Profit and Loss

Definitions

Cost Price (CP) The price at which an article is bought is called its cost price. All the overhead expenses in the transaction like fright, demurrage etc., are added to the cost price. Profit and Loss percentage is always calculated as the percentage of CP unless otherwise specified.

Selling Price (SP) The price at which an article is sold is called its selling price.

There is a gain in the transaction, if SP > CP

There is a loss in the transaction, if CP > SP

List Price/Marked Price The list price is called as the marked price of the article. Some time the shopkeeper increases or decreases the cost price, then this price is the list price of the articles.

Formulae to be Remember
▢ Profit = Selling Price − Cost Price
▢ Loss = Cost Price − Selling Price
▢ Profit or Loss is always calculated on cost price.
▢ Profit % $= \dfrac{\text{Profit}}{\text{CP}} \times 100 = \dfrac{(SP-CP)}{CP} \times 100$
▢ Loss % $= \dfrac{\text{Loss}}{\text{CP}} \times 100 = \dfrac{(CP-SP)}{CP} \times 100$

Important Rules and Formulae

Rule 1 If there is a profit of $r\%$, then

(i) $SP = \dfrac{(100+r) \times CP}{100}$

(ii) $CP = \dfrac{100 \times SP}{(100+r)}$

Example 1. If the SP of a commodity is ₹ 440 with a profit of 10%. Then, CP is

(a) ₹ 200   (b) ₹ 300
(c) ₹ 400   (d) ₹ 800

Sol. (c) Here, $r = 10$ and there is a profit.

So, $CP = \dfrac{100 \times SP}{(100+r)} = \dfrac{100 \times 440}{(100+10)} = ₹ 400$

Example 2. If CP of a fan is ₹ 720. If there is a profit of $16\dfrac{2}{3}\%$. Then, SP is

(a) ₹ 840   (b) ₹ 940
(c) ₹ 1050   (d) None of these

Sol. (a) Here, $x = 16\dfrac{2}{3}\%$, CP = ₹ 720

$SP = \dfrac{CP \times (100+r)}{100}$

$= \dfrac{720 \times \left(100 + 16\dfrac{2}{3}\right)}{100} = \dfrac{720 \times \left(100 + \dfrac{50}{3}\right)}{100} = \dfrac{720 \times 350}{300}$

$= ₹ 840$

Rule 2 If there is a loss of $r\%$, then

(i) $SP = \dfrac{(100-r)}{100} \times CP$ (ii) $CP = \dfrac{100 \times SP}{(100-r)}$

Example 3. If the SP of a commodity is ₹ 400 with a loss of 20%. Then, CP is

(a) ₹ 300   (b) ₹ 450   (c) ₹ 480   (d) ₹ 500

Sol. (d) Here, $r = 20\%$ (loss), SP = ₹ 400

$CP = \dfrac{100 \times 400}{(100-20)} = \dfrac{100 \times 400}{80} = ₹ 500$

Example 4. When CP = ₹ 75 and there is a loss of 12%. Then, SP is

(a) ₹ 22   (b) ₹ 44   (c) ₹ 55   (d) ₹ 66

Sol. (d) Here, $r = 12\%$, CP = ₹ 75

$SP = \dfrac{(100-r) \times CP}{100}$

$= \dfrac{(100-12) \times 75}{100} = \dfrac{88 \times 75}{100} = ₹ 66$

Rule 3

(i) When there are two successive profits of $x\%$ and $y\%$ then the resultant profit per cent is given by $x + y + \dfrac{xy}{100}$

(ii) When where are two successive losses of $x\%$ and $y\%$, the net loss % is given by $\left(-x - y + \dfrac{xy}{100}\right)$.

Example 5. By selling a watch for ₹ 132 a trademan got two successive profits of 10% and 20%, respectively. Then the resultant profit is

(a) 22%   (b) 30%   (c) 32%   (d) 34%

Sol. (c) Let CP be x.

Here, first $SP = \dfrac{110 \times x}{100}$,

then second $SP = 20\%$ of first SP

$= \dfrac{20}{100} \times \dfrac{110}{100} \times x = 132 \Rightarrow x = ₹\ 100$

So, resultant profit $= ₹\ (132 - 100) = ₹\ 32$

Percentage profit $= \dfrac{32}{100} \times 100 = 32\%$

Shortcut method

Here, the profits are 10%, 20%.

So, resultant profit $= \left(10 + 20 + \dfrac{20 \times 10}{100}\right)\% = 32\%$

Rule 4 Where there is a profit of x% and loss of y%, then the resultant profit or loss per cent is given by $\left(x - y - \dfrac{xy}{100}\right)\%$

- If the sign of result is positive, then there is a total gain.
- If the sign of result is negative, then there is a total loss.

Example 6. A sold a watch to B at a gain of 10% and B sold it to C at a loss of 10%. If C paid ₹ 1980 for it, then the amount paid by A is

(a) ₹ 1000   (b) ₹ 1500   (c) ₹ 2000   (d) ₹ 2500

Sol. (c) Here, the resultant profit or loss

$= 10 - 10 - \dfrac{10 \times 10}{100} = -1$ so there is a loss of 1%

Selling price of watch $= ₹\ 1980$

Amount paid by $A = \dfrac{1980 \times 100}{(100 - 1)} = \dfrac{1980 \times 100}{99} = ₹\ 2000$

Example 7. Ram sells a tape recorder to Shyam at a profit of 30% and Shyam sell it to Sonu at a loss of 20%. If Sonu paid ₹ 520 for it, at what price did Ram buy?

(a) ₹ 500   (b) ₹ 550   (c) ₹ 600   (d) ₹ 750

Sol. (a) Here, resultant profit or loss

$= 30 - 20 - \dfrac{30 \times 20}{100}$

$= 30 - 20 - 6 = 4$ as sign is positive

Hence, Sonu has a net profit.

∴ Amount paid by Ram $= \dfrac{520 \times 100}{104} = ₹\ 500$

Rule 5 If the cost of both the item be S. One is sold at a loss of r% and the other at a gain of R%, then

Cost price of item sold at loss $= \dfrac{S \times (100 + R)}{(100 - r) + (100 + R)}$

Cost price of item sold at gain $= \dfrac{S \times (100 - r)}{(100 - r) + (100 + R)}$

Example 8. Sudhir bought two boxes for ₹ 1300. He sold one box at a profit of 20% and the other at a loss of 12%. If the selling price of both boxes is the same, then the cost price of each box is

(a) ₹ 700 and ₹ 500   (b) ₹ 750 and ₹ 550
(c) ₹ 800 and ₹ 600   (d) None of these

Sol. (b) Total price of two boxes = ₹1300

Let cost price of first box = ₹ x

∴ Cost price of second box = ₹ (1300 − x)

Profit on first box = 20%

∴ Selling price of first box $= x + \dfrac{20x}{100} = \dfrac{120x}{100}$ ...(i)

Loss on second box = 12%

∴ Selling price of second box = Cost price − Loss

$= (1300 - x) - \dfrac{12}{100}(1300 - x) = 1144 - \dfrac{88x}{100}$ ...(ii)

But as SP of both is same, so

$\dfrac{120x}{100} = 1144 - \dfrac{88x}{100}$ [from Eqs. (i) and (ii)]

$\dfrac{208x}{100} = 1144 \Rightarrow x = \dfrac{1144 \times 100}{208}\ x = 550$

∴ Cost price of first box = ₹ 550 and
Cost price of second box = ₹ (1300 − 550) = ₹ 750

Shortcut method

As S = ₹ 1300, R = 20%, r = 12%

Cost price of box sold at loss

$= \dfrac{1300 \times (100 + 20)}{(100 - 12) + (100 + 20)} = \dfrac{1300 \times 120}{88 + 120} = ₹\ 750$

Cost price of box sold at gain

$= \dfrac{1300 \times (100 - 12)}{(100 - 12) + (100 + 20)} = \dfrac{1300 \times 88}{88 + 120} = ₹\ 550$

Rule 6 If 'a' part is sold at l% profit, 'b' part is sold at m% profit, 'c' part is sold at n% profit. If ₹ 'R' is earned as overall profit, then the value of total consignment

$= \dfrac{R \times 100}{al + bm + cn}$

Example 9. $\dfrac{2}{3}$ of a consignment was sold at 6% profit and the rest at a profit of 3%. If there was an overall profit of ₹ 500, then the value of the consignment is

(a) ₹ 9000   (b) ₹ 10000   (c) ₹ 12000   (d) ₹ 12500

Sol. (b) Comparing with rule 6,

Here, $a = \dfrac{2}{3}, l = 6\%$

$b = \left(1 - \dfrac{2}{3}\right) = \dfrac{1}{3}, m = 3\%$. Also, $R = ₹\ 500$

∴ Total value of consignment $= \dfrac{R \times 100}{al + bm}$

$= \dfrac{500 \times 100}{\dfrac{2}{3} \times 6 + \dfrac{1}{3} \times 3} = \dfrac{50000}{4 + 1} = ₹\ 10000$

Example 10. $\dfrac{1}{3}$ of a consignment was sold at 3% profit, $\dfrac{5}{9}$ of the consignment was sold at a gain of 9% while the remaining at a loss of 18%. If there was an overall profit of ₹ 540, then the value of consignment is

(a) ₹ 13000　(b) ₹ 13500　(c) ₹ 14000　(d) ₹ 14500

Sol. (b) Comparing again with rule 6.

$$a = \frac{1}{3}, l = 3, b = \frac{5}{9}, m = 9$$

$$c = \left(1 - \frac{1}{3} - \frac{5}{9}\right) = \frac{1}{9}, n = -18 \quad (\because \text{Loss} = -\text{Profit})$$

Also,　　　　$R = ₹\ 540$

∴ Total value of consignment

$$= \frac{R \times 100}{al + bm + cn} = \frac{540 \times 100}{\frac{1}{3} \times 3 + \frac{5}{9} \times 9 + \frac{1}{9} \times (-18)}$$

$$= \frac{540 \times 100}{1 + 5 - 2} = \frac{54000}{4} = ₹\ 13500$$

Rule 7 If a certain number of articles are purchased at '*r*' a rupee and the same number at '*R*' a rupee. He mixes them together and sells them at '*M*' a rupee. Then, his gain per cent or loss per cent

$$= \left[\frac{2Rr}{M(r+R)} - 1\right] \times 100$$

According as the sign +ve or −ve.

If $M = \dfrac{r+R}{2}$ there is always loss.
If $r = R = M$ there is neither gain nor loss.

Example 11. Apples are bought at 9 for a rupee and an equal number more at 11 for a rupee. If these are mixed and sold at 10 for a rupee, then the loss or gain percent is

(a) gain of 1%　　　　(b) loss of 1%
(c) no gain or no loss　(d) None of these

Sol. (b) Comparing above, here, $r = 9, R = 11, M = 10$

∴ Gain or loss per cent $= \left[\dfrac{2 \times 9 \times 11}{10(11+9)} - 1\right] \times 100$

$$= \left[\frac{198}{200} - 1\right] \times 100 = \frac{-2}{200} \times 100 = -1\%$$

As the sign is negative, there is a loss of 1%.

Rule 8 If a shopkeeper marks his items at $a\%$ above the cost price and allows customers a discount of $b\%$ for cash, then there is $\left(a - b - \dfrac{ab}{100}\right)\%$ profit or loss according to positive or negative sign, respectively.

Example 12. A shopkeeper marks his goods 20% higher than the cost price and allows a discount of 5%. Then, the profit percentage is

(a) 12%　　(b) 14%　　(c) 15%　　(d) 17%

Sol. (b) Let the cost price of goods = ₹ 100

∴ Marked price of goods $= \dfrac{120}{100} \times 100 = ₹\ 120$

Selling price of goods $= 120 - \dfrac{5}{100} \times 120 = ₹\ 114$

∴ Profit percentage $= (114 - 100) = 14\%$

Shortcut method

Compare with rule 8, Here, $a = 20\%, b = 5\%$

∴ Net profit $= \left(20 - 5 - \dfrac{20 \times 5}{100}\right) = 20 - 5 - 1 = 14\%$

Rule 9 If cost price of '*n*' articles is equal to the selling price of '*m*' articles, then

$$\text{Profit percentage} = \left(\frac{n-m}{m}\right) \times 100\% \ (n > m)$$

and $\quad\text{loss percentage} = \left(\dfrac{m-n}{m}\right) \times 100\% \ (m > n)$

Example 13. If the cost price of 18 chairs be equal to selling price of 16 chairs. The gain per cent is

(a) 12%　　(b) 12.5%　　(c) 14%　　(d) 15.5%

Sol. (b) Let cost price of 1 chair = ₹ 1

Then, cost price of 18 chairs = ₹ 18
Cost price of 16 chairs = ₹ 16
Selling price of 16 chairs = Cost price of 18 chairs = ₹ 18
∴ Profit on 16 chairs = ₹ (18 − 16) = ₹ 2

Profit percentage $= \dfrac{2}{16} \times 100 = 12.5\%$

Shortcut method

$$n = 18, \ m = 16 \text{ and } n > m$$

∴ Profit percentage $= \left(\dfrac{18-16}{16}\right) \times 100 = \dfrac{2}{16} \times 100$

$$= \frac{100}{8} = 12.5\%$$

Example 14. If the cost price of 10 chairs be equal to selling price of 16 chairs, the gain or loss per cent is

(a) loss of 37.5%　　　(b) gain of 37.5%
(c) gain of 37%　　　　(d) loss of 37%

Sol. (a) Here, $n = 10, m = 16$

So, $m > n$ here not loss

Loss per cent $= \dfrac{16 - 10}{16} \times 100 = \dfrac{6 \times 100}{16} = 37.5\%$

∴ Loss percentage in the transactions $= 37.5\%$

Discount

The reduction allowed on the marked price of an article is called as discount. Discount is always reckoned on the marked price.

Selling price = Marked price − Discount
Discount = Selling price − Marked price

If discount allowed is r%, then

$$\text{Selling price} = \frac{(100 - r)}{100} \times \text{Marked price}$$

Example 15. If the marked price of a fan is ₹ 700 and a discount of 10% is given on it, what is the selling price of the fan?

(a) ₹ 500   (b) ₹ 575   (c) ₹ 610   (d) ₹ 630

Sol. (d) Marked price of article = ₹ 700

Discount per cent = 10%

∴ Selling price = 90% of marked price

$$= \frac{90}{100} \times 700 = ₹ 630$$

Example 16. A dealer marked his goods 20% above the cost price and allows a discount of 10%. Then his gain per cent is

(a) 2%   (b) 4%   (c) 6%   (d) 8%

Sol. (d) Let cost price of article = ₹ 100

∴ Marked price of article = 120% of 100 = $\frac{120}{100} \times 100$ = ₹ 120

∴ Selling price of article = 90% of 120 = $\frac{90}{100} \times 120$ = ₹ 108

∴ Gain profit = $(108 - 100) = 8\%$

Successive Discounts (Discount Series) Suppose the marked price of an article is ₹ P and a discount of r_1% is given on it and on the reduced price, a further discount of r_2% is given. Then, the successive discount of r_1% and r_2% are given on the article.

∴ Selling price of article after r_2% discount

$$= (100 - r_2)\% \text{ of } (100 - r_1)\% \text{ of } P$$
$$= \frac{(100 - r_2)}{100} \times \frac{(100 - r_1)}{100} \times P$$

Example 17. A single discount which is equivalent to two successive discounts of 20% and 5% is

(a) 20%   (b) 22%   (c) 24%   (d) 25%

Sol. (c) Let the cost price of article be ₹ 100.

∴ Selling price of article after two successive discount of 20% and 5% = $(100 - 20)\%$ of $(100 - 5)\%$ of 100

$$= \frac{80}{100} \times \frac{95}{100} \times 100 = ₹ 76$$

∴ Single discount equivalent to a series of discount
$$= 100 - 76 = 24\%$$

Example 18. Which of the following discount series is better for a customer 25%, 10% or 30%, 10%?

(a) 30%, 10% is better for a customer
(b) 25%, 10% is better for a customer
(c) both are equal
(d) None of the above

Sol. (a) *Case I* Successive discount series is 25%, 10%.

Let cost price be ₹ 100.

∴ Selling price of article after discounts

$$= (100 - 25)\% \text{ of } (100 - 10)\% \text{ of } 100$$
$$= \frac{75}{100} \times \frac{90}{100} \times 100 = ₹ 67.50$$

Case II Successive discount series is 30%, 10%.

∴ Selling price of article after discounts

$$= (100 - 30)\% \text{ of } (100 - 10)\% \text{ of } 100$$
$$= \frac{70}{100} \times \frac{90}{100} \times 100 = ₹ 63$$

As the customer will have to pay less in case II.

Here, the discount series 30%, 10% is better for a customer.

Example 19. The marked price of a watch is ₹ 1600. The shopkeeper gives successive discount of 10%, r% to the customer. If the customer pays ₹ 1224 for the watch, then the value of r is

(a) 20%   (b) 35%
(c) 37%   (d) None of these

Sol. (d) Marked price of article = ₹ 1600

∴ Selling price = $(100 - 10)\%$ of $(100 - r)\%$ of 1600

$$= \frac{90}{100} \times \frac{100 - r}{100} \times 1600$$

$\Rightarrow \quad 1224 = \frac{9}{10} \times (100 - r) \times 16$ (given)

$\Rightarrow \quad \frac{1224 \times 10}{9 \times 16} = (100 - r)$

$\Rightarrow \quad 85 = 100 - r \Rightarrow r = 100 - 85$

$\Rightarrow \quad r = 15\%$

Exercise

1. By selling an article for ₹ 247.50, Sonu get a profit of 12.5%. The cost of the article is

   (a) ₹ 220   (b) ₹ 205   (c) ₹ 210   (d) ₹ 200

2. If cost price of a fan is ₹ 720 and its SP is ₹ 840. Find the gain per cent.

   (a) 16%   (b) $16\frac{2}{3}\%$ (c) $16\frac{1}{3}\%$ (d) $16\frac{7}{3}\%$

3. By selling an article for ₹ 110, a man losses 12%. For how much should he sell it to gain 8%?

   (a) ₹ 120   (b) ₹ 125   (c) ₹ 135   (d) ₹ 140

4. If the selling price of a commodity is ₹ 450 with a profit of 12.5%. The cost price of the commodity is

   (a) ₹ 400   (b) ₹ 405
   (c) ₹ 410   (d) ₹ 415

5. A man buys 4 tables and 5 chairs for ₹ 1000. If he sells the tables at 10% profit and chairs 20% profit, he earns a profit of ₹ 120. What is the cost of one table?

   (CDS 2007 II)

   (a) ₹ 200   (b) ₹ 220
   (c) ₹ 240   (d) ₹ 260

6. By selling 12 articles for ₹ 100, a man losses 20%. How many articles for ₹ 100 should he sell to gain 20%?
   (a) 4   (b) 5   (c) 6   (d) 8

7. If selling price of 8 articles is equal to the cost price of 10 articles, then per cent gain or loss is
   (a) 20   (b) 25   (c) 30   (d) 35

8. A trader marks 10% higher than the cost price. He gives a discount of 10% on the marked price. In this kind of sales how much per cent does the trader gain or loss?   **(CDS 2011 I)**
   (a) 5% gain   (b) 2% gain   (c) 1% loss   (d) 3% loss

9. A man sells 320 mangoes at the cost price of 400 mangoes. His gain per cent is
   (a) 10%   (b) 15%   (c) 20%   (d) 25%

10. Arjun bought two buffaloes for ₹ 30000, By selling one at a loss of 15% and other at a gain of 19%, he found the selling price of both buffaloes is the same. The cost price of each buffalo is
    (a) ₹ 17500 and ₹ 12500   (b) ₹ 17000 and ₹ 13000
    (c) ₹ 18000 and ₹ 12000   (d) ₹ 16000 and ₹ 14000

11. A man sells fans at the same price on one he gain 20% and losses 20% on the other. His gain or loss is
    (a) 4% loss   (b) 4% gain
    (c) neither gain nor loss   (d) 1% loss

12. Sneh gains 10% on selling a pen. If she sells it at double the price, the profit per cent is
    (a) 120%   (b) 60%   (c) 100%   (d) 200%

13. A man purchased a watch for ₹ 400 and sold it at a gain of 20% of the selling price. The selling price of the watch is
    (a) ₹ 300   (b) ₹ 320   (c) ₹ 440   (d) ₹ 500

14. By giving 25% discount a trader earns 25% profit. If he sells the item at 10% discount, what is his profit?
    (CDS 2007 I)
    (a) 10%   (b) 40%   (c) 45%   (d) 50%

15. Successive discounts of $12\frac{1}{2}$% and $7\frac{1}{2}$% are given on the marked price of a cupboard. It the customer pays ₹2590, then what is the marked price?   **(CDS 2008 I)**
    (a) ₹3108   (b) ₹148   (c) ₹3200   (d) ₹3600

16. The difference between a discount of 40% on ₹1000 and two successive discounts of 35% and 5% on the same amount is
    (a) ₹15.50   (b) ₹16.50   ( ) ₹17.50   ( ) ₹18.00

17. A discount series of 10%, 20% and 40% is equal to a single discount of
    (a) 50%   (b) 60%   (c) 56.8%   (d) 70.28%

18. A dealer buys an article listed at ₹100 and gets two successive discounts of 10% and 20%. He spends 10% of the cost price on transport etc. At what price should he sell the article to earn a profit of 15%?
    (a) ₹ 90   (b) ₹ 91   (c) ₹ 91.08   (d) ₹ 91.10

19. A person A sells a table costing ₹ 2000 to a person B and earns a profit of 6%. The person B sells it to another person C at a loss of 5 %. At what price did B sell the table?   **(CDS 2009 I)**

(a) ₹ 2054   (b) ₹ 2050   (c) ₹ 2024   (d) ₹ 2014

20. The list price of a watch is ₹ 160. After two successive discounts, it is sold for ₹122.40. If the first discount is 10%, what is the rate of second discount?
    (a) 10%   (b) 15%   (c) 20%   (d) 22%

21. The manufacturer of a certain item can sell all he can produce at the selling price of ₹ 60 each. If costs him ₹ 40 in materials and labour to produce each item and he has overhead expenses of ₹ 3000 per week in order to operate the plant. The number of items he should produce and sell in order to make a profit of atleast ₹ 1000 per week is
    (a) 400   (b) 300   (c) 250   (d) 200

22. An item costing ₹ 200 is being sold at 10% loss. If the price is further reduced by 5%, the selling price will be
    (a) ₹ 170   (b) ₹ 171   (c) ₹ 175   (d) ₹ 179

23. A trader sells two cycles at ₹ 1188 each and gains 10% on the first and loses 10% on the second. What is the profit or loss per cent on the whole?   **(CDS 2009 II)**
    (a) 1% loss   (b) 1% gain
    (c) No loss no gain   (d) 2% loss

24. A man sold two watches, each for ₹ 495. If he gained 10% on one watch and suffered a loss of 10% on the other, then what is the loss or gain percentage in the transaction?   **(CDS 2011 II)**
    (a) 1% gain   (b) 1% loss
    (c) 100/99% loss   (d) No loss no gain

25. If bought two old scooters for ₹ 9000. By selling one at a profit of 25% and the other at a loss of 20%, 2 neither gain nor loses. The cost of each scooter is
    (a) ₹ 3500, ₹ 500   (b) ₹ 4500, ₹ 4500
    (c) ₹ 4000, ₹ 5000   (d) ₹ 5300, ₹ 3700

26. List price of a video cassette is ₹ 100. A dealer sells three video cassettes for ₹ 274.50 after allowing discount at certain rate. The rate of discount allowed is
    (a) 7%   (b) 7.5%   (c) 8%   (d) 8.5%

27. If a shopkeeper marks the price of goods 50%, more than their cost price and allows a discount of 40%, what is his gain or loss per cent?
    (a) Gain 10%   (b) Loss 10%
    (c) Loss 9%   (d) No profit no loss

28. A man bought a number of oranges at 3 for a rupee and an equal number at 2 for a rupee. At what price per dozen should he sell them to make a profit of 20%?
    (CDS 2010 I)
    (a) ₹ 4   (b) ₹ 5   (c) ₹ 6   (d) ₹ 7

29. Jyoti bought a computer system for ₹ 40000. She sold it to Brajesh at a loss of 4%. If Brajesh sells it for ₹ 40320 to Yash, then the profit per cent earned by Brajesh is
    (a) 3%   (b) 5%   (c) 7%   (d) 10%

30. An agent buys a TV set listed at ₹ 10000 and gets 10% and 20% successive discount. He spends 10% of his CP on transport. At what price (in ₹) should he sell the TV set to earn a profit of 10%?
    (a) 8692   (b) 8699
    (c) 8700   (d) 8712

31. What the seller marked the printed price of a watch purchased at ₹ 380, so that giving 5% discount, there is 25% profit?
(a) ₹ 400 (b) ₹ 450 (c) ₹ 500 (d) ₹ 600

32. By selling 8 dozen pencils, a shopkeeper gains the selling price of 1 dozen pencils. What is the gain?

(CDS 2010 II)

(a) $12\frac{1}{2}\%$ (b) $13\frac{1}{7}\%$ (c) $14\frac{2}{7}\%$ (d) $87\frac{1}{2}\%$

33. At what price must Sarita sell a mixture of 80 kg sugar at ₹ 6.75 per kg with 120 kg at ₹ 8 per kg to gain 20%?
(a) ₹ 7.50 per kg (b) ₹ 8.20 per kg
(c) ₹ 8.85 per kg (d) ₹ 9 per kg

34. A merchant advertises 10% off on the items bought from his store. The total discount got by a customer who bought a suitcase worth ₹ 560, a bag worth ₹ 90 and a towel worth ₹ 45 is
(a) ₹ 69.50 (b) ₹ 70
(c) ₹ 71.50 (d) ₹ 72

Answers

1. (a)	2. (b)	3. (c)	4. (a)	5. (a)	6. (d)	7. (b)	8. (c)	9. (d)	10. (a)
11. (a)	12. (a)	13. (d)	14. (d)	15. (c)	16. (c)	17. (c)	18. (c)	19. (d)	20. (b)
21. (d)	22. (b)	23. (a)	24. (b)	25. (c)	26. (d)	27. (b)	28. (c)	29. (b)	30. (d)
31. (a)	32. (c)	33. (d)	34. (a)						

Hints and Solutions

1. Selling price of article = ₹ 247.50 and gain = $\frac{25}{2}\%$

$$\therefore \text{Cost price} = ₹ \left\{ \frac{100}{\left(100 + \frac{25}{2}\right)} \times 247.50 \right\}$$

$$= ₹ \frac{100 \times 2 \times 247.50}{225} = ₹ 220$$

2. Total gain = SP – CP = ₹(840 – 720) = ₹120

$$\therefore \text{Gain per cent} = \frac{120}{720} \times 100 = 16\frac{2}{3}\%$$

3. SP = ₹ 110, Loss = 12%

$$\therefore \text{Cost price} = ₹ \left(\frac{100}{88} \times 110\right) = ₹ 125$$

Now, CP = ₹ 125, Gain required = 8%

$$\therefore SP = ₹ \left(\frac{(100+8)}{100} \times 125\right) = ₹ 135$$

4. $\because$ CP $= \frac{SP \times 100}{100 + \text{gain percent}} = \frac{450 \times 100}{100 + 12.5} = \frac{450 \times 100}{112.5} = ₹ 400$

5. Let cost of 1 table be ₹ x and cost of 1 chair be ₹ y.

$$4x + 5y = 1000 \quad ...(i)$$

	Table	Chair
CP	4x	5y
SP	$4x\left(1+\frac{1}{10}\right)=\frac{44x}{10}$	$5y\left(1+\frac{1}{5}\right)=6y$

$\because$ SP – CP = Profit

$$\therefore \left(\frac{44x}{10} - 4x\right) + 6y - (4x + 5y) = 120$$

$$\Rightarrow \frac{4x}{10} + y = 120 \quad ...(ii)$$

From Eqs. (i) and (ii), we get x = ₹ 200

6. Cost price of 12 articles $= \frac{100 \times 100}{80} = ₹ 125$

Selling price for gain 20% $= \frac{125 \times 120}{100} = ₹ 150$

Selling price of one article $= \frac{150}{12} = ₹ 12.5$

Number of articles to be sold in ₹ 100 $= \frac{100}{12.5} = 8$

7. Here, m = 8, n = 10 As n > m so net profit

$$\therefore \text{Profit percentage} = \frac{10-8}{8} \times 100 = 25\%$$

8. Let cost price = ₹x

$$\text{Marked price} = \frac{x \times 110}{100} = ₹ \frac{11x}{10}$$

$$\therefore SP = \frac{11x}{10} \times \frac{90}{100} = \frac{99x}{100}$$

$$\therefore \text{Required gain/loss per cent} = \frac{\frac{99x}{100} - x}{x} \times 100 = -1\% \quad \text{(loss)}$$

9. Here, m = 320, n = 400

$$\text{Profit percentage} = \left(\frac{400-320}{320}\right) \times 100 = \frac{80}{320} \times 100 = 25\%$$

10. Cost of buffaloes sold at loss (see rule 5)

$$= \frac{30000(100+19)}{(100-15)+(100+19)} = \frac{30000(119)}{85+119} = ₹ 17500$$

Cost of buffaloes sold at gain

$$= \frac{30000(100-15)}{(100-15)+(100+19)}$$

$$= \frac{30000 \times 85}{85+119} = ₹ 12500$$

11. Here, $x = 20\%$ (see rule 4) $y = 20\%$

Profit or loss per cent $= \left(20 - 20 - \dfrac{20 \times 20}{100}\right)\% = -4\%$

∴ There is net loss of 4%.

12. Let the selling price be ₹ 100.

∴ Cost price $= \dfrac{SP \times 100}{(100 + 10)} = \dfrac{100 \times 100}{110} = ₹ \dfrac{1000}{11}$

Now, if SP is ₹ 200.

∴ Gain $= ₹\left(200 - \dfrac{1000}{11}\right) = ₹ \dfrac{1200}{11}$

Gain per cent $= \dfrac{1200/11}{1000/11} \times 100 = 120\%$

13. Let selling price $= ₹ x$

Then, $400 + 20\%$ of $x = x \Rightarrow 400 + \dfrac{x}{5} = x$

$\Rightarrow \dfrac{4x}{5} = 400 \Rightarrow x = \dfrac{400 \times 5}{4}$

$\Rightarrow x = ₹ 500$

∴ Selling price $= ₹ 500$

14. Let the cost price of an item $= ₹ x$

∴ Selling price of the item $= ₹ \dfrac{x \times 125}{100} = ₹ \dfrac{5x}{4}$

Since, the rate of discount $= 25\%$

∴ Marked price of an item $= ₹ \dfrac{5x}{4} \times \dfrac{100}{75} = ₹ \dfrac{5x}{3}$

New rate of discount $= 10\%$

∴ New selling price of an item $= \dfrac{5x}{3} \times \dfrac{90}{100} = ₹ \dfrac{3x}{2}$

Profit on new selling item on 10% discount $= ₹\left(\dfrac{3x}{2} - x\right) = ₹ \dfrac{x}{2}$

∴ Percentage profit $= \dfrac{x/2}{x} \times 100\% = 50\%$

15. Let the marked price of a cupboard $= ₹ x$

∴ $x \times \dfrac{(100 - 12.5)}{100} \times \left(\dfrac{100 - 7.5}{100}\right) = 2590$

$\Rightarrow x = \dfrac{2590 \times 100 \times 100}{87.5 \times 92.5} = ₹ 3200$

16. **Case I** Discount $= 40\%$

$\Rightarrow$ Selling price $= 60\%$ of $1000 = \dfrac{60}{100} \times 1000 = ₹ 600$

Case II Two successive discount are of 35% and 5%.

$\Rightarrow$ Selling price $= 65\%$ of (95% of 1000)

$= \dfrac{65}{100} \times \dfrac{95}{100} \times 1000 = ₹ 617.50$

∴ Difference $= ₹ (617.50 - 600) = ₹ 17.50$

17. Let the original price $= ₹ 100$

Discount series $= 10\%, 20\%$ and 40%

∴ Selling price of item after discounts

$= \dfrac{(100 - 40)}{100} \times \dfrac{(100 - 20)}{100} \times \dfrac{(100 - 10)}{100} \times 100$

$= \dfrac{60}{100} \times \dfrac{80}{100} \times \dfrac{90}{100} \times 100 = ₹ 43.20$

∴ Single discount equivalent to series discount
$= 100 - 43.20 = 56.8\%$

18. List price of article $= ₹ 100$

Cost price for dealer $= \dfrac{(100 - 20)}{100} \times \dfrac{(100 - 10)}{100} \times 100$

$= \dfrac{80 \times 90 \times 100}{100 \times 100} = ₹ 72$

Money spent on transport $= \dfrac{10}{100} \times 72 = ₹ 7.20$

∴ Total cost price $= 72 + 7.20 = ₹ 79.20$

∴ Selling price should be $= \dfrac{(100 + 15)}{100} \times 79.20$

$= \dfrac{115 \times 79.20}{100} = ₹ 91.08$

19. The cost price of table for person B

$= 2000 + 6 \times \dfrac{2000}{100} = 2000 + 120 = ₹ 2120$

Its selling price $= 2120 - \dfrac{2120 \times 5}{100}$

$= 2120 - 106 = ₹ 2014$

20. List price $= ₹ 160$

Let second discount be $r\%$.

∴ Cost after second discount

$= \dfrac{(100 - r)}{100} \times \dfrac{(100 - 10)}{100} \times 160 = \dfrac{(100 - r)}{100} \times \dfrac{90}{100} \times 160$

$= (100 - r) \times \dfrac{36}{25}$

But cost is ₹ 122.40

Given, ₹ $122.40 = (100 - r) \times \dfrac{36}{25}$

$\dfrac{122.40 \times 25}{36} = 100 - r$

$\Rightarrow 85 = 100 - r$

$\Rightarrow r = 100 - 85 = 15\%$

21. Let the number of items be 'x'.

Then, selling price of items $= 60x$

Cost of material of items $= 40x$

Overhead expenses $= ₹ 3000$

∴ $60x - (40x + 3000) = 1000 \Rightarrow 20x = 4000$

$x = \dfrac{4000}{20} = 200$

22. Cost of article $= ₹ 200$

Selling price $= 95\%$ of (90% of 200)

$= \dfrac{95}{100} \times \dfrac{90}{100} \times 200 = ₹ 171$

23. By using the rule,

When there is a profit of $x\%$ and loses of $y\%$, then the resultant

Profit/Loss $= \left(x - y - \dfrac{xy}{100}\right)\%$

Here, $x = y = 10\%$

$\therefore$ Profit/Loss $= \left(10 - 10 - \dfrac{10 \times 10}{100}\right)\% = -1\%$

Negative sign represent there is a loss of 1%.

24. $\therefore$ Loss/gein per cent $= \left(10 - 10 - \dfrac{10 \times 10}{100}\right)\% = -1\%$

Negative sign indicate that there is a loss of 1%.

25. Let cost price of one scooter $= ₹ \, x$

Cost price of other scooter $= ₹ \,(9000 - x)$

$\therefore$ Selling price of first scooter $= x + \dfrac{25x}{100} = \dfrac{125x}{100}$

Also, selling price of second scooter

$= (9000 - x)\left(1 - \dfrac{20}{100}\right) = (9000 - x)\left(\dfrac{80}{100}\right)$

$\therefore$ Total selling price of scooter $= \dfrac{125x}{100} + (9000 - x)\dfrac{80}{100}$

$\therefore$ $\dfrac{125x}{100} + (9000 - x)\dfrac{80}{100} = 9000$ (given)

$\dfrac{45x}{100} + 7200 = 9000$

$45x = 180000$

$x = \dfrac{180000}{45} = ₹ \, 4000$

$\therefore$ Cost price of 1st scooter $= ₹ \, 4000$

Cost price of 2nd scooter $= ₹ \, 5000$

26. List price of a vedio cassette $= ₹ \, 100$

Let the rate of discount $= r\%$

Selling price of 3 vedio cassette $= ₹ \, 274.50$

$\therefore$ Selling price of 1 vedio cassette $= ₹ \, \dfrac{27450}{3} = ₹ \, 91.50$

$\therefore$ $100 - \dfrac{r}{100} \times 100 = ₹ \, 91.50$

$100 - 9150 = r \Rightarrow 8.50 = r$

$\Rightarrow$ Rate of discount $= 8.5\%$

27. Let the cost price $= ₹ \, 100$

$\therefore$ Marked price $= ₹ \, 150$

Rate of discount on marked price $= 40\%$

Selling price $= ₹ \left(150 - \dfrac{40}{100} \times 150\right) = ₹ \,(150 - 60) = ₹ \, 90$

$\therefore$ Loss $= 100 - 90 = ₹ \, 10$

$\therefore$ Loss per cent $= \dfrac{10}{100} \times 100 = 10\%$

28. Given,

CP of 3 oranges of Ist variety $= ₹ \, 1$

CP of 1 orange of Ist variety $= ₹ \, \dfrac{1}{3}$

CP of 2 oranges of IInd variety $= ₹ \, 1$

CP of 1 orange of IInd variety $= ₹ \, \dfrac{1}{2}$

Total CP of 2 oranges of different variety $= \dfrac{1}{3} + \dfrac{1}{2} = ₹ \, \dfrac{5}{6}$

Profit on 2 oranges $= 20\%$ of $\dfrac{5}{6} = \dfrac{20}{100} \times \dfrac{5}{6} = ₹ \, \dfrac{1}{6}$

$\therefore$ SP of 2 oranges $= \dfrac{5}{6} + \dfrac{1}{6} = 1$

Hence, SP of 12 oranges ₹ 6.

29. Cost price of computer for Brajesh

$= 40000 - \dfrac{4}{100}(40000) = ₹ \, 38400$

Selling price of computer for Brajesh $= ₹ \, 40320$

$\therefore$ Profit amount $= ₹ \, 40320 - ₹ \, 38400 = ₹ \, 1920$

$\therefore$ Profit percentage earned by Brajesh $= \dfrac{1920}{38400} \times 100 = 5\%$

30. Cost price of TV $= \dfrac{80}{100} \times \dfrac{90}{100} \times (10000) = ₹ \, 7200$

$\therefore$ Amount spent on transport $= \dfrac{10}{100} \times 7200 = ₹ \, 720$

$\therefore$ Net cost price $= 7200 + 720 = ₹ \, 7920$

$\therefore$ Selling price of TV $= 110\%$ of $7920 = \dfrac{110}{100} \times 7920 = ₹ \, 8712$

31. Let marked price be $₹ \, x$.

$\therefore$ Discount $= 5\%$ of $x = \dfrac{5}{100} x = \dfrac{x}{20}$

Since, $SP = MP - Discount$

$\Rightarrow$ $380 = x - \dfrac{x}{20} \Rightarrow 380 = \dfrac{19x}{20} \Rightarrow x = ₹ \, 400$

32. Let cost price of 1 dozen pencil $₹ \, x$.

$\therefore$ Selling price of 8 dozen pencils $= ₹ \, 8x$

and   profit $= ₹ \, x$

$\Rightarrow$ Cost price of 8 dozen pencils $= ₹ \, 7x$

$\therefore$ Gain per cent $= \dfrac{4}{7x} \times 100\% = 14\dfrac{2}{7}\%$

33. Total cost of 200 kg of sugar

$= ₹ \,(80 \times 6.75 + 120 \times 8) = ₹ \, 1500$

Cost price of 1 kg $= ₹ \, \dfrac{1500}{200} = ₹ \, 7.50$

Gain required $= 20\%$

Here, selling price of 1 kg $= ₹ \,(120\% \text{ of } 7.50)$

$= ₹ \left(\dfrac{120}{100} \times 7.50\right) = ₹ \, 9 \text{ per kg}$

34. Total discount amount $= 10\%$ of total cost of items

$= \dfrac{10}{100} \times (560 + 90 + 45) = \dfrac{10}{100} \times 695 = ₹ \, 69.50$