Profit & Loss Example

Example 1:

An article was brought for Rs 2000 and sold for Rs 2200. Find the gain or loss.

Solution:

C.P. of the article = ` 2000

S.P. of the article = ` 2200
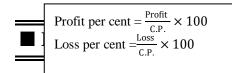
Since S.P. > C.P. So there is gain.

Gain (profit) = S. P. - C. P.

= ` 2200- ` 2000= ` 200

Profit and loss percentage

The profit per cent is the profit that would be obtained for a C.P. of `100.

Similarly, the loss per cent is the loss that would be made for a C.P. of ` 100.

$$\text{Profit per cent} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$
$$\text{Loss per cent} = \frac{\text{Loss}}{\text{C.P.}} \times 100$$

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

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

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

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

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

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

Example 2:

A cycle was purchased for Rs 1600 and sold for Rs 1400. Find the loss and loss %.

Solution:

C.P. of the cycle = Rs 1600

S.P. of the cycle = Rs 1400

Since S.P. < C.P., so there is a loss.

Loss = C.P. – S.P.

= Rs 1600 - Rs 1400 = Rs 200.

Loss % = $\frac{Loss}{C.P.} \times 100 = \frac{200}{1600} \times 100 = 12\frac{1}{2}\%$

Example 3:

By selling a table for Rs 330, a trader gains 10%. Find the cost price of the table.

Solution:

S.P. = Rs 330, Gain = 10%

∴C.P. = $\frac{100}{100 + Gain \%} \times S.P.$

= Rs $\frac{100}{100+10} \times 330$

= $\frac{100}{110} \times 330 = $ Rs 300

Example 4:

A sells a bicycle to B at a profit of 20% and B sells it to C at a profit of 25%. If C pays `225 for it, what did A pay for it.

Solution:

C.P. of A= $225 \times \frac{100}{100+20} \times \frac{100}{100+25}$

= $225 \times \frac{100}{120} \times \frac{100}{125} = Rs$ 150.

Example 5:

A mobile phone is sold for Rs 5060 at a gain of 10%. What would have been the gain or loss per cent if it had been sold for Rs 4370?

Solution:

S.P. = Rs 5060, gain = 10%

∴C.P. = $\frac{5060 \times 100}{100 + 10} = Rs$ 4600.

2nd S.P. = Rs 4370

Since, S.P. < C.P., so there is loss.

∴Loss % = $\frac{(4600 - 4370) \times 100}{4600} = 5\%$

If a man buys x items for Rs y and sells z items for Rs w, then the gain or loss percent made by him is $\frac{xw}{zy} - 1) \times 100\%$

Example 6:

Some articles were bought at 6 for Rs 5 and sold at 5 for Rs 6. Gain percent is:

Solution:

Suppose, number of articles bought = L.C.M of 6 and 5 = 30

C.P. of 30 articles = Rs $\frac{5}{6} \times 30) = 25$

S.P. of 30 articles = Rs $\frac{5}{6} \times 30) = 36$

Gain % = $\frac{11}{25} \times 100)\% = 44\%$

Shortcut method:

Quantity   Price

6 ⤫ 5
5 ⤫ 6

% profit = $\frac{xw}{yz} - 1) \times 100\%$

= $\frac{6 \times 6}{5 \times 5} - 1) \times 100\%$

= $\frac{11}{25} \times 100\% = 44\%$

DISHONEST DEALING

*

$$\text{Gain \%} = \frac{\text{Error}}{\text{Truevalue} - \text{Error}} \times 100$$

$$\frac{\text{True Scale}}{\text{False Scale}} = \frac{100 + \text{gain\%}}{100 - \text{loss\%}}$$

* A merchant uses y% less weight/length and sells his good at gain/loss of x%. The overall % gain/loss is given by $\left[\left(\frac{y+x}{100-y}\right) \times 100\right]\%$

Example 7:

A shopkeeper sells the goods at 44% loss on cost price but uses 30% less weight. What is his percentage profit or loss?

Solution:

Given, x = -44, y = 30

The overall % gain/loss = $\frac{30-44}{100-30} \times 100)\%$ = -20%

Which represents loss being a negative expression.

Example 8:

A cloth merchant says that due to slump in the market, he sells the cloth at 10% loss, but he uses a false metre-scale and actually gain 15%. Find the actual length of the scale.

Solution:

$\frac{\text{True Scale}}{\text{False Scale}} = \frac{100 + \text{gain }\%}{100 - \text{loss }\%}$

$\frac{100}{\text{False Scale}} = \frac{100+15}{100-10}$

$\Rightarrow \text{False Scale} = \frac{100 \times 90}{115} = 78.26\text{cm}$

Example 9:

A dishonest dealer professes to sell his goods at cost price, but he uses a weight of 960 g for the kg weight. Find his gain per cent.

Solution:

Error = 1 kg – 960g

= 1000g – 960 g = 40g.

$\therefore \text{Gain}\% = \frac{40}{1000-40} \times 100$

$= \frac{40}{960} \times 100 = 4\frac{1}{6}\%$

GOODS PASSING THROUGH SUCCESSIVE HANDS

❖ When there are two successive profits of a % and b%, then the resultant profit per cent is given by

$a + b + \frac{ab}{100})\%$

❖ When there is a profit of a % and loss by b % in a transaction, then the resultant profit or loss per cent is given by $\left(a - b - \frac{ab}{100}\right)\%$, according to the ve or –ve sign respectively.

❖ When cost price and selling price are reduced by the same amount (A) and profit increases then cost price (C.P.)

$= \frac{\text{Initial profit } \% + \text{Increase in profit }\%] \times A}{\text{Increase in profit }\%}$

Example 10:

A table is sold at a profit of 20%. If the cost price and selling price are Rs 200 less, the profit would be 8% more. Find the cost price.

Solution:

By direct method,

C.P. = Rs $\frac{(20+8) \times 200}{8}$ = Rs 28×25 = Rs 700

If cost price of x articles is equal to the selling price of y articles, then profit/loss percentage $= \frac{x-y}{y} \times 100\%$, according to +ve or –ve sign respectively.

Example 11:

If the C.P. of 15 tables be equal to the S.P. of 20 tables, find the loss per cent.

Solution:

By direct method,

Profit/loss % = $\frac{-5}{20} \times 100$ = 25% loss, since it is –ve.

Example 12:

If the C.P. of 6 articles is equal to the S.P. of 4 articles. Find the gain per cent.

Solution:

Let C.P. of an article be Rs x; then,

C.P. of 6 articles = Rs 6x

C.P. of 4 articles = Rs 4x

But S.P. of 4 articles = C.P. of 6 articles

$\therefore$S.P. of 4 articles = 6x

Thus, gain = S.P. – C.P. = Rs (6x-4x) = Rs 2x

$\therefore$Gain % = $\frac{2x}{4x} \times 100 = 50$

Thus, gain in the transaction = 50%

Example 13:

By selling 33 metres of cloth, a man gains the sale price of 11 metres. The gain % is

Solution:

Gain = S.P. of 33 metres – C.P. of 33 metres

= S.P. of 11 metres

$\Rightarrow$ S.P. of 22 metres = C.P. of 33 metres

$\therefore \% \text{ gain} = \frac{\text{gain}}{\text{C.P.of metres}} \times 100$

$= \frac{\text{S.P.of 11 metres}}{\text{C.P.of 33 metres}} \times 100$

$= \frac{\text{S.P.of 11 metres}}{\text{S.P.of 22 metres}} \times 100 = \frac{11}{22} \times 100 = 50\%$

Shortcut method:

If on selling 'x' articles a man gains equal to the S.P. of y articles.

Then,

%gain=$\frac{y}{x-y} \times 100 = \frac{11}{33-11} \times 100 = \frac{11}{22} \times 100 = 50\%$

Marked Price: The price on the lable is called the marked price.

The marked price is abbreviated as M.P.

Discount: The reduction made on the 'marked price' of an article is called the discount.

NOTE:

When no discount is given, 'selling price' is the same as 'marked price'.

❖ Discount = Marked price × Rate of discount.

❖ S.P. = M.P. − Discount.

❖ Discount% = $\frac{\text{Discount}}{\text{M.P.}} \times 100$

❖ Buy x get y free i.e., if x + y articles are sold at cost price of x articles, then the percentage discount =$\frac{y}{x+y} \times 100$.

Example 14:

How much % must be added to the cost price of goods so that a profit of 20% must be made after throwing off a discount of 10% from the marked price?

Solution:

Let C.P. = Rs 100, then S.P. = Rs 120

Also, Let marked price be Rs x. Then

90% of x = 120 $\Rightarrow x = \frac{120 \times 100}{90} = 133\frac{1}{3}$

∴ M.P. should be Rs $133\frac{1}{3}$

or M.P. = $33\frac{1}{3}$ % above C.P.

Example 15:

At a clearance sale, all goods are on sale at 45% discount. If I buy a skirt marked Rs600, how much would I need to pay?

Solution:

M.P. =Rs 600, Discount = 45%

Discount = $\frac{\text{M.P.} \times \text{Discount \%}}{100} = \frac{600 \times 45}{100} = $ Rs270.

∴ S.P. = M.P. − Discount

s.p =600-270=330. Hence the amount I held to pay is 330.Alternate method; s.p capital =M.P×0.55

= Rs 600× 0.55 = Rs 330

❖ A man purchases a certain number of articles at x a rupee and the same number at y a rupee. He mixes them together and sells them at z a rupee. then his gain or loss %

$= \frac{2xy}{z(x+y)} - 1] \times 100$ according as the sign is +ve or −ve.

❖ If two items are sold, each at Rs x, one at a gain of p% and the other at a loss of p%, there is an overall loss given by$\frac{p^2}{100}$%.

Note that in such cases there is always a loss.

The absolute value of the loss is given by $\frac{2p^2 x}{100^2 - p^2}$

❖ If CP of two items is the same and % Loss and % Gain on the two items are equal, then net loss or net profit is zero.

Example 16:

A shopkeeper sold two radio sets for Rs 792 each, gaining 10% on one, and losing 10% on the other. Then he

Solution:

When selling price of two articles is same and % gain = % loss

then there will be always loss.

and overall % loss = $\frac{(10)^2}{100}$%= 1%

Example 17:

A man bought two housing apartments for Rs2 lakhs each. He sold one at 20% loss and the other at 20% gain. Find his gain or loss.

Solution:

When C.P. of two articles is same and % gain = % loss

Then, on net, there is no loss, no gain

❖ If an article is sold at a price S.P₁..., then % gain or % loss is x and if it is sold at a price S.P₂... then % gain or % loss is y. If the cost price of the article is C.P., then

$\frac{\text{S.P}_1}{100+x} = \frac{\text{S.P}_2}{100+y} = \frac{\text{C.P.}}{100} = \frac{\text{S.P}_1 - \text{S.P}_2}{x-y}$

where x or y is negative, if in indicates a loss, otherwise it is positive.

Example 18:

By selling a radio for Rs 1536, Ramesh lost 20%. What per cent shall he gain or lose by selling it for Rs 2000?

Solution:

Given, S.P₁ = 1536, x = -20 (-ve sign indicates loss)

S.P₂ = Rs 2000, y =?

Using the formula,

$\frac{\text{S.P}_1}{100+x} = \frac{\text{S.P}_2}{100+y}$

we get $\frac{1536}{100-20} = \frac{2000}{100+y}$

$\Rightarrow 100 + y = \frac{2000 \times 80}{1536} = 104\frac{1}{6}$

$\Rightarrow y = 4\frac{1}{6}\%$

Thus, Ramesh has a gain of $4\frac{1}{6}\%$ by selling it for Rs 2,000

❖ It A sells an article to B at a gain/loss of m% and B sells it to C at a gain/loss of n%. If C pays Rs z for it to B then the cost

price for A is $\frac{100^2 z}{(100+m)(100+n)}$

Where m or n is negative, of it indicates a loss, otherwise it positive.

Example 19:

Mohit sells a bicycle to Rohit at a gain of 10% and Rohit again sells it to Jyoti at a profit of 5%. If Jyoti pays Rs 462 to Rohit. What is the cost price of the bicycle for Mohit.

Solution:

Given, m = 10, n = 5, z = Rs 462

Using the formula, C.P. $= \left[\frac{100^2 z}{(100+m)(100+n)}\right]$

we get C.P. for Mohit $= \frac{100^2 \times 462}{(100+10)(100+5)}$

When two different articles sold at same S.P. x and y are % gain (or loss) on them. Then overall % gain or loss

$= \frac{100(x+y)+2xy}{(100+x)(100+y)}$

The above expression represent overall gain or loss according to its sign.

Example 20:

A man sold two watches for ` 1000 each. On one he gains 25% and on the other 20% loss. Find how much % does he gain or loss in the whole transaction?

Solution:

When $S_1 = S_2$, then
overall % gain or % loss

$= \frac{100(x+y)+2xy}{(100+x)+(100+y)}$

$= \frac{100(25-20)+2\times25\times-20}{(100+25)+(100-20)}$

$= -\frac{100}{41}\%$ loss ($\because$ it is –ve)

Example 21:

After allowing a discount of 12% on the marked price of an article, it is sold for `880. Find its marked price.

Solution:

S.P. = `880 and Discount % = 12

Let M.P. = x

Discount $= \frac{M.P. \times Discount\ \%}{100} = \frac{x \times 12}{100} = \frac{3}{25}x$

Now, M.P. = S.P. + Discount

x $= 880 + \frac{3}{25}$x

$\Rightarrow x - \frac{3}{25}x = 880 \Rightarrow \frac{22x}{25} = 880$

$\Rightarrow x = \frac{880 \times 25}{22} = 40 \times 25 =$ `1000

$\therefore$ Marked price of the article is `1000

Example 22:

A shopkeeper offers his customers 10% discount and still makes a profit of 26%. What is the actual cost to him of an article marked `280?

Solution:

M.P. = `280 and Discount % = 10

Discount $= \frac{M.P. \times Discount\ \%}{100} = \frac{280 \times 10}{100} =$ `28

S.P. = M.P. – Discount = `280- `252

Now, S.P. = `252 and profit = 26%

$\therefore$ C.P. $= \frac{100}{100 + Profit\ \%} \times$ S.P.

$= \frac{100}{100+26} \times 252 =$ `200

Hence, the actual cost of the article is `200.

SUCCESSIVE DISCOUNT:

In successive discounts, first discount is subtracted from the marked price to get net price after the first discount. Taking this price as the new marked price, the second discount is calculated and it is subtracted from it to get net price after the second discount. Continuing in this manner, we finally obtain the net selling price.

In case of successive discounts a % and b%, the effective discount is $\left(a + b - \frac{ab}{100}\right)\%$

$$\boxed{\text{or Single discount} = \left[1 - \left(1 - \frac{ay}{100} \quad 1 - \frac{by}{100} \times 100\right)\right.}$$

Example 23:

Find the single discount equivalent to successive discounts of 15% and 20%

Solution:

By direct formula,

Single discount $= \left(a + b - \frac{ab}{100}\right)\%$

$= \left(15 + 20 - \frac{15 \times 20}{100}\right)\% = 32\%$

❖ If three or more successive discounts on an article are a%, b%, c% and respectively then a single discount to the successive discounts will be

$$\left[1 - \left(1 - \frac{a\%}{100}\right)\left(1 - \frac{b\%}{100}\right)\left(1 - \frac{c\%}{100}\right)\left(1 - \frac{d\%}{100}\right)\right]\%$$

Example 24:

Find single equivalent discount of successive discount of 30%, 20%, 40% and 10%.

Solution:

Single discount = [1-(1-30) × (1-20) × (1-40)× (1-10)×100] = 69.76%

Example 25:

Find the S.P. of an article whose M.P. is `9988467 giving successive discount of 50%, 40% and 10%.

Solution:

Equivalent discount = [1-(.50×.60×.90) ×100] =73%

S.P. = $9988467 \times \frac{100-73}{100} = 2696886.09$

Example 26:

If an article is marked at `1000000, and on purchasing a person gets discount of 30%, 30%, 20%, 10% and 10% successively. Find his over all discount percentage.

Solution:

[1-(.07×.07×.08×.09×.09)] × 100 = 68.24%

Example 27:

An article is listed at `65. A customer bought this article for `56.16 and got successive discounts of which the first one is 10%. The other rate of discount of this scheme that was allowed by the shopkeeper was:

Solution:

Price of the article after discount 65 − 6.5 = `58.5

Therefore, the second discount

$= \frac{58.5-56.16}{58.5} \times 100 = 4\%$

Example 28:

A shopkeeper offers 5% discount on all his goods to all his customers. He offers a further discount of 2% on the reduced price to those customers who pay cash. What will you actually have to pay for an article in cash if its M.P. is `4800?

Solution:

M.P. = `4800

First discount = 5% of M.P.

$= \frac{5}{100} \times 4800 =$ `240

Net price after discount = `4800 - `240

= `4560

Second discount = 2% of `4560

$= \frac{2}{100} \times 4560 =$ `91.20

Net price after discount = ` 4560 - ` 91.20

= `4468.80

By Direct Method:

S.P. = $4800 \left(1 - \frac{5}{100}\right)\left(1 - \frac{2}{100}\right) =$ `4468.80

❖ A person buys two items for ` A and sells one at a loss of l% and other at a gain of g%. If each item was sold at the same price, then

(a) The cost price of the items sold at loss

$= \frac{A(100+\%gain)}{(100-\%loss)+(100+\%gain)}$

(b) The cost price of the item sold at gain

$= \frac{A(100+\%loss)}{(100-\%loss)+(100+\%gain)}$

Example 29:

Ramesh buys two books for `410 and sells one at a loss of 20% and the other at a gain of 25%. If both the books are sold at the same price. Find the cost price of two books.

Solution:

Give, A = 410

Cost price of the books sold at loss = $\frac{(410)(100+25)}{(100-20)+(100+25)}$

$= \frac{410 \times 125}{80+125} =$ `250/-

Cost price of the books sold at profit

$$= \frac{(410)(100-20)}{(100-20)+(100+25)}$$

$$= \frac{410 \times 80}{80+125} = `160/-$$

SALES TAX

To meet government's expenditures like construction of roads, railway, hospitals, schools etc, the government imposes different types of taxes. Sales tax

(S.T.) is one of these tax.

Sales tax is calculated on selling price (S.P.)

NOTE:

If discount is given, selling price is calculated first and then sales tax is calculated on the selling price of the article.

Example 30:

Sonika bought a V.C.R. at the list price of `18,500. If the rate of sales tax was 8%, find the amount she had to pay for purchasing the V.C.R.

Solution:

List price of V.C.R. = `18,500

Rate of sales tax = 8%

∴ Sales tax = 8% of `18,500

$$= \frac{8}{100} \times 18500 = `1480$$

So, total amount which Sonika had to pay for purchasing the V.C.R. = `18,500 + `1480

= `19,980

Example 31:

The sale price of an article including the sales tax is `616. The rate of sales tax is 10%. If the shopkeeper has made a profit of 12%, then the cost price of the article is:

Solution:

Let the CP of the article be `x

Then, SP = x × 1.12 × 1.1
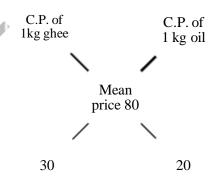
Now, x × 1.12 × 1.1 − 616

$$\Rightarrow x = \frac{616}{1.232} = `500$$

Example 32:

Pure ghee cost ` 100 per kg. After adulterating it with vegetable oil costing `50 per kg, a shopkeeper sells the mixture at the rate of ` 96 per kg, thereby making a profit of 20%. In what ratio does he mix the two?

Solution:

Mean cost price = ` $\frac{100}{120} \times 96$) = `80 per kg.

By the rule of allegation:

C.P. of 1 kg ghee

∴ Required ratio = 30:20=3:2.