2 Profit and Loss

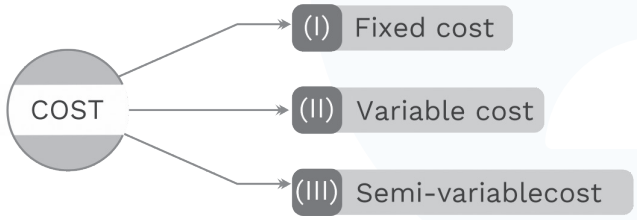
Introduction

Profit, loss, and discount is an application of the concept of percentages in commercial mathematics. It is an important topic for CAT and OMETs. One can expect two to three questions from this topic in CAT every year, that involve simple and complex calculations.

Terminology:

1. **Cost price:** The price (amount) paid to purchase an article/ product, or the cost incurred in manufacturing a product is known as the cost price (C.P) of that product.

Types of costs



1. **Fixed cost:**

   As the name suggests, it is that kind of cost that remains fixed in all the cases.

2. **Variable cost:**

   Variable cost are those costs which vary depending on the number of units produced.

3. **Semi-variable cost:**

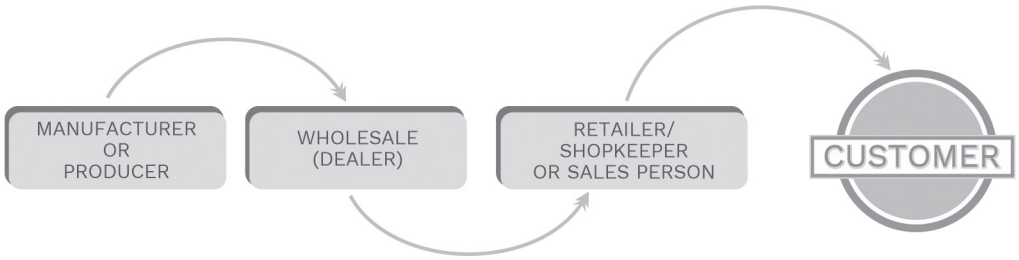
   Semi variable costs are a blend of fixed and variable costs. There can be instances when the cost of production involves wages of workers and the cost of raw materials. Here, the wages of workers can be fixed and the cost of raw materials can vary, according to the quantum of production.

Example:

An important example to understand the above-stated costs is the telephone bill. A part of that bill, i.e. rental is a fixed cost. The remaining part of the bill is calculated based on the number of calls made.

Note: If an article is purchased for some amount and there are some additional expenses on transportation labor, commission, etc; these are to be added to the cost price. Such expenses are called overhead expenses or overheads.

In day-to-day life, we sell and purchase things as per our requirements. A customer can get the things as shown in the below-given flowchart.



2. **Selling Price (SP):** The price at which the goods are sold is called the selling price (SP).
3. **Profit:** If the selling price of an article is more than its cost price, then the shop-keeper realises a profit or (gain).

   Profit = SP – CP

   SP > CP
4. **Loss:** If the selling price of an article is less than its cost price, then the dealer suffers a loss.

   Loss = CP – SP

   CP > SP

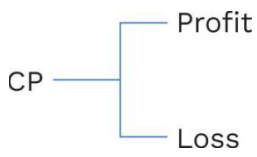
Basic Formulae (Important):

1. Profit = SP-CP
2. Loss = CP-SP
3. Profit % = $\frac{\text{Profit}}{\text{Cost price}} \times 100$
4. Loss% = $\frac{\text{Loss}}{\text{Cost price}} \times 100$
5. SP = CP(1 + P%) = CP(100 + P)%
6. SP = CP(1 – L%) = CP(100 – L)%

Rack Your Brain

Suraj buys 1,000 mangoes for ₹ 2,000. In the night, due to bad weather, 20% of the mangoes are rotten. He made an overall profit of 20% after selling all the mangoes. At what price did he sell two dozen mangoes?

Note: Profit and loss are always calculated over the cost price.



$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100$$

CP is base

$$\text{Loss \%} = \frac{\text{Loss}}{\text{CP}} \times 100$$

CP is base

Example 1:

If a shopkeeper sells an article at a profit of 20%, the cost price of which is ₹ 1,000. Find its selling price.

Solution:

CP = ₹ 1,000

Profit = 20%

Profit in (Rs) = 1,000 × 20% = ₹ 200

We know that,

SP = CP + Profit

SP = 1,000+200 = ₹ 1,200

Alternate Solution:

$20\% = \frac{1}{5}$ (Profit / CP) $\Rightarrow$ SP = 5+1 = 6 Unit

Since CP = 5 unit

and 5 unit → ₹ 1000

1 unit → ₹ 200

6 unit → 200 × 6 = ₹ 1200

Rack Your Brain

A dishonest milkman sells milk at the-cost price, but he mixes water and earns $16\frac{2}{3}\%$ profit. Find the ratio of water and milk in the mixture.

Example 2

A shopkeeper buys 300 pens at 5 for ₹ 8, and sold them at 2 for ₹ 5.

Find:

1. The CP of each pen.
2. The selling price of each pen.
3. Profit or loss on selling one pen.
4. His total profit or loss on selling all the pens.

Solution:

1. Cost price of 5 pens = ₹ 8

   CP of 1 pen $= \frac{8}{5}$ = ₹ 1.60

2. Selling price of 2 pens = ₹ 5

   Selling price (SP) of each pen

   $= \frac{5}{2}$ = ₹ 2.50

3. Since SP > CP

   Then the profit occurs

   Profit = SP – CP

   = ₹ 2.5 – ₹ 1.6

   = ₹ 0.90

4. Profit (in Rs) when selling all the pens

   = ₹ 0.90 × 300 = ₹ 270

   Hence total profit on selling all the pens = ₹ 270

Example 3

Find the cost price of an article that is sold at ₹ 660 at a loss of 12%.

Solution:

Let CP be 100%

SP = CP – loss

SP = 100% – 12% = 88%

88% → ₹ 660

1% → $\frac{₹\ 660}{88}$

100% → $\frac{₹\ \cancel{660}^{60}}{\cancel{88}_{8}} \times 100 = \frac{\cancel{6000}}{\cancel{8}} = ₹\ 750$

Alternate Solution:

12% → $\frac{12}{100} = \frac{-3}{25}$

Loss

SP = CP – Loss

= 25 – 3 = 22 unit

CP

22 unit (SP) → ₹ 660

1 unit → ₹ 30

25 unit → ₹ 30 × 25 = ₹ 750 (CP)

Mark up and Discount:

Basically, to avoid loss due to bargaining by the customer and to get profit over the cost price, the trader increases the cost price by a certain value. This increase in value over the cost price is known as mark up, and this increased price (i.e. CP +Mark up) is called the marked price or the printed price or the list price.

Example

CP		MRP		SP
100	+ 50%	150	− 20% (Discount)	120

Marked Price (MRP) = CP + Mark up

Marked Price (MRP) = CP + (% Mark up on CP)

Generally, goods are sold at a marked price, and if there is no further discount, then the selling price is equal to the marked price.

CP		MRP		SP
100	+ 50%	150	no discount (0)	150

If no discount is allowed then

MRP = SP

Discount:

In order to attract the buyers, the practice of offering discount is employed. The discount is offered as a percentage of the marked price. The decreased value would be equal to the selling price, and the decrement would be equal to the absolute value of the discount (in terms of units of currency).

Example:

CP		MRP		SP
₹ 100	+ 50%	₹ 150	− 20% ₹ 30 (Discount)	120

Discount percentage (D%) = $\frac{\text{Discount}}{\text{MRP}} \times 100$

Note: Discount % is always calculated on MRP.

Example 1:

If the cost price of the article is ₹ 600 and the percent markup is 20%, then what is the marked price?

Solution:

MRP = CP + % Mark up on CP

= 600 + 600 × 20%

= 600 + 120 = ₹ 720

Alternate Solution:

20% = $\frac{+1}{5}$ → CP

MRP= CP + mark up value

= 5+1 = 6 unit

5 unit → ₹ 600

1 unit → $\frac{₹\ 600}{5}$ = ₹ 120

6 unit → 6 × 120 = ₹ 720

Example 2:

If the marked price of an article is ₹ 900 and the mark up percentage is 25%, then what is the cost price?

Solution:

MRP = CP × (100 + 25)% = CP × 125%

900 = CP × 125%

$900 = CP \times \frac{5}{4}$

$CP = \frac{4}{5} \times 900 = \text{Rs. } 720$

Successive percentage discount:

Whenever there are successive % discounts of first being a%, second being b%...

We can represent it as below:

.... and so on

Here A, B and C are intermediate prices after discounts of a%, b% and c% respectively.

MRP (1-a%)(1-b%)(1-c%)...., and so on .... (Basic structure of successive % discount)

Example 1

Abhi sold the article at ₹ 3,600 at the successive % discount of 20% and 33.33% find the MRP of the article.

Solution:

MRP(1-a%) (1-b%) = SP

here a = 20% and b= 33.33%

MRP(1-20%) (1-33.33%) = 3,600

$$MRP\left(1-\frac{1}{5}\right)\left(1-\frac{1}{3}\right)=3,600$$

$$\frac{4}{5}\times\frac{2}{3}\times MRP=3,600$$

MRP = ₹ 6,750.

Example 2

What is the single equivalent discount of two successive discounts of 33.33% and 25%, respectively?

Solution:

MRP (1-33.33%) (1-25%)

$$=MRP\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)=\frac{2}{3}\times\frac{3}{4}MRP=\frac{MRP}{2}$$

Clearly, the overall % discount is 50%.

Alternate Method:

$$d1 = 33.33\% = -\frac{1}{3} \text{ and } d2 = 25\% = -\frac{1}{4}$$

where d1 and d2 are the % discounts.

MRP	:	SP
3	:	2
4	:	3
-----	:	-----
12	:	6

Therefore, % discount

$$=\left(\frac{\text{Discount}}{\text{MRP}}\right)\times 100=\left(\frac{6}{12}\right)\times 100=50\%$$

Example 3:

The MRP of a watch is ₹ 720. A man bought the same for ₹ 550.80 after getting two successive percent discounts of which the first is 10%. What was the second % discount?

Solution:

MRP(1-a%) (1-b%) = SP here a = 10% b = ? and SP = 550.80

720(1-10%) (1-b%) = 550.8

$$720\times\frac{9}{10}(1-b\%)=550.80$$

$$1-b\% = \frac{550.8}{72\times 9}$$

$$\therefore \frac{100-b}{100}=\frac{85}{100}$$

$$\therefore 100-b=85$$

$$\therefore b=15\%$$

Example 4:

Single equivalent % discount of 16.66%, 33.33% and 25% is

Solution:

Since we know that: 16.66% = 1/6, 33.33% = 1/3 and 25% = 1/4

So, it becomes $MRP \times \frac{5}{6} \times \frac{2}{3} \times \frac{3}{4} = MRP \times \frac{5}{12}$

So, overall discount is $\frac{7}{12}$ i.e. $\frac{7}{12} \times 100 = 58.33\%$

Single equivalent discount of two succes sive discounts of first being a and second being b :

Using successive % change formula

$$\left|x + y + \frac{x \times y}{100}\right|\%$$

Where x = -a% and y = -b%

$$= \left|-a - b + \frac{-a \times -b}{100}\right|\%$$

$$= -\left|a + b - \frac{a \times b}{100}\right|\%$$

(– sign depicts the discount)

Note: Single equivalent discount % of two successive discounts of a% and b% is given by $\left|a + b - \frac{a \times b}{100}\right|\%$

Example 1:

Find the single equivalent discount of 20% and 30%.

Solution:

Using formula

$$\left|a + b - \frac{a \times b}{100}\right|\% = \left[20 + 30 - \frac{20 \times 30}{100}\right]\%$$

$$= [50 - 6]\% = 44\%$$

Example 2:

If the difference between a single discount of 40% and two successive discounts of 20% each is ₹ 720, find the MRP of an article.

Solution:

Using formula,

The single equivalent discount of 20% each

$$= \left[a + b - \frac{a \times b}{100}\right]\% = \left[20 + 20 - \frac{20 \times 20}{100}\right]\%$$

$$= [40 - 4]\% = 36\%$$

So, according to the question

40% of MRP – 36% of MRP = ₹ 720

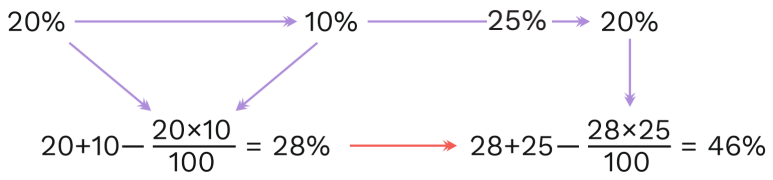
$\Rightarrow$ 4% of MRP = ₹ 720

$\Rightarrow$ 1% of MRP = 180

$\Rightarrow$ MRP = ₹ 18,000

Example 3:

Single equivalent discount % of 20%, 10% and 25%



Example 4:

Single equivalent discount % of 10%, 15% and 5% is:

Key Points

In successive change order does not matter.

Example 5:

The single equivalent discount of two successive discounts of a% each is less than 40%. Find how many positive integral values can 'a' take.

Solution:

The overall % discount

$$= \left[a + a - \frac{a \times a}{100}\right]\% < 40\% = \left[2a - \frac{a^2}{100}\right] < 40\%$$

'a' can take the value from 1 to 22,

as at 23 the expression becomes

$$\left[46 - \frac{529}{100}\right] = 40.71$$

Thus 'a' can take 22 integral values i.e. from 1 to 22.

Common gain or loss concept:

If two articles are sold at the same price, where one is sold at x% profit and the other at x% loss, then there would always be a net loss. The loss percentage is given by:

$$\text{Loss\%} = \left(\frac{x}{10}\right)^2$$

Proof:

When the first article is sold at x% profit.

$CP_1 \xrightarrow{+} x\% \longrightarrow SP$

$CP_1 (1 + x\%) = SP$

$$CP_1 = \frac{SP}{1 + x\%} \quad \ldots\ldots\ldots (1)$$

When the second article is sold at x% loss

$3CP_2 \xrightarrow{-} x\% \longrightarrow SP$

$CP_2 (1\text{-}x\%) = SP$

$$CP_2 = \frac{SP}{1 - x\%} \quad \ldots\ldots\ldots (2)$$

Adding (1) and (2)

$$CP_1 + CP_2 = SP\left[\frac{1}{1 + x\%} + \frac{1}{1 - x\%}\right]$$

$$= SP\left[\frac{2}{1 - (x\%)^2}\right]$$

$$\text{Net \% loss} = \frac{\text{Overall CP} - \text{Overall SP}}{\text{Overall CP}} \times 100$$

$$= \frac{SP\left[\frac{2}{1 - (x\%)^2}\right] - 2SP}{SP\left[\frac{2}{1 - (x\%)^2}\right]} \times 100$$

$$= \frac{2SP\left[\frac{1}{1 - (x\%)^2} - 1\right]}{2SP\left[\frac{1}{1 - (x\%)^2}\right]} \times 100 = (x\%)^2 \times 100$$

$$= \frac{x^2}{100^2} \times 100$$

$$\text{Net \% loss} = \left(\frac{x^2}{100}\right)\% \quad \ldots \text{ it is independent on}$$

The SP of an article.

$$\text{Overall Loss} = \frac{x^2}{100}\% \text{ of } SP\left[\frac{2}{1 - (x\%)^2}\right]$$

$$= \frac{x^2}{100^2} \times \frac{100^2}{100^2 - x^2} \times 2SP$$

$$= \frac{x^2}{100^2 - x^2} \times 2SP$$

Key Points

If the first article is sold at x% profit and the second article is sold at x% loss, and the SP of both the articles is same, then:

1. There will always be a loss of $\left(\frac{x^2}{100}\right)\%$
2. overall loss amount

$$= \frac{x^2}{100^2 - x^2} \times 2SP$$

Example 1:

A man sells two articles, one at a profit of 10% and the other at a loss of 10%, but the selling price of each article is the same, which is ₹ 600.

Find:

(i) Profit or Loss%

(ii) Overall profit or loss in ₹.

Solution:

(i) Since $SP_1 = SP_2$

P% = L%

Then there is always a loss which is:

$$\text{Loss\%} = \left(\frac{x}{10}\right)^2 = \left(\frac{10}{10}\right)^2 = 1\%$$

(ii) Since we know that total

SP = 600 + 600 = ₹ 1,200

Also $\boxed{SP = CP - Loss}$

overall SP = 100% – 1% = 99%

99% → ₹ 1200

1% → $\frac{₹\ 1200}{99}$ = ₹ 12.12

Hence, overall loss amount = ₹ 12.12

Alternate Method:

(i)

+10% = $\frac{1}{10}$ → Profit

SP = CP + P

= 10 + 1 = 11 unit

→ CP

–10% = $\frac{-1}{10}$ → Loss

SP = CP - LOSS

= 10 - 1 = 9 unit

→ CP

Since SP is the same in both cases.

	CP	:	SP	
	₹ 90 = [10	:	11] × 9 = 99	
Total CP =	₹ 110 = [10 / ₹ 200	:	9] × 11 = 99 / 198	→ Total SP

Loss = 2 unit

$$\text{Loss\%} = \frac{\text{Loss}}{CP} \times 100 = \frac{\cancel{2}}{\cancel{200}} \times \cancel{100} = 1\%$$

(ii) Amount of loss:

Since we know that 99 unit → ₹ 600

1 unit → $\frac{₹\ 600}{99}$

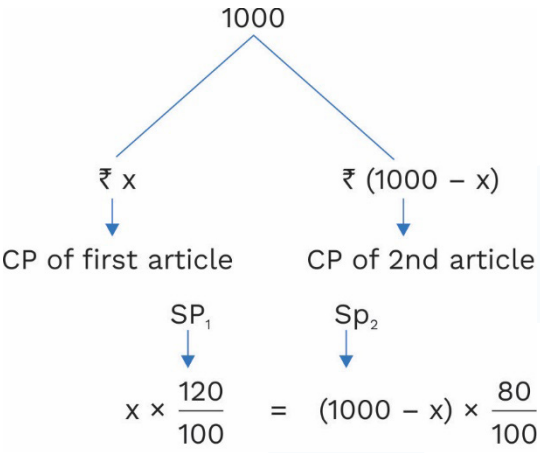
∴ 2 unit → $\frac{600}{99} \times 2 = \frac{1200}{99}$

Loss amount = ₹ 12.12

Example 2:

Two articles were sold at the same price, and the first article was sold at a 20% profit and the second article was sold at a 20% loss, and the sum of the cost price of both the articles is ₹ 1,000 then find the amount of the overall loss.

Solution:



$$x \times \frac{6}{5} = (1000 - x) \times \frac{4}{5}$$

$$3x = 2000 - 2x$$

$$5x = 2000$$

$$x = ₹\ 400$$

CP of profit yielding article = ₹ 400

CP of loss yielding article = ₹ 1,000 – ₹ 400

= ₹ 600

Hence SP of each article

= 400 × 120% = 400 × 1.2

= ₹ 480

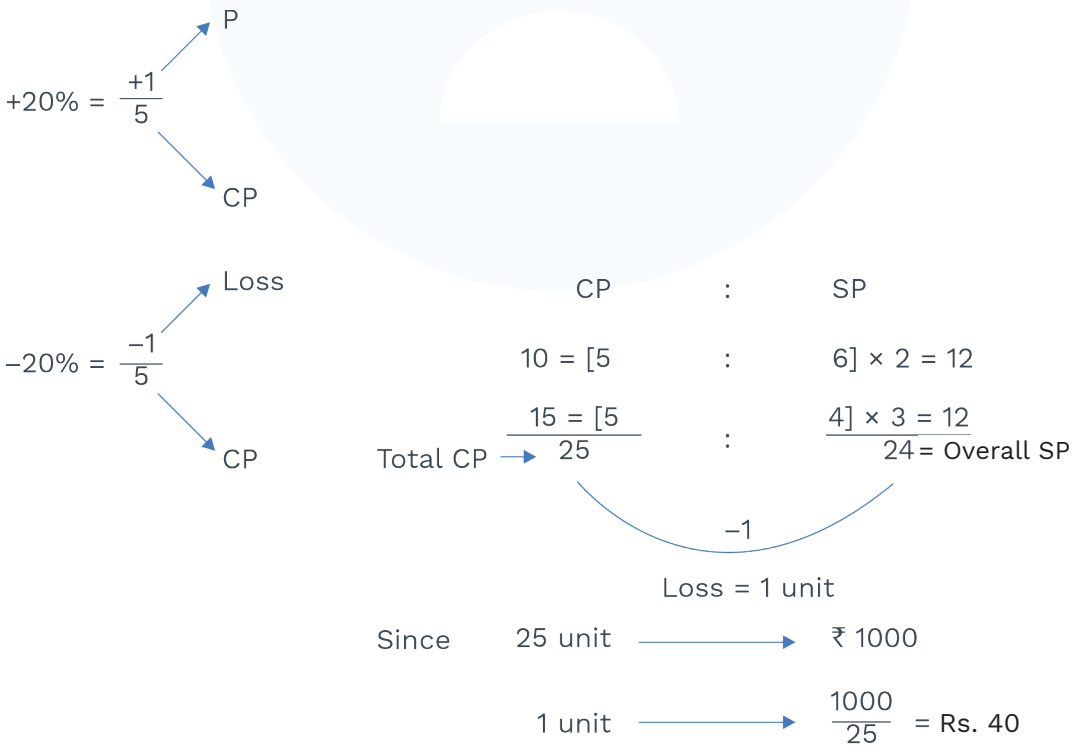
∴ Amount of loss = Total CP – Total SP

= 1,000 – 2 × 480

= 1,000 – 960

= ₹ 40

Alternate Solution:



Hence, the amount of loss is 1 unit which is equal to ₹ 40.

Example 3:

Mr. Ashok sold his scooter at the profit of x% and his bike at the loss of x%. If the SP of of the scooter and the bike remains the same, and in the entire transaction he incurred a loss of 10.24%; then find the value of x.

Solution:

Since the SP remains the same, we can use the short-cut.

The overall loss % $= \frac{x^2}{100}\%$

$\therefore 10.24\% = \frac{x^2}{100}\%$

$\therefore 1024\% = x^2\%$

$\therefore x = \sqrt{1024} = 32$

Example 4:

Ramlal sold his two cow's each at the same price of ₹ 30,000 each. On the first cow, he made a profit of 20% and on the second he made a loss of 20%. Find his overall profit or loss amount.

Solution:

Since the SP remains the same we can use the short-cut.

Overall loss amount $= \frac{x^2}{100^2 - x^2} \times 2\,SP$

$= \frac{20^2}{100^2 - 20^2} \times 2 \times 30,000$

$= \frac{400}{120 \times 80} \times 60,000$

$= \frac{5}{120} \times 60,000 = `2500$

Selling price and Cost price equality :

When the total selling price of 'x' articles is the same as the total cost price of 'y' articles.

Example 1:

If the cost price of 10 apples is equal to the selling price of 9 apples. Find the profit % or loss %.

Solution:

CP of 10 apples = SP of 9 apples

10 CP = 9 SP

$\frac{CP}{SP} = \frac{9}{10}$

So, one can observe that SP > CP. Then there is a profit.

Profit % $= \frac{P}{CP} \times 100$

$= \frac{10 - 9}{9} \times 100 = \frac{1}{9} \times 100 = 11\frac{1}{9}\%$

Example 2:

If the selling price of 12 oxygen cylinders is equal to the cost price of 9 oxygen cylinders. Find the profit and loss %.

Solution:

9 CP = 12 SP

$\frac{CP}{SP} = \frac{12}{9} = \frac{4}{3}$

Since CP > SP,

Then there is a loss.

Hence loss % $= \frac{Loss}{CP} \times 100$

$= \frac{1}{4} \times 100 = 25\%$

Example 3:

The cost price of 36 articles is equal to the selling price of x articles. Find the value of x that will result in a profit of 12.5%.

Solution:

Let CP of 1 article = n and SP of 1 article = m

SP of x articles = CP of 36 articles.

m × x = 36 × n

$$\frac{m}{n} = \frac{36}{x} \quad \text{..... (1)}$$

Also, Profit % = 12.5% = $\frac{1}{8}$,

means $\frac{SP}{CP} = \frac{9}{8}$ ..... (2)

Equating (1) and (2) we get,

$\frac{36}{x} = \frac{9}{8}$

$\therefore x = 32$

Example 4:

Jincy buys 12 chocolates for ₹ 5. How many chocolates she must sell for ₹ 4 so that she makes a profit of 6.66%?

Solution:

CP of 1 chocolate = ₹ 5/12

SP of 1 chocolate = CP(1 + P%)

$= \frac{5}{12} \times (1 + 6.66\%) = \frac{5}{12} \times \left(1 + \frac{1}{15}\right) = \frac{5}{12} \times \frac{16}{15} = \frac{4}{9}$

So SP of 9 chocolates = ₹ 4

Thus, she has to sell 9 chocolates for ₹ 4.

Example 5:

By selling 40 Kg of rice a shopkeeper incurred the loss of as much money as he received for 20 Kg of rice. Find his overall loss %.

Solution:

CP of 40 kg of Rice – SP of 40 kg of Rice = SP of 20 kg of Rice .... as he incurred the loss of SP of 20Kg

SP of 60 Kg = CP of 40 Kg

Using LCM approach, SP of 60 Kg = CP of 40 Kg = ₹ 120

CP of 1 Kg Rice = ₹ 3 and SP of 1 Kg Rice = ₹ 2

Loss % = $\frac{1}{3} \times 100 = 33.33\%$

Quantity Based Questions:

Example 1:

Virat purchases 15 articles for ₹ 3 and sells 25 articles for ₹ 4. Find his profit or loss percentage.

Solution:

Here we try to make the articles equal for that we take the LCM (15,25) = 75 articles

CP of 15 articles → ₹ 3

SP of 25 articles → ₹ 4

CP of 75 articles → ₹ 15

SP of 75 articles → ₹ 12

% loss = $\frac{Loss}{CP} \times 100 = \frac{3}{15} \times 100 = 20\%$

Example 2:

Ramo purchases some articles for ₹ 8 and sold 5 articles for ₹ 8; and in the entire process, he made a profit of 20%. Find how many articles he had purchased initially.

Solution:

Let Ramo purchased x articles for ₹ 8.

CP of 1 article $= \frac{8}{x}$

also SP of 5 articles = ₹ 8.

So, SP of 1 article = ₹ $\frac{8}{5}$

We know that Profit % = 20% = $\frac{1}{5}$

So, $\frac{SP}{CP} = \frac{6}{5}$

$\therefore \frac{\frac{8}{5}}{\frac{8}{x}} = \frac{8}{5}$

$\therefore \frac{8x}{40} = \frac{6}{5}$

$\therefore x = \frac{240}{40} = 6$

Rack Your Brain

On selling tea at ₹ 36/kg Raghav suffered a loss of 10%. Find the quantity of tea which he would have sold if he suffered a loss of ₹ 80.

Example 3:

Rakesh purchases some articles at the rate of 6 for ₹ 5 and some at the rate of 3 for ₹ 8. He sold all the articles at the rate of 15 for ₹ 20. Find his overall profit or loss.

Solution:

Here, we try to make the articles equal for that we take the LCM (6,3,15) = 30 articles.

He buys 6 articles for ₹ 5, so 30 articles would cost him ₹ 25.

He also buys 3 articles for ₹ 8, so 30 articles would have cost him ₹ 80.

So, cost price of 60 articles

= (25 + 80) = ₹ 105

Now, he sold 15 articles for ₹ 20 so he would have sold 60 articles for ₹ 80.

$$\% \text{ Loss} = \frac{25}{105} \times 100 = \frac{500}{21} = 23\frac{17}{21}\%$$

Example 4:

Mangilal purchased mangoes in two lots one at the rate of ₹ 15 per dozen and the other at the rate of ₹ 20 per dozen. He sold them at the rate of ₹ 18 per dozen Find his profit or loss percentage, if he spends the same amount of rupees on the lots.

Solution:

As he is spending equal amounts on each of the lots.

Thus, let he spends ₹ 60 (the LCM of 15 and 20) on each lot.

So, of the first lot he bought $\frac{60}{15} = 4$ dozen

Of the second lot he bought $\frac{60}{20} = 3$ dozen

Overall cost incurred by him

= (60+60) = ₹ 120 for 7 dozen

Now he sells 1 dozen at ₹ 18 so 7 dozen he would have sold at ₹ 126.

So, profit % = $\frac{6}{120} \times 100 = 5\%$

Chain of sale and purchase (Successive % profit or Loss):

Example 1:

A manufacturer sells a bicycle to the wholesaler at a profit of 20%. The wholesaler sells it to the dealer at a profit of 12.5%. The dealer sells to a retailer at a profit of 25% and the retailer to the customer at a loss of 11.11%. If the cost of manufacturing the bicycle for the manufacturer was ₹ 1,500, find the price paid by the customer for the bicycle.

Solution:

M(1 + 20%)(1 + 12.5%)(1 + 25%)(1 – 11.11%) = C

$$1500\left(1+\frac{1}{5}\right)\left(1+\frac{1}{8}\right)\left(1+\frac{1}{4}\right)\left(1-\frac{1}{9}\right) = C$$

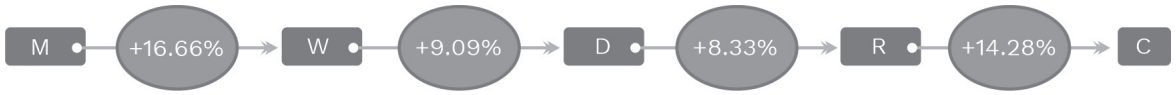
$$1500 \times \frac{6}{5} \times \frac{9}{8} \times \frac{5}{4} \times \frac{8}{9} = C$$

Therefore, C = ₹ 2,250

Example 2:

A manufacturer sells to the wholesaler at a profit of 16.66%. The wholesaler sells to the dealer at a profit of 9.09%. The dealer sells to a retailer at a profit of 8.33% and the retailer to the customer at a profit of 14.28%. If the customer paid ₹ 4,680 for the article, find the cost of manufacturing the product incurred by the manufacturer.

Solution:

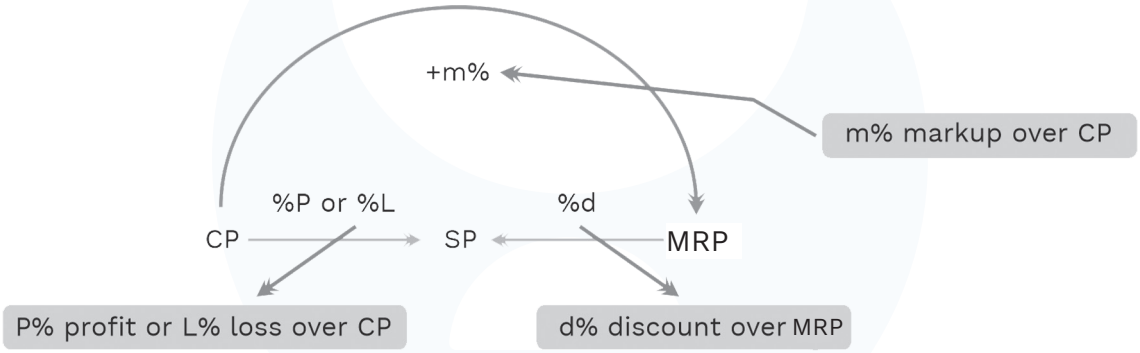


$M(1 + 16.66\%)(1 + 9.09\%)(1 + 8.33\%)(1 + 14.28\%) = 4,680$

$\Rightarrow M \times \frac{7}{6} \times \frac{12}{11} \times \frac{13}{12} \times \frac{8}{7} = 4,680$

$\Rightarrow M = \frac{4,680 \times 11 \times 3}{13 \times 4} = 2,970$

Structure of CP-SP-MP:



% Mark Up →

If the cost price is increased by a certain % let's say by m%, then it is known as m% mark up over CP.

Thus, markup is nothing but certain % increase over cost price.

SP = Marked price – Discount

SP = MRP (MP) – (% discount on MP) Or

SP = MP (1-d%)

Marked price = CP + % Markup on CP Or

MP = CP(1+m%)

Key points from the above illustration:

m % is a percentage increase over the CP to result in the MP.

d % is a percentage decrease over MP to result in SP.

Initially CP is increased by m% to result in the MP, and then the MP is decreased by d % to result in the SP.

Thus, CP(1+m%)(1-d%) = SP (this relation would help us to find the overall percentage profit or loss)

Equating the selling price from the above structure, one can get the below results.

CP (1+p%) = MP(1-d%) ____(if there is a profit of P%)

or CP(1-l%) = MP(1-d%) ____(if there is a loss pf l%)

m % and d % are two successive percentage changes acting on CP to result in SP.

Thus, Profit/Loss percentage

$= \left[m - d - \frac{m \times d}{100}\right]\%$ ..... using successive percentage change.

Note:

(1) The formula $\left[m - d - \frac{m \times d}{100}\right]\%$ is helpful in quick calculation when the m% and d% are good numbers like 10%, 20%, 25%, and so on.

(2) If the m% and d% are numbers are like 12.5%, 33.33%, and 16.66%, we can use successive structure as CP(1+m%)(1-d%) = SP to find overall % profit or loss.

Example 1:

A trader marks-up his goods by 31.25%, and then offers a discount of 14.28%. Find the net profit or loss percentage that he makes.

Solution:

CP(1 + m%) (1 – d%) = SP

CP(1 + 31.25%)(1 – 14.28%) = SP

$CP \times \left(1 + \frac{5}{16}\right)\left(1 - \frac{1}{7}\right) = SP$

$\Rightarrow CP \times \frac{21}{16} \times \frac{6}{7} = SP$

$\Rightarrow \frac{SP}{CP} = \frac{9}{8}$

Thus, there is profit of 1 over 8 i.e., 1/8 i.e. 12.5%.

Example 2:

In-spite of giving a discount of 9.09%, a trader made a profit of 11.11%. By what percentage did he mark-up his goods.

Solution:

CP(1+p%) = MP(1-d%)

$\Rightarrow$ CP(1 + 11.11%) = MP(1 – 9.09%)

$\Rightarrow CP \times \left(1 + \frac{1}{9}\right) = MP \times \left(1 - \frac{1}{11}\right)$

$\Rightarrow CP \times \frac{10}{9} = MP \times \frac{10}{11}$

$\Rightarrow \frac{MP}{CP} = \frac{11}{9}$

Thus, there is a mark-up of 2 over 9 i.e 2/9 i.e 22.22%.

Example 3:

The ratio of the marked price and the cost price of an article is 4 : 3. If 2x% discount is given on the article, then x% loss is incurred. What is the value of x?

Solution:

Given: MP : CP = 4 : 3

CP(1 – x%) = MP(1 – 2x%)

$\Rightarrow \frac{CP}{MP} = \frac{1 - 2x\%}{1 - x\%}$

$\Rightarrow \frac{3}{4} = \frac{1 - 2x\%}{1 - x\%}$

$\Rightarrow 3 - 3x\% = 4 - 8x\%$

$\Rightarrow 5x\% = 1$

$\Rightarrow x = \frac{100}{5} = 20\%$

Rack Your Brain

The total cost of 8 books and 5 pens is ₹ 92, and the cost of 5 books and 8 pens is ₹ 77. Find the cost of 3 books and 2 pens.

Example 4:

A trader allows a trade discount of 20% and a cash discount of 6.25% on the marked price of the goods, and gets a net gain of 20% of the cost price. Find his mark-up %.

Solution:

CP(1 + p%) = MP(1 – d1%)(1 – d2%)

CP(1 + 20%) = MP(1 – 20%)(1 – 6.25%)

$$\Rightarrow CP\left(1+\frac{1}{5}\right)=MP\left(1-\frac{1}{5}\right)\left(1-\frac{1}{16}\right)$$

$$\Rightarrow CP\times\frac{6}{5}=MP\left(\frac{4}{5}\times\frac{15}{16}\right)$$

$$\Rightarrow \frac{MP}{CP}=\frac{24}{15}=\frac{8}{5}$$

Thus, there is a mark-up of 3 over 5 i.e 3/5 i.e 60%.

Fraudulent shopkeepers and faulty machines:

In some real-life instances, unethical shopkeepers deceive their customers by using faulty weighing machines or by using some kind of adulteration techniques. Interesting questions can be formed on this widespread practice. Given below are few examples:

Type 1: Dishonesty by Adulteration

Example 1:

A milkman mixes milk and water in the ratio of 5:2. Find his profit or loss percent %, if he sells his mixture:

(i) At the cost price of milk

(ii) At the mark-up of 10%

(iii) At the discount of 10%

Solution:

(i)	Milk	Water	Total
Quantity	5 L	2 L	7 L
Let price be	1 Rs/L	0	

Total CP = (5 × 1) + (2 × 0) = ₹ 5

Total SP = 7×1 = ₹ 7

$$\therefore \text{ Profit \%} = \frac{7-5}{5}\times 100 = 40\%$$

(i) Short-cut:

As profit is nothing but the quantity of water being mixed, and the price of pure milk:

$$\text{Profit \%} = \frac{\text{Water}}{\text{Milk}}\times 100 = \frac{2}{5}\times 100 = 40\%$$

Note: Applicable when water is free of cost and the mixture is sold at the price of pure milk:

(ii) Total CP will remain ₹ 5.

Now, total SP is 7 × 1.1 = ₹ 7.7, since markup is 10%

$$\therefore \text{ Profit} = \frac{7.7-5}{5}\times 100 = 54\%$$

(ii) Short-cut

Net % profit = successive change of water profit % and mark-up %.

$$=\left(40+10+\frac{40\times 10}{100}\right)\% = 54\%$$

Firstly profit is generated because of mixing water and secondly because of mark up over CP.

(iii) Total CP will remain ₹ 5.

And now the total SP is 7×0.9 = ₹ 6.3, since discount is 10%.

$$\text{Profit \%} = \frac{6.3-5}{5}\times 100 = 26\%$$

Net % profit = successive change of water profit % and discount %.

$$=\left(40-10-\frac{40\times 10}{100}\right)\% = 26\%$$

Type 2 : Faulty weights/Measurements

Example 1:

if a shopkeeper uses a weight of 800 gm for 1 kg, find profit/loss %, if he sells his goods.

(i) at the cost price

(ii) At. the mark-up of 10%

(iii) if he sells his good at the discount of 10%

Solution:

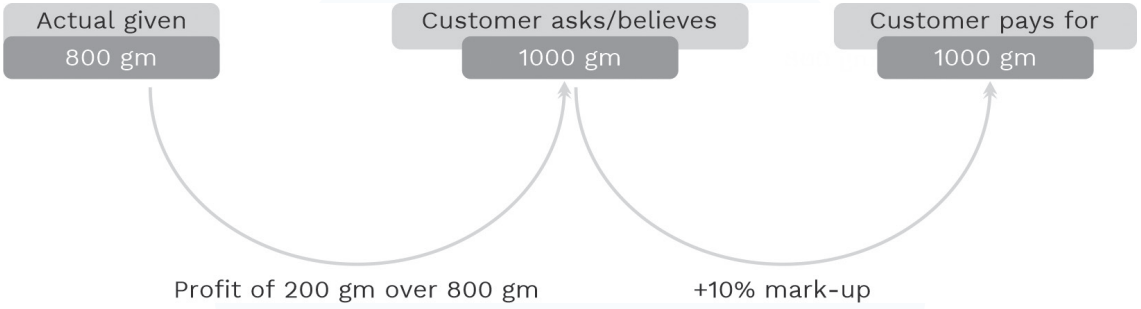
(i) Here, the shopkeeper is very smart. Let us suppose he has the weight of 800 gm, but on this weight he has engraved 1 Kg label, so that when the customer sees that weight on the other side of the scale, he will be assured that he is getting 1 kg in actual; but this would not be the case. The customer is getting only 800 gm instead of 1,000 gm just because of faulty weights.

Case 1:

Actual given	Customer asks /believes	Customer pays for
800 gm	1,000 gm	1,000gm

Note: Whatever customer pays will be the SP for the shopkeeper the actual quantity given will be his cost price.

So, here the shopkeeper is gaining 200 gm over 800 gm, meaning $\frac{200}{800}$ i.e. $\frac{1}{4}$ i.e. 25%

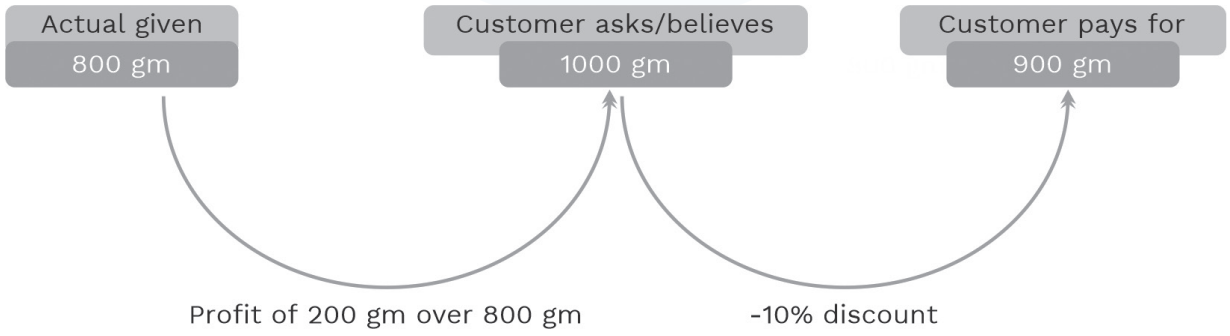


Here, the shopkeeper is gaining 300 gm over 800 gm means $\frac{300}{800}$ i.e. $\frac{3}{8}$ i.e. 37.5%

We can clearly see that it is the successive profit of 25% and 10%.

So, the net profit %

$$= \left(25 + 10 + \frac{25 \times 10}{100}\right)\% = 37.5\%$$



Here, the shopkeeper is gaining 100 gm over 800 gm means $\frac{100}{800}$ i.e. $\frac{1}{8}$ i.e. 12.5%

We can clearly see that is the successive profit of 25% and -10%

So, the net profit %

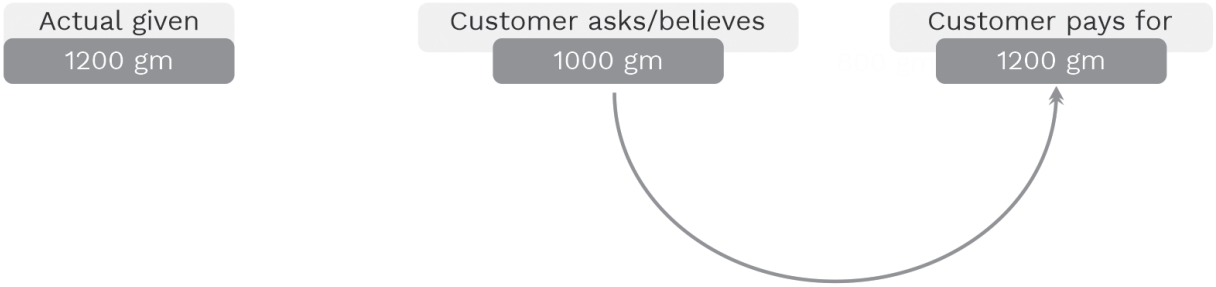
$$\left(25 - 10 - \frac{25 \times 10}{100}\right)\% = 12.5\%$$

Example 2:

A shopkeeper uses a weight of 1,200 gm for 1kg by what % should he mark-up the price so that:

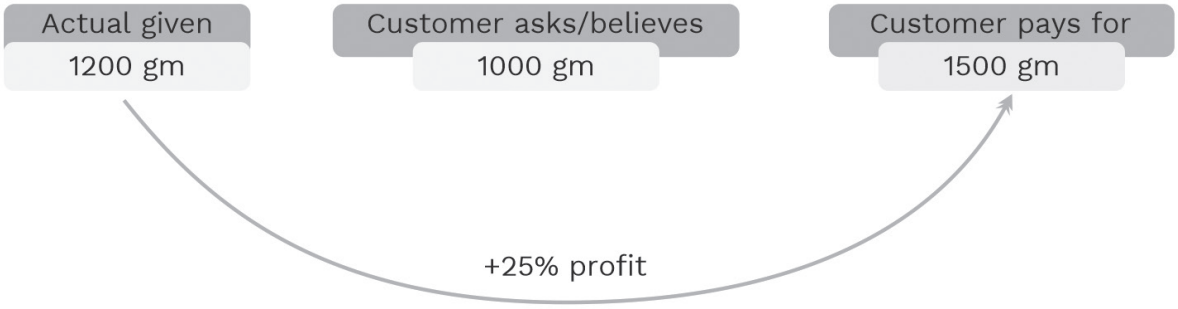
(i) There is no profit or loss.

(ii) There is a profit of 25%.



So, clearly we can see that there must be a mark-up of 200 gm over 1,000 gm, i.e., 20% for no profit no loss condition for the shopkeeper.

Case 2:



Clearly, we can see that for 25% profit, he must mark it up by 500gm over 1,000 gm, i.e., 50%.

Example (3)

(i) A meter scale measures only 90 cm. Find the profit or loss % for the merchant, if he sells at the cost price.

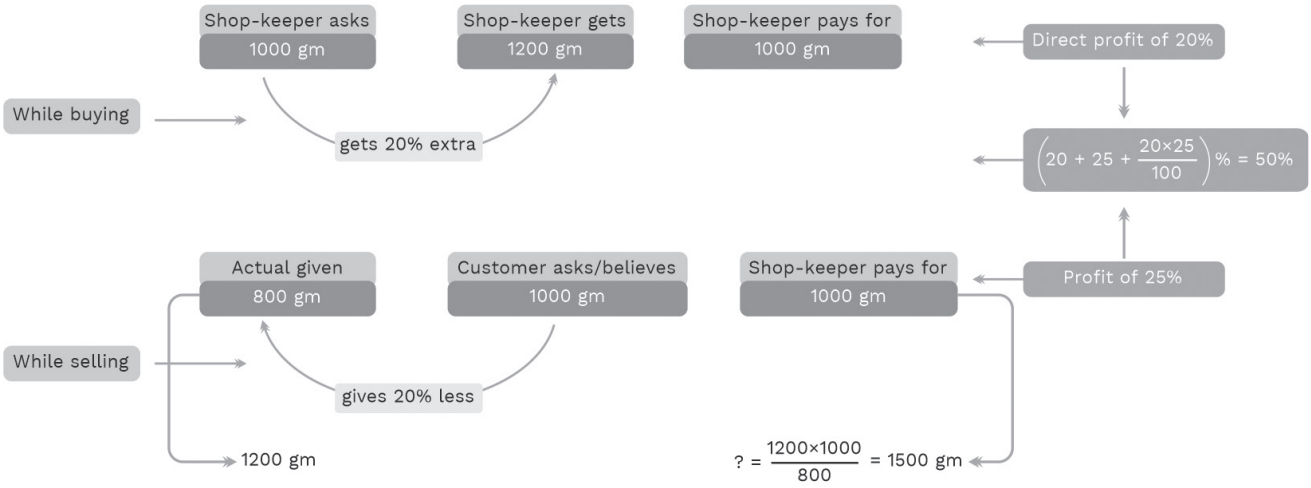
Solution:

Actual given	Customer asks /believes	Customers pays for
90 cm	100 cm	100 cm

Here, on the meter scale, the grading is from 0 to 100 cm, but the actual length is not 100 cm but 90 cm, This is done so that the customer believes that he is getting 100 cm, but in reality he is getting only 90 cm.

Clearly the merchant is gaining 10 cm over 90 cm i.e. $\frac{10}{90}$ i.e. $\frac{1}{9}$ i.e. 11.11%.

(ii) If a shopkeeper cheats by 20 % while buying as well as selling; by using faulty weight: find his overall Profit %.



Clearly there is a profit of 500 gm over 1,000 gm; means 50 gm over 100 gm means 50 %

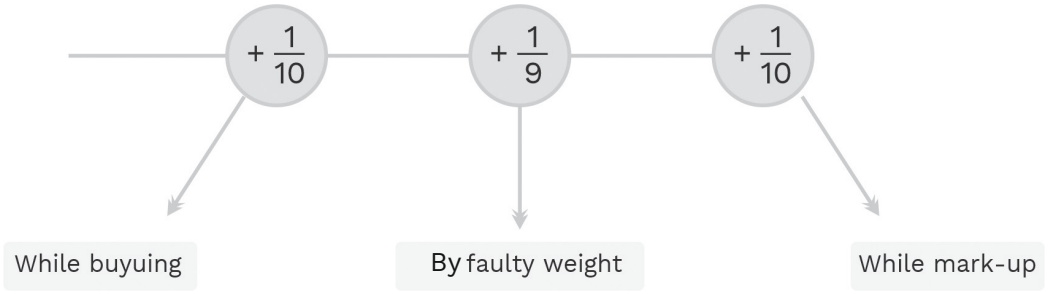
Example 4:

A dishonest seller, at the time of selling and purchasing, uses weight 10% less and 10% more per kg respectively, and also sells his goods at 10% more than CP. Find the percent profit earned by him, if he sells his goods at cost price.

Clearly there is a profit of 344.44 gm over 1,000 gm. This means 34.44 gm over 100 gm means 34.44%.

Smart Work:

We can see this as three successive % profit.



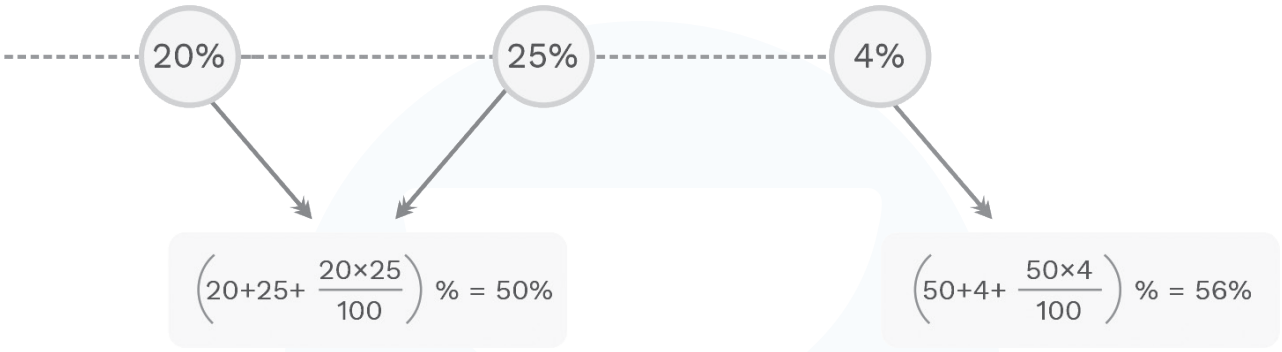
$\frac{11}{10}\times\frac{10}{9}\times\frac{11}{10}=\frac{121}{90}$ profit of 31 over 90 i.e., $\frac{31}{90}$ i.e. 34.44%.

Example 5:

A dishonest seller, at the time of selling and purchasing uses weight 20% less and 20% more per kg respectively, and marks up the price of his goods by 30% and gives a discount of 20% to the customer. Find the percent profit earned by him.

1st profit is directly 20% while buying.

2nd profit is, while selling he cheats and gives 20% less; this means he gives only 800 gm and charges for 1,000 gm, making a profit of 200 over 800, i.e., a 25% profit. 3rd profit he earns by marking it up by 30%, but he gives 20% discount so overall profit is $\left(30-20-\frac{30\times 20}{100}\right)\% = 4\%$



Smart Way

Using successive method directly $\frac{6}{5}\times\frac{5}{4}\times\frac{13}{10}\times\frac{4}{5}=\frac{78}{50}=\frac{156}{100}$ clearly profit is 56%.

Example 6:

A dishonest shopkeeper promises to sell his goods at CP, but he uses 40% less weight. Find his profit %?

(A) 33.33%

(B) 14.28%

(C) 66.66%

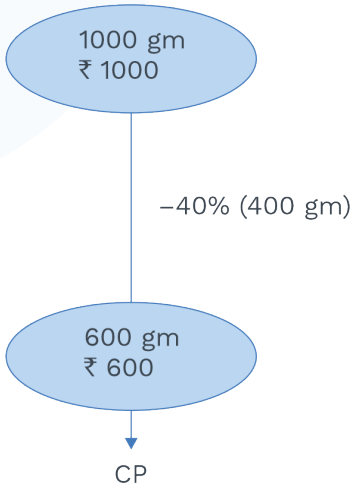
(D) 83.33%

Solution:

Let price of 1 gm goods is ₹1.

1 kg = 1,000 gm

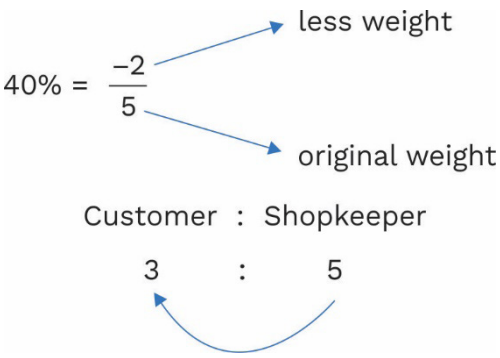
Therefore, the price of 1,000 gm goods is ₹ 1,000.



Profit % of the shopkeeper

$= \frac{400}{600}\times 100 = 66.66\%$

Alternate Solution:



$$\% \text{ profit} = \frac{2}{3} \times 100 = 66.66\%$$

Rack Your Brain

A man purchased some oranges at 2 for ₹ 1 and other type of oranges at 4 for ₹ 1. He mixed both the types of oranges in the ratio 2:5 and sold at ₹ 3 per dozen. Find his loss %?

Calculation on Selling Price:

In some questions, the profit or the loss is mistakenly calculated over the selling price. This makes the question tricky and interesting at the same time. Given below are few examples:

Example 1:

A person sold an article at 9.09% profit on the selling price of the article. Then find his actual profit %?

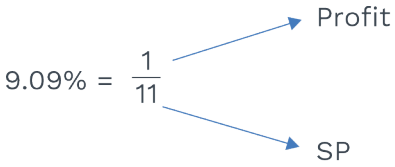
(A) 10%

(B) 20%

(C) 11.11%

(D) $8\frac{1}{3}\%$

Solution:



SP = 11 unit

Profit = 1 unit

We know that, actual profit is calculated on cost price. Therefore we have to find the cost price of the article.

CP = SP – Profit = 11 – 1 = 10 unit

$$\therefore \quad \text{Actual profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100$$

$$= \frac{1}{10} \times 100 = 10\%$$

Example 2:

Rahul calculates his profit on selling price while Sujit calculates his profit on CP. They find the difference in their profits to be ₹ 900. If the selling price (SP) for both of them is same, and Rahul and Sujit get 50% and 40% profits, respectively then, find the selling price (SP)?

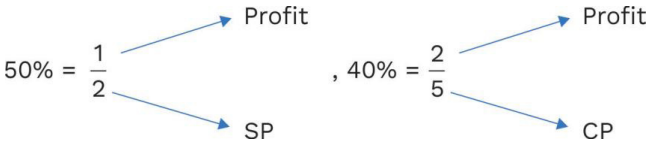
(A) ₹ 2,100

(B) ₹ 1,300

(C) ₹ 4,200

(D) ₹ 2,800

Solution:



Let SP for Rahul = 2x

Profit for Rahul = x

Again, suppose CP for Sujit is 5y and profit for Sujit is 2y.

Then selling price (SP) for Sujit = CP + Profit

= 5y + 2y

= SP = 7y

Since it is given in the question that the selling price for Rahul and Sujit are the same:

Therefore, selling price for Rahul = Selling price for Sujit

2x = 7y

One more condition is also given in the question that the difference of their profits ₹ 900.

Hence, x - 2y = ₹ 900

$\frac{7}{2}y - 2y$ = ₹ 900

$\frac{3y}{2}$ = ₹ 900

y = ₹ 600

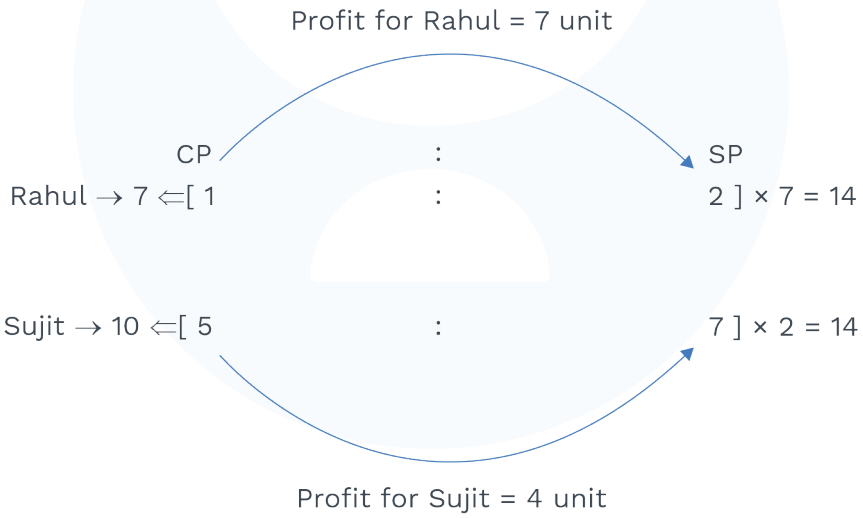
Again, $x = \frac{7}{2}y = \frac{7}{2} \times 600 = 2100$

Hence selling price = 2x = 2 × 2,100 = ₹ 4,200

Rack Your Brain

Some toys were bought at 11 for ₹ 10 and some at 9 for ₹ 10. If the whole lot was sold at one rupee per toy. Find the gain or loss % in the whole transaction.

Alternate Solution:



Difference of profit ⇒ (7 unit – 4 unit) → ₹ 900

3 unit → ₹ 900

1 unit → ₹ 300

Hence, 14 unit → 14 × 300 = ₹ 4200

Therefore, the selling price for both of them is ₹ 4,200 each.

Practice Exercise - 1

Level of Difficulty – 1

1. The price of a product was decreased by 25% and the sales increased by 30%. What is the overall change in the revenue?

(A) 5% increase
(B) 2.5% decrease
(C) 5% decrease
(D) 8% increase

2. Ankur buys 200 mangoes for ₹ 400. In the night, due to bad weather, 20% of the mangoes rotted. He made an overall profit of 20% after selling all the mangoes. At what price did he sell 6 mangoes?

(A) ₹ 18
(B) ₹ 30
(C) ₹ 54
(D) ₹ 72

3. Anil buys some article at ₹ 60 per item. Due to the demand-supply issue, Anil sells the first article at ₹ 6, the 2nd article at ₹ 12, and the third one at ₹ 18, and so on. After selling how many articles will Anil make an overall profit of 40%?

Write your answer here.

4. A shopkeeper sells two items at ₹ 1,000. One was sold at a profit of 20%, and another at a loss of 20%. What was the net profit or loss %?

(A) 8% profit
(B) 10% loss
(C) 5% loss
(D) 4% loss

5. A milkman has 60 liters of milk with him. He sells 30 liters for a total of ₹ 1,200 and then adds 30 liters of water to the remaining milk. He sells this at a discount of 30% (when compared to the earlier sale) and the overall profit made by him in the entire transaction is $\left(66\frac{2}{3}\%\right)$.

What is the cost price of milk (in rupees)?

(A) ₹ 28.8/liter
(B) ₹ 38.8/liter
(C) ₹ 68.8/liter
(D) ₹ 48.8/liter

Level of Difficulty – 2

6. The cost price of a cooler 'x' is ₹ 1,000. Anuj, A shopkeeper offers an early bird discount to his customers on cooler 'x'. According to the scheme, he sells the first two 'x's coolers at ₹ 100, and the next two coolers at ₹ 200 and 5th, 6th cooler at ₹ 300, and so on. What is the minimum number of coolers he has to sell to ensure an overall profit of 35%?

(A) 42
(B) 49
(C) 50
(D) 52

7. A shopkeeper announces an end-of-season sale on his articles and gave a discount of 30% on the market price, However, before the day of the sale, he increases the marked price of all articles by 20%. If the cost price at which

the shopkeeper bought each article was 80% of the original marked price, what was his overall profit or loss percentage?

(A) 4% loss

(B) 3% loss

(C) 5% profit

(D) 10% profit

8. Rakul buys a car from a dealer at $\frac{2}{3}$rd the marked price. He plans to sell the car at a minimum profit of 20%. What is the maximum discount he can give to another person, who is buying the car to earn the minimum profit?

(A) 20%

(B) 30%

(C) 60%

(D) 70%

9. In a store, the manager of the store for taking promotional measures, sells three varieties of hair oil, one at a loss of 15%, another at a profit of 20%, and the third one at a loss of 30%. Assuming that the manager sells all the three varieties of hair oil at the same price, find the profit or loss % in the whole transaction (approximately).

(A) 12.56% loss

(B) 8% Profit

(C) 14% Profit

(D) 9% loss

10. A manufacturing company sells a car to a wholesale dealer at a profit of 20%. The wholesale dealer sells the car to a retailer at a profit of 40%. Finally, the retailer sells it to a customer at a profit of 60%. If the customer pays ₹ 80,64,00 for the car, Then find the manufacturing cost of the car (in rupees)?

(A) ₹ 5,00,000

(B) ₹ 8,00,000

(C) ₹ 9,00,000

(D) ₹ 3,00,000

Level of Difficulty – 3

11. Dishonest shopkeeper uses faulty balance to measure the weight and gives 120gm less for every 1 kg of sugar purchased. Also, at the time of buying, he measures 100 gms extra from the whole-seller. If he marks-up the price of sugar by 40%, then what is the maximum discount he can offer so that he can earn exactly 40% profit?

(A) 15%

(B) 20%

(C) 17.35%

(D) 8.16%

12. A trader marks-up the price of an article by 4m%. He then offers a discount of (m + 10)% on it. He makes a profit of 30% on the transaction. If it is known that the value of 'm' is a multiple of '8', how much discount he should offer on the market price so that he can make a profit of (m + 10)%?

Write your answer here.

13. 'A' goes to a shopkeeper 'B' to purchase a green tea packet for ₹ 250 and gives him a ₹ 500 note, 'B' does not have the change and hence, goes to the shopkeeper 'C'

to get the change. He then gives 'A' ₹ 50. Later, 'C' realizes that a 500–rupee note is a duplicate note and asks 'B' to return his money. 'B' returns the money. What is the amount of loss incurred by 'B', if it is given that 'B' sold the green tea at a profit of 20%?

(A) ₹ 410
(B) ₹ 360
(C) ₹ 560
(D) ₹ 900

14. Dhiraj bought two properties 'x' and 'y' at Juhu beach in Mumbai. The price of property x decreases by 20% every year, concerning the previous year. The price of property 'B' increases 20% every year, concerning the previous year. If the price of both the properties were equal at the end of 2,030 and the price of both the properties together at the end of 2,031 will be 36 crores, what will be the price of property 'X at the end of 2,029?

(A) 4 crores
(B) 8 crores
(C) 9 crores
(D) 22.5 crores

15. A petrol-pump dealer purchases the petrol from a petroleum company that adds 3 litres of kerosene with every 7 litres of petrol before selling the petrol to its customer. Further, the petroleum company gives 10% less quantity that it claims to sell to a dealer. However, it charges 20% less than the normal price. The dealer adds 2 litres of kerosene with every 10 litres of petrol that he has purchased from the petroleum company. The dealer trying to impress the customer give 10% extra quantity than what a customer pays for. However, he marksup the price by 10%. Kerosene is 50% cheaper than petrol. What is the overall profit (%) earned by the dealer?

(A) 23%
(B) 42%
(C) 19%
(D) 25%

Solutions

1. (B) 2.5% decrease

Since, Revenue = Price of the one product × Total number of items.

Let initial price of the product = ₹ 100

and initially total number of products also be 100

Therefore, initial revenue

= ₹ 100 × 100 = ₹ 10,000

Now we have to find final revenue when the price of the product decreased by 25% and sales increased by 30%.

∴ New price of the product

= 100 × 75% = ₹ 75

Also, total number of products become after 30% increase

= 100 × 130% = 130

Therefore, Revenue at present

= ₹ 75 × 130 = ₹ 9,750

Decrease in the Revenue

= ₹ 10,000 - ₹ 9,750 = ₹ 250

∴ overall change in the Revenue (in %)

$$= \frac{250}{10,000} \times 100 = 2.50\%$$

Hence option (B) is the correct answer.

Alternate Solution 1:

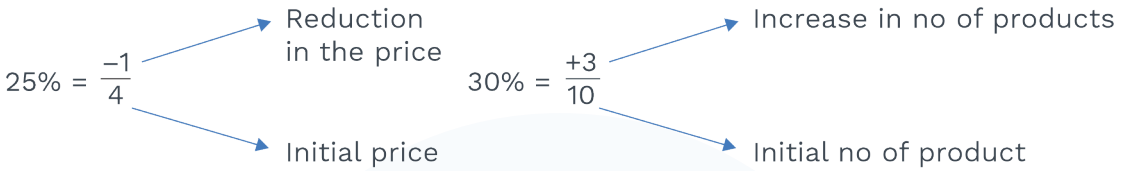
Initial Revenue	:	Final Revenue
₹ 100 × 100	:	₹ 75 × 130
1000	:	75 × 13
40	:	39

−1

% Decrease in the Revenue

$= \frac{1}{40} \times 100 = 2.5\%$

Alternate Solution 2:



Initial Revenue	:	Final Revenue
₹ 4 × 10	:	₹ 3 × 13
40	:	39

−1

% decrease in the Revenue

$= \frac{1}{40} \times 100 = 2.5\%$

2. (A) ₹ 18

It is given in the question that 200 mangoes cost price is ₹ 400.

∴ Total CP = ₹ 400

⇒ 20% mangoes rotten due to bad weather.

∴ Number of mangoes left

= 200 × 80% = 160 mangoes.

Therefore, selling price of 160 mangoes

= ₹ 400 × 120% = ₹ 480

∴ Selling price of 1 mango $= \frac{480}{160} = ₹ 3$

Now we have to find selling price of 6 Mangoes.

⇒ Selling price of 6 mangoes

= ₹ 3 × 6 = ₹ 18

Alternate Method:

No of mangoes		CP
200	→	₹ 400
	− 20% (rotten)	+ 20% (Profit)
160 mangoes	→	480 (SP)
1 mango	→	$\frac{480}{160}$ = ₹ 3/mango

∴ Selling price of 6 mangoes

= 3 × 6 = ₹ 18

Hence option (A) is the correct answer.

3. 27

Let total no of the article be n.

∴ Total cost price = 60 × n = ₹ 60 n

Now we have to find the total selling price of the articles when a profit of 40% is given in the question.

Therefore, the total selling price of all the articles = 60n × 140% = 84n

Again, Total selling price = 6 + 12 + 18 + ... + 6n

$= \frac{n}{2}\left[2 \times 6 + (n-1) \times 6\right]$

$84n = \frac{n}{2}\left[12 + 6n - 6\right]$

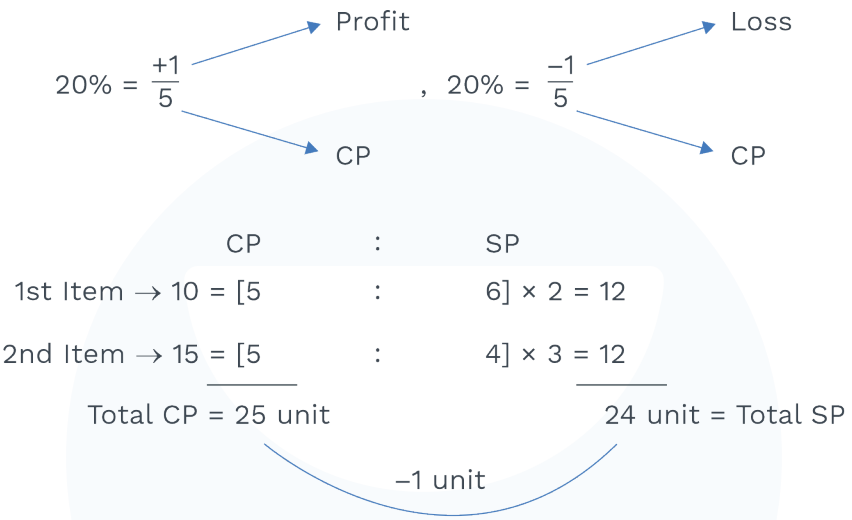
$84n = \frac{n}{2}[6 + 6n]$

$84 = 3 + 3n$

$3n = 81$

$n = 27$

4. (D) 4% loss



$$\% \text{ loss} = \frac{\text{loss}}{CP} \times 100$$

$$= \frac{1}{25} \times 100^{4} = 4\%$$

Hence option (D) is the correct answer.

Alternate solution 2:

Since this is the case of SP equal and also % profit is equal to the loss % and both % values are equal. Then we use the direct formula for common gain or loss % (we also know that in such cases only loss occurs).

$\therefore$ Overall loss % $= \left(\frac{x}{10}\right)^2 = \left(\frac{20}{10}\right)^2 = 4\%$

5. (A) ₹ 28.8/liter

Let CP of 1 liter milk = ₹ x

Selling price per liter

$= \frac{1200}{30 \text{ liter}}$ = ₹ 40/liter

Selling price of 1 liter milk after a discount of 30% = ₹ 40 × 70%

= 40 × 0.7 = ₹ 28.0 = ₹ 28

Now, total CP of 60 liter milk = ₹ 60 × x

Total selling price after selling 60 liter milk

= 1200 + 60 litre × 28

SP of 30 litre milk | milk + water (30 + 30) | SP of 1 litre (milk + water) after discount

= ₹ 1,200 + ₹ 1,680

= ₹ 2,880

Since, milkman makes $66\frac{2}{3}\% = 66.67\%$ profit in the entire transaction.

$\therefore \quad 66.67\% = 66\frac{2}{3}\% = \frac{200}{3}\% = \frac{+2}{3}$ (Profit / CP)

(CP) (P)

SP = 3 unit + 2 unit = 5 unit

5 unit → ₹ 2880

1 unit → $\frac{₹\ 2880}{5}$ = ₹ 576

3 unit → 576 × 3 = ₹ 1728

Therefore 60x = ₹ 1,728

$x = \frac{1728}{60}$ = ₹ 28.8/ liter.

6. (D) 52

The minimum number of coolers he sells can be in either form 2n or 2n – 1.

Let us assume total number of coolers were sold = 2n

$\therefore \quad 2 \times 100 + 2 \times 200 + 2 \times 300 + \ldots + 2 \times \left(\frac{2n}{2}\right) \times 100 \geq 1.35 \times 2n \times 1000$

$\Rightarrow \quad 2 \times 100 [1 + 2 + 3 + \ldots + n] \geq 1.35 \times 2n \times 1,000$

$\Rightarrow \quad 200\left[\frac{n(n+1)}{2}\right] \geq 1.35 \times 2n \times 1000$

$n(n + 1) \geq 13.5 \times 2n$

$n + 1 \geq 27$

$n \geq 26$

$2n \geq 52$

The total number of coolers can be either 52 or 51.

Let's check for 51 coolers.

Amount of money obtained after selling 51 coolers.

= 2 × 100 + 2 × 200 + 2 × 300 + ... 2 × 25 × 100 + 2,600 = ₹ 67,600

But ₹ 67,600 < 1.35 × 1,000 × 51

₹ 67,600 < 68,850

Therefore, the minimum number of coolers Anuj should sell to ensure a profit of 35% is 52.

Hence option (D) is the correct answer.

7. (C) 5% profit

Let the Marked price be ₹ x.

Therefore, cost price of the article

= x × 80% = 0.8x

The Marked price of the article after hike in the price by 20%

= x × 120%

= 1.2x

∴ Cost price : Marked price : Selling price

0.8 x : 1.2 x : 0.84 x

−30%

−Discount

Selling price of the article after discount
= 1.2x × 70% = 0.84x

∴ Profit % = $\frac{0.84x - 0.8x}{0.8x} \times 100$

P% = $\frac{0.04x}{0.8x} \times 100 = 5\%$

Hence, option (C) is the correct answer.

Alternate Solution:

Let marked price be ₹ 100.

CP : MRP : SP

80 : 100 :

+20%

80 : 120 : 84

−30%

Discount

Profit = ₹ 4

P% = $\frac{4}{80} \times 100 = 5\%$

8. (A) 20%

Let the marked price of the car be 300 unit

∴ Cost price for the Rakul

= $300 \times \frac{2}{3}$ = 200 unit

Minimum profit Rakul wants to earn = 20% of 200 = 40 unit

Therefore, selling price of the car for the Rakul = 200 + 40 = 240 unit

Now, we have to find maximum discount
= 300 unit − 240 unit = 60 unit

Discount % = $\frac{\text{Discount}}{\text{MRP}} \times 100$

= $\frac{60}{300} \times 100$

= 20%

Hence option (A) is the correct answer.

Alternate Solution:

Let the marked price of the car be 300 units.

Discount = 60

CP : MRP : SP

200 : 300 : 240

$\times \frac{2}{3}$

+20%

+40

∴ D% = $\frac{D}{\text{MRP}} \times 100 = \frac{60}{300} \times 100 = 20\%$

9. 12.56% loss

Let selling price for each hair oil will be ₹ x.

Now, we have to calculate CP for each variety of hair oil.

We know that:

SP = $CP\left(\frac{100 - L}{100}\right)$

x = $\frac{CP_1(100 - 15)}{100}$

CP_1 = $\frac{100x}{85} = 1.176x$

Similarly:

$CP_2 = \frac{100x}{100 + 20} = \frac{100x}{120} = 0.833x$

$CP_3 = \frac{100x}{100 - 30} = \frac{100x}{70} = 1.428x$

Therefore, Total CP ($CP_1 + CP_2 + CP_3$)
= 1.176x + 0.833x + 1.428x = 3.431x
Total SP = x + x + x = 3x

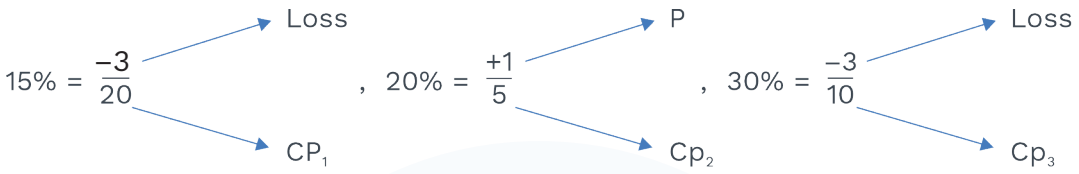
∴ Loss amount = CP – SP
= 3.431x – 3x
= 0.431x

Therefore, loss% = $\frac{0.431x}{3.431x} \times 100 = 12.56\%$

Hence option (A) is the correct answer.

Alternate Solution:

Since SP is equal, then—



CP	:	SP
840 ⇐ [20	:	17] × 6 × 7 = 714
595 ⇐ [5	:	6] × 7 × 17 = 714
1020 ⇐ [10	:	7] × 17 × 6 = 714
Total CP = 2,455	:	Total SP = 2,142

∴ Loss amount = 2,455 – 2,142 = 313

∴ Loss% = $\frac{313}{2455} \times 100$
= 12.74%

10. (D) ₹ 3,00,000

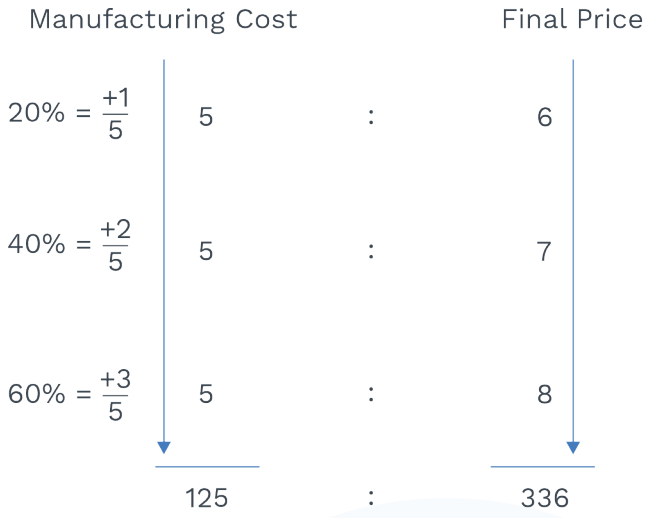
Let the manufacturing cost of a car = ₹ x
Hence, the price at which wholesaler bought from the manufacturer
= x × 120%
= ₹ 1.20x
Now, retailer bought the car from the wholesaler (in rupees)
= 1.2x × 140%
= 1.2x × 1.40
= ₹ 1.68x

Again, we have to find the price at which the customer bought from the retailer
= 1.68x × 160%
= 1.68x × 1.60
= 2.688x
Since the customer bought the car in ₹ 8,06,400
Therefore, 2.688x = 8,06,400

$x = \frac{806400}{2.688}$

= ₹ 3,00,000
Hence the manufacturing cost of the car is ₹ 3,00,000.
Hence option (D) is the correct answer.

Alternate Solution:



Therefore 336 unit → ₹ 80,64,00

1 unit → $\frac{₹\ 80,64,00}{336}$ = ₹ 2400

∴ 125 unit → ₹ 2400 × 125

= ₹ 3,00,000

11. (B) 20%

Let the CP of 1,000gm of sugar be ₹ 1,000.

At the time of buying he has taken 100 gm extra from the whole seller.

⇒ CP of 1,100 gm of sugar = ₹ 1,000

⇒ CP of 1gm of sugar = ₹ $\frac{1000}{1100}$ = ₹ $\frac{10}{11}$

At the time of selling, he gives 120 gm less weight.

⇒ At the time of selling he gives 1,000 gm – 120 gm = 880 gm

but he takes the price of 1,000 gm.

CP of 840 gm of sugar = 880 × $\frac{10}{11}$ = ₹ 800

The shopkeeper wants to earn a profit of 40%.

Therefore, selling price will be

= ₹ 800 × 140% = 800 × 1.4

= ₹ 1,120.0

⇒ MRP = ₹ 1,000 × 140% = ₹ 1,400

Thus, the maximum discount he can give so that he earns 40% profit.

% D = $\frac{1400 - 1120}{1400} \times 100$ = 20%

Hence, option (B) is the correct answer.

12. (42.30%)

Let the cost price of the article be ₹ x.

⇒ Market price = x × $\left(\frac{100 + 4m}{100}\right)$

The selling price of the article after giving a discount of (m + 10) % on MRP.

SP = x × $\left(\frac{100 + 4m}{100}\right) \times \left(\frac{100 - m - 10}{100}\right)$

SP = x$\left(\frac{100 + 4m}{100}\right) \times \left(\frac{90 - m}{100}\right)$

He also makes a profit of 30%.

Therefore, SP = x × $\frac{130}{100}$ ...(2)

Now, solve equation (1) and equation (2).

$$x\left(\frac{100+4m}{100}\right)\times\left(\frac{90-m}{100}\right)=x\times\frac{130}{100}$$

$\Rightarrow$ (100 + 4m) × (90 – m) = 130 × 100

$\Rightarrow$ 9,000 – 100m + 360 m – $4m^2$ = 13,000

– $4m^2$ + 260 m + 9,000 – 13,000 = 0

$4m^2$ – 260 m + 4,000 = 0

m^2 – 65m + 1,000 = 0

m^2 – 40m – 25m + 1,000 = 0

m (m – 40) – 25(m –25) = 0

m = 40, m = 25

Since 'm' is multiple of '8'.

It is given in the question.

Hence m = 40 is a value which is a multiple of 8.

Therefore, marked price

$$= x\times\left(\frac{100+4\times40}{100}\right)$$

$$= x\times\frac{260}{100}=2.60\,x$$

Also, profit% = (m + 10)% = (40 + 10)

= 50%

$\Rightarrow$ Selling price = x × 150% = 1.5 x

$$\Rightarrow \%\ \text{Discount} = \frac{1.1x}{2.6x}\times100 = 42.30\%$$

13. (A) ₹ 410

Let us assume that in the starting 'B' only has a Green tea packet, he does not have any money, only he has a green tea packet whose selling price is ₹ 450.

Since it is given that 'B' sold the green tea packet at a profit of 25%.

Then, SP = CP + P

↓ ↓

= 100% + 25% = 125%

125% ⟶ ₹ 450

$$1\% \longrightarrow \frac{₹\,450}{125}$$

$$\therefore\ 100\% \longrightarrow \frac{₹\,450}{125}\times100 = ₹\,360$$

'A' gives ₹ 500 to B and B gives the money to 'C'. In exchange for a change of ₹ 500. He then gives ₹ 50 to 'A'.

$\Rightarrow$ 'B' is left with ₹ 450

Now 'C' asks his ₹ 500 back. A give ₹ 450 and is in dept of ₹ 50. So his total loss is ₹ 50 and the cost price of the plant, which is ₹ 360. Hence his total loss = ₹ 50 + ₹ 360 = ₹ 410

Hence, option (A) is the correct answer.

14. (D) 22.5 crores

At the end of 2029, let the price of property 'x's be ₹ m. At the end of 2,029 let the price of property 'y' be ₹ n.

m × 80% = n × 120%

$$m\times\frac{4}{5}=n\times\frac{6}{5}$$

4m = 6n .....(1)

Again, according to the condition given in the question.

$$m\times\frac{4}{5}\times\frac{4}{5}+n\times\frac{6}{5}\times\frac{6}{5}=36\ \text{crores}$$

16m + 36n = 36 × 25 crores

16m + 36 n = 900 .....(2)

Put equation (1) in (2)

$4 \times 4m + 36n = 900$ crores

$4 \times 6n + 36n = 900$

$60n = 900$ crores

$n = \frac{900}{60} = 15$ crores

Since $4m = 6n$

$4m = 6 \times 15$

$m = \frac{6 \times 15}{4} = \frac{45}{2} = 22.5$ crores

Hence, option (D) is the correct answer.

15. (D) 25%

Margin factor = Material factor × Measuring factor × Pricing factor

Margin factor

$= \left(\frac{10 \times 100}{8 \times 100 + 2 \times 50}\right) \times \left(\frac{90 \times 100}{100 \times 110}\right) \times \left(\frac{100}{80} \times \frac{110}{100}\right)$

Margin factor $= \frac{5}{4} = 1.25$

Profit factor = 1.25 – 1 = 0.25

Profit% = 0.25 × 100 = 25%

Hence, option (D) is the correct answer.

Practice Exercise - 2

Level of Difficulty – 1

1. Ritik spent Rs. 50,000 to purchase a laptop and a desktop computer. He sold the laptop at a 20% profit and the desktop at a 10% loss. If, overall, he made a 2% profit, then the purchase price (in rupees) of the laptop is:
(A) Rs. 40,000
(B) Rs. 45,000
(C) Rs. 60,000
(D) Rs. 20,000

2. Abhinav purchased 10 laptops in 2016, all at the same price. He sold six of these at a profit of 24% and the remaining four at a loss of 18%. If he made a total profit of Rs. 6,912, find the purchase price of a laptop (in Rs.):
(A) 6,250
(B) 9,350
(C) 8,900
(D) 9,600

3. Rohit earns a profit of 17% after selling an article at a 22% discount on the marked price. In which of the following option choices, should he sell the article to earn a profit of 25%?
(A) Should sell at a discount of 10%
(B) Should sell at a discount of 15%
(C) Should sell at a discount of 16.66%
(D) Should sell at a discount of 20%

4. Arun buys 40kg of wheat for Rs. 9,600. He uses faulty balance and takes 250gm extra per kg. If 40% of the wheat gets spoiled, then at what price should he sell the remaining wheat (per kg), so that he can earn an overall profit of 30%?
(A) 84
(B) 266.66
(C) 416
(D) 420

5. Anil buys some articles at Rs 60 per item. Due to the demand-supply issue, Anil sells the first article at Rs. 6 and the second article at Rs. 12, third article at Rs. 18 and so on. By selling how many such articles will Anil make an overall profit of 40%?
(A) 27
(B) 30
(C) 25
(D) 45

6. Even after giving two successive discounts of 8.33% and 6.66%, the shopkeeper earns a profit of 5%. Find the markup percentage.
(A) 17.28%
(B) 22.725%
(C) 25%
(D) 45.45%
(A) Rs. 6,800
(B) Rs. 7,200
(C) Rs. 7,600
(D) Rs. 8,000

8. Madan sold an article to Jitendra at a profit of Rs. 1,200. Jitendra increased its price by 60% and sold it to Mahendra at a discount of 25%. The profit earned by Jitendra is Rs. 450 which is more than

that of Madan. Find the selling price of the article for Jitendra.

(A) Rs. 2,500
(B) Rs. 2,700
(C) Rs. 2,850
(D) Rs. 2,250

9. Ravi sells an article at a profit of 40% and gives a discount of 25% at a marked price. If the cost price of the article is Rs. 4,500, then find the difference between the marked price and the cost price of the article.

(A) Rs. 4,000
(B) Rs. 3,500
(C) Rs. 3,900
(D) None of these

10. The Maximum Retail Price (MRP) of a product is 60% above its manufacturing cost. The product is sold through a retailer, who earns 16% profit on the purchase price. What is the profit percentage (expressed to the nearest integer) for the manufacturer, who sells his product to the retailer? The retailer gives a 12% discount on the MRP.

(A) 19 %
(B) 21 %
(C) 13 %
(D) 15 %

Level of Difficulty – 2

11. A bookseller buys a book for Rs. 1,000 and marks it up to Rs. 1,560. After that, he has given three successive discounts of a%, b%, c% in such a way that a + b + c = 18.75. If his overall loss or profit % is 'x', then find the possible correct range of 'x'.

(A) $105\% \leq x \leq 109\%$
(B) $102\% \leq x \leq 103\%$
(C) $108\% \leq x \leq 110.9375\%$
(D) $110\% \leq x \leq 115.25\%$

12. Namita purchased two varieties of rice – 'K' and 'M' for a total of Rs. 70,000. The weights in kg of 'K' and 'M' purchased by Namita are in the ratio of 3:5. But the cost per kg of 'K' is 25% more than that of 'M'. Namita sells 'K' and 'M' with profits of 20% and 15% respectively. Find the overall profit in rupees.

(A) Rs. 18,000
(B) Rs. 6,000
(C) Rs. 12,000
(D) Rs. 3,000

13. A shopkeeper purchases a product at 40% discount from its MRP. He erases the old price tag and adds a new one. He offered a discount of 20% while selling the product. As a result, his profit percentage gets doubled compared to what it would have been if he had not changed the tag. By how much percent did he increase the MRP?

(A) 10 %
(B) 20 %
(C) 25 %
(D) 40 %

14. A shopkeeper bought 240 shirts from a wholesaler at Rs. 300 a piece. The marked price he set for each shirt was Rs. 900. Out of the 240 shirts, he sold a few shirts in the first month at a 30% discount and the remaining shirts in the second month at a 50% discount. If the profit earned by selling the shirts in both the months was the same, then what is

the difference between the number of shirts sold in the two months?

(A) 36
(B) 60
(C) 90
(D) 75

15. If two articles were sold at the same price and if the first article was sold at a 20% profit and the second article was sold at a 20% loss and the sum of the cost prices of both the articles is Rs. 1,000, then find the amount of overall loss.

(A) Rs 40
(B) Rs 60
(C) Rs 400
(D) Rs 769

16. The cost of 7 shirts, 10 jackets, and 13 trousers is Rs. 25,000, whereas the cost of 25 trousers, 17 shirts, and 21 jackets is Rs. 41,000. If the S.P of 1 shirt, 1 jacket and 1 trouser is Rs. 1,350, then find the profit percentage in selling 1 shirt, 1 jacket and 1 trouser.

(A) 20%
(B) 25%
(C) 30%
(D) None of these

17. A cloth merchant has a strange problem. His meter scale contracts 10% in length in winter and expands 10% in length in summer. He sells only one type of fabric and its unit price remains the same throughout the year. If the ratio of the volume sold in summer and winter is 3 : 7, then what will be the total percentage profit/loss in the year if the trader professes to sell at the cost price only?

(A) 4.04% profit
(B) 4.04% loss
(C) 5.05% profit
(D) 5.05% loss

18. Mr. Bikanerwala marks up an article by P%, gives a discount of 2P/5%, and gets a profit of 2P/5%. Had it been marked up by P/2% and given a discount of 3P/10%, then what would be his profit percentage?

(A) 6.66%
(B) 6.25%
(C) 3.33%
(D) 5.5%

19. In the year 2020, the cost price of a Covid vaccine was 80% of its selling price. In 2021, The cost price of the same Covid vaccine is 90% of its selling price. If the profit from the vaccine remains the same for both years, find the % change in the cost price of the Covid vaccine from 2020 to 2021.

(A) 150%
(B) 125%
(C) 120%
(D) 100%

20. A trader gives a discount based on the number of articles purchased by the customer. The trader gives a 5% discount when 8 articles are bought and 8.33% discount when 12 articles are bought. If the net profit for the trader in each case is the same, then find the ratio of the marked price to the cost price of the article.

(A) 20:19
(B) 20:17
(C) 20:13
(D) 15:11

Level of Difficulty – 3

21. A merchant in order to promote his chocolate business, distributed a few chocolates for free. In a particular month when he distributed 10 chocolates for free, he was able to sell 15 chocolates at a certain fixed price and make 50% net profit and in another month, he distributed 'x' chocolates for free and sold 36 chocolates at the same fixed price, thereby making a net profit of 25%. What is the value of x?

(A) 18

(B) 24

(C) 30

(D) 36

22. Gunjan got a discount of 10% on an antique piece from shopkeeper Shubham. As she wasn't satisfied with the price, Shubham gave her a discount of 9.09% more on the discounted price. She insisted on more discounts, so Shubham gave a final discount of 8.33 % more on the previous discounts. She was still not happy, and left the shop. When she couldn't find that piece at any other shop, she came back to Shubham. Irritated by her, Shubham increased the actual MRP by 50% and sold the piece to her at an increased MRP without giving any discounts this time. Due to a lack of options, Gunjan bought the piece at the increased price. How much percent is she paying extra this time as compared to the price Shubham was offering to her when she left the shop?

(A) 37.5%

(B) 50%

(C) 80%

(D) 100%

23. The price of an electric scooter is marked at 40% more than its manufacturing cost. What is the average of the maximum and minimum discount percentages that the manufacturing company offers so that the company can make a profit of not more than 20% and not less than 10%?

(A) 125/7 %

(B) 150/7 %

(C) 112.5%

(D) 54.25%

24. Amar, Akbar, and Anthony purchased 1, 10, and 25 notebooks for a total of Rs. 15, Rs. 120 and Rs. 250 respectively from a stationery shop. In his transaction with Amar and Anthony, the shopkeeper made a profit of A% and B% respectively such that 3A = 8B. How much profit did the shopkeeper make in his transaction with Akbar? (Assume that the shopkeeper bought each notebook at the same price)

(A) $\frac{300}{7}$%

(B) $\frac{800}{7}$%

(C) $\frac{500}{7}$%

(D) $\frac{200}{7}$%

25. Rajan purchased some goods for Rs. 4,000 and Shiva purchased some goods for Rs. 5,000. Rajan marks the price of goods up by 3a% and gives a discount of a%, whereas, Shiva marks the price of goods up by a% and gives no discount. If they both made the same profit (non-zero), then find a.

(A) 15%
(B) 25%
(C) 50%
(D) 75%

26. Aman goes to an electronic shop to buy a TV and a washing machine. He bargains for a 12.5% discount on the washing machine and a 30% discount on the TV. By mistake, the owner of the electronic shop interchanged the discounts rates while making a manual bill. Aman also paid according to the interchanged discount rates. It is also given that the cost price of the washing machine is 20% higher than the cost price of the TV. The bill that Aman paid is what percent less than the bill he could have paid, had the discount rates not been interchanged?
(A) 1%
(B) 2%
(C) 3%
(D) 5%

27. The profit is 20%, when two types of pulses, 'x' and 'y' are mixed in the ratio 3: 2 and then sold at Rs. 60/kg. The profit is 5%, when the same two types of pulses 'x' and 'y' are mixed in the ratio 2 : 3 and then sold at Rs. 60/kg. The cost prices, per kg, of x and y, are in the ratio:
(A) 41 : 43
(B) 5 : 3
(C) 1 : 2
(D) 2 : 3

28. Amitabh buys 70 kg of wheat at a certain price and then marks it up by 20%. He sells 10 kg of wheat at a marked price and 20 kg of wheat at a 20% discount on the marked price. Accidently, 6 kg of wheat is wasted. He sells the remaining wheat at the new marked price by increasing the existing marked price by a%, to make an overall profit of 30%. Find the value of 'a' (to the nearest integer).
(A) 47
(B) 50
(C) 42
(D) 39

29. Ramesh bought two kinds of flowers i.e. roses and marigold. He purchased fewer roses than marigolds as roses were more expensive. However, he didn't purchase more than 20 flowers of any kind. Now, he plans to sell all these roses at Rs 13 per piece, whereas, he plans to sell these marigolds at Rs 5 per piece. He sells all these flowers for Rs 151. If he makes 30% profit on each rose and 25% profit on each marigold, then his overall profit percentage in selling all the roses and marigold is:
(A) 26.8%
(B) 29.45%
(C) 27.96%
(D) 28.5%

30. A fruit seller is earning a certain profit by selling mangoes, such that the selling price of 15 mangoes is equal to the cost price of 24 mangoes, which in turn equals 1/3rd of the total discount on 90 mangoes. Now if he reduces the earlier mark-up by 40 percentage points and the earlier discount by 50%, then find the new profit percentage.
(A) 30%
(B) 40%
(C) 50%
(D) 60%

Solution

1. (D)

Let the price of the laptop and the desk-top be x, y respectively.

Given: x + y = 50,000 ...(1)

1.2x + 0.9y = 51,000 ...(2)

Subtract 0.9 × (1) from equation (2).

1.2x + 0.9y = 51,000

0.9x + 0.9y = 45,000

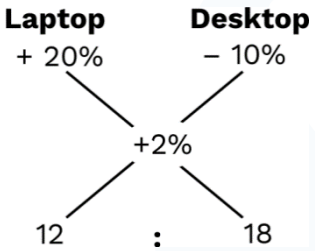
0.3x = 6000

0.3x = Rs. 6,000

x = Rs. 20000

Alternate Solution:

By using the alligation method.



CP → 2 : 3 ⇒ 5 Unit→Rs. 50,000

|× 10,000 I× 10,000 1 Unit → Rs, 10,000

Rs. 20,000 Rs. 30,000

Hence, the cost price of the laptop is Rs 20,000.

Hence, option (D) is the correct answer.

2. (D)

Let x be the cost of every laptop.

∴ The cost of 10 laptops = 10x

According to the question:

Profit = S.P. – C.P.

∴ S.P. = 6(1.24x) + 4(0.82x)

⇒ S.P. = 7.44x + 3.28x = 10.72x

∴ Profit = S.P. – C.P.

= 10.72x – 10x = 0.72x

According to question:

0.72x = 6912

⇒ x = 9600

Hence, the purchase price of a laptop (in Rs.) was 9,600.

Hence, option (D) is the correct answer.

3. (C)

Let the marked price be 100a and the cost price be 100b.

So, SP at 17% profit = 117b

Also, SP after 22% discount = 78a

So 117b = 78a

a/b = 117/78 = 3/2

Now assume a = 3 and b = 2

So, MRP = 300 and CP = 200

For 25% profit SP should be

= 200 x 1.25 = 250 = Marked price

Required discount percentage

= (50/300) x 100 = 16.66%

Thus, he should sell at a discount of 16.66%

Hence, option (C) is the correct answer.

4. (C)

Total wheat bought by Arun

= 40kg + 40×0.250 kg = 40+10 = 50 kg

Since, 40% of the wheat gets spoiled.

∴ Remaining quantity of wheat

= 50 × 60% = 50 × 0.60 = 30 kg

Arun wants to earn 30% overall profit, so that he needs to earn a total revenue

= 9,600 × 130% = Rs. 12,480

Thus, the price per kg at which Arun sells the remaining wheat so that he can earn an overall profit of 30%

= 12,480/30 = Rs. 416/kg

Hence, option (C) is the correct answer.

5. (A)

Let the total number of articles be n.

∴ Total cost price = 60 × n = Rs 60 n.

Now we have to find the total selling price of the article when the profit of 40% is given in the question.

Therefore, total selling price of all the articles = 60n × 140% = 84n

Again, total selling price = 6 + 12 + 18 +.....+ 6n= $\frac{n}{2}[2\times 6+(n-1)\times 6]$

$84n = \frac{n}{2}[12 + 6n - 6]$

$84n = \frac{n}{2}[6 + 6n]$

3n = 81

n = 27

Hence, option (A) is the correct answer.

6. (B)

According to the question:

MP (1-1/12) (1-1/15) = CP×(1 + 1/20)

MP × (11/12) × (14/15) = CP × 21/20

MP/CP = 27/22

Let M.P be 27 k and C.P be 22k.

Then mark-up = 27k – 22k = 5k

Therefore, mark up % = (5k/22k) × 100 = 22.725%

Hence option (B) is the correct answer.

7. (A)

Let us assume the cost price of washing machine = Rs. 100K

Profit = 20% of 100K = Rs. 20K

SP of washing machine = Rs. 120K

Discount % = 15%

SP = 0.85 × Marked Price

Marked Price = SP/0.85 = 120K/0.85

= Rs. 2,400K/17

Given 2400K/17 = 9600

K = 68

Cost price = 100K = Rs. 6,800

Hence, option (A) is the correct answer.

8. (B)

Let the cost price of the article for Madan = Rs. Y

Selling price of the article for Madan = Y + 1200

The cost price of the article for Jitendra = (Y + 1200)

Selling price for Jitendra

$= (Y + 1200) \times \frac{160}{100} \times \frac{75}{100} = 1.2Y + 1440$

Now, according to the question

1.2Y + 1,440 – (Y + 1200) = 450

0.2Y + 240 = 450

0.2Y = 210

Y = 1,050 = cost price for Madan

The selling price of the article for Jitendra

= (1.2 × 1,050 + 1440) = Rs. 2,700

Hence, option (B) is the correct answer.

9. (C)

The cost price of the article = Rs. 4,500 is given.

Since we know that:

$\frac{CP}{MRP} = \frac{(100 - D\%)}{(100 + P\%)}$

$\frac{4500}{MRP} = \frac{(100 - 25)}{(100 + 40)}$

$\frac{4500}{MRP} = \frac{75}{140}$

MRP = 4,500 x 140/75 = Rs 8,400

Now, we have to find the difference between MRP and CP.

∴ MRP – CP = Rs 8,400 – Rs 4,500

= Rs 3,900

Hence, option (C) is the correct answer.

10. (B)

Let the manufacturing cost = Rs. 100

∴ M.R.P. = Rs. 160

Given: discount = 12%

∴ S.P. (of retailer)

= 160 × 0.88 = Rs. 140.8

Profit % (of retail) = 16%

∴ S.P. (of manufacturer) = 140.8 × 1,00,116

= 14080116 = 121.3793 ≈ 21 %

∴ Profit % (of manufacturer) = 21%

Hence, option (B) is the correct answer

11. (C)

Since CP of a book Rs. 1,000 is given.

CP : MRP

1,000 : 2560

100 : 256

Case-1:

When a = 0, b = 0 and c = 18.75%

SP (selling price of a book)

= 256 (100 – 18.75%) = 256 × 81.25% = 208

Profit = (208 – 100) = 108%

Case-2:

When a = b = c = 6.25%

SP = 256 × (100 – 6.25%) × (100 – 6.25%) × (100 – 6.25%)

SP = 210.9375

Profit % = 210.9375 – 100

= 110.9375%

Therefore, x lies between 108% and 110.9375%

108% ≤ x ≤ 110.9375%

Hence, option (C) is the correct answer.

12. (C)

Let the weights of 'K' and 'M' varieties of rice purchased be 3x kg and 5x kg.

Since it is given in the question that the cost price per kg of 'K' is 25% more than that of B.

$\therefore \quad 25\% = \frac{+1}{4}$

Therefore, CP of 'K'/kg = 5y and CP of 'M'/kg = 4y

∴ Total cost price of 'K' = 3x × 5y

= Rs. 15xy

And total cost price of 'M' = 4y × 5x

= Rs. 20xy

The total cost price of both type of rice = Rs. 70,000

∴ 15xy + 20xy = Rs. 70,000

35xy = Rs. 70,000

xy = 2,000

∴ The total cost price of 'K' = 15xy

= 15 × 2,000 = Rs. 30,000

Also, the total cost price of 'M' = 20xy = 20 × 2,000 = Rs. 40,000

Thus, the profit earned by Namita on the 'K' type of rice = 30,000 × 20% = Rs. 6,000

Also, the profit earned by Namita on 'M' type of rice = 40,000 × 15% = Rs. 6,000

Therefore, the total profit earned by Namita on both varieties of rice

= Rs. 6,000 + Rs. 6,000 = Rs. 12,000

Hence, option (C) is the correct answer.

13. (C)

Let the original MRP be Rs. x.

CP to shopkeeper: MRP – 40% of

MRP = x – 40% of x = x – 0.4x = 0.6x

Case 1:

Original Price Tag

MRP = x

SP: MRP – Discount = x – 20% of

x = x – 0.2x = 0.8x

Profit: SP – CP = 0.8x – 0.6x = 0.2x

Case 2:

New Price Tag

let MRP be y

SP = MRP – Discount = y – 20% of

y = y – 0.2y = 0.8y

Profit: SP – CP = 0.8y – 0.6x

And the profit percentage is double of the original case. Since CP is the same in

both cases, profit is doubled in the 2nd case.

0.8y – 0.6x =2 * 0.2x = 0.4x

0.8y = 0.4 x + 0.6 x = x

y = x/0.8 = 1.25x

Percentage increase in MRP = (New MRP–Old MRP) / old MRP × 100% = (1.25x–x)/x * 100%=25%

Hence option (C) is the correct answer.

14. (C)

Selling price of a shirt in the first month = Rs.(70% x 900) = Rs. 630

Profit earned by selling 1 shirt in the first month = Rs. 630 – Rs. 300 = Rs. 330.

Selling price of a shirt in the second month = Rs.(50% x 900) = Rs. 450.

Profit earned by selling 1 shirt in the second month = Rs. 450 – Rs. 300 = Rs.150

Let, the number of shirts sold in the first month be 'x'.

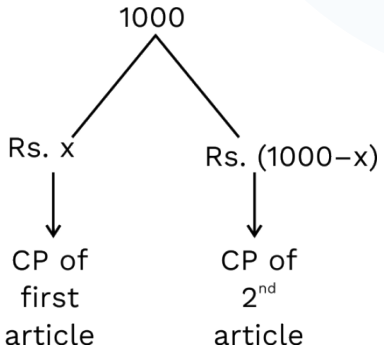
330x = 150(240 – x)

x = 75

Required difference = 240 – 2x = 90.

Hence, option (C) is the correct answer.

15. (A)



Now , $SP_1 = SP_2$

$$x \times \frac{120}{100} = (1000 - x) \times \frac{80}{100}$$

$$x \times \frac{6}{5} = (1000 - x) \times \frac{4}{5}$$

3x = 2,000 – 2x

5x = 2,000

x = Rs. 400

CP of profit yielding article = Rs. 400

CP of loss yielding article

= 1,000– 400 = Rs. 600

Hence SP of each article

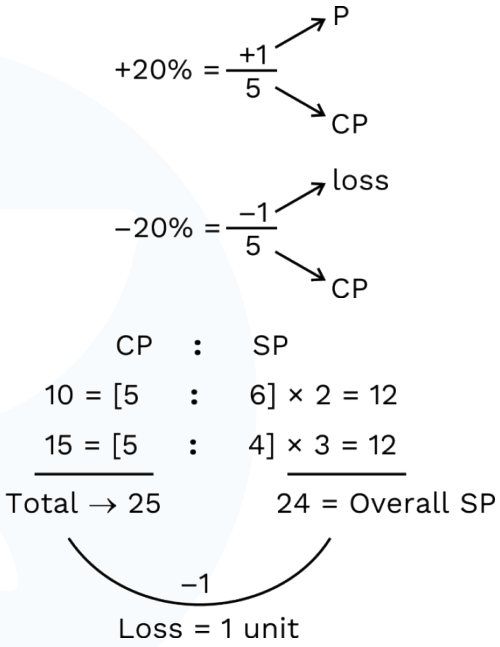
= 400 × 120% = 400x1.2 = Rs. 480

∴ Amount of loss = Total CP – Total SP

= 1,000 – 2 × 480 = 1,000 – 960 = Rs. 40

Hence, option (A) is the correct answer.

Alternate Solution:



Since 25 unit →Rs. 1,000

1 unit → $\frac{1000}{25}$ =Rs. 40

Hence the amount of loss is 1 unit which is equal to Rs. 40.

16. (D)

Let the cost of each shirt, jacket, and trousers be Rs. S, J, T respectively.

7S + 10J + 13T = 25,000 – (1)

17S + 21J + 25T = 41,000 – (2)

Multiplying (1) by 4 and (2) by 3, we get

28S + 40J + 52T = 1,00,000 – (3)

51S + 63J + 75T = 1,23,000 – (4)

Subtracting equation (3) from equation (4), we get

23S + 23J + 23T = 23,000

$\Rightarrow$ S + J + T = Rs. 1,000

$\Rightarrow$ Required Profit Percentage

= (350/1,000) × 100 = 35%

Hence option (D) is the correct answer.

17. (C)

Profit % in winter

= (10/90) × 100 = (100/9)%

Loss % in summer

= (10/110) × 100 = (100/11)%

Hence net profit %

= (3/10) × (– 100/11) + (7/10) (100/9)

Hence, option (C) is the correct answer.

18. (B)

Let the CP of the article be Rs. 100

MP = Rs (100 + P)

After the discount,

$SP = (100+P)\left(1-\frac{2P}{500}\right)$

$= (100+P)\left(\frac{500-2P}{500}\right)$

Since profit in this situation is (2P/5)%

Therefore,

$(100+P)\left(\frac{500-2P}{500}\right) = 100\left(1+\frac{2P}{500}\right)$

$(100+P)\left(\frac{500-2P}{500}\right) = 100\left(\frac{500+2P}{500}\right)$

$\frac{100+P}{100} = \frac{500+2P}{500-2P}$

Using componendo and dividendo

100+P+100/100+P–100

= 500+2P+500-2P/500+2P–500+2P

= (200 + P)/P = 1,000/4p

P = 50

Now, if markup is $\frac{P}{5}\%$ i.e., $\frac{50}{2}$ = 25%

Then, MP $= 100\left(1+\frac{1}{4}\right) = 125$

Now, discount offered

$= \frac{3P}{100}\%$ i.e., $\frac{3\times 50}{10}$ = 15%

Hence, SP $= 125\times\frac{85}{100} = \frac{425}{4}$

Profit = $\frac{425}{4} - 100 = \frac{25}{4}$

Profit % = $\frac{\left(\frac{25}{4}\right)\times 100}{100} = 6.25\%$

Hence, option (B) is the correct answer.

19. (B)

Let's assume the SP of Covid vaccine in 2020 = 100a

So, the CP of Covid vaccine in 2020 = 80a

Profit from Covid vaccine in 2020 = 20a

Let's assume the SP of Covid vaccine in 2021 = 100b

So, the CP of Covid vaccine in 2021 = 90b

Profit from Covid vaccine in 2021 = 10b

According to the question,

20a = 10b

So, a : b = 1 : 2

Now, let's assume a = k and b = 2k

So, the the CP of Covid vaccine in 2020 = 80a = 80k

So, the the CP of Covid vaccine in 2021 = 90b = 180k

increase in the CP of Vaccine from 2020 to 2021 100k 80k x 100 125

Hence, option (B) is the correct answer.

20. (B)

Let's assume the Marked price (MP) of each article = Rs. 100 and CP of each article is Rs. K

In the first case when 8 articles are bought, the CP = 8K, MRP = 800, Discount

= 5% of 800 = 40,
SP = 760, so profit in the first case
= 760 – 8K
In the Second case when 12 articles are bought, the CP = 12K, MRP = 1200, Discount = 1/12 x 1,200 = 100, SP= 1100, So, profit in the Second case = 1,100 – 12K
According to the question,
760 – 8K = 1,100 – 12K,
which gives us the value of K = 85
Hence, the ratio of MP to CP of each article = 100/K = 100/85 = 20:17
Hence, option (B) is the correct answer.

21. (D)

Let the Selling price of each chocolate be 'SP' and the Cost price of each chocolate be 'CP'.
Given that in a particular month when he gave 10 chocolates for free and sold 15 chocolates, he earned a net profit of 10%, this means
15SP – (10CP +15CP) = 50% of (10CP+15CP)
which when simplified will give
SP: CP = 5: 2 ...(1)
Next, we know that if 'x' chocolates are distributed for free and 36 chocolates are sold, the profit will be 36SP – (x CP + 36CP) = 25% of (x CP + 36CP)
which gives 36SP = 5/4(x+36) CP.
Using SP: CP = 5: 2 from (1), we get

$$36 \times 5 = \frac{5}{4} \times (x + 36) \times 2$$

$\Rightarrow$ x + 36 = 72
$\Rightarrow$ x = 36
Hence, when 36 chocolates are distributed for free and 36 chocolates are sold, 25% profit will be earned.
Hence option (D) is the correct answer.

22. (D)

Let the actual MRP of the piece be Rs. X
After 3 successive discounts, the price of the piece is

$$= x\left(1-\frac{1}{10}\right)\left(1-\frac{1}{11}\right)\left(1-\frac{1}{12}\right)$$

$$= x \times \frac{9}{10} \times \frac{10}{11} \times \frac{11}{12} = \frac{3x}{4}$$

$$= \frac{1}{4} \times 100 = 25\%$$

Overall discount $= \frac{1}{4} \times 100 = 25\%$

Discounted price offered to her when she left the shop = 0.75x
When she came back to Shubham after searching for the piece irritated by her, Shubham increased this actual MRP by 50%
Therefore, the new price of the piece she has to pay now = 1.5x
Now, the percent extra she is paying

$$= \left(\frac{15x - 0.75x}{0.75x}\right) \times 100\% = 100\%$$

Hence, option (D) is the correct answer.

23. (A)

Let the manufacturing cost of the Electric Scooter = 100 units.
$\therefore$ MRP of the Electric Scooter
= 100 × 140% = 140 units
$\therefore$ The selling price of the Electric Scooter when it is sold at 10% profit
= 110 units.
$\therefore$ Maximum discount %

$$= \frac{140 - 110}{140} \times 100$$

= (30/140) x 100 = 150/7 %
Again, the selling price of the Electric Scooter when it is sold at 20% profit
= 100 × 120% = 120 units
$\therefore$ Minimum discount %

$$= \frac{140 - 120}{140} \times 100$$

$= \frac{20}{140} \times 100 = (100/7)\ \%$

Now, we have to find the average of the maximum and minimum discount %

$= \left(\frac{\frac{150}{7} + \frac{100}{7}}{2} \right) \% = \frac{125}{7} \%$

Hence, option (A) is the correct answer.

24. (C)

Let the CP of each notebook for shopkeeper = Rs. y

Now profit percent of the shopkeeper from Amar = A = $\left(\frac{15 - y}{y} \right) \times 100$

Profit percent of the shopkeeper from Anthony

$\Rightarrow B = \frac{25 \times 10 - 25y}{25y} \times 100 = \left(\frac{10 - y}{y} \right) \times 100$

According to the question: 3A = 8B

$3\left(\frac{15 - y}{y} \right) \times 100 = 8\left(\frac{10 - y}{y} \right) \times 100$

$\Rightarrow$ 3(15 – y) = 8(10-y)

$\Rightarrow$ 45 – 3y = 80 – 8y

$\Rightarrow$ Y = 7

Now for Akbar

Shopkeeper CP = 10y = 70

Shopkeeper SP = 120

Profit = 50

Profit %= (50/70) X 100 = 500/7 %

Hence, option (C) is the correct answer.

25. (B)

For Rajan: C.P. Rs. 4,000

M.P. = (1 + 3a) 4000

S.P. after discount = (1 + 3a) 4,000 (1 – a)

For Shiva: C.P. = Rs. 5,000

M.P. = S.P = (1 + a) 5000

Profit for Rajan = (1 + 3a) (1 – a) 4,000 – 4,000 = [(1 + 3a) (1 – a) – 1] 4000 ...(1)

Profit for Shiva= (1 + a) 5,000 – 5,000 = (1 + a – 1) 5,000 = 5000a ...(2)

According to the question:

Profit for Rajan = Profit for Shiva

[(1 + 3a) (1 – a) -1] 4,000 = 5000a

$\Rightarrow$ [1 – a + 3a – $3a^2$ – 1] 4 = 5a

($-3a^2$ + 2a) 4 = 5a

$-12a^2$ + 8a – 5a = 0

($4a^2$ – a) = 0

a(4a – 1) = 0

$a = 0, \frac{1}{4}$

But a ≠ 0

$\Rightarrow a = \frac{1}{4} \times 100 = 25\%$

Hence option (B) is the correct answer.

26. (B)

Let's assume the CP of the TV = 100 units

So, the cost price of the washing machine is 120 units

The amount Aman is supposed to pay (without the interchange of discount rates)

= 100 × 70% + 120 × 87.5%

= 70 + 105 = 175 units

When discount rates were interchanged then the amount was calculated by the shop owner.

= 100 × 87.5% + 120×70% = 87.5+84

= 171.5 units

Therefore, Aman has paid a lesser amount = 175-171.5 = 3.5

Required % = (3.5/175) x 100 = 2%

Hence, option (B) is the correct answer.

27. (C)

Let 'a' be the price of 1 Kg of pulse 'x' in the mixture and 'b' be the price per kg of pulse 'y'.

Case-1

Since the selling price of the mixture is Rs. 60/kg and a profit of 20% is given.
Let the cost price of the mixture is CP.

$CP_{mix\ 1} \times 120\% = 60$

$CP_{mix\ 1} = \frac{60}{120} =$ Rs. 50 / kg

Price per kg of the mixture when pulses are mixed in the ratio 3 : 2.

$\Rightarrow \quad \frac{3 \times a + 2 \times b}{5} = 50$

$3a + 2b = 250$ ...(1)

Case-2

The profit is 5% if the two varieties of pulses are mixed in the ratio 2 : 3.

$CP_{mix\ 2} \times 105\% = 60$

$CP_{mix\ 2} = \frac{60}{105}$

$\therefore$ Price per kg of the mixture when pulses are mixed in the ratio 2 : 3.

$\frac{2a + 3b}{5} = \frac{60}{105}$

$2.1a + 3.15b = 300$ ...(2)

Now solving equation 1 and 2.

$3a + 2b = 250$

$2.1a + 3.15b = 300$

$6.3a + 4.2b = 525$

$\Rightarrow \quad 6.3a + 9.45b = 900$

$- \quad - \quad -$

$-5.25b = -375$

$b = \frac{375}{5.25} = \frac{500}{7}$

Put the value $b = \frac{500}{7}$ in equation (1).

$b = \frac{375}{5.25} = \frac{500}{7}$

$3a + 2 \times \frac{500}{7} = 250$

or $\quad 3a = 250 - \frac{1000}{7}$

or $\quad 3a = \frac{1750 - 1000}{7}$

$\boxed{a = \frac{750}{7 \times 3} = \frac{250}{7}}$

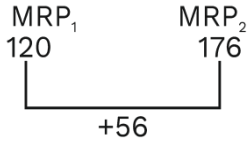
Therefore, the cost prices, per kg of x and y are in the ratio...

x	:	y
$\frac{250}{7}$	:	$\frac{500}{7}$
1	:	2

Hence, option (C) is the correct answer.

28. (A)

Let the cost price of 1 kg of wheat
= Rs. 100
Selling price of the 10 kg wheat
= 10 × 120 = Rs. 1,200
Again, the selling price of the 20 kg, wheat which is sold at 20% discount
= 20 × 120 × 80% = 20 × 120× 80/100
= 120 × 16 = Rs. 1,920
$\therefore$ Selling price of 30 kg wheat
= Rs. 1,200 + Rs. 1,920 = Rs. 3,120
Selling price of all the 70 kg wheat
= 70 × 100 × 130% = 70 × 130
= Rs. 9,100
Since 6 kg of wheat is wasted.
Now, we have to find the selling price of the remaining wheat (70 – 36 = 34 kg)
$\therefore$ selling price of remaining 34 kg wheat
= Rs. 9,100 – Rs. 3,120 = Rs. 5,980
Therefore, the selling price of the re-maining 1 kg of wheat
= Rs. 5,980/ = Rs. 175.88/kg
= Rs. 176 /kg
Hence marked price should further marked up by:



∴ % Further markup

= (56/120) × 100 = 46.67% ≈ 47%.

Hence, option (A) is the correct answer.

29. (C)

Let Ramesh purchase & sell 'x' roses and 'y' marigolds (x < y ≤ 20)

Now, 13x + 5y = 151

Since, x < y ≤ 20, therefore,

x = 7 and y = 12 is the only possible case.

Then,

Total cost price of all flowers

= 7 × (13/1.3) + 12 × (5/1.25)

= 70 + 48 = Rs 118

Total selling price = Rs 151

So, profit = (33/118) × 100 = 27.96%

Hence, option (C) is the correct answer.

30. (D)

Let's assume the CP/mango = C, SP/mango = S and Discount/mango = D respectively

According to the question

S x 15 = C x 24 = 1/3 (D x 90) ...(1)

From I, C : S = 5 : 8

So, let's assume C = 5 units, so accordingly S = 8 units and D = 4 units

Case - 1

CP = 5, SP = 8, MRP = 8 + 4 = 12, Discount = 4 units

CP = 5, SP = 8, MRP = 8 + 4 = 12, Discount = 4 units, Mark-up = 7 and Mark-up% = 140%

Case - 2

Now if discount is reduced by 50%, new discount = 2 units

Mark-up% is reduced by 40 percentage point, so new Mark-up% = 140% - 40% = 100%

CP = 5, Mark-up% = 100%, Mark-up = 5, MRP = 10, Discount = 2, SP = 8, Profit = 3, Profit % = 3/5 x 100 = 60%

Hence, option (D) is the correct answer.

Previous Years' Questions

1. Anil buys 12 toys and labels each with the same selling price. He sells 8 toys initially at a 20% discount on the labelled price. Then he sells the remaining 4 toys at an additional 25% discount on the discounted price. Thus, he gets a total of ₹ 2,112 and makes a 10% profit. With no discounts, his percentage of profit would have been:

(A) 60
(B) 50
(C) 55
(D) 54

2. A person spent ₹ 50,000 to purchase a desktop computer and a laptop computer. He sold the desktop at a 20% profit and the laptop at a 10% loss. If, overall he made a 2% profit the purchase price, in rupees, of the desktop is:

Write your answer here.

3. A man buys 35 kg of sugar and sets a marked price to make a 20% profit. He sells 5 kg at this price and 15 kg at a 10% discount. Accidentally, 3 kg of sugar is wasted. He sells the remaining sugar by raising the marked price by 'p' percent to make an overall profit of 15%. Then 'p' is nearest to:

(A) 35
(B) 31
(C) 22
(D) 25

4. On selling a pen at 5% loss and a book at 15% gain, Karim gains ₹ 7. If he sells the pen at 5% gain and the book at 10% gain, he gains ₹ 13. What is the cost price of the book in Rupees?

(A) 80
(B) 85
(C) 100
(D) 95

5. Mukesh purchased 10 bicycles in 2017, all at the same price. He sold six of these at a profit of 25% and the remaining four at a loss of 25%. If he made a total profit of ₹ 2,000, then his purchase price of a bicycle, in Rupees, was:

(A) 2,000
(B) 6,000
(C) 8,000
(D) 4,000

6. A shopkeeper sells two tables, each procured at cost price p, to Amal and Asim at a profit of 20% and a loss of 20%, respectively. Amal sells his table to Bimal at a profit of 30%, while Asim sells his table to Barun at a loss of 30%. If the amounts paid by Bimal and Barun are x and y, respectively, then ((x-y)/P) equals:

(A) 1
(B) 1.2
(C) 0.7
(D) 0.50

7. A wholeseller bought walnuts and peanuts, the price of walnut per kg. being thrice that of peanut per kg. He then sold 8 kg of peanuts at a profit of 10% and

16 kg of walnuts at a profit of 20% to a shopkeeper. However, the shopkeeper lost 5 kg of walnuts and 3 kg of peanuts in transit. He then mixed the remaining nuts and sold the mixture at ₹ 166 per kg. Thus making an overall profit of 25%. At what price, in ₹ per kg, did the wholesaler buy the walnuts?

(A) 84
(B) 86
(C) 96
(D) 98

8. If a seller gives a discount of 15% on retail price, she still makes a profit of 2%. Which of the following ensures that she makes a profit of 20%?

(A) Give a discount of 5% on the retail price.
(B) Give a discount of 2% on the retail price.
(C) Increase the retail price by 2%.
(D) Sell at Retail price.

9. In a market, the price of medium-quality mangoes is half that of good mangoes. A shopkeeper buys 80kg good mangoes and 40kg medium quality mangoes from the market and then sells all these at a common price which is 10% less than the price at which he bought the good ones. His overall profit is:

(A) 6%
(B) 8%
(C) 10%
(D) 12%

10. If Fatima sells 60 identical toys at a 40% discount on the printed price, she makes a 20% profit. Ten of these toys are destroyed in the fire. While selling the rest, how much discount should be given on the printed price so that she can make the same amount of profit?

(A) 30%
(B) 25%
(C) 24%
(D) 28%

11. The manufacturer of a table sells it to a wholesale dealer at a profit of 10%. The wholesale dealer sells the table to a retailer at a profit of 30%. Finally, the retailer sells it to a customer at a profit of 50%. If the customer pays ₹ 4,290 for the table, then its manufacturing cost (in Rs) is:

(A) 1,500
(B) 2,000
(C) 2,500
(D) 3,000

12. Mayank buys some candies for ₹ 15 a dozen and an equal number of different candies for ₹ 12 a dozen. He sells all for ₹ 16.50 a dozen and makes a profit of ₹ 150. How many dozens of candies did he buy altogether?

(A) 50
(B) 30
(C) 25
(D) 45