Profit, Loss and Discount

Concept of Profit and Loss

Generally when an item is purchased, some additional expenses such a labour charges, transportation charges, maintenance charges etc are made before the selling of the item. These expenses are known as overhead charges. These expenses have to be added in the cost price of the item.

∴ Real cost price = Price for purchasing the goods + Overhead charges

Let us discuss some examples based on the above concept.

Example 1:

Find out the profit or loss in the following transactions.

(i) Rahul bought a bicycle for Rs 1200 and sold it for Rs 1150.

(ii) Tanmay bought a pair of trousers for Rs 700 and sold them for Rs 725.

Solution:

(i) Here, C.P. = Rs 1200

S.P. = Rs 1150

∴ Loss incurred = C.P. − S.P. = Rs 1200 − Rs 1150 = Rs 50

Hence, a loss of Rs 50 was incurred in this transaction.

(ii) Here, C.P. = Rs 700

S.P. = Rs 725

∴ Profit made = S.P. − C.P. = Rs 725 − Rs 700 = Rs 25

Hence, a profit of Rs 25 was made in this transaction.

Example 2:

Javed bought 10 pens for Rs 120 and sold them for Rs 80. Find out the loss incurred on five pens.

Solution:

Cost price (C.P.) of 1 pen = $\text{Rs}\left(\frac{120}{10}\right)$ = Rs 12

Selling price (S.P.) of 1 pen = $\text{Rs}\left(\frac{80}{10}\right) = \text{Rs } 8$

∴ Loss incurred on 1 pen = Rs 12 − Rs 8 = Rs 4

Hence, loss incurred on 5 pens = 5 × Rs 4 = Rs 20

Example 3:

Kanika sold three bottles for Rs 135 and incurred a loss of Rs 15. What is the cost price of one bottle?

Solution:

SP of 3 bottles = Rs 135

∴ SP of 1 bottle = $\text{Rs}\,\frac{135}{3} = \text{Rs}\,45$

Loss incurred on 3 bottles = Rs 15

∴ Loss incurred on 1 bottle = $\text{Rs}\,\frac{15}{3} = \text{Rs}\,5$

CP = Loss + SP

= Rs 5 + Rs 45

= Rs 50

Thus, the cost price of one bottle is Rs 50.

Concept of Profit Percent and Loss Percent

In buying and selling articles, sometimes there is loss and sometimes profit. We can also write profit and loss as a percentage. Profit percent or loss percent is always calculated on the cost price of the article.

In the same way, we can find loss percent.

Remember the following formulae.

Profit % $= \frac{\text{Profit}}{\text{C.P}} \times 100$

Loss % $= \frac{\text{Loss}}{\text{C.P.}} \times 100$

$$\text{S.P.} = \frac{(100 + \text{Profit}\,\%)}{100} \times \text{C.P.}$$

$$\text{S.P.} = \frac{(100 - \text{Loss}\,\%)}{100} \times \text{C.P.}$$

$$\text{C.P.} = \frac{100}{(100 + \text{Profit}\,\%)} \times \text{S.P.}$$

$$\text{C.P.} = \frac{100}{(100 - \text{Loss}\,\%)} \times \text{S.P.}$$

Now, let us solve some examples.

Example 1:

Apurva sold his bike for Rs 30000 at a loss of 40%. At what price did Apurva buy the bike?

Solution:

Let the price at which Apurva bought the bike be *x*.

C.P. = *x*

S.P. = Rs 30000

Loss = C.P. − S.P. = Rs (*x* − 30000)

We know that, Loss % $= \frac{\text{Loss}}{\text{C.P.}} \times 100$

$$40 = \frac{(x - 30000)}{x} \times 100$$

40*x* = 100*x* − 3000000

$100x - 40x = 3000000$

$60x = 3000000$

$$x = \frac{3000000}{60}$$

x = Rs 50000

Thus, Apurva bought the bike for Rs 50000.

Example 2:

Javed sold a refrigerator and a washing machine for Rs 15000 and Rs 10000 respectively. He made a gain of 25% on the refrigerator and a loss of 20% on the washing machine. Find his overall gain or loss.

Solution:

Let the cost price of refrigerator be x and that of washing machine be y.

S.P. of refrigerator = Rs 15000

Gain on refrigerator = S.P. − C.P. = Rs (15000 − x)

We know that, gain % $= \frac{\text{Gain}}{\text{C.P.}} \times 100$

$$25 = \frac{(15000 - x)}{x} \times 100$$

$25x = (1500000 - 100x)$

$125x = 1500000$

$$x = \frac{1500000}{125}$$

x = Rs 12000

C.P. of refrigerator = Rs 12000

Now, selling price of washing machine = Rs 10000

Loss on washing machine = Rs (y − 10000)

We know that, Loss% $= \frac{\text{Loss}}{\text{C.P.}} \times 100$

$$20 = \frac{(y - 10000)}{y} \times 100$$

$20y = 100y - 1000000$

$100y - 20y = 1000000$

$80y = 1000000$

$$y = \frac{1000000}{80}$$

y = Rs 12500

C.P. of washing machine = Rs 12500

Now, total cost price of refrigerator and washing machine is, (Rs 12000 + Rs 12500)

= Rs 24500

Total S.P. = Rs 15000 + Rs 10000 = Rs 25000

Overall gain = Rs 25000 − Rs 24500 = Rs 500

Thus, there is an overall gain of Rs 500 on the selling of the refrigerator and the washing machine.

Example 3:

Rahul purchased a television for Rs 20000 and its transportation cost was Rs 100. For how much should the television be sold so that he makes a profit of 7%?

Solution:

C.P. of the television = Rs 20000

Overhead charges = Rs 100

∴ Total cost of TV = Rs 20000 + Rs 100 = Rs 20100

Profit % = 7%

We know that, Profit % $= \frac{\text{Profit}}{\text{C.P.}} \times 100$

$$7 = \frac{\text{Profit}}{20100} \times 100$$

7 × 201 = Profit

∴ Profit = Rs 1407

Now,

S.P. = C.P. + Profit = Rs 20100 + Rs 1407 = Rs 21507

Thus, the television should be sold for Rs 21507.

Example 4:

Arun bought an umbrella for Rs 125 and sold it for a profit of Rs 20. What was the selling price of the umbrella and the profit percent of the transaction?

Solution:

Cost price (C.P.) of the umbrella = Rs 125

Profit made in the transaction = Rs 20

∴ Selling price (S.P.) of the umbrella = C.P. + Profit = Rs 125 + Rs 20 = Rs 145

Hence, profit percent of the transaction = $\frac{\text{Profit}}{\text{C.P.}} \times 100 = \frac{20}{125} \times 100 = 16\,\%$

Example 5:

Julie bought a washing machine for Rs 20000. She then sold it at 10% profit. At what price did she sell the washing machine?

Solution:

Profit per cent = 10%

Cost price (C.P.) of the washing machine = Rs 20000

Profit per cent of the transaction $= \frac{\text{Profit}}{\text{C.P.}} \times 100 = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100$

$$\therefore 10 = \frac{\text{S.P.} - 20000}{20000} \times 100$$
$$\text{S.P.} - 20000 = \frac{10 \times 20000}{100}$$
$$\text{S.P.} - 20000 = 2000$$
$$\text{S.P.} = 20000 + 2000 = 22000$$

Hence, Julie sold the washing machine for Rs 22000.

Example 6:

If the cost price of 16 chocolates is equal to selling price of 12 chocolates, then find the profit percent.

Solution:

Let the C.P. of each chocolate be Re 1. Then the C.P. of 16 chocolates will be Rs 16.
By the given data, S.P. of 12 chocolates = C.P. of 16 chocolates = Rs 16

∴ S.P. of 1 chocolate = Rs $\frac{16}{12}$

Profit = S.P. – C.P. = $\text{Rs}\frac{16}{12} - \text{Re}1 = \text{Re}\frac{4}{12} = \text{Re}\frac{1}{3}$

Thus, there is a profit of Rs $\frac{1}{3}$ on each chocolate.

Profit % = $\frac{\text{Profit}}{\text{C.P.}} \times 100\% = \frac{\text{Re}\frac{1}{3}}{\text{Re}1} \times 100\% = \frac{100}{3}\% = 33\frac{1}{3}\%$

Thus, the profit percent is $33\frac{1}{3}\%$.

Example 7:

On selling a bicycle for Rs 5,600, a dealer loses 20%. For how much should he sell it to gain 15%?

Solution:

Selling price of the bicycle is Rs 5,600 and the loss is 20%. Therefore,

$$\begin{aligned}\text{C.P.} &= \frac{100}{(100-\text{loss}\%)} \times \text{S.P.} \\ &= \frac{100}{(100-20)} \times \text{Rs } 5{,}600 \\ &= \frac{100}{80} \times \text{Rs } 5{,}600 \\ &= \text{Rs } 7{,}000\end{aligned}$$

Expected profit = 15%

$$\begin{aligned}\text{S.P.} &= \frac{(100+\text{profit}\%)}{100} \times \text{C.P.} \\ &= \frac{(100+15)}{100} \times \text{Rs } 7{,}000 \\ &= \frac{115}{100} \times \text{Rs } 7{,}000 \\ &= \text{Rs } 8{,}050\end{aligned}$$

Thus, the selling price of the bicycle to gain 15% is Rs 8,050.

Example 8:

The cost price of a laptop is Rs 24,000. An additional Rs 1000 was spent on installing a software. If it is sold at 15% profit, then find the selling price of the laptop.

Solution:

Cost price of the laptop = Rs 24,000 + Rs 1,000 (overhead charges) = Rs 25,000
The laptop is sold at a profit of 15%. Therefore,

$$\text{S.P.} = \frac{(100 + \text{Profit}\,\%)}{100} \times \text{C.P.}$$
$$= \frac{(100+15)}{100} \times \text{Rs } 25{,}000$$
$$= \text{Rs } \frac{115}{100} \times 25{,}000$$
$$= \text{Rs } 28{,}750$$

Thus, the selling price of the laptop is Rs 28, 750.

Concept of Discount

We have come across situations where some shops give **discount (rebate)** and we can obtain the article for less than the **marked price** or **catalogue price** of the article. Let us consider such a situation.

A book shop offers a discount of 20% on the purchase of any book. If the marked price of a book is Rs 350, then what will be the cash discount and the sale price of the book?

In the above example, we calculated the sale price of the book when its marked price was Rs 350 and the discount was 20%. What will be the sale price of the book, if the above bookshop offers yet another discount of 25% after giving the discount of 20%?

In this case, the bookshop offers two successive discounts (one is 20% and the other is 25% after giving the discount of 20%) on Rs 350. So, first of all, we calculate the sale price of the book when M.P. = Rs 350 and discount % = 20%.

After that, we take this sale price as the M.P., on which the discount of 25% is offered and then, we calculate the sale price as follows:

For the 1st part of the successive discounts:

M.P. (marked price) = Rs 350, discount (*d*)% = 20%

So, the selling price (*S.P.*) of the book after 1st discounts is:

$$\text{S.P.} = \frac{100 - d}{100} \times \text{M.P.}$$
$$\Rightarrow \text{S.P.} = \frac{100 - 20}{100} \times \text{ Rs } 350 = \text{Rs } 280$$

For the 2nd part of the successive discounts:

M.P. (marked price) = Rs 280, discount (d)% = 25%

So, the selling price (S.P.) of the book after 2nd successive discounts is:

$$\text{S.P.} = \frac{100-d}{100} \times \text{M.P.}$$

$$\Rightarrow \text{S.P.} = \frac{100-25}{100} \times \text{Rs } 280 = \text{Rs } 210$$

So, the bookshop sells the given book for Rs 210.

For successive discounts on an item, we can generalise a formula as given below:

If the successive discount %, d_1%, d_2%, d_3% … are given, then

S.P. = $$\text{M.P.} \times \left(\frac{100-d_1}{100}\right) \times \left(\frac{100-d_2}{100}\right) \times \left(\frac{100-d_3}{100}\right) \times \ldots.$$

We can also find the marked price, if the discount and the sale price are known.

Now, let us solve some more examples to understand the concept better.

Example 1:

The price of a movie ticket is Rs 200, but there is a discount of 15% on the tickets of the morning show. Calculate the discount and cost of tickets of the morning show.

Solution:

Actual cost of a movie ticket = Rs 200

Discount = 15% of Rs 200

$$= \text{Rs} \frac{15}{100} \times 200$$

= Rs 30

Cost of a ticket of the morning show

= Rs 200 − Rs 30

= Rs 170

Thus, the cost of a ticket of morning show is Rs 170 and cash discount is Rs 30.

Example 2:

A shop offers a discount of 25% on each purchase of item made of leather. A customer purchases a leather belt for Rs 375. What is the marked price of the belt?

Solution:

Let the marked price of the leather belt be *x*.

Discount = 25% of *x*

$$= \frac{25}{100} \times x$$
$$= \frac{x}{4}$$

We know that,

Sale price = M.P. − Discount

$$\text{Rs } 375 = x - \frac{x}{4}$$

$$\text{Rs } 375 = \frac{4x - x}{4}$$

$$\frac{3x}{4} = \text{ Rs } 375$$
$$x = \text{Rs} \frac{375 \times 4}{3}$$

x = Rs 500

Thus, the marked price of the belt is Rs 500.

Example 3:

For the stock sale at the end of a season, a garment shop offers 50% and then 40% on the garments. What is the marked price of a shirt if the shop offers a total discount of Rs 840 after giving two successive discounts?

Solution:

Let the marked price of the shirt be Rs x.

In two successive discounts, $d_1\%$ = 50% and $d_2\%$ = 40%.

We know that

$$\begin{aligned}\text{S.P.} &= \left(\frac{100-d_1}{100}\right)\times\left(\frac{100-d_2}{100}\right)\times \text{M.P.}\\ &= \left(\frac{100-50}{100}\right)\times\left(\frac{100-40}{100}\right)\times x\\ &= \frac{50}{100}\times\frac{60}{100}\times x\\ &= \frac{3x}{10}\end{aligned}$$

We know that

Discount = M.P. − S.P.

$$\begin{aligned}&\Rightarrow 840 = x-\frac{3x}{10}\\ &\Rightarrow \frac{7x}{10}=840\\ &\Rightarrow x=\frac{840\times 10}{7}=1200\end{aligned}$$

Hence, the marked price of the shirt is Rs 1200.

Example 4:

A shop keeper buys an article for Rs 750. He marks it at 10% above the cost price. If he sells it at 8% discount, then find the selling price.

Solution:

Cost price of the article = Rs 750

Profit = 10% of Rs 750 $= \frac{10}{100} \times \text{Rs}\,750 = \text{Rs}\,75$

Marked price = Cost price + Profit = Rs 750 + Rs 75 = Rs 825
Discount = 8%

For Rs 825, discount $= \frac{8}{100} \times \text{Rs}\ 825 = \text{Rs}\,66$

∴ Selling price = Marked price – Discount = Rs 825 – Rs 66 = Rs 759
Thus, the selling price of article is Rs 759.

Example 5:
A cloth seller marks a dress at 35% above the cost price and allows a discount of 10%. What profit does he make in selling the dress?

Solution:

Suppose the cost price of the dress material is Rs 100. Since the seller marks it at 35% above the C.P., the marked price would be Rs 100 + Rs 35 = Rs 135.

Discount of 10% on this marked price = 10% of Rs 135 $= \frac{10}{100} \times \text{Rs}\,135 = \text{Rs}\,13.50$

∴ Selling price = Rs 135 – Rs 13.50 = Rs 121.50. So,

Profit = S.P. – C.P. = Rs 121.50 – Rs 100 = Rs 21.50

Hence, profit percent = $\frac{\text{Profit}}{\text{C.P.}} \times 100 = \frac{21.50}{100} \times 100 = \text{Rs}\ 21.50$

Thus, the cloth seller makes a profit of 21.50% on selling the dress.

Example 6:
The catalogue price of a book is Rs 450. If a shopkeeper offers some discount on the book and sells it at Rs 405. What is the rate of discount?

Solution:

Marked price of the book = Rs 450

Price after discount = Rs 405

Discount = Marked price – Price after discount

= Rs 450 – Rs 405

= Rs 45

Rate of discount = $\frac{\text{Discount} \times 100}{\text{Marked price}}$

$= \frac{45 \times 100}{450}$

= 10 %