

PROFIT, LOSS AND DISCOUNT

10.1 PROFIT AND LOSS

1. The cost price (C.P.) of an article is the price at which the article is bought.
2. The selling price (S.P.) of an article is the price at which the article is sold.
3. If **selling price** of an article is **more** than its **cost price**; it is sold at a **profit** (gain).

$$\text{Profit} = \text{Selling Price} - \text{Cost Price}$$

$$\text{i.e., Profit (gain)} = \text{S.P.} - \text{C.P.} \text{ and } \text{S.P.} = \text{C.P.} + \text{Gain}$$

4. If **selling price** of an article is **less** than its **cost price**; it is sold at a **loss**.

$$\text{Loss} = \text{Cost Price} - \text{Selling Price}$$

$$\text{i.e., Loss} = \text{C.P.} - \text{S.P.} \text{ and } \text{S.P.} = \text{C.P.} - \text{Loss}$$

5. Profit percent and loss percent are always calculated on cost price (C.P.) only.

$$\text{i.e., (i) Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100\% \text{ and (ii) Loss \%} = \frac{\text{Loss}}{\text{C.P.}} \times 100\%$$

Example 1 :

- (i) An article, bought for ₹ 120 is sold for ₹ 150. Find the gain or loss percent.
- (ii) A bicycle, bought for ₹ 600 is sold for ₹ 550. Find gain or loss percent.

Solution :

$$(i) \text{ Given : C.P.} = ₹ 120 \text{ and S.P.} = ₹ 150$$

$$\therefore \text{Gain} = ₹ 150 - ₹ 120 = ₹ 30$$

$$\text{And, gain \%} = \frac{\text{Gain}}{\text{C.P.}} \times 100\% = \frac{30}{120} \times 100\% = 25\% \quad (\text{Ans.})$$

$$(ii) \text{ Given : C.P.} = ₹ 600 \text{ and S.P.} = ₹ 550$$

$$\therefore \text{Loss} = \text{C.P.} - \text{S.P.} = ₹ 600 - ₹ 550 = ₹ 50.$$

$$\text{And, loss percent} = \frac{\text{Loss}}{\text{C.P.}} \times 100\% = \frac{50}{600} \times 100\% = \frac{25}{3}\% = 8\frac{1}{3}\% \quad (\text{Ans.})$$

10.2 TO FIND SELLING PRICE (WHEN C.P. AND PROFIT% OR LOSS% ARE KNOWN)

Example 2 :

- (i) Geeta bought a watch for ₹ 450. For how much should she sell it to gain 10% ?
- (ii) Rahul bought an article for ₹ 800 and sold it at 25% loss. Find the selling price.

Solution :

$$(i) \text{ Given : C.P.} = ₹ 450$$

$$\therefore \text{Gain} = 10\% \text{ of C.P.} = \frac{10}{100} \times ₹ 450 = ₹ 45 \quad [\text{Gain \% is always on C.P.}]$$

$$\text{And, Selling Price} = \text{Cost price} + \text{Gain}$$

$$= ₹ 450 + ₹ 45 = ₹ 495 \quad (\text{Ans.})$$

Alternative method (Direct method) :

$$\text{Gain} = 10\% \Rightarrow \text{S.P.} = 110\% \text{ of C.P.}$$

$$\therefore \text{S.P.} = 110\% \text{ of ₹ 450} = \frac{110}{100} \times ₹ 450 = ₹ 495 \quad (\text{Ans.})$$

$$(ii) \therefore \text{C.P.} = ₹ 800 \text{ and loss} = 25\% \text{ of ₹ 800} = \frac{25}{100} \times ₹ 800 = ₹ 200$$

$$\therefore \text{Selling price} = \text{Cost price} - \text{Loss} = ₹ 800 - ₹ 200 = ₹ 600 \quad (\text{Ans.})$$

Alternative method :

$$\therefore \text{Loss} = 25\% \Rightarrow \text{S.P.} = 75\% \text{ of C.P.}$$

$$\text{i.e., selling price} = \frac{75}{100} \times ₹ 800 = ₹ 600 \quad (\text{Ans.})$$

Remember :

$$1. \text{ If gain} = 20\%, \text{ S.P.} = 120\% \text{ of C.P., i.e., } \text{S.P.} = \frac{120}{100} \times \text{C.P.}$$

$$2. \text{ If loss} = 20\%, \text{ S.P.} = 80\% \text{ of C.P., i.e., } \text{S.P.} = \frac{80}{100} \times \text{C.P.}$$

Note : Some times, the selling price and the cost price are given for different number of articles, then to find loss or gain percent, first of all, find the cost price and the selling price of equal number of articles.

Examples 3 :

A shopkeeper buys 50 pencils for ₹ 80 and sells them at 40 pencils for ₹ 90. Find his gain or loss percent.

Solution :

$$\text{Since, C.P. of 50 pencils} = ₹ 80 \quad \therefore \text{C.P. of 1 pencil} = ₹ \frac{80}{50} = ₹ 1.60$$

$$\text{Since, S.P. of 40 pencils} = ₹ 90 \quad \therefore \text{S.P. of 1 pencil} = ₹ \frac{90}{40} = ₹ 2.25$$

$$\text{Hence, gain} = ₹ 2.25 - ₹ 1.60 = ₹ 0.65$$

$$\text{And, Gain \%} = \frac{0.65}{1.60} \times 100\% = 40\frac{5}{8}\% \quad (\text{Ans.})$$

EXERCISE 10(A)

1. Find the gain or loss percent, if :

(i) C.P. = ₹ 200 and S.P. = ₹ 224

(ii) C.P. = ₹ 450 and S.P. = ₹ 400

(iii) C.P. = ₹ 550 and gain = ₹ 22

(iv) C.P. = ₹ 216 and loss = ₹ 72

(v) S.P. = ₹ 500 and loss = ₹ 100

2. Find the selling price, if :

(i) C.P. = ₹ 500 and gain = 25%

(ii) C.P. = ₹ 60 and loss = $12\frac{1}{2}\%$

3. Rohit bought a tape-recorder for ₹ 1,500 and sold it for ₹ 1,800. Calculate his profit or loss percent.

4. An article bought for ₹ 350 is sold at a profit of 20%. Find its selling price.
5. An old machine is bought for ₹ 1,400 and is sold at a loss of 15%. Find its selling price.
6. Oranges are bought at 5 for ₹ 10 and sold at 6 for ₹ 15. Find profit or loss as percent.
7. A certain number of articles are bought at 3 for ₹ 150 and all of them are sold at 4 for ₹ 180. Find the loss or gain as percent.
8. A vendor bought 120 sweets at 20 p each. In his house, 18 were consumed and he sold the remaining at 30 p each. Find his profit or loss as percent.

$$\text{C.P. of all the sweets} = 120 \times 20 \text{ p and S.P. of all the sweets} = (120 - 18) \times 30 \text{ p.}$$

9. The cost price of an article is ₹ 1,200 and selling price is $\frac{5}{4}$ times of its cost price.
Find : (i) selling price of the article, (ii) profit or loss as percent.
10. The selling price of an article is ₹ 1,200 and cost price is $\frac{5}{4}$ times of its selling price.
Find : (i) cost price of the article, (ii) profit or loss as percent.

10.3 TO FIND COST PRICE

Example 4 :

By selling an article for ₹ 550, a profit of 10% is made. Find its cost price.

Solution :

$$\text{Let C.P.} = ₹ 100$$

$$\therefore \text{Profit} = 10\% \text{ of } ₹ 100 = ₹ 10$$

$$\text{and S.P.} = ₹ 100 + ₹ 10 = ₹ 110 \quad [\text{S.P.} = \text{C.P.} + \text{Profit}]$$

$$\text{When S.P.} = ₹ 110, \quad \text{C.P.} = ₹ 100$$

$$\therefore \text{When S.P.} = ₹ 1, \quad \text{C.P.} = ₹ \frac{100}{110}$$

$$\text{And, when S.P.} = ₹ 550, \quad \text{C.P.} = ₹ \frac{100}{110} \times 550 = ₹ 500 \quad (\text{Ans.})$$

Alternative method :

$$\therefore \text{Profit} = 10\% \Rightarrow \text{S.P.} = 110\% \text{ of C.P.}$$

$$\therefore ₹ 550 = \frac{110}{100} \times \text{C.P.} \Rightarrow ₹ 550 \times \frac{100}{110} = \text{C.P.}$$

$$\text{Hence, C.P.} = ₹ 550 \times \frac{100}{110} = ₹ 500 \quad (\text{Ans.})$$

Algebraic method :

$$\text{Let C.P.} = ₹ x;$$

$$\therefore \text{Profit} = 10\% \text{ of } ₹ x = \frac{10}{100} \times ₹ x = ₹ \frac{x}{10}$$

$$\text{C.P.} + \text{Gain} = \text{S.P.} \Rightarrow x + \frac{x}{10} = 550$$

$$\Rightarrow \frac{10x + x}{10} = 550 \Rightarrow \frac{11x}{10} = 550$$

$$\Rightarrow x = 550 \times \frac{10}{11} \Rightarrow \text{C.P.} = ₹ 500 \quad (\text{Ans.})$$

Example 5 :

By selling an article for ₹ 270, a loss of 10 percent is made.

Find : (i) the cost price of the article.

(ii) the price at which the article must be sold in order to gain 12%.

Solution :

(i) Let C.P. = ₹ 100

∴ Loss = 10% of ₹ 100 = ₹ 10

and S.P. = ₹ 100 - ₹ 10 = ₹ 90

∴ When S.P. = ₹ 90, C.P. = ₹ 100

When S.P. = ₹ 1, C.P. = ₹ $\frac{100}{90}$

And, when S.P. = ₹ 270, C.P. = ₹ $\frac{100}{90} \times 270 = ₹ 300$ (Ans.)

Alternative method :

Loss = 10% \Rightarrow S.P. = 90% of C.P.

∴ ₹ 270 = $\frac{90}{100} \times$ C.P. \Rightarrow ₹ 270 $\times \frac{100}{90} =$ C.P.

Or C.P. = ₹ 270 $\times \frac{100}{90} = ₹ 300$ (Ans.)

Algebraic method :

Let C.P. = ₹ x

Loss = 10% of ₹ x = $\frac{10}{100} \times ₹ x = ₹ \frac{x}{10}$

∴ C.P. - Loss = S.P. $\Rightarrow x - \frac{x}{10} = 270$

$\Rightarrow \frac{10x - x}{10} = 270 \Rightarrow \frac{9x}{10} = 270$

$\Rightarrow x = 270 \times \frac{10}{9} = 300 \Rightarrow$ C.P. = ₹ 300 (Ans.)

(ii) C.P. = ₹ 300

and gain = 12% of ₹ 300 = $\frac{12}{100} \times ₹ 300 = ₹ 36$.

∴ New selling price = ₹ 300 + ₹ 36 = ₹ 336 (Ans.)

Alternative method :

Since, gain = 12%

S.P. = $\frac{112}{100} \times$ C.P.

= $\frac{112}{100} \times ₹ 300 = ₹ 336$ (Ans.)

Example 6 :

A trader bought 12 eggs for ₹16. For how much should he sell one egg to gain 50 percent ?

Solution :

$$\therefore \text{C.P. of 12 eggs} = ₹ 16$$

$$\text{and, gain} = 50\% \text{ of } ₹ 16 = \frac{50}{100} \times ₹ 16 = ₹ 8$$

$$\therefore \text{S.P. of 12 eggs} = ₹ 16 + ₹ 8 = ₹ 24$$

$$\text{and, S.P. of 1 egg} = ₹ \frac{24}{12} = ₹ 2 \quad (\text{Ans.})$$

Alternative method :

$$\text{Since, C.P. of 12 eggs} = ₹ 16 \Rightarrow \text{C.P. of 1 egg} = ₹ \frac{16}{12} = ₹ \frac{4}{3}$$

$$\text{Gain} = 50\% \Rightarrow \text{S.P.} = 150\% \text{ of C.P.}$$

$$\Rightarrow \text{S.P.} = \frac{150}{100} \times ₹ \frac{4}{3} = ₹ 2 \quad (\text{Ans.})$$

EXERCISE 10 (B)

- Find the cost price, if :
 - S.P. = ₹ 21 and gain = 5%
 - S.P. = ₹ 22 and loss = 12%
 - S.P. = ₹ 340 and gain = ₹ 20
 - S.P. = ₹ 200 and loss = ₹ 50
 - S.P. = ₹ 1 and loss = 5 p
- By selling an article for ₹ 810, a loss of 10 percent is suffered. Find its cost price.
- By selling a scooter for ₹ 9,200, a man gains 15%. Find the cost price of the scooter.
- On selling an article for ₹ 2,640, a profit of 10 percent is made.
Find : (i) cost price of the article.
(ii) new selling price of it, in order to gain 15%.
- A T.V. set is sold for ₹ 6,800 at a loss of 15%.
Find : (i) cost price of the T.V. set.
(ii) new selling price of it, in order to gain 12%.
- A fruit seller bought mangoes at ₹ 90 per dozen and sold them at a loss of 8 percent.
How much will a customer pay for :
(i) one mango (ii) 40 mangoes
- By selling two transistors for ₹ 600 each, a shopkeeper gains 20 percent on one transistor and loses 20 percent on the other.
Find : (i) C.P. of each transistor.
(ii) total C.P. and total S.P. of both the transistors.
(iii) profit or loss percent on the whole.

8. Mangoes are bought at 20 for ₹ 60. If they are sold at $33\frac{1}{3}$ percent profit, find : (i) selling price of each mango. (ii) S.P. of 8 mangoes.
9. Find the cost price of an article, which is sold for ₹ 4,050 at a loss of 10%. Also, find the new selling price of the article which must give a profit of 8%.
10. By selling an article for ₹ 825, a man loses equal to $\frac{1}{3}$ of its selling price. Find : (i) the cost price of the article. (ii) the profit percent or the loss percent made, if the same article is sold for ₹ 1,265.

10.4 DISCOUNT

Students must have seen price-chits on the articles, which are kept in shops for sale.

The price written on a chit is the *Marked Price (M.P.)* or *List Price* or *Advertised Price of the article on which the chit is attached*.

Often the shopkeepers say, they will give a discount.

What does this discount mean ?

It means, a reduction in the price, which is always calculated on the marked price of the article.

$$\begin{aligned} \text{Selling price} &= \text{Marked price} - \text{Discount} \\ \text{i.e., S.P.} &= \text{M.P.} - \text{Discount} \end{aligned}$$

Example 7 :

A dealer marks a T.V. set for ₹ 9,000 but agrees to give a discount of 20%. Find the selling price of the T.V. set.

Solution :

$$\text{Here, marked price (M.P.)} = ₹ 9,000$$

$$\text{Discount} = 20\% \text{ of } ₹ 9,000 = ₹ \frac{20}{100} \times 9,000 = ₹ 1,800$$

$$\therefore \text{S.P.} = ₹ 9,000 - ₹ 1,800 = ₹ 7,200 \quad (\text{Ans.})$$

Example 8 :

An article, marked at ₹ 155, is sold for ₹ 124. Find the discount and discount percent ?

Solution :

$$\text{M.P.} = ₹ 155 \text{ and } \text{S.P.} = ₹ 124$$

$$\therefore \text{Discount} = ₹ 155 - ₹ 124 = ₹ 31 \quad (\text{Ans.})$$

$$\begin{aligned} \text{And, discount percent} &= \frac{\text{Discount}}{\text{M.P.}} \times 100\% \\ &= \frac{31}{155} \times 100\% = 20\% \quad (\text{Ans.}) \end{aligned}$$

EXERCISE 10 (C)

1. A machine is marked at ₹ 5,000, and is sold at a discount of 10%. Find the selling price of the machine.
2. A shopkeeper marked a dinner set for ₹ 1,000. He sold it at ₹ 900. What percent discount did he give ?
3. A pair of shoes, marked at ₹ 320, are sold at a discount of 15 percent.
Find : (i) discount, (ii) selling price of the shoes.
4. The list price of an article is ₹ 450 and it is sold for ₹ 360.
Find : (i) discount, (ii) discount percent.
5. A shopkeeper buys an article for ₹ 300. He increases its price by 20% and then gives 10% discount on the new price.
Find : (i) the new price (marked price) of the article.
(ii) the discount given by the shopkeeper.
(iii) the selling price.
(iv) profit percent made by the shopkeeper.
6. A car is marked at ₹ 50,000. The dealer gives 5% discount on first ₹ 20,000 and 2% discount on the remaining ₹ 30,000.
Find : (i) the total discount. (ii) the price charged by the dealer.
7. A dealer buys a T.V. set for ₹ 2,500. He marks it at ₹ 3,200 and then gives a discount of 10% on it.
Find : (i) the selling price of the T.V. set
(ii) the profit percent made by the dealer.
8. A sells his goods at 15% discount. Find the price of an article which is sold for ₹ 680.
9. A shopkeeper allows 20% discount on the marked price of his articles. Find the marked price of an article for which he charges ₹ 560.
10. An article is bought for ₹ 1,200 and ₹ 100 is spent on its transportation, etc.
Find : (i) the total C.P. of the article.
(ii) the selling price of it in order to gain 20% on the whole.
11. 40 pens are bought at 4 for ₹ 50 and all of them are sold at 5 for ₹ 80.
Find : (i) C.P. of one pen.
(ii) S.P. of one pen.
(iii) Profit made by selling one pen.
(iv) Profit percent made by selling one pen.
(v) C.P. of 40 pens.
(vi) S.P. of 40 pens.
(vii) Profit made by selling 40 pens.
(viii) Profit percent made by selling 40 pens.

Are the results of parts (iv) and (viii) same ?

What conclusion do you draw from the above result ?

12. The C.P. of 5 identical articles is equal to S.P. of 4 articles. Calculate the profit percent or loss percent made if all the articles bought are sold.

$$\begin{aligned} \text{Let C.P. of 5 articles} &= \text{S.P. of 4 articles} = ₹ 100 \\ \Rightarrow \text{C.P. of 1 article} &= \frac{₹ 100}{5} = ₹ 20 \\ \text{and, S.P. of 1 article} &= \frac{₹ 100}{4} = ₹ 25 \\ \therefore \text{Profit on 1 article} &= ₹ 25 - ₹ 20 = ₹ 5 \\ \text{Profit \%} &= \frac{\text{Profit}}{\text{C.P.}} \times 100\% \\ &= \frac{₹ 5}{₹ 20} \times 100\% = 25\% \end{aligned} \quad (\text{Ans.})$$

Alternative method

$$\begin{aligned} \text{Let C.P. of 1 article} &= ₹ 100 \\ \Rightarrow \text{C.P. of 5 articles} &= ₹ 100 \times 5 = ₹ 500 \\ \Rightarrow \text{S.P. of 4 articles} &= ₹ 500 \\ \text{and S.P. of 1 article} &= \frac{₹ 500}{4} = ₹ 125 \\ \text{Profit on 1 article} &= ₹ 125 - ₹ 100 = ₹ 25 \\ \text{Profit \%} &= \frac{\text{Profit}}{\text{C.P.}} \times 100\% \\ &= \frac{25}{100} \times 100\% = 25\% \end{aligned} \quad (\text{Ans.})$$

13. The C.P. of 8 pens is same as S.P. of 10 pens. Calculate the profit or loss percent made, if all the pens bought are considered to be sold.
14. A certain number of articles are bought at ₹ 450 per dozen and all of them are sold at a profit of 20%. Find the S.P. of :
- one article
 - seven articles.
15. An article is marked 60% above the cost price and sold at 20% discount. Find the profit percent made.

$$\begin{aligned} \text{Let C.P.} &= ₹ 100 \\ \Rightarrow \text{M.P.} &= ₹ 100 + 60\% \text{ of } ₹ 100 \\ &= ₹ 100 + ₹ 60 = ₹ 160 \\ \text{Now, M.P.} &= ₹ 160 \text{ and discount} = 20\%, \text{ so we can find the S.P.} \\ \text{With the known S.P. and known C.P.,} &\text{ we can find the profit percent.} \end{aligned}$$