

Profit and Loss

Profit and loss are the governing factors for success or failure in business ventures. Business essentially consists in buying articles from the manufacturers or the wholesale dealers and selling the articles at a higher rate in the retail markets. Thus 'profit' arises out of such business transactions. It is the difference between the 'Selling Price' and the 'Cost Price'. Sometimes unfavorable circumstances force businessmen to sell articles at a lower rate, thereby bringing about 'loss'. Therefore loss is the difference between the 'Cost Price' and 'Selling Price'. Generally, profit and loss are expressed as a percentage of the cost price. If a person earns a profit of Rs. 100 by investing Rs. 500 in a business, then the percentage of profit is $100/500 \times 100 = 20\%$.

It is necessary to note the following :

$$\text{Profit \%} = (\text{S.P.} - \text{C.P.})/\text{C.P.} \times 100$$

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

$$\text{S.P.} = (\text{C.P.} \times [100 + \text{gain\%}])/100$$

$$\text{Or S.P.} = (\text{C.P.} \times [100 - \text{loss\%}])/100$$

$$\text{C.P.} = (\text{S.P.} \times 100)/(100 + \text{gain\%})$$

$$\text{Or C.P.} = (\text{S.P.} \times 100)/(100 - \text{loss\%})$$

Examples

Ex. 1. By selling mangoes at Rs. 180 a basket a fruit merchant loses 10% on his outlay. Find the percentage of profit or loss when he sells each basket of mangoes at Rs. 240.

Sol. : S.P. of a basket of mangoes = 180
 C.P. of a basket of mangoes = $180 \times 100/90 = \text{Rs. } 200$
 When S.P. of a basket of mangoes is Rs. 240, gain is
 $\text{Rs. } 240 - \text{Rs. } 200 = \text{Rs. } 40$
 Gain percentage = $40/200 \times 100 = 20\%$

Ex. 2. A man sells two articles for Rs. 325 each. On one he gains $8\frac{1}{3}\%$ and on the other he loses $8\frac{1}{3}\%$. Find the total gain or loss.

Sol. : For the first article
 $\text{C.P.} = \text{S.P.} \times 100/(100 + 8\frac{1}{3}\%)$
 $= \text{S.P.} \times 300/325$
 $= 325 \times 300/325$
 $= 300$

For the second article

$$\begin{aligned}\text{C.P.} &= \text{S.P.} \times 100/(100 - 8\frac{1}{3}) \\ &= 325 \times 300/275 \\ &= 13 \times 300/11 \\ &= 3900/11 \\ &= 354.55\end{aligned}$$

$$\begin{aligned}\text{Total cost price} &= \text{Rs. } 300 + \text{Rs. } 354.55 \\ &= \text{Rs. } 654.55\end{aligned}$$

$$\text{Total selling price} = 325 + 325 = 650$$

$$\begin{aligned}\text{Total loss} &= \text{Rs. } 654.55 - 650 \\ &= \text{Rs. } 4.55\end{aligned}$$

3. A furniture dealer bought 80 chairs. By selling 50 chairs at a profit of Rs. 15 per chair and the remaining for Rs. 1200, he gains 25% on the whole.

What is the C.P. of a chair?

Sol. : Let the C.P. of a chair be Rs. x

\therefore C.P. of 80 chairs is Rs. $80x$

Profit is 25%

\therefore S.P. = $80x \times 125/100 = 100x$ (1)

He sold 50 chairs at a profit of Rs. 15 per chair.

\therefore S.P. of 1 chair = Rs. $x + \text{Rs. } 15$

\therefore S.P. of 50 chairs = $50(x + 15)$

and S.P. of the remaining 30 chairs is Rs. 1200

\therefore Total selling price = $50(x + 15) + 1200$ (2)

From results (1) and (2), we get

$$100x = 50(x + 15) + 1200$$

$$50x = 750 + 1200 = 1950$$

$$\therefore x = 1950/50 = 39$$

\therefore C.P. of a chair is Rs. 39.

Ex. 4. A milkman buys milk at Rs. 15 per litre and after mixing water sells it at the same rate and makes a profit of 25%. Find the quantity of water he mixes.

Sol. : S.P. of the mixture = Rs. 15

Gain = 25%

C.P. of the mixture = $15 \times 100/125 = \text{Rs. } 12$

C.P. of milk = Rs. 15 per litre

C.P. of water = 0

Quantity of milk/Quantity of water

= $(\text{C.P. of water} - \text{C.P. of mixture}) /$

$(\text{C.P. of mixture} - \text{C.P. of milk})$

$$= (0 - 12) / (12 - 15)$$

$$= 1.20 / 0.30$$

$$= 12/3$$

\therefore He mixes one litre of water with 4 litres of milk.

Partnership

Ex. 5. A starts with a capital of Rs. 3000. Four months later B joins him and a further four months later C joins them. What amounts of capital are put in by B and C if at the end of the year their shares of the

profit are as 15 : 5 : 3?

Sol. : The shares of the profit are as 15 : 5 : 3, therefore the ratio of amounts invested by A, B, C will also be the same.

Amount invested by A for one year
 $= \text{Rs. } 3000 \times 12$
 $= \text{Rs. } 36000$

Amount invested by B for eight months
 $= 5/15 \times 36000$
 $= \text{Rs. } 12000$

\therefore Amount invested by B = $12000/8 = 1500$
 Further, amount invested by C for 4 months
 $= 3/15 \times 36000$
 $= 7200$

\therefore Amount invested by C = $7200/4 = 1800$
 Hence B and C invest Rs. 1500 and Rs. 1800 respectively.

Ex. 6. A sold an article to B at a profit of 12%. B sold it to C at a profit of 15%, and C sold it to D who paid a sum which is 35.24% more than the cost price of A. Find the percentages of profit made by C.

Sol. : Let the cost price to A be Rs. 100
 \therefore its cost to B is Rs. 112 (A's profit of 12%)
 \therefore its cost to C is Rs. 128.80 (B's profit of 15%)
 Now, the cost to A is Rs. 100 over which D paid Rs. 35.24 extra, therefore cost to D is Rs. 135.24. Thus C makes a net profit of Rs. 6.44 ($135.24 - 128.80$) on his cost price of 128.80.

\therefore C makes a profit of $6.44 \times 100/128.80$
 $= 5\%$ on his C.P.

Ex. 7. Find the cost of an article which, when sold at a profit of $8\frac{1}{3}\%$ yields Rs. 7.50 more than when it is sold at a loss of $6\frac{2}{3}\%$?

Sol. : Let the C.P. of the article be Rs. 100
 \therefore its first S.P. = Rs. $325/3$ and

its second S.P. = Rs. 280/3

Net difference = $45/3$ = Rs. 15.

Thus when difference is Rs. 15, C.P. is 100

\therefore when it is Rs. 7.50 C.P. is Rs. 50.

Ex. 8. A dealer sells a radio set at Rs. 300 making a profit of 20% on the selling price. Find the cost of the radio and the percentage of profit on the cost price.

Sol. : If the S.P. is Rs. 100, the C.P. is Rs. 80

\therefore When the S.P. is Rs. 300, the C.P. is Rs. 240

Thus the dealer makes a net profit of Rs. 60 on the cost of Rs. 240

\therefore % profit on the cost price = $60 \times 100 / 240 = 25\%$

Ex. 9. A dealer sells a radiogram for Rs. 950 making a profit of $18\frac{3}{4}\%$. The cost price suddenly rises by Rs. 200. Find the percentage of profit or loss on the new cost, if the selling price remains the same.

Sol. : The dealer makes a profit of $18\frac{3}{4}\%$ on his cost.

\therefore If the selling price is Rs. 118 $\frac{3}{4}$,

his C.P. is Rs. 100

\therefore When the S.P. is Rs. 950,

C.P. is = $(975 \times 100 \times 4) / 475$

= Rs. 800

\therefore The new cost price is = $800 + 200 = 1000$.

But the S.P. remains the same (950) thus making a loss of Rs. 50 on new C.P. (1000)

\therefore Percentage loss = $(50 \times 100) / 1000 = 5\%$

Ex. 10. A dealer sells two articles together for Rs. 46, making 10% profit on one and 20% on the other. If he had sold each article at 15% profit, the result would have been the same. Find the selling prices of the two articles in the first deal.

Sol. : Here the algebraic method will be more helpful.

Let the selling prices of the two articles be Rs. x and y

$$\therefore x + y = 46$$

Now Rs. x includes 10% profit on the cost price

$$\therefore \text{Cost of the first article is} = \text{Rs. } 100x/110$$

S.P. of the other includes 20% profit on its C.P.

$$\therefore \text{Its C.P. is} = \text{Rs. } 100y/120$$

Now instead of this transaction if each article is sold at 15% profit on the C.P. the selling price remains the same. Thus by selling the two articles for Rs. 46, 15% profit is made on C.P.

$$\therefore \text{The C.P. of the two articles together} \\ = \text{Rs. } 46 \times 100/115$$

$$\therefore (100x/110) + (100y/120) = 4600/115$$

$$\therefore (10/11)x + (5/6)y = 40$$

$$\text{Also, } x + y = 46$$

Solving these equations, we get $x = \text{Rs. } 22$ and $y = \text{Rs. } 24$.

Ex. 11. In selling an article at Rs. 5, the dealer makes a certain percentage of profit. By increasing the selling price to Rs. 6 per article, his percentage of profit increases by 25. Find the cost price of the article.

Sol. : Let the C.P. of the article be Rs. x

\therefore The percentages of profit in the two transactions are :

$$(5-x)/x \times 100 \text{ and } (6-x)/x \times 100 \text{ respectively}$$

$$\therefore \text{we have } (6-x)/x \times 100 - (5-x)/x \times 100 = 25$$

$$\text{Solving we get } x = 4$$

\therefore The cost price of the article is Rs. 4

Ex. 12. A merchant bought a table and a cupboard together for Rs. 550. He sold the table at a loss of $16\frac{2}{3}\%$ and the cupboard at a gain of 9% thereby making a total profit of 2% on the whole. Find the cost price of each article.

Sol. : Let the C.P. of table be Rs. x and the C.P. of the cupboard be Rs. y

$$\therefore x + y = 550 \quad \dots\dots\dots (1)$$

Now the table is sold at a loss of $16\frac{2}{3}\%$

$$\therefore \text{Its selling price would be } (250/300)x = (5/6)x$$

The cupboard is sold at a profit of 9%

$$\therefore \text{Its S.P. would be } (109/100)y$$

Now the dealer is making 2% profit on the total C.P. of Rs. 550.

$$\therefore \text{His total S.P. would be } 550 \times (102/100) = \text{Rs. } 561$$

$$\therefore (5/6)x + (109/100)y = 561 \quad \dots\dots\dots (2)$$

Solving the two equations (1) and (2) we get
 $x = 150$ and $y = 400$

\therefore The C.P. of the table is Rs. 150 and that of the cupboard is Rs. 400.

Ex. 13. A dealer sells an article at a profit of 20% on the selling price. If the cost price of the article is Rs. 400, find its selling price and percentage profit on the cost price.

Sol. : As 20% profit is made on the selling price we can say that if the S.P. of the article is Rs. 100 its C.P. would be Rs. 80. Here the actual C.P. of the article is Rs. 400

$$\therefore \text{Its actual S.P. is } 400 \times (100/80) = \text{Rs. } 500$$

$$\therefore \text{The net profit is } (500 - 400) = \text{Rs. } 100 \text{ on the C.P. of Rs. } 400, \text{ which is } 25\%.$$

Ex. 14. In selling an article for Rs. 155, there is a profit of 25%. What percentage of profit would be gained by selling it for Rs. 175?

Sol. : Here the cost price of the article is

$$155 \times (100/125) = \text{Rs. } 125$$

\therefore Net profit in the second transaction is

$$(175 - 125) = \text{Rs. } 50, \text{ this compared to the C.P. of Rs. } 125 \text{ gives the percentage of profit as } (50/125) \times 100 = 40\%.$$

Ex. 15. Some articles were bought at the rate of 11 articles for Rs. 10 and were sold at the rate of 10 articles for Rs. 11. Find the percentage gain or loss.

Sol.: Here the C.P. of each article is Rs. $10/11$ and the S.P. of each article is Rs. $11/10$
 \therefore Net profit per article is
 $11/10 - 10/11 = \text{Rs. } 1/110$
 This as compared to the C.P. of Rs. $10/11$ amounts to $[(1/110)/(10/11)] \times 100 = 21\%$ profit.

Ex. 16. If the cost price of 10 articles is equal to the selling price of 8 articles of the same kind, find the percentage gain or loss.

Sol.: Let the C.P. of each article be Re. 1
 \therefore The S.P. of each of the 8 articles is Rs. 10
 \therefore The S.P. of each article is $10/8 = \text{Rs. } 1.25$
 \therefore The net profit per article is 25 paise.
 This, as compared to the C.P. of one article is $(0.25/1) \times 100 = 25\%$.

Ex. 17. A firm fixed the selling price of an article at Rs. 2.80, which is 140% of the cost price. After selling $(5/6)^{\text{th}}$ part of the number of articles bought by him, at what price should he sell the remaining part of the lot, so as to make 30% profit on the total cost price.

Sol.: Here the actual number of articles in the lot is immaterial, but as the lot is then divided into two parts $(5/6)^{\text{th}}$ and $(1/6)^{\text{th}}$, let us assume the number of articles in the lot as 6.

It is given that the selling price of Rs. 2.80, fixed by the firm is 140% of the cost price.

\therefore The C.P. of the article is

$$(100/140) \times 2.80 = \text{Rs. } 2$$

\therefore His total C.P. is Rs. 12.

On this he intends making 30% profit.

\therefore His total S.P. is $12 \times (130/100) = \text{Rs. } 15.60$

But he sells 5 articles at the fixed S.P. of Rs. 2.80 each,

\therefore Total S.P. of these 5 article is Rs. 14

\therefore S.P. of the 6th article is $(15.60 - 14) = \text{Rs. } 1.60$

[But this amounts to a net loss of $(2 - 1.60) = 40$ paise or Rs. 0.40, and when compared to the C.P. of Rs. 2 amounts to a loss of $(0.40/2.00) \times 100 = 20\%$].

Ex. 18. If $1/4^{\text{th}}$ of the cost price of the article is equal to $1/5^{\text{th}}$ of its selling price and $1/4^{\text{th}}$ of the selling price exceeds $1/6^{\text{th}}$ of the cost price by Rs. 7, find the C.P., the S.P. and the percentage profit or loss.

Sol. : Let the C.P. be x and the S.P. be y .

$$\therefore x/4 = y/5 \text{ and } y/4 - x/6 = 7$$

Solving we get $x = 48$ and $y = 60$ which shows the net profit of Rs. 12. This as compared to the C.P. of Rs. 48 amounts to the profit of 25%.

Exercises

(1) A bookseller had 800 copies of a novel. He sold 360 copies for Rs. 200 more than their cost. If he gained 20% on the whole by selling the remaining copies for Rs. 2800, find the cost price of a copy.

[Ans : Rs. 2.75]

(2) X sells his goods 15% cheaper than Y and 15% dearer than Z. A person purchases goods worth Rs. 1700 from X. If the person purchases half the goods from Y and half from Z does he stand to gain or lose, and by how much?

[Ans : No gain or loss]

(3) A shopkeeper sells an article so as to make 25% on the cost price. If he had sold it for 50 p. more, he would have made 30% profit. What is the selling price?

[Ans : Rs.10] [N.D.A.]

- (4) A man bought a horse and a cart. If he sold the horse at 10% loss and the cart at 20% gain he would not lose anything. But if he sold the horse at 5% loss and the cart at 5% gain, he would lose Rs. 10 in the bargain. What did he pay for each?

[Ans : Horse : Rs.400, Cart : Rs. 200] [I.T.I.]

- (5) In selling each of the two articles at Rs. 99, the dealer gains 10% in one, while he loses 10% in the other. Find his percentage gain or loss in the whole transaction.

[Ans : 1% loss]

- (6) If the selling price of 5 articles is the same as the cost price of 4 articles of the same kind, find the percentage gain or loss.

[Ans : 20% loss]

- (7) A person bought two articles, each at the same price. One of them he sold at a profit of 15% and the other at a loss of 10%. If the difference between the two selling prices is Rs. 6.25, find the cost price of each article.

[Ans : Rs. 25]

- (8) A person sold 30 articles at a gain of 10% and 45 articles at a gain of 20%. Had he sold them all at a uniform gain of 20%, he would have received Rs. 3 more. Find the cost of each article.

[Ans : Re. 1]

- (9) If a bookseller sells a book at the published price, he makes 40% profit on its cost. What percentage of profit will he make if he reduces the selling price of the book by 25%?

[Ans : 5%]

- (10) The profit obtained by running a bus is proportional to the distance as well as the number of passengers exceeding a fixed number of them. When it travels a distance of 20 km. with 30 passengers, it fetches a profit of Rs. 30; while if it runs a distance of 35 km.

with 23 passengers, the profit is Rs. 28. Find the minimum number of passengers that should be taken in a bus so that running the bus will not result into a loss.

[Ans : 15]

- (11) A dealer bought a motorcycle and a moped together for Rs. 7,200. He sold the motorcycle at 10% profit and the moped at 8% loss. If on the whole he earned 4% profit, find the cost price of each.

[Ans : Motorcycle : Rs. 4,800] [Moped : Rs. 2,400]

- (12) 'A' sells a radio set to 'B' gaining 20%, 'B' sells it to 'C' gaining 10%. While 'C' sells it to 'D' for Rs. 880, thereby gaining 10% of the selling price. What was its cost to 'A'?

[Ans : 600]

- (13) A dealer bought 30 tables at Rs. 50 each and sold them so as to make a profit which is $\frac{2}{5}$ th of the total cost. Find the percentage of profit and the selling price of each table.

[Ans : Profit 40% and S.P. Rs. 70]

- (14) A radio set was being sold at a profit of 25%. The cost price as well as the selling price was increased by Rs. 100 each. If the profit in the new transaction was 20%, find the original cost price of the radio.

[Ans : Rs. 400]

□□