4. Profit and Loss

Terminology

- **Cost Price (CP):** The cost born by the seller.
- **Selling Price (SP):** Price at which item is sold by the seller.
- **Marked Price (MP):** The price at which the article is marked. If the article is sold at this price, then the selling price (SP) is equal to marked price (MP). But generally some discounts might be available on the marked price, and then marked priceless discount will be equal to the selling price.
- **Profit/Gain**: SP – CP
- **Loss**: CP – SP

  Profit and loss are always calculated with CP, as the base.
- **Gain%** = $\frac{\text{Gain}}{\text{CP}}$ x 100%
- **Loss%** = $\frac{\text{Loss}}{\text{CP}}$ x 100%

  SP = CP x $\frac{100 + \text{Gain \%}}{100}$ or CP x $\frac{100 - \text{Loss \%}}{100}$

  CP = SP x $\frac{100}{100 + \text{Gain \%}}$ or SP x $\frac{100}{100 - \text{Loss \%}}$

  Discount = MP – SP
- If d % discount is given yet made r% profit/loss during a sale then SP, CP and MP linked using the following formula

  SP = CP x $\frac{100 \pm \text{R\%}}{100}$ = MP (1-$\frac{d}{100}$)
- If m pens are sold at the cost price of n pens the % profit/loss made is

  = $\frac{\text{n} - \text{m}}{\text{m}}$ x 100% (If the value is negative it is loss)

If C. P. of both the items is same and the percentage loss and gain are equal, then net loss or profit is zero.

Example: Two shirts were having a cost price of Rs. 200 each. One was sold at a profit of 15% and the other was sold at a loss of 15%. Find the net profit or loss.

Sol. SP_1 = 200 x $\frac{(100 + 15)}{100}$ = Rs. 230.

SP_2 = 200 x $\frac{(100 - 15)}{100}$ = Rs. 170.

Total SP received = SP_1 + SP_2 = 230 + 170 = Rs. 400

Total CP = 200 + 200 = 400.

Net result: No profit, No Loss.

Important:

If two items are SOLD, each at rupees S, one at a gain of x %and other at a loss of x%, then the net result is always a loss which is equal to $x^2/100$%

Example: Two articles were sold at Rs. 100 each. After selling it was realized that on one, a profit of 10% was made, and on the other, a loss of 10% was made. What is the net result?

Sol:

	Item 1	Item 2
Selling Price	Rs. 100	Rs. 100
Profit %	10	-
Loss %	-	10
Cost Price	100/1.1	100/0.9
	= 90.90	= 111.11

Total SP received = 100 + 100 = Rs. 200.

Total CP = 90.90 + 111.11 = Rs. 202.01.

➔ Loss % = $\frac{200-202.01}{202.01}$ x 100 = $\frac{-2.01}{202.01}$ x 100 = -1%

The same calculation can be done by a very simple formula

Loss % = $\frac{X^2}{100}$and Value of loss = $\frac{2X^2S}{100^2-x^2}$

Where x is the percentage profit and loss made on each of the items and S is the common selling price received on both.

In case of discounts being offered, the price on which the discount was offered is known as the marked price and the price that is finally received is known as the selling price.

Example: A merchant purchases an item for Rs. 500. He marks the item at a price of Rs. 700 but allows a discount of 10% on cash payment. What is the total profit in terms of amount and percentage made by the merchant?

Sol. CP = Rs. 500, MP = Rs. 700.

Hence SP = 700 $\left(1-\frac{10}{100}\right)$ = Rs. 630

➔ Thus, profit = Rs. 630 - Rs. 500 = Rs. 130.

Profit % = (130/500) x 100 = 26%.

Example: A milkman claims to sell milk at the cost price but uses a measure of 800 ml instead of a liter. Find the net profit made by him.

Sol. Using the formula given above Gain% = $\left[\frac{200}{1000-200}\times 100\right] = \frac{200}{800}\times 100 = 25$.

If a tradesman defrauds (by means of a false balance or otherwise) to the tune of x% in buying and

also defrauds to the tune of x% in selling, his overall percentage gain will be

$$\left[\frac{(100 + \text{common gain}\%)^2}{100} - 100\right]\%$$

Example: The cost price of 20 pens is equal to the selling price of 25 pens What is the net loss percentage

Sol: Here, cost price of 20 pens = selling price of 25

So the net loss percentage = $\frac{20-25}{25}$ x 100 = -20% Here minus sign indicates the loss,

Example: Ramesh, a fruit seller bought bananas at the rate of Rs. 5 a dozen. He sold 2 bananas for Re. 1. Find his profit percentage.

Sol. Here selling price of 10 bananas is equal to the cost price of 12 bananas, so the net profit percentage = $\frac{12-10}{10}$ x 100 = 20%.

Practice Exercise

DIRECTIONS: For the following questions, four options are given. Choose the best option.

1. If the SP of RS. 24 results in a 20% discount on list price, then what SP would result in a 30% discount on list price?
   1) Rs. 21 2) Rs. 24 3) Rs. 18 4) Rs. 15

2. When the cost of petroleum increases by 40%, a man reduces his annual consumption by 20%. Find the percentage change in his annual expenditure on petroleum.
   1) 20% 2) 16% 3) 12% 4) 40%

3. A person bought two clocks. The cost price of one of them exceeds the cost price of the other by 1/4th. He sold the dearer one at a gain of 10% and the other at a gain of 7.5%and thus got Rs. 98 in all as S.P. Find the cost price of the cheaper one.
   1) Rs. 40 2) Rs. 50 3) Rs. 30 4) Rs. 60

4. A shopkeeper marks his goods in such a way that after allowing a discount of 10%, he gains 26%. How much percent above C.P. is the marked price?
   1) 50% 2) 30% 3) 45% 4) 40%

5. The population of a country doubled every 10 years from 1960 to 1990. What was the percent increase in population during this time?
   1) 400% 2) 700% 3) 600% 4) 800%

6. An electrical contractor purchases a certain amount of wire, 10% of which was stolen. After using

85% of the remainder, he had 47 m and 25 cm of wire left. How much wire did he purchase?
1) 325 m 2) 350 m 3) 96 m 4) 103 m

7. If Ramu buys books from Delhi at 11 books for Rs. 10 and sells at 10 books for Rs. 12, then find his gain percent.
1) 11% 2) 22% 3) 32% 4) 15%

8. By selling a watch at a profit of 10%, a man got RS. 15 more than half its price. What is the price of the watch?
1) Rs. 10 2) Rs. 15 3) Rs. 25 4) Rs. 5

9. A man's working hours per day were increased by 25%, and his wages per hour were increased by 20%. By how much percent were his daily earnings increased?
1) 20% 2) 25% 3) 50% 4) 45%

10. A tradesman marks his goods at 25 % above cost price and allows discount of 12.5 % for cash payment. What profit percent does he make on a cash payment?
1) $9\frac{3}{8}\%$ 2) $9\frac{1}{8}\%$ 3) $9\frac{5}{8}\%$ 4) $9\frac{7}{8}\%$

11. Anil and Biswas invest Rs. 3000 and Rs. 4000 respectively ina business. If Anil doubles his capital after 6 months, then in what proportion should Anil and Biswas divide that year's profit?
1) 6:5 2) 9:8 3) 5:6 4) 8:9

12. Two partners, A and B invested in a business in the ratio 5:6 and they shared their profits in the ratio 5:6. If A invested the money for 8 months, then for how much time did B invest the money?
1) 8 months 2) 12 months 3) 6 months 4) 10 months

13. What rate of dividend will a person receive if he invests in6.5% at 130?
1) 2% 2) 2.8% 3) 5% 4) 3.8%

14. A man borrows a certain sum and pays back in 2 years in two equal installments. If compound interest is reckoned at 4 percent and if he pays back annually Rs. 676, what sum did he borrow?
1) Rs. 1200 2) Rs. 1250 3) Rs. 1275 4) None of these

15. Equal sums are invested in 3% stock at 80, 4% at 90 and 5%at 100. The price of each stock rises by Rs. 10, so that 1st & 3rd are sold and the proceeds are invested in the 2nd. If the rise in the income be Rs. 1.5, then the whole sum invested is (Nominal value = 100)
1) Rs. 2700 2) Rs. 3000 3) Rs. 3300 4) None of these

16. A car bought at Rs. 13350 depreciates each year by $12\frac{1}{2}$ %. In how many years will its value be reduced to approxRS. 6000?

1) 4 years 2) 10 years 3) 8 years 4) 6 years

17. A man invested Rs. 8000 and, after paying 10% of the firstyear's interest as income tax, he had Rs. 900 of the interestleft. Calculate the rate percent at which interest was paid.
    1) 10% 2) 12.5% 3) 12% 4) 5%

18. On what sum of money will the C.I for 2 years be the sameas the S.I on Rs. 943 for 10 years. The rate of interestbeing 5%?
    1) Rs. 1400 2) Rs. 5000 3) Rs. 3600 4) Rs. 4600

19. A man owns Rs. 7500 of 3% stock. He sells out and investsthe proceeds in 5% stock at 120, thereby gaining in incomeby Rs. 25. The price at which he sold out is
    1) Rs. 90 2) Rs. 110 3) Rs. 80 4) RS. 70

20. Which isthe better investment :$4^{3}/_{4}$% stock at Rs. 5 belowpar or $5^{1}/_{4}$% stock at Rs. 5 premium?
    1) Second 2) First 3) Both yield same incomes 4) None of these

1. 1	**2.** 3	**3.** 1	**4.** 4	**5.** 2
6. 2	**7.** 3	**8.** 3	**9.** 3	**10.** 1
11. 2	**12.** 1	**13.** 3	**14.** 3	**15.** 2
16. 4	**17.** 2	**18.** 4	**19.** 3	**20.** 3