

Discounts - Quant Study Notes for Competitive Exams

In today's blog, we will be talking about multiplying factors to calculate profit and loss percentage, discounts and Successive discount. So, let's study.

Multiplying factors

Cost price \times (1 + %gain or loss/100) \rightarrow selling price

So, we got, CP(Cost price) \times MF(multiplying factors) = SP(selling price)

No matter what we have, profit or loss. Just simple.

E.g. Find the SP, when CP is 80 rs. and the gain is 20%. Sol: So, multiplying factor would be $= 1 + 20/100 = 1 + 0.2 = 1.2$ So, by multiplying factor method, $\Rightarrow 80 \times 1.2 = SP \Rightarrow 96 = SP$ (Ans.)

This is the same question which we had solved above with two methods. Let's take some variety of questions related to profit and loss;

E.g. A shopkeeper buys 100 eggs at Rs. 1.20 per piece Unfortunately 4 eggs got spoiled during transportation. The shopkeeper sells the remaining eggs at rs. 15 a dozen. Find his profit or loss. Sol: The cost price of one egg = 1.2 rs. Cost Price of 100 eggs = $100 \times 1.2 = 120$ rs. The selling price of one egg = $15 / 12 = 1.25$ rs. [One Dozen = 12 units] The selling price of (100 - 4) eggs = $96 \times 15 / 12 = 120$ rs. $\Rightarrow SP = CP$ So, there is neither profit nor loss incurred. (Ans.)

E.g. A grocer buys 160 kg of rice at 27 per kg and mixes it with 240kg of rice available at 32 per kg. At what rate per kg should he sell the mixture to gain 20% on the whole? Sol: Total rice = $160 + 240 = 400$ kg Total cost price of rice = $160 \times 27 + 240 \times 32 = \text{Rs } 12000$ The multiplying factor would be $= 1 + 20 / 100 = 1 + 0.2 = 1.2$ By multiplying factor $\Rightarrow SP = CP \times MF \Rightarrow SP = 12000 \times 1.2 = \text{Rs } 14000$ (Ans.)

E.g. A man sold two radios for 2000 each. At first, he gains 16%, and on the other he loses 16%. Find his gain or loss percent in the whole transaction. Sol: Let's talk about the first case $\Rightarrow SP = 2000$ rs. $\Rightarrow MF = 1 + 16/100 = 1.16 \Rightarrow SP = MF \times CP \Rightarrow CP = SP / MF = 2000 / 1.16 = 1724$ (Approx) Now, see the second case $\Rightarrow SP = 2000$ rs. $\Rightarrow MF = 1 - 16/100 = 0.84 \Rightarrow SP = MF \times CP \Rightarrow CP = SP / MF = 2000 / 0.84 = 2381$ (Approx) So total SP = $2000 + 2000 = 4000$ So total CP = $1724 + 2381 = 4104$ Profit% = $[(SP - CP) / CP] \times 100$ Profit% = $[(4000 - 4104) / 4104] \times 100$ Profit% = $-104/4104 \times 100 = 2.56\%$ (Ans.)

NOTE: If a person sells two similar articles, one at a gain of a% and another at a loss of a%, Then the seller always incurs a loss which is given by: **Loss% = $(a/10)^2$**

E.g. A man sold two radios for 2000 each. At first, he gains 16%, and on the other he loses 16%. Find his gain or loss percent in the whole transaction. Sol: By applying formula $\Rightarrow \text{Loss}(\%) = (x/10)^2 \Rightarrow \text{Loss}(\%) = (16/10)^2 = 2.56\%$ (Ans.)

E.g. 32% of the goods in a shop is sold at 25% profit and remaining at c% loss. If the overall loss is 2.2%, what is the value of c? Sol: Remaining amount of goods sold at c% loss = $100 - 32 = 68\%$ Overall loss = $-32/100 \times \text{Profit}\% + 68/100 \times \text{Loss}\% \Rightarrow 2.2 = -32/100 \times 25 + 68/100 \times c \Rightarrow 2.2 = -8 + 0.68c \Rightarrow 10.2 = 0.68c \Rightarrow c = 10.2/0.68 = 15$ (Ans.)



Discounts - Quant Study Notes for Competitive Exams

Discounts

Now, we all learnt about the basics of profit and loss in the previous unit so in continuation of that we will learn about Discounts and Successive Discounts. It's an important topic with your exam point of view and questions are widely asked from it.

We all are slaves of marketization; we all are greedy for more products and the market is providing us our needy things. Last time when you went to markets did you notice there are terms like 20% off, SALE SALE SALE. On e-commerce sites, we saw discounts on items. We will try to solve this type of question.

Discount is defined as the amount of rebate given on a fixed price (called a marked price) of an article.

Marked price = CP + Markup, So, we got to know Goods are sold at market price, if there is no discount then \Rightarrow Marked price = CP

So, we got to know how marked price is calculated but in case of discount product it sold at d% discount,

Selling price = Marked price - Discount

Selling price = Marked price (MP) - discount on MP(d%)

NOTE- discount is always calculated on the marked price, not on cost price and mark-up is calculated on the basis of CP.

$$\text{MP}(1 - d/100) = \text{SP} = \text{CP}(1 + a/100)$$

Where, SP = selling price, MP = Marked price, CP = Cost price, d = Discount % and a = Gain%

E.g. A trader offers his consumer 10% discount still makes a profit of 26%. What is the actual cost of an article marked at rs 280? Sol: By putting the values in the formula $\Rightarrow \text{MP}(1 - d/100) = \text{SP} = \text{CP}(1 + a/100) \Rightarrow 280(1 - 10/100) = \text{CP}(1 + 26/100) \Rightarrow 280 \times 0.9 = \text{CP} \times 1.26 \Rightarrow \text{CP} = (280 \times 0.9) / 1.26 \Rightarrow \text{CP} = 200$ rs. (Ans.)

E.g. If the marked price of an article is Rs.660 and the discount is 10%, then what is the selling price of the article? Sol: Putting the values in formula $\Rightarrow \text{MP}(1 - d/100) = \text{SP} = \text{CP}(1 + a/100) \Rightarrow \text{MP}(1 - d/100) = \text{SP} \Rightarrow 660(1 - 10/100) = \text{SP} \Rightarrow 660(1 - 0.1) = \text{SP} \Rightarrow 660 \times 0.9 = \text{SP} \Rightarrow \text{SP} = 600$ Rs. (Ans.)

E.g. A trader marks up the goods by 10% and then gives a discount of 10%. What is the profit or loss percentage? Sol: Let the cost price of the good be 100 As we know the markup is calculated on CP $\Rightarrow \text{MP} = 100(1 + 10/100) = 110$ We got a marked price and we know the discount is always calculated on the marked price so the selling price would be $\Rightarrow \text{SP} = 110 \times (1 - 10/100) = 110 \times 0.9 = 99$ So, there is a loss of 1% (Ans.)

E.g. The marked price of a bicycle is 1100. A shopkeeper allows a discount of 10% and gets a profit of 10%. Find the cost price of the bicycle. Sol: As we have given gain%, MP and discount% so we will use our general formula $\Rightarrow \text{MP}(1 - d/100) = \text{SP} = \text{CP}(1 + a/100) \Rightarrow \text{MP}(1 - d/100) = \text{CP}(1 + a/100) \Rightarrow 1100(1 - 10/100) = \text{CP}(1 + 10/100) \Rightarrow 1100 \times 0.9 = \text{CP} \times 1.1 \Rightarrow \text{CP} = (1100 \times 0.9) / 1.1 = \text{Rs } 900$ (Ans.)

Successive discounts

When two or more discounts are allowed one after the other, then such discounts are known as successive discounts. Let $r_1\%$, $r_2\%$, $r_3\%$... be the series of discounts on an article with marked price P then the selling price of the article is given by:

$$SP = P \times (1 - r_1/100)(1 - r_2/100)(1 - r_3/100)...$$

E.g. An item is sold for 680 rs. by allowing a discount of 15% on its marked price. What is the marked price of an item?

Sol: $SP = P \times (1 - r/100) \Rightarrow P = SP / (1 - r/100) \Rightarrow P = 680 / (1 - 0.15) \Rightarrow P = 680 / 0.85 \Rightarrow P = 800$ rs. (Ans.)

E.g. Which is a better bargain for the customer? 1. Successive discounts of 20% and 15% 2. Successive discounts of 10% and 25% Sol: Let's calculate the total discount for the first case, as we don't have given marked price so we assume $MP = 100 \Rightarrow SP = 100 \times (1 - 20/100)(1 - 15/100) \Rightarrow SP = 100 \times 0.8 \times 0.85 = 68$ So, the discount would be $100 - 68 = 32\%$ In the second scenario, $\Rightarrow SP = 100 \times (1 - 10/100)(1 - 25/100) \Rightarrow SP = 100 \times 0.9 \times 0.75 \Rightarrow SP = 67.5$ The discount would be $100 - 67.5 = 32.5\%$ So, the second bargain would be better. (Ans.)

E.g. Successive discount of 10%, 15%, 20%, and 25% is equivalent to? Sol: Let the marked price of the item be 100 rs. Then the selling price would be $\Rightarrow SP = P \times (1 - r_1/100)(1 - r_2/100)(1 - r_3/100)(1 - r_4/100) \Rightarrow SP = 100 \times (1 - 10/100)(1 - 15/100)(1 - 20/100)(1 - 25/100) \Rightarrow SP = 100 \times 0.9 \times 0.85 \times 0.8 \times 0.75 \Rightarrow SP = 45.9$ rs. So, the discount would be $= 100 - 45.9 = 54.1\%$ (Ans.)

In the case of two successive discounts, **Total discount = $x + y - xy/100$** Where x, y are the successive discounts.

E.g. Which is a better bargain for the customer? 1. Successive discounts of 20% and 15% 2. Successive discounts of 10% and 25% Sol: In the first case, the total discount would be $\Rightarrow 20 + 15 - (20 \times 15)/100 = 35 - 300/100 = 35 - 3 = 32\%$ In the second case, $\Rightarrow 10 + 25 - (10 \times 25)/100 = 35 - 2.5 = 32.5\%$ The bargain would be higher in the second case. (Ans.)

NOTE- If a shopkeeper wants a profit of $R\%$ after allowing a discount of $r\%$, then, **Marked Price = $CP((100 + R) / (100 - r))$**
Or, Cost Price = $MP((100 - r) / (100 + R))$

E.g. The marked price of a bicycle is 1100. A shopkeeper allows a discount of 10% and gets a profit of 10%. Find the cost price of the bicycle. Sol: So by formula $\Rightarrow \text{Cost Price} = M\{(100 - r) / (100 + R)\} \Rightarrow \text{Cost Price} = 1100 \times \{(100 - 10) / (100 + 10)\} \Rightarrow \text{Cost Price} = 1100 \times 90/110 = 900$ rs. (Ans.)

Now, let's take some hard examples so that you can understand it more clearly.

E.g. A shopkeeper offers two plans of discount. In scheme A, two successive discounts of 25% and 16% are offered and in scheme B, 38% of one-time discount is offered. If the marked price is Rs 200, what is the difference between the discounted amount if scheme I and scheme II? Sol: In scheme I: Effective discount on two successive discounts $= (x + y - xy/100) = (25 + 16 - 25 \times 16/100) = 25 + 16 - 4 = 37\%$ Difference in the discount% in scheme I and scheme II $= 38 - 37 = 1\%$ 1% of M.P. $= 1/100 \times 200 = \text{Rs } 2$, scheme II offers more discounts.



Discounts - Quant Study Notes for Competitive Exams

E.g. A shopkeeper purchases shirts from three wholesale shops having the same marked price and discount% of 25%, 10% and 20% respectively. The ratio of the amount of shirts purchased is 4: 6: 5, then what is the effective discount%? Sol:
Effective discount = $(4 \times \text{Discount in first shop} + 6 \times \text{Discount in second shop} + 5 \times \text{Discount in third shop}) / (4 + 6 + 5)$
 $\Rightarrow (4 \times 25 + 6 \times 10 + 5 \times 20) / 15 = 260/15 = 52/3 = 17.33\%$

We have learned the importance of applying formulas to solve mathematical problems effectively. It is essential to understand these formulas and their applications, rather than just memorizing them. So, practice hard and stay connected with us.

