrow$ Rs 4000 = MP – $\frac{20}{100} \times$ MP $\Rightarrow$ Rs 4000 = $\frac{4}{5} \times$ MP.

$\therefore$ MP $= \frac{5}{4} \times$ Rs 4000 = Rs 5000.

(ii) Given, discount = 8%, i.e., $d = 8$.

$\therefore$ SP $= \left(1 - \frac{d}{100}\right) \times$ MP $= \left(1 - \frac{8}{100}\right) \times$ Rs 5000 $= \frac{23}{25} \times$ Rs 5000 = Rs 4600.

(iii) Profit = SP – CP = Rs 4600 – Rs 4000 = Rs 600.

(iv) Profit percentage $= \frac{\text{profit}}{\text{CP}} \times 100 = \frac{600}{4000} \times 100 = 15$.

EXAMPLE 6 **A shopkeeper marks his goods at 35% above the cost price and allows a discount of 10%. Find his percentage profit.**

Solution Let CP = Rs 100. Then, MP = CP + 35% of CP = Rs 100 + Rs 35 = Rs 135.

Now, discount = 10% of MP $= \frac{10}{100}$ of Rs 135 = Rs 13.50.

$\therefore$ SP = MP – discount = Rs 135 – Rs 13.50 = Rs 121.50.

So, profit = SP – CP = Rs 121.50 – Rs 100 = Rs 21.50.

$\therefore$ profit percentage $= \frac{\text{profit}}{\text{CP}} \times 100 = \frac{21.50}{100} \times 100 = 21.5$.

EXAMPLE 7 **A trader marks an article such that after allowing a discount of 8%, he still makes a profit of 15%. By what per cent is the marked price above the cost price?**

Solution Let the CP of the article = Rs 100. Profit = 15% of CP = Rs 15.

$\therefore$ SP = CP + profit = Rs 100 + Rs 15 = Rs 115.

Given, discount = 8%, i.e., $d = 8$.

Now, SP $= \left(1 - \frac{d}{100}\right) \times$ MP or Rs 115 $= \left(1 - \frac{8}{100}\right) \times$ MP or Rs 115 $= \frac{23}{25} \times$ MP.

So, MP $= \frac{25}{23} \times$ Rs 115 = Rs 125.

MP – CP = Rs 125 – Rs 100 = Rs 25 = 25% of CP.

Hence, the MP is 25% above the CP.

EXAMPLE 8 **A trader marks a jacket at such a price that after allowing a discount of 10% he still makes a profit of 20%. If the cost price of the jacket is Rs 1500, find (i) its selling price and (ii) its marked price.**

Solution (i) CP = Rs 1500, profit = 20%, i.e., $r = 20$.

$\therefore$ SP $= \left(1 + \frac{r}{100}\right) \times$ CP $= \left(1 + \frac{20}{100}\right) \times$ Rs 1500 $= \frac{6}{5} \times$ Rs 1500 = Rs 1800.

(ii) SP = Rs 1800, discount = 10%, i.e., $d = 10$.

SP $= \left(1 - \frac{d}{100}\right) \times$ MP or Rs 1800 $= \left(1 - \frac{10}{100}\right) \times$ MP or Rs 1800 $= \frac{9}{10} \times$ MP.

So, MP $= \frac{10}{9} \times$ Rs 1800 = Rs 2000.

EXAMPLE 9 **A trader allows two successive discounts of 50% and 25% on a pair of jeans. If its marked price is Rs 3600, find the selling price.**

Solution Here, $d_1 = 50$, $d_2 = 25$ and MP = Rs 3600.

$$\therefore \quad \text{SP} = \left(1 - \frac{d_1}{100}\right)\left(1 - \frac{d_2}{100}\right) \times \text{MP} = \left(1 - \frac{50}{100}\right)\left(1 - \frac{25}{100}\right) \times \text{Rs } 3600$$

$$= \frac{1}{2} \times \frac{3}{4} \times \text{Rs } 3600 = \text{Rs } 1350.$$

EXAMPLE 10 **Find a single discount equivalent to two successive discounts of 15% and 20%.**

Solution Let a single discount of d% be equivalent to the two successive discounts. Then, SP after a discount of d% = SP after the two successive discounts of 15% and 20%.

$$\therefore \quad \left(1 - \frac{d}{100}\right) \times \text{MP} = \left(1 - \frac{15}{100}\right)\left(1 - \frac{20}{100}\right) \times \text{MP}$$

$$\text{or} \quad 1 - \frac{d}{100} = \frac{17}{20} \cdot \frac{4}{5} = \frac{17}{25} \quad \text{or} \quad \frac{d}{100} = 1 - \frac{17}{25} = \frac{8}{25}.$$

$$\text{So, } d = \frac{8}{25} \times 100 = 32.$$

Hence, the single equivalent discount = 32%.

Alternative method

Here, $d_1 = 15$ and $d_2 = 20$.

$$\therefore \quad \text{SP after two discounts of 15\% and 20\%} = \left(1 - \frac{d_1}{100}\right)\left(1 - \frac{d_2}{100}\right) \times \text{MP}$$

$$= \left(1 - \frac{15}{100}\right)\left(1 - \frac{20}{100}\right) \times \text{MP}$$

$$= \frac{17}{20} \times \frac{4}{5} \times \text{MP} = \frac{17}{25} \times \text{MP}$$

$$= \frac{68}{100} \times \text{MP} = \left(1 - \frac{32}{100}\right) \times \text{MP}$$

= SP after a single discount of 32%.

Hence, the single discount equivalent to the two successive discounts = 32%.

Remember These

1. (i) Discount = MP − SP (ii) SP = MP − discount (iii) MP = SP + discount
2. Discount per cent $= = \dfrac{\text{discount}}{\text{MP}} \times 100$
3. After a discount of d% on the MP, $\text{SP} = \left(1 - \dfrac{d}{100}\right) \times \text{MP}$.
4. After two successive discounts of d_1% and d_2% on the MP, $\text{SP} = \left(1 - \dfrac{d_1}{100}\right)\left(1 - \dfrac{d_2}{100}\right) \times \text{MP}$.

EXERCISE 4B

1. Find the discount and the discount percentage when
   (i) MP = Rs 250, SP = Rs 210 (ii) MP = Rs 60, SP = Rs 40

2. Find the discount and the selling price when

(i) MP = Rs 1750, discount = 6% (ii) MP = Rs 2,46,000, discount = $13\frac{1}{3}\%$

3. Priya paid Rs 630 for a blanket with a marked price of Rs 900. Find the discount and discount percentage.

4. Jeevan paid Rs 595 for a shirt after a discount of 15%. Find its marked price.

5. The marked price of a book is Rs 360. The dealer offers a discount of 10% and still makes a profit of 20%. Find its selling price and cost price.

6. A dealer bought a bag for Rs 3600 and marked it 15% above the cost price. If he allows a discount of 5%, find

(i) the marked price, (ii) the selling price, (iii) the profit and (iv) the profit percentage.

7. The cost price of a printer is Rs 3400, which is 15% below the marked price. If the article is sold at a discount of 10%, find

(i) the marked price, (ii) the selling price, (iii) the profit and (iv) the profit percentage.

8. A shopkeeper marks an article 20% above its cost price and allows a discount of 15%. Find his percentage of profit.

9. After allowing a discount of 15% on the marked price of an article, a dealer still makes a profit of 19%. By what per cent is the marked price above the cost price?

10. By what per cent above the cost price should a dealer mark a pen so that after allowing a discount of 4% he gains 20%?

11. A dealer marks a damaged article at 10% above the cost price and then allows a discount of 10%. Find his gain or loss per cent.

12. A dealer allows a discount of 10% on the marked price of a book and still makes a profit of 10%. If the cost price of the book is Rs 90, find (i) its selling price and (ii) its marked price.

13. A trader allows two successive discounts of 50% and 50% on a shirt marked Rs 2600. Find the selling price of the shirt.

14. Find a single discount equivalent to two successive discounts of 20% and 10%.

ANSWERS

1. (i) Rs 40, 16 (ii) Rs 20, $33\frac{1}{3}$ **2.** Rs 105, Rs 1645 (ii) Rs 32800, Rs 2,13,200

3. Rs 270, 30 **4.** Rs 700 **5.** Rs 324, Rs 270

6. (i) Rs 4140 (ii) Rs 3933 (iii) Rs 333 (iv) $9\frac{1}{4}$ **7.** (i) Rs 4000 (ii) Rs 3600 (iii) Rs 200 (iv) $5\frac{15}{17}$

8. 2 **9.** 40 **10.** 25 **11.** loss of 1%

12. (i) Rs 99 (ii) Rs 110 **13.** Rs 650 **14.** 28%

Revision Exercise 2

1. On a particular day, 24 of the 40 students of a class were present. What percentage of the students was absent?
2. The number of dolphins in a river increased by 40% from 225 in 2009 and further increased by 20% in 2010. Find the number of dolphins in the river in 2010.
3. 80% of the children of a school were girls. How many children would be in the school if there were 845 boys?
4. A man had his salary increased by 5%. If he received Rs 468 increase, what were his wages before the increase?
5. By selling a toy for Rs 286, a shopkeeper faces a loss of 12%. At what price should he sell it to earn a profit of 20%?
6. A fan was sold at a loss of 15%. Had it been sold for Rs 828 more, the profit would have been 8%. Find its cost price.
7. A sold an article to B at a profit of 24% and B sold it to C at a loss of 20%. If C pays Rs 124 for the article, find the cost price for A.
8. A shopkeeper bought two articles for Rs 3600 and Rs 3900 respectively. He sold the first article at a profit of 10% and the second article at loss of 10%. Find the profit or loss percentage on the total transaction.
9. A trader allows two successive discounts of 50% and 50% on a pair of shoes. If its marked price is Rs 2400, find the selling price.
10. Find a single discount equivalent to two successive discounts of 40% and 80%.
11. A toy was priced at Rs 540. The price is increased by 5% and then by a further 15% due to tax. Find the new price.
12. A shopkeeper marks an article at 36% above its cost price and allows a discount of 25% on its marked price. Find his percentage profit or loss.
13. By how much percent above the cost price should a dealer mark a toy so that after allowing a discount of 30% he gains 12%?

ANSWERS

1. 40%	**2.** 378	**3.** 4225	**4.** Rs 9360
5. Rs 390	**6.** Rs 3600	**7.** Rs 125	**8.** loss of 0.4%
9. Rs 600	**10.** 88%	**11.** Rs 652.05	**12.** profit of 2%
13. 60%			