PROFIT AND LOSS

Important Points :

Cost Price : The price at which an article is purchased is called its cost price, abbreviated as C.P.

Selling Price : The price at which an article is sold, is called its selling price, abbreviated as S.P.

Profit or Gain : = (S. P.) – (C. P.)

Loss = (C. P.) – (S. P.)

An Important Result : Loss or gain is reckoned on Cost Price.

FORMULAE :

(i) Gain = (S.P.) – (C. P.)

(ii) $\text{Gain \%} = \left(\frac{\text{Gain} \times 100}{\text{C.P.}}\right)$

(iii) Loss = (C. P.) – (S.P.)

(iv) $\text{Loss \%} = \left(\frac{\text{Loss} \times 100}{\text{C.P.}}\right)$

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

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

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

(ix) If an article is sold at a gain of 35%, then S.P. = 135 % of C.P.

(x) If an article is sold at a loss of 35%, then S.P. = 65% of C.P.

SOLVED EXAMPLES

1. A shopkeeper sells 100 kg of sugar partly at 10 % profit and the remaining at 20 % profit. If he gains 12% on the whole transaction, how much sugar did he sell at 20 % profit ?

(1) 20 kg. (2) 32 kg. (3) 25 kg.
(4) 22 kg (5) None of these

Sol. (1) : Let the cost price of 100 kg. of sugar be Rs. 100.

Again suppose that x kg. of sugar is sold at 10% gain and $(100 - x)$ kg. of sugar is sold at 20 % gain.

C.P. of x kg. of sugar = Rs. x.

$\therefore$ Gain = 10 % of $x = x \times \frac{10}{100} = \text{Rs.} \frac{x}{10}$

C.P. of $(100 - x)$ kg. of sugar = Rs. $(100 - x)$

Gain = 20% of $(100 - x)$

$= (100 - x) \times \frac{20}{100} = \text{Rs.} \frac{100 - x}{5}$

Total gain = $\text{Rs.}\left(\frac{x}{10} + \frac{100 - x}{5}\right)$

According to the question,

$\frac{x}{10} + \frac{100 - x}{5} = 12\ \%$ of 100

$\frac{x}{10} + 20 - \frac{x}{5} = 12 \Rightarrow \frac{x}{5} - \frac{x}{10} = 20 - 12$

$\Rightarrow \frac{2x - x}{10} = 8 \Rightarrow x = 80$

$\therefore$ Amount of sugar sold at 20 % profit $= 100 - x = 100 - 80 = 20$ kg.

2. A tradesman allows a discount of 15 % on the written price. How much above the cost price must he mark his goods to make a profit of 19 % ?

(1) 35% (2) 40% (3) 32%
(4) 35.2% (5) None of these

Sol. (2) : Let the tradesman mark his goods at x% higher than the cost price.

Let cost price = Rs. 100

Marked price = Rs. $(100 + x)$

Discount = 15% of Rs. $(100 + x)$

$= \text{Rs.} \frac{15}{100} \times (100 + x) = \text{Rs.} (15 + 0.15x)$

Reduced price = Rs. $(100 + x - 15 - 0.15x)$

= Rs. $(85 + 0.85x)$

Price on Rs. 100 = Rs. $(85 + 0.85x - 100)$

= Rs. $(0.85x - 15)$

$0.85x - 15 = 19 \Rightarrow 0.85x = 15 + 19.$

$x = \frac{34}{0.85} = 40.$

3. A dealer marks his goods 20% above the cost price. He then allows some discount on it and earns a profit of 14%. What is the rate of discount offered by the dealer ?

(1) 3% (2) 4% (3) 5%
(4) 6% (5) None of these

Sol. (3) : Let the cost price be Rs. x.

Marked Price $= x + \frac{20x}{100} = \text{Rs.} \frac{6x}{5}$

Gain % = 14 %

$\therefore$ S.P. $= x + \frac{14x}{100} = \frac{114x}{100}$ = Rs. $\frac{57x}{50}$

Discounted amount $= \frac{6x}{5} - \frac{57x}{50} = \frac{60x - 57x}{50}$ = Rs. $\frac{3x}{50}$

Rate of discount $= \frac{\frac{3x}{50}}{\frac{6x}{5}} \times 100 = \frac{3x}{50} \times \frac{5}{6x} \times 100 = 5\%$

4. An article is sold at a profit of 20%. If both the cost price and the selling price were to be Rs. 20 less, the profit would have been 10 % more. Find the cost price of the article.
(1) Rs. 40 (2) Rs. 45 (3) Rs. 50
(4) Rs. 60 (5) None of these
Sol. (4) : Let the cost price of the article be Rs. x.

$\therefore$ First S. P. $= \frac{120x}{100}$ = Rs. $\frac{6x}{5}$

New C.P. = Rs. $(x - 20)$

New S.P. = Rs. $\left(\frac{6x}{5} - 20\right)$

$\therefore$ Profit = Rs. $\left(\left(\frac{6x}{5} - 20\right) - (x - 20)\right)$

= Rs. $\left(\frac{6x}{5} - 20 - x + 20\right)$ = Rs. $\frac{x}{5}$

According to the question, $\frac{\frac{x}{5}}{x - 20} \times 100 = 30$

$\Rightarrow \frac{20x}{x - 20} = 30 \Rightarrow 2x = 3x - 60$

$\Rightarrow 3x - 2x = 60 \Rightarrow x = 60$

$\therefore$ The cost price of article = Rs. 60

5. A man sold two houses for Rs. 675958 each. On one he gains 16 % while on the other he loses 16%. How much does he gain or lose in the whole transaction ?
(1) 2.56 % (2) 4.56 %
(3) 3.65 % (4) None of these
Sol. : In Such a question, there is always a loss, the selling price is immaterial.

Formula : Loss% $= \left(\frac{\text{Common loss \& gain\%}}{10}\right)^2$

$\therefore$ Loss % $= \left(\frac{16}{10}\right)^2 \% = \left(\frac{64}{25}\right)\% = 2.56\ \%$

Hence, option (1) is correct.

6. By selling 33 metres of cloth, one gains the selling price of 11 metres. Find the gain per cent.
(1) 40% (2) 20%
(3) 50% (4) 45 %
Sol. S.P. of 33 m-C P of 33 m = Gain = S.P. of 11 m
$\therefore$ S.P. of 22 m = C.P. of 33 m

Let C.P. of each metre be Re. 1.
C.P. of 22 m = Rs. 22
S.P. of 22 m = Rs. 33

$\therefore$ Gain % $= \left(\frac{11}{22} \times 100\right)\% = 50$

Hence option (3) is correct.

7. A man sells an article at a profit of 25 %. If he had bought it at 20% less and sold it for Rs. 10.50 less, he would have gained 30%. Find the cost price of the article .
(1) Rs. 40 (2) Rs. 50
(3) Rs. 20 (4) Rs. 15
Sol. : Let the C.P. be Rs. x.

First S.P. = 125 % of Rs. $x = \frac{125}{100}x = \frac{5x}{4}$

Second C.P. = 80% of $x = \left(\frac{80}{100}x\right) = \frac{4x}{5}$

Second S.P. = 130% of $\frac{4x}{5} = \frac{130}{100} \times \frac{4x}{5} = \frac{26x}{25}$

$\frac{5x}{4} - \frac{26x}{25} = 10.50$

Or, $\frac{21x}{100} = 10.50$ Or, $x = \frac{10.50 \times 100}{21} = 50$

Hence, C.P. = Rs. 50.
Hence, option (2) is correct.

8. A reduction of 20 % in the price of sugar enables a purchaser to obtain 2.5 kg. more for Rs. 160. Find the original rate and the reduced price per kg.
(1) Rs. 11.80 per kg. (2) Rs. 13.50 per kg
(3) Rs. 12.80 per kg (4) None of these
Sol. : Let original rate = Rs. x per kg.

New rate = 80 % of x = Rs. $\left(\frac{80}{100}x\right)$ = Rs. $\frac{4x}{5}$

Original quantity for Rs. 160 $= \frac{160}{x}$

New quantity $= \left(160 \times \frac{5}{4x}\right) = \frac{200}{x}$

$\frac{200}{x} - \frac{160}{x} = 2.5$ or, $\frac{40}{x} = 2.5$ Or, $x = \frac{40}{2.5} = 16$.

Original rate = Rs. 16 per kg.
Reduced rate = 80 % of Rs. 16 = Rs. 12.80 per kg.
Hence, option (3) is correct.

9. One trader calculates the percentage of profit on the buying price and another calculates on the selling price. When their selling prices are the same, then the difference of their actual profits is Rs. 85 and both claim to have made 20% profit. What is the selling price of each ?
(1) Rs. 1700 (2) Rs. 2100
(3) Rs. 2550 (4) Rs. 2750
[SSS Graduate Level Prelim. Exam; 27.07.2008 (1st Sitting)]

Sol. (3) For the first trader,
Let the CP of the article of Rs. 100
∴ SP = Rs. 120
For the second trader,
SP of the article = Rs. 120
Gain = 20%
Let the CP be Rs x.

$$\therefore \frac{120-x}{120}\times 100 = 20$$

$$\Rightarrow 120 - x = 20 \times \frac{6}{5} = 24$$

$\Rightarrow x = 120 - 24 =$ Rs. 96
∴ Gain = Rs. 24
Difference of Gains = 24 – 20 = Rs. 4
∵ If the difference of gains be Rs. 4, then SP = Rs. 120

$$\therefore \text{When the difference be Rs. 85, SP} = \frac{120}{4}\times 85$$

= Rs. 2550

10. An article is listed at Rs. 900 and two successive discounts of 8% and 8% are given on it. How much would the seller gain or lose, if he gives a single discount of 16%, instead of two discounts ?
(1) Gain of Rs. 4.76 (2) Loss of Rs. 5.76
(3) Gain of Rs. 5.76 (4) Loss of Rs. 4.76
[SSS Graduate Level Prelim. Exam; 04.02.2007 (1st Sitting)]

Sol. (2) Equivalent discount for two successive discounts of 8% and 8%

$$= \left(8 + 8 - \frac{8\times 8}{100}\right)\% = (16 - 0.64)\% = 15.36\%$$

∴ SP = (100 – 15.36) % of Rs. 900

$$= \text{Rs.}\left(\frac{84.64\times 900}{100}\right) = \text{Rs. } 761.76$$

For a single discount of 16%,

$$\text{SP} = 84\% \text{ of } 900 = \text{Rs.}\left(\frac{84\times 900}{100}\right) = \text{Rs. } 756$$

Certainly seller will lose in this case.
∴ Loss = Rs. (761.76 – 756) = Rs. 5.76

11. The marked price of a TV is Rs. 16,000. After two successive discounts it is sold for Rs. 11,400. If the first discount is 5%, then the rate of second discount is
(1) 15% (2) 20%
(3) 30% (4) 25%
[SSC CPO Sub-Inspector Exam; 06.09.2009]

Sol. (4) After a discount of 5%,

$$\text{SP} = \frac{95\times 16000}{100} = \text{Rs. } 15200$$

Let the second discount be x%.
∴ x % of 15200 = (15200 – 11400)

$$\Rightarrow \frac{x\times 15200}{100} = 3800 \Rightarrow x = \frac{3800\times 100}{15200} = 25$$

∴ Second discount = 25%

12. A man buys a certain number of oranges at 20 for Rs. 60 and an equal number at 30 for Rs. 60. He mixes them and sells them at 25 for Rs. 60. What is gain or loss per cent ?
(1) Gain of 4% (2) Loss of 4%
(3) Neither gain nor loss (4) Loss of 5%
[SSC CPO Sub-Inspector Exam; 09.11.2008]

Sol. (2) Let the man buy 60 oranges (LCM of 20 and 30) of each kind.
CP of the 60 oranges of the first kind

$$= \frac{60}{20}\times 60 = \text{Rs. } 180$$

CP of 60 oranges of second kind

$$= \frac{60}{30}\times 60 = \text{Rs. } 120$$

Total CP of 120 oranges
= Rs. (180 + 120) = Rs. 300

$$\text{Their SP} = \frac{60}{25}\times 120 = \text{Rs. } 288$$

Loss = Rs. (300 – 288) = Rs . 12

$$\therefore \text{Loss per cent} = \frac{12}{300}\times 100 = 4\%$$

13. A man sold two chairs at Rs. 1,200 each. On one he gained 20% and on the other he lost 20%. His gain or loss in the whole transaction is
(1) 1% loss (2) 2% loss
(3) 4% loss (4) 1% gain
[SSC Section Officer (Commercial Audit) Exam; 30.09.2007]

Sol. (3) If two articles are sold at the same S.P. and there is a gain of x% on one article and a loss of x% on the other, then there is always a loss in this transaction

$$\text{and loss\%} = \frac{x^2}{100} = \frac{20\times 20}{100} = 4\%$$ □□□