

MATHEMATICS

Class-VIII

Topic-11

PERCENTAGE AND ITS APPLICATIONS



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CH-11

PERCENTAGE AND ITS APPLICATIONS

TERMINOLOGIES

Percent, cost price, selling price, gain, loss, overhead, discount, marked price, list price, sales tax, value added tax, original value.

INTRODUCTION

In this chapter, we learn about the concept of percentages and its wider applications in day to day life situation. In order to solve problems related to profit and loss, compound interest etc. It is essential to have a through understanding of this chapter.

11.1 PERCENTAGE

Percent means per hundred or for every hundred. By a certain percent, we mean that many hundredths. The symbol “%” is used to express the word percent.

(a) Percent as a fraction

A fraction with its denominator as 100 is called a percent and is equal to that percent as is

the numerator. i.e. $\frac{75}{100} = 75 \times \frac{1}{100} = 75$ hundredths
 $= 75$ per hundred
 $= 75\%$.

(b) Percent as a ratio

A ratio with its second term 100 is also called a **percent**.

For ex. $8 : 100 = \frac{8}{100} = 8\%$.

(c) Conversion of a percent into a fraction

To convert a percent into a fraction, we drop percent sign (%) and divide the number by 100.

❖ Drop the percent sign (i.e. %) and divide the number by 100. Thus, $x\% = \frac{x}{100}$.

i.e. $36\% = \frac{36}{100} = \frac{9}{25}$.

(d) Conversion of a fraction into a percent & vice versa

To convert a fraction into a percent we multiply the fraction by 100.

Multiply the fraction by 100 and put the percent sign % to obtain the required percent.

Thus, $\frac{a}{b} = \left(\frac{a}{b} \times 100 \right) \%$

For example :(i) $\frac{4}{5} = \left(\frac{4}{5} \times 100\right) = 80\%$.

(ii) $6 : 5 = \frac{6}{5} = \left(\frac{6}{5} \times 100\right)\% = 120\%$.

- ❖ To convert a percent into a decimal, we drop percent sign (%) and shift the decimal point two places to the left.

Illustration 11.1

Express each of the following as a decimal.

(i) 65% (ii) 0.1%

Sol. (i) We have,

$$65\% = \frac{65}{100} = 0.65.$$

(ii) $0.1\% = \frac{0.1}{100} = \frac{1}{1000} = 0.001.$

(e) Conversion of a decimal into a fraction

To convert a decimal into a percent, we shift the decimal point two places to the right.

Illustration 11.2

Express each of the following as percent

(i) 0.037 (ii) 0.275

Sol. (i) $0.037 = \frac{37}{1000} = \left(\frac{37}{1000} \times 100\right)\% = 3.7\%$

(ii) $0.275 = \frac{275}{1000} = \left(\frac{275}{1000} \times 100\right)\% = 27.5\%$

Illustration 11.3

Express 75 paise as a percent of Rs 5.

Sol. We have, Rs. 5 = 500 paise

Let x% of Rs. 5 be 75 paise.

Then, x% of Rs. 5 = 75 paise

$$\Rightarrow x\% \text{ of } 500 \text{ paise} = 75 \text{ paise}$$

$$\Rightarrow \frac{x}{100} \times 500 = 75$$

$$\Rightarrow x = \frac{75 \times 100}{500}$$

$$\Rightarrow x = 15.$$

Hence, 15% of Rs 5 is 75 paise.

❖ **Percent Increase and Decrease**

The percent increase of a quantity is :

$$\left(\frac{\text{Increase}}{\text{Original value}} \times 100\right)\%$$

The percent decrease of a quantity is :

$$\left(\frac{\text{Decrease}}{\text{Original value}} \times 100\right)\%$$

Illustration 11.4

A fruit seller has 2000 fruits. 20% of these are mangoes, 25% are banana's and rest are oranges. Find the number of fruit of each kind.

Sol. Mangoes are 20% of 2000

$$\text{Number of mangoes} = \frac{20}{100} \times 2000 = 400$$

Banana's are 25% of 2000

$$\text{Number of Banana's} = \frac{25}{100} \times 2000 = 500$$

Oranges are $(100-20-25)$ % of 2000

Oranges are 55 % of Rs. 2000

$$\text{Number of Oranges} = \frac{55}{100} \times 2000 = 1100.$$

Illustration 11.5

Ram's salary is 20% more than Shyam's. How much percent is Shyam's income less than Ram's?

Sol. Suppose Shyam's income = Rs. 100

Ram's income = Rs. $(100 + 20)$ = Rs. 120

If Ram's income is Rs. 120, then Shyam's income = Rs. 100

If Ram's income is Re. 1, then Shyam's income = Rs. $\frac{100}{120}$

If Ram's income is Rs. 100, then Shyam's income = Rs. $\frac{100}{120} \times 100 = \text{Rs. } 83\frac{1}{3}$

Shyam's income is $\left(100 - 83\frac{1}{3}\right)$ % or $16\frac{2}{3}$ % less than Ram's income.

Illustration 11.6

The prices of pulses increased by 30%. By how much percent should Nalini reduce her consumption of pulses so that her expenditure on pulses does not increase ?

Sol. Suppose original consumption of pulses = 100 kg

Suppose price of 100 kg pulses = Rs 100

Increased price of 100 kg pulses = Rs 130

But Nalini does not want to spend more than Rs 100

\therefore For Rs 130, Nalini gets 100 kg pulses

For Rs 1, Nalini gets $\frac{100}{130}$ kg pulses

For Rs 100, Nalini gets $\frac{100 \times 100}{130}$ or $\frac{1000}{13}$ kg pulses

\therefore Reduction in consumption = $\left(100 - \frac{1000}{13}\right)$ % = $\frac{300}{13}$ or $23\frac{1}{13}$ %.

Illustration 11.7

A students scores 40 marks in an examination and fails by 26 marks. If the passing percentage is 33, then find maximum marks in the examination.

Sol. Let, the maximum marks in the examination is 100

Then he needs 33 marks to pass.

But, passing marks required are $40 + 26 = 66$ marks

33 marks are required to pass if maximum marks are 100.

Here, 66 marks are required to pass, then maximum marks are $\frac{100 \times 66}{33} = 200$ marks.

Ask yourself _____

1. What percentage of 240 is 90 ?
2. 800 Kg of mortar consists of 55% sand , 33 % cement and rest lime. What is the mass of lime in mortar?
3. Chalk contains 10 % calcium ,3% carbon and 12 % oxygen . Find the amount of carbon and calcium (in gms) in $2\frac{1}{2}$ kg of chalk.
4. In an examination, Mohit secured 60% of the maximum marks which is 45 marks more than the pass marks. If the pass mark is 45% then find the maximum marks in the examination.
5. If $2a = 3b$, $b = \frac{3}{4}c$, and $c = 0.8d$, then find by what percent is 'a' less/more than 'd'.

Answers

1. 37.5% 2. 96 kg 3. Carbon = 75g , Calcium = 250g 4. 300. 5. 10% less

11.2 PROFIT, LOSS AND DISCOUNT

(a) Definitions

- Cost price (CP)** : The amount for which an article is bought is called its **cost price**, abbreviated to **CP**.
- Selling price (SP)** : The amount for which an article is sold is called its **selling price**, abbreviated to **SP**.
- Gain** : When $(SP) > (CP)$ then there is a gain. $\text{Gain} = (SP) - (CP)$
- Loss** : When $(SP) < (CP)$ then there is a loss. $\text{Loss} = (CP) - (SP)$

An important fact : The gain or loss is always reckoned on the cost price.

(b) Formulae

- $\text{Gain} = (SP) - (CP)$
- $\text{Loss} = (CP) - (SP)$
- $\text{Gain}\% = \left(\frac{\text{gain}}{CP} \times 100 \right) \%$
- $\text{Loss}\% = \left(\frac{\text{loss}}{CP} \times 100 \right) \%$
- To find SP when CP and gain % or loss % are given.
 - $SP = \frac{(100 + \text{gain}\%)}{100} \times CP$
 - $SP = \frac{(100 - \text{loss}\%)}{100} \times CP$
- To find CP when SP and gain % or loss % are given
 - $CP = \frac{100}{100 + \text{gain}\%} \times SP$
 - $CP = \frac{100}{100 - \text{loss}\%} \times SP$

(c) Overhead

Sometimes, after purchasing an article, we have to pay some more money for things like transportation, labour charges, repairing charges, local taxes, etc. These extra expenses are called **overhead**. For calculating the total cost price, we add overhead to the purchase price.

Illustration 11.8

Mohit bought a CD for Rs 750 and sold it for Rs 875. Find his gain percent.

Sol. CP = Rs 750 and SP = Rs 875

Since (SP) > (CP), Mohit makes a gain.

The gain = Rs (875 – 750) = Rs 125.

$$\text{gain\%} = \left(\frac{\text{gain}}{\text{CP}} \times 100 \right) \% = \left(\frac{125}{750} \times 100 \right) \% = 16\frac{2}{3} \% .$$

Illustration 11.9

Rahul purchased a table for Rs 1260 and due to some scratches on its top, he had to sell it for Rs 1197. Find his loss percent.

Sol. CP = Rs 1260 and SP = Rs 1197

Since (SP) < (CP), Rahul makes a loss.

The loss = Rs (1260 – 1197) = Rs 63.

$$\text{The loss\%} = \left(\frac{\text{loss}}{\text{CP}} \times 100 \right) \% = \left(\frac{63}{1260} \times 100 \right) \% = 5\% .$$

Illustration 11.10

A grocer buys 20 kg of sugar at a cost of Rs 18 per kg and 30 kg of an inferior sugar at a cost of Rs 15 per kg. He mixes the two kinds of sugar and sells the mixture at a cost of Rs 16.50 per kg. Find his profit or loss percent.

Sol. CP of 20 kg of sugar = Rs 18 × 20 = Rs 360

CP of 30 kg of sugar = Rs 15 × 30 = Rs 450

∴ Total C.P. = Rs 360 + Rs 450 = Rs 810

S.P. of (20 + 30) kg = 50 kg of sugar = Rs 16.50 × 50 = Rs 825

∴ Profit = SP – CP = Rs 825 – Rs 810 = Rs 15

$$\therefore \text{Profit percent} = \frac{15}{810} \times 100 = \frac{50}{27} = 1\frac{23}{27} .$$

Hence, the required profit = $1\frac{23}{27}\%$.

Illustration 11.11

If the selling price of 20 articles is the same as the cost price of 23 articles, find the profit or loss percent in the transaction.

Sol Let the CP of an article be Rs x.

Then CP of 23 articles = Rs 23 x

and CP of 20 articles = Rs 20 x

SP of 20 articles = CP of 23 articles = Rs 23 x

Since SP of 20 articles > CP of 20 articles, hence there is a profit in the transaction,

Hence, profit on 20 articles = SP – CP = Rs (23x – 20 x) = Rs 3x.

$$\therefore \text{Profit percent} = \frac{3x}{20x} \times 100 = 15$$

∴ Required profit = 15%.

Illustration 11.12

A man bought 2 boxes for Rs 1300. He sold one box at a profit of 20% and other box at a loss of 12%. If the selling price of both the boxes is the same, find the cost price of each box.

Sol. Let the CP of the first box which was sold at a profit of 20% be Rs x . Then the CP of the second box which was sold at a loss of 12% will be Rs $(1300 - x)$

Since the first box was sold a profit of 20%, its SP = Rs $\frac{120}{100}x$

Hence, its SP = Rs $\frac{88(1300 - x)}{100}$

Since the SPs of both the boxes are the same, we have

$$\frac{120x}{100} = \frac{88(1300 - x)}{100} \quad \Rightarrow \quad 15x = 11(1300 - x)$$

$$\Rightarrow 15x + 11x = 11 \times 1300 \quad \Rightarrow \quad x = \frac{11 \times 1300}{26} = 550$$

Hence, CP of the first box = Rs 550 and that of the second box = Rs $(1300 - 550) = \text{Rs } 750$.

Illustration 11.13

A man buys an article and sells it at a profit of 20%. If he would buy it at 20% less and sell it for Rs 75 less, he would have gained 25%. What is the cost price of the article?

Sol Let the CP of the article be Rs x
He makes a profit of 20%. Hence,

$$\text{SP} = \text{Rs } \frac{120x}{100} = \text{Rs } \frac{6x}{5}$$

If he would buy it at 20% less, then

$$\text{The new CP} = \text{Rs } x \left(1 - \frac{20}{100}\right) = \text{Rs } x \left(1 - \frac{1}{5}\right) = \text{Rs } \frac{4x}{5}$$

If he would sell it for Rs 75 less, then the new SP = Rs $\left(\frac{6x}{5} - 75\right)$

If he gains 25%, then the new SP = Rs $\frac{125}{100} \times \frac{4x}{5} = \text{Rs } x$

$$\text{Hence, } \frac{6x}{5} - 75 = x \quad \Rightarrow \quad \frac{6x}{5} - x = 75 \quad \Rightarrow \quad \frac{x}{5} = 75$$

\Rightarrow Hence, the required CP = Rs 375.

Illustration 11.14

A person purchases his goods for Rs 1600. He sells $\frac{3}{4}$ th of his goods at a profit of 10%. At what profit percent should he sell his remaining goods so as to make a gain of 16% on the whole transaction?

Sol. Let the man purchase y kg of goods at Rs 1600.
Then his total CP = Rs 1600.

He sells $\frac{3y}{4}$ kg of his goods at a profit of 10%.

Now, CP of $\frac{3y}{4}$ kg of his goods = Rs $= 1600 \times \frac{3}{4}$ Rs 1200.

\therefore SP of $\frac{3y}{4}$ kg of his goods = Rs $= \frac{110}{100} \times 1200$ Rs 1320.

Now, CP of the remaining $\frac{y}{4}$ kg of his goods = Rs $1600 \times \frac{1}{4} =$ Rs 400.

Let the man sell the remaining $\frac{y}{4}$ kg of his goods at a profit of $x\%$.

Then SP of $\frac{y}{4}$ kg of his good = Rs $\frac{100+x}{100} \times 400 =$ Rs $(400 + 4x)$

\therefore Total SP of y kg of goods = Rs $(1320 + 400 + 4x) =$ Rs $(4x + 1720)$

If the man makes a gain of 16% on the whole transaction,

then SP of y kg of goods = Rs $\frac{116}{100} \times 1600 =$ Rs 1856

$\therefore 4x + 1720 = 1856 \Rightarrow 4x = 1856 - 1720 = 136 \Rightarrow x = \frac{136}{4} = 34$

Hence, the required profit = 34%.

Illustration 11.15

Oranges are bought at 11 for Rs 10 and an equal number more at 12 for Rs 10. If these are sold at 1 for Re 1, find the loss or gain percent.

Sol. Let x oranges be bought at 11 for Rs 10 and an equal number x be bought at 12 for Rs 10.

Then the total CP of $(x + x) = 2x$ oranges

= Rs $\left(\frac{10x}{11} + \frac{10x}{12} \right) =$ Rs $10x \left(\frac{1}{11} + \frac{1}{12} \right) =$ Rs $10x \left(\frac{23}{132} \right) =$ Rs $\frac{115x}{66}$

Total SP of $2x$ oranges = Rs $2x$

\therefore Profit = SP – CP = Rs. $\left(2x - \frac{115x}{66} \right) =$ Rs $\left(\frac{132x - 115x}{66} \right) =$ Rs $\frac{17x}{66}$

\therefore Profit percent = $\frac{17x}{66} \times \frac{66}{115x} \times 100 = \frac{340}{23} = 14\frac{18}{23}$

Hence, his profit = $14\frac{18}{23}\%$.

Illustration 11.16

A vendor bought oranges at 20 for Rs 56 and sold them at Rs 35 per dozen. Find his gain or loss percent.

Sol. Let the number of oranges bought = LCM of 20 and 12 = 60

CP of 20 oranges = Rs 56.

CP of 1 orange = Rs $\cdot \frac{56}{20}$

Hence, the CP of 60 oranges = Rs $\left(\frac{56}{20} \times 60 \right) =$ Rs 168

SP of 12 oranges = 35.

SP of 1 orange = Rs $\cdot \frac{35}{12}$

Hence, the SP of 60 oranges = Rs $\left(\frac{35}{12} \times 60 \right) =$ Rs 175

Thus, CP = Rs 168 and SP = Rs 175.

Since (SP) > (CP), the vendor has made a gain.

Gain = Rs (175 – 168) = Rs 7

$$\text{Gain\%} = \left(\frac{\text{gain}}{\text{CP}} \times 100 \right) \% = \left(\frac{7}{168} \times 100 \right) \% = 4\frac{1}{6} \% .$$

Illustration 11.17

By selling a T-shirt for Rs 216, a shopkeeper loses 4%. For how much should he sell it to gain 12% ?

Sol. SP = Rs 216 and loss percent = 4%

$$\text{CP} = \frac{100}{(100 - \text{loss\%})} \times \text{SP} = \text{Rs} \left\{ \frac{100}{(100 - 4)} \times 216 \right\} = \text{Rs} \left\{ \frac{100}{96} \times 216 \right\} = \text{Rs} 225.$$

Now the CP = Rs 225 and the desired gain% = 12%

$$\therefore \text{SP} = \frac{(100 + \text{gain\%})}{100} \times \text{CP} = \text{Rs} \left\{ \frac{(100 + 12)}{100} \times 225 \right\} = \text{Rs} \left(\frac{112}{100} \times 225 \right) = \text{Rs} 252.$$

Hence, the shopkeeper should sell the T-shirt for Rs 252.

(d) Discount

(i) Definitions

Marked price : In big shops and department stores, every article is tagged with a card and its price is written on it. This is called the **marked price** of that article, abbreviated to MP. For books, the printed price is the marked price.

List price : Items which are manufactured in a factory are marked with a price according to the list supplied by the factory, at which the retailer is supposed to sell them. This price is known as the **list price** of the article.

Discount : In order to increase the sale or clear the old stock, sometimes the shopkeepers offer a certain percentage of rebate on the marked price. This rebate is known as **discount**.

An important fact :

The discount is always reckoned on the marked price.

Clearly, selling price = (marked price) – (discount).

$$\diamond \quad \text{Discount \%} = \left(\frac{\text{M.P.} - \text{S.P.}}{\text{M.P.}} \right) \times 100$$

$$\diamond \quad \text{S.P.} = \text{M.P.} \times \left(\frac{100 - \text{Discount\%}}{100} \right)$$

$$\diamond \quad \text{M.P.} = \frac{100 \times \text{S.P.}}{100 - \text{Discount\%}}$$

❖ If $D_1\%$, $D_2\%$, $D_3\%$, ..., $D_n\%$ are n successive discounts then

$$\text{S.P.} = \left(\frac{100 - D_1}{100} \right) \times \left(\frac{100 - D_2}{100} \right) \times \dots \times \left(\frac{100 - D_n}{100} \right) \times \text{M.P.}$$

Step IV If $m \neq 1$, then $\frac{p \div m}{q \div m}$ is the lowest form of $\frac{p}{q}$

Illustration 11.18

A motor cycle is sold at Rs 23750 after allowing certain discount. If the list price of the motor cycle is Rs 25000, find the discount in percent.

Sol. We have

$$\text{Discount} = \text{List Price} - \text{SP} = \text{Rs. } 25000 - \text{Rs. } 23750 = \text{Rs. } 1250$$

This discount is on the list price of Rs 25000

$$\therefore \text{Discount percent} = \frac{1250}{25000} \times 100 = 5$$

\therefore The required discount = 5%.

Illustration 11.19

The marked price of a woolen coat is Rs 2000. It is sold at a discount of 15%. The shopkeeper has allowed a further discount of 5% due to off season. Find the selling price of the coat.

Sol. The marked price = Rs 2000

$$1\text{st discount} = 15\% \text{ of Rs } 2000 = \text{Rs. } \frac{15}{100} \times 2000 = \text{Rs } 300$$

\therefore The reduced marked price after the 1st discount = Rs 2000 – Rs 300 = Rs 1700

$$2\text{nd discount due to off-season} = 5\% \text{ of Rs } 1700 = \text{Rs. } \frac{5}{100} \times 1700 = \text{Rs } 85.$$

Hence, the final reduced price after the 2nd discount = Rs. 1700 – Rs 85 = Rs 1615 = SP

Hence, the required SP of the coat is Rs 1615.

Illustration 11.20

Find a single discount equivalent to the discount series 25%, 10% and 5%.

Sol. Let the marked price of the article be Rs 100

$$\text{SP} = \left(\frac{100 - 25}{100} \right) \times \left(\frac{100 - 10}{100} \right) \times \left(\frac{100 - 5}{100} \right) \times 100 = \left(\frac{75}{100} \right) \times \left(\frac{90}{100} \right) \times \left(\frac{95}{100} \right) \times 100 = \frac{513}{8} = 64.125$$

$$\text{So net discount} = \text{MP} - \text{SP} = 100 - 64.125 = 35.875$$

Hence, the given discount series is equivalent to a single discount of 35.875%.

Illustration 11.21

A dealer buys a table listed at Rs 1000 and gets successive discounts of 10% and 20%. He spends 10% of his cost price on transport, etc. At what price should he sell the table to earn a profit of 15%?

Sol. First discount = 10% of Rs 1000 = Rs $\frac{10}{100} \times 1000 = \text{Rs } 100$

First reduced price of the table after the first discount = Rs (1000 – 100) = Rs 900

$$\text{Second discount} = 20\% \text{ of Rs } 900 = \text{Rs. } \frac{20}{100} \times 900 = \text{Rs } 180.$$

\therefore Second reduced price of the table after the second discount = Rs (900 – 180) = Rs 720.

This is the dealer's CP.

The dealer spends 10% of Rs 720 i.e., Rs $\frac{10}{100} \times 720 = \text{Rs. } 72$.

Hence, dealer's actual cost price = Rs (720 + 72) = Rs 792

If the dealer wants to make a profit of 15% by selling it, then his

$$\text{SP} = \text{Rs} \left(\frac{115}{100} \times 792 \right) = \text{Rs } 910.80$$

Hence, the required selling price of the dealer is Rs 910.80.

Illustration 11.22

A person marks his goods 10% above his cost price. He then sells it by allowing a discount of 10%. What is his profit or loss percent?

Sol. Let his cost price be Rs. x

$$\text{Then his marked price} = \left(x + \frac{10x}{100}\right) \text{ Rs} = \text{Rs} \frac{11x}{10}$$

He then sells it at a discount of 10% on this marked price.

$$\therefore \text{Discount} = 10\% \text{ of Rs} \frac{11x}{10} = \text{Rs} \frac{10}{100} \times \frac{11x}{10} = \text{Rs} \frac{11x}{100}$$

$$\therefore \text{His SP} = \text{Rs} \left(\frac{11x}{10} - \frac{11x}{100}\right) = \text{Rs} \frac{110x - 11x}{100} = \text{Rs} \frac{99x}{100}$$

Since his CP > SP, hence there will be a loss

$$\text{and loss} = \text{CP} - \text{SP} = \text{Rs} \left(x - \frac{99x}{100}\right) = \text{Rs} \frac{x}{100}$$

$$\therefore \text{Loss percent} = \frac{x}{100} \times \frac{1}{x} \times 100 = 1$$

Hence, the loss = 1%.

(e) Sales tax/value added tax

(i) Sales tax (ST) is a tax which is paid by us when we buy items.

NOTE :

ST is charged by the government on the sale of an item. Shopkeeper takes it from the customer and gives to the government. So ST is always calculated on selling price of an item and is added to the price of items we purchased. So, the customer pays the price of the items and ST on it in the bill.

Now a days **value added tax (VAT)** has been included as a tax.

Illustration 11.23.

The cost of a chair at a shop was Rs 220. The sales tax charged was 5%. Calculate the bill amount.

Sol. If the cost was Rs 100, the ST paid was Rs 5

$$\text{On Rs 220, the tax paid would be} = \text{Rs} \frac{5}{100} \times 220 = \text{Rs. 11}$$

$$\text{Bill amount} = \text{Cost of item} + \text{ST} = \text{Rs 220} + \text{Rs 11} = \text{Rs 231.}$$

Illustration 11.24

Ram paid Rs 8400 for a refrigerator including a tax (VAT) of 12.5%. Find the price of refrigerator before VAT was added.

Sol. If the price without VAT is Rs. 100 then price including VAT is 112.5

When price including VAT is Rs 112.5, original price is Rs 100.

$$\text{Now, the price including VAT is Rs 8400, the original price} = \text{Rs} \frac{100}{112.5} \times 8400 \cong \text{Rs. 7466.}$$

Ask yourself

1. A shopkeeper purchased 100 blankets at Rs. 2000 each. He found that 10 blankets were defective and he sold these at Rs. 1200 each. At what rate should he sell the remaining blankets so as to gain 14% on the whole ?
2. Sarita and Salma purchased one buffalo each for the same price. Sarita sold it for Rs. 14880 and lost 7%. At what price should Salma sell her buffalo so as to earn a profit of 5% ?
3. William sells a quintal of wheat for Rs. 924 and earns a profit of 12%. By selling a quintal of rice for the same amount he loses 12%. Find
 - (i) C.P. of wheat.
 - (ii) C.P. of rice.
4. Find the S.P. when
 - (i) M.P. = Rs. 320 and discount = 12.5%.
 - (ii) M.P. = Rs. 990 and discount = 10%
5. A discount of 3% is offered on the marked price of sewing machines. What cash amount will a customer pay for a sewing machine, the price of which is marked at Rs. 1300 ?
6. List price of a scooter is Rs. 35000. It is available at a discount of 8%. Find the selling price of the scooter.

Answers

- | | | | | | | |
|----|---------------|--------------|-----------|----------|-------------|---------------|
| 1. | Rs. 2400 each | 2. | Rs. 16800 | 3. | (i) Rs. 825 | (ii) Rs. 1050 |
| 4. | (i) Rs. 280 | (ii) Rs. 891 | 5. | Rs. 1261 | 6. | Rs. 32200 |
-

Add your knowledge _____

Important concepts associated with percentage

1. Conversion of Fractions into Percentages :

Knowing conversion of common fractions into percentages helps you convert many fractions into percentage immediately, For example, knowing that $\frac{1}{8} = 12.5\%$ will help you

convert fractions like $\frac{3}{8}$ or $\frac{5}{8}$ into percentages immediately.

❖ **Given below are the fractions converted into percentage.**

Fraction	Percentage	Fraction	Percentage	Fraction	Percentage
$\frac{1}{2}$	50%	$\frac{1}{10}$	10%	$\frac{1}{18}$	5.55%
$\frac{1}{3}$	33.33%	$\frac{1}{11}$	9.09%	$\frac{1}{19}$	5.26%
$\frac{1}{4}$	25%	$\frac{1}{12}$	8.33%	$\frac{1}{20}$	5%
$\frac{1}{5}$	20%	$\frac{1}{13}$	7.69%	$\frac{1}{21}$	4.76%
$\frac{1}{6}$	16.66%	$\frac{1}{14}$	7.14%	$\frac{1}{22}$	4.54%
$\frac{1}{7}$	14.28%	$\frac{1}{15}$	6.66%	$\frac{1}{23}$	4.34%
$\frac{1}{8}$	12.50%	$\frac{1}{16}$	6.25%	$\frac{1}{24}$	4.16%
$\frac{1}{9}$	11.11%	$\frac{1}{17}$	5.88%	$\frac{1}{25}$	4%

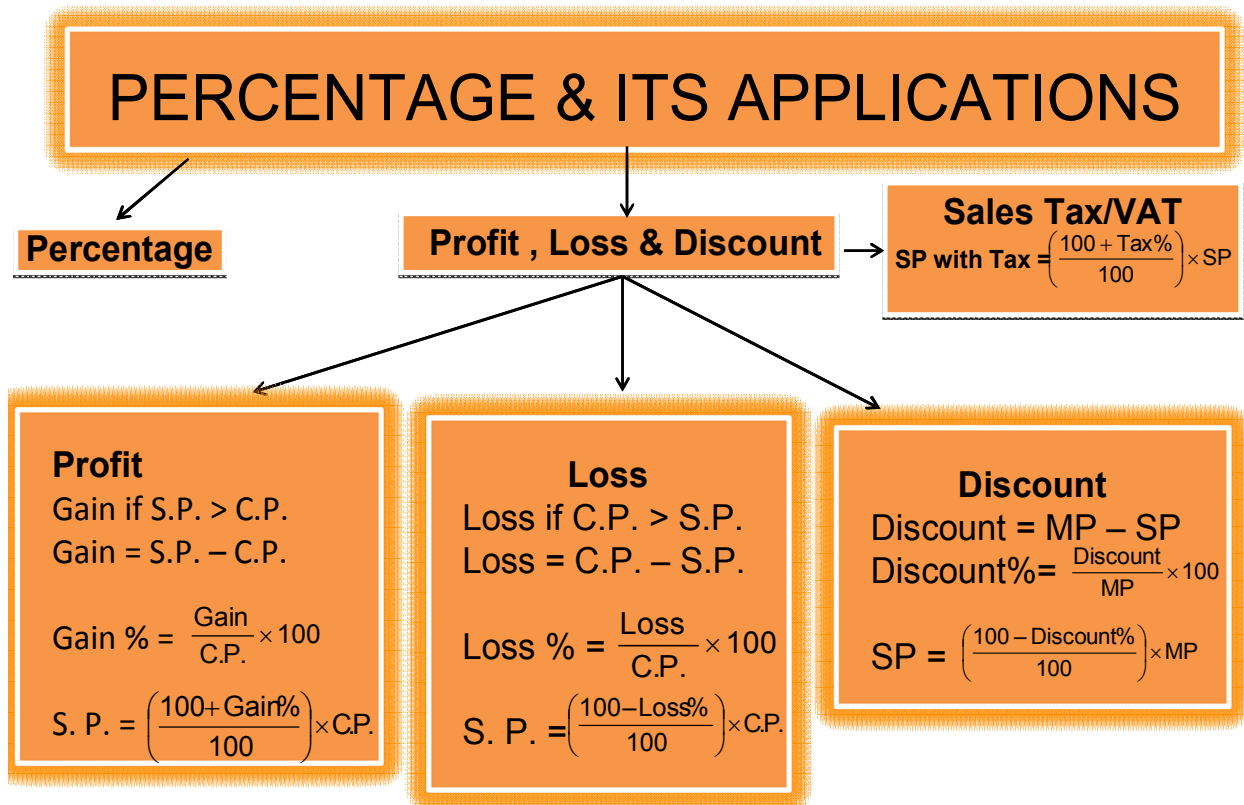
1. The salary of Sachin Tendulkar is 20% more than that of Ricky Ponting. By what percentage is Ricky's salary less than that of Sachin's ?

2. If SP of x articles is same as CP of y articles then

(i) if $x > y \Rightarrow \text{loss \%} = \frac{x-y}{x} \times 100$

(ii) if $x < y \Rightarrow \text{profit \%} = \frac{y-x}{x} \times 100$

Concept Map



Summary

1. In case of profit,

$$S.P. = C.P. \times \left(\frac{100 + \text{Profit \%}}{100} \right)$$

$$C.P. = \frac{100 \times S.P.}{100 + \text{Profit \%}}$$

2. In case of loss,

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

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

3. Discount is usually expressed as a certain percent of the M.P.

4. Discount = M.P. – S.P.

5. Rate of Discount = Discount % = $\frac{\text{Discount}}{\text{M.P.}} \times 100$.

6. $S.P. = M.P. \times \left(\frac{100 - \text{Discount\%}}{100} \right)$.

7. $M.P. = \frac{100 \times S.P.}{100 - \text{Discount\%}}$.

Exercise-1
SECTION -A (FIXED RESPONSE TYPE)
MULTIPLE CHOICE QUESTIONS

1. Passing percentage marks in an exam is 40. A obtained 72 out of 200. By what percent did he fail ?
 (A) 8 % (B) 5 % (C) 4 % (D) 16 %
2. If $x\%$ of $\frac{1}{y} = 16\frac{2}{3}\%$ of $\frac{1}{150}$, then what percent of y is x :
 (A) $11\frac{1}{9}\%$ (B) $9\frac{1}{11}\%$ (C) 10% (D) 9%
3. If all the sides of a cuboid increase by 20%, then by what percentage does its volume increase
 (A) 20% (B) 44% (C) 60% (D) 72.8
4. A's income is 60% of B's income. If A's expenditure is Rs. 260 less than B's and their savings are 10% and 20% of their incomes, find their incomes respectively.
 (A) Rs. 600 and Rs. 1000 (B) Rs. 540 and Rs. 900
 (C) Rs. 1200 and Rs. 2000 (D) None of these
5. If the price of a commodity increases first by 10%, then by 20% and subsequently decreases by 20%, what is the net percentage increase/decrease in the price.
 (A) 10% increase (B) 20% decrease (C) 5.6% decrease (D) None of these
6. A vendor sells 30% of his fruit and throws away 40% of the remainder. Next day he sells 50% of the remainder and throws away the rest. What % of the fruit does the vendor throw ?
 (A) 51% (B) 49% (C) 63% (D) 72%
7. The correct formula is :
 (A) $\text{Profit}\% = \frac{\text{C.P.} \times 100}{\text{Loss}}$ (B) $\text{Profit}\% = \frac{\text{Loss} \times 100}{\text{C.P.}}$
 (C) $\text{Profit}\% = \frac{\text{Profit} \times 100}{\text{C.P.}}$ (D) None of these
8. When S.P. is greater than C.P., then there is always :
 (A) a loss (B) a gain (C) No loss no gain (D) None of these
9. Profit or loss percent are always calculated on :
 (A) C.P. (B) S.P. (C) M.P. (D) None of these
10. The correct relationship is :
 (A) $\text{M.P.} = \text{S.P.} - \text{discount}$ (B) $\text{S.P.} = \text{M.P.} - \text{discount}$
 (C) $\text{M.P.} + \text{S.P.} = \text{discount}$ (D) None of these
11. Single discount equivalent to two successive discounts of 50%, and 50 % is :
 (A) 100% (B) 80% (C) 75% (D) 85%
12. If C.P. of 4 articles is equal to the S.P. of 5 articles, then in this transaction there is :
 (A) a loss (B) a gain (C) No loss no gain (D) None of these

13. A's salary is reduced by 10%. In order to bring his salary back to original position, it must be raised by :
- (A) 10% (B) 12.5% (C) 20% (D) $11\frac{1}{9}\%$
14. A student has to secure 35% marks to pass the examination. If he gets 120 marks and fails by 20 marks, find the maximum marks set for the examination :
- (A) 1000 (B) 400 (C) 350 (D) 700
15. In selling an article for Rs. 76, there is a gain of 52%. the gain by selling that for Rs. 74 is :
- (A) 50% (B) 48% (C) 46% (D) 44%
16. A shop keeper after allowing a discount of 20%, he have 20% profit. How much % he has written above cost price ?
- (A) 52% (B) 55% (C) 50% (D) 48%

FILL IN THE BLANKS

- 6.25% as a decimal is _____
- What percent of 50 is 5 ? _____
- $7\frac{1}{2}\%$ of Rs. 1200 = _____
- 240 mL is _____ % of 3L
- If x% of 35 is 42, then x = _____
- $\frac{12}{5} =$ _____ %
- 120 = _____ % of 80
- If SP is more than CP then a person will have _____.
- MP of a table is Rs. 2000 and discount is 30% then SP is _____

TRUE / FALSE

- To convert a fraction into a percent multiply by 100.
- 40% of 60 is greater than 25% of 90.
- If C.P. = Rs. 400 and loss = 15%, then SP = Rs. 400 – 15% of 400.
- 6% of 8 is 48
- 6 : 5 = 30%
- $\frac{3}{5} = 60\%$
- 6 hours = 25% of a day
- Profit and loss is always calculated on SP
- Discount is always calculated on MP.

MATCH THE COLUMN

- | | |
|---|-----------------------|
| 1. Column-I | Column-II |
| (A) Percentage form of 3 : 4 | (p) $8\frac{1}{3}$ |
| (B) Percentage decrease if price reduces from Rs. 60 to 55 | (q) 25% |
| (C) Percentage increase in price if price increases from Rs. 55 to 60 | (r) 75% |
| (D) Profit percent when SP = 100, CP = 75 | (s) $9\frac{1}{11}\%$ |
| (E) Loss percent when SP = 75, CP = 100 | (t) $33\frac{1}{3}\%$ |
| 2. Column-I | Column-II |
| (A) Discount percent when SP = 80, MP = 100 | (p) 20% |
| (B) Tax rate when basic price = 160, price after tax = 180 | (q) 100 % |
| (C) Gain percent when CP = Rs. 200, Gain Rs. 200 | (r) 40 % |
| (D) Single discount equivalent to two successive discounts of 15% and 20% | (s) $12\frac{1}{2}\%$ |

SECTION -B (FREE RESPONSE TYPE)
VERY SHORT ANSWER TYPE

- Subtracting 40% of a number from the number, we get the result as 30. Then find the number.
- The price of an article is cut 20%. To restore it to its former value, by what percentage the new price must be increased ?
- Rakesh bought a CD for Rs 750 and sold it for Rs 875. Find his gain percent.
- A motor cycle is sold at Rs 23750 after allowing certain discount. If the list price of the motor cycle is Rs 25000, find the discount in percent.

SHORT ANSWER TYPE

- A student scores 80 marks in an examination and fails by 52 marks. If his passing percentage is 33, then what will be the maximum marks in the examination ?
- The salaries of A, B, C are in the ratio 2 : 3 : 5. If the increments of 15%, 10% and 20% are allowed respectively in their salaries, then what will be the new ratio of their salaries ?
- A shopkeeper marks his goods at such a price that after allowing a discount of 30% he makes a profit of 40%. Find the M.P. of an article where C.P. is Rs. 150.

8. Rahim lost the SP of 6 hens by selling 144 hens. Find his loss per cent. Had he purchased them for Rs 7200, what would have been the SP of one hen?
9. Hari bought 20 kg of rice at Rs 18 per kg and 25 kg of rice at Rs 16 per kg. He mixed the two varieties and sold the mixture at Rs 19 per kg. Find his gain per cent in the whole transaction.
10. If 140 mangoes are sold at the cost price of 175 mangoes, what will be the profit percent?

LONG ANSWER TYPE

11. The ratio of the number of boys and girls in a school is 3 : 2. If 20% of the boys and 25% of the girls are scholarship holders, what percentage of the students does not get the scholarship ?
12. A bag contains 600 coins of 25 p denomination and 1200 coins of 50 p denomination. If 12% of 25 p coins and 24% of 50 p coins are removed, find the percentage of money removed from the bag.
13. A man bought certain apples at the rate of Rs 15 for 4 and sold them at the rate of Rs 16 for 5. What will be his profit or loss percent?
14. A man sold each of two cows at Rs 1955. As a result, he made a profit of 15% in one cow and a loss of 15% in the other. What was his total profit or loss?
15. A tradesman marks his goods at 25% above their CP and allows for purchasers a discount of 12.5% for cash. What profit % does he make ?

Exercise-2
SECTION -A (COMPETITIVE EXAMINATION QUESTION)
MULTIPLE CHOICE QUESTIONS

1. What % of 200 is 360 ?
 (A) 80% (B) 36 % (C) 180 % (D) 90 %
2. A shopkeeper weighs 10% more while purchasing and weighs 10% less while selling. His gain by this dishonesty is
 (A) 10% (B) 11% (C) 20 % (D) $22\frac{2}{9}$ %
3. A person gains 8% by selling a taperecorder for 972. If he would have sold it for Rs. 872, his loss would have been
 (A) Rs. 7 (B) Rs. 14 (C) Rs. 21 (D) Rs. 28
4. If a number is increased by 10% and then decreased by 10% the number
 (A) remains same (B) decreases by 1%
 (C) increases by 1% (D) increases by 0.1%
5. 20% of 15% of 10% of 500 is
 (A) 225 (B) 150 (C) 120 (D) 1.50
6. In how much time will a sum triple itself at 20% p.a.?
 (A) 5 years (B) 10 years (C) 15 years (D) 20 years

7. A shopkeeper marks his goods 40% above the cost price and allows 5% discount, his profit percent is
 (A) 25% (B) 15% (C) 20% (D) 33%
8. A man purchased a horse and a cow for Rs. 35500 and Rs. 8500 respectively. On the horse, he lost 10% and on the cow, he gained 10%. Find his total gain or loss percent.
 (A) $\frac{132}{22}$ % (B) $\frac{135}{22}$ % (C) 22% (D) 50%
9. The S.P. of 4 dozen oranges is the same as the C.P. of 5 dozen oranges. Find the gain percent.
 (A) 25% (B) 75% (C) 10% (D) 90%
10. By selling an oven for Rs. 3800, a lady loses 5%. What percent will shee gain or lose if she sells it for Rs. 4500 ?
 (A) $\frac{25}{2}$ % loss (B) $\frac{25}{2}$ % gain (C) 25% gain (D) 25% loss

SECTION -B (TECHIE STUFF)

11. In CP of 5 oranges is same as SP of 4 oranges find the profit or loss percentage.
 (A) 25% profit (B) 25% loss (C) 10% profit (D) 10% loss
12. Income of A is 20% more than income of B then. How much percent income of B is less than income of A.
 (A) 20% (B) 16.66 % (C) 25% (D) 33.33%

Exercise-3

(PREVIOUS YEAR EXAMINATION QUESTIONS)

1. Anil owns a plot worth Rs. 10000. He sells it to Mukesh at a profit of 10%. After sometimes, Mukesh sells it back to Anil at a loss of 10%, then Anil **[NSTSE - 2010]**
 (A) loses Rs. 100 (B) losses Rs. 900 (C) gains Rs. 100 (D) gain Rs. 1100
2. The difference between a discount of 40% and two successive discounts of 36% and 4% for Rs. 10000 is **[NSTSE - 2010]**
 (A) Rs. 0 (B) Rs. 144 (C) Rs. 256 (D) Rs. 400
3. Last year Mr. Nitin earned Rs.5800 from the corn he grew on his farm. This year he expects a 7% increase in the income from corn. How much does he expect to earn from corn this years? **[IMO - 2010]**
 (A) Rs.406 (B) Rs.6,206 (C) Rs.8,600 (D) Rs.9,600
4. Sushmita used 200 square tiles to tile her kitchen floor. Of these, 66 tiles were green. What percent of the tiles were green? **[IMO - 2010]**
 (A) 134% (B) 66% (C) 33% (D) 3.03%
5. Shreya bought an article and sold it for 125% per cent of its cost price. What was the cost price of the article, it Shreya sold it for Rs.30,750 ? **[IMO - 2011]**
 (A) Rs. 24,600 (B) Rs.25,640 (C) Rs.24,250 (D) Rs.23,200

6. If 35% of a number is 12 less than 50% of that number, then the number is _____. **[IMO - 2011]**
 (A) 40 (B) 50 (C) 60 (D) 80
7. Soha purchased an item for Rs.9,600 and sold it for loss of 5 per cent. From that money she purchased another item and sold it for gain of 5 per cent. What is her overall gain/loss? **[IMO - 2011]**
 (A) Loss of Rs.36 (B) Profit of Rs.24 (C) Loss of Rs. 24 (D) None of these
8. Out of a number of electronic items, Rohit purchases 60% coloured T.Vs. 5% of these are found to be defective. The percentage of defective T.Vs in all is _____. **[IMO - 2011]**
 (A) 3% (B) 6% (C) 12% (D) Can't be determined
9. Harry goes to a shop to buy a watch costing Rs.1404 including sales tax of 8%. He asks the shopkeeper to reduce the price of the watch so that he can save an amount equal to the sales tax. The reduction in the price of the watch is _____. **[IMO - 2011]**
 (A) Rs.108 (B) Rs.104 (C) Rs.112.32 (D) None of these
10. A person wants to reduce the trade tax so he calculates his profit on the sale price instead of on the cost price. In this way by selling an article for Rs. 280 he calculates his profit as $14\frac{2}{7}\%$. What is the actual profit percentage? **[IMO - 2011]**
 (A) 20 % (B) 16.66 % (C) 25 % (D) None of these
11. The population of a town increased at the rate of 10% p.a. If in the year 2009 it was 3.2×10^7 , then what will it be in the year 2012 ? **[NSTSE - 2012]**
 (A) 4.2592×10^7 (B) 4259200 (C) 3.963×10^8 (D) 39860000
12. Rajesh bought an arm chair for Rs. 2200 and sold it for Rs 2420. Find his profit percentage ? **[NSTSE - 2012]**
 (A) 5% (B) 10% (C) 12% (D) 15%
13. A merchant marks his goods at Rs.300 and allows a discount of 25 %. If he still gains 12.5 %, then the cost price of article is _____. **[IMO - 2012]**
 (A) Rs. 220 (B) Rs.200 (C) Rs.240 (D) Rs.260
14. Latika owns a mobile worth 10000. She sells it to Priya at a profit of 10% based on the worth of the mobile. Priya sells the mobile back to Latika at a loss of 10%. In this transaction Latika gets _____. **[IMO - 2012]**
 (A) No profit No loss (B) Profit of 1000 (C) Profit of 1100 (D) Loss of 1100
15. A trader lists his articles 20% above C.P. and allows a discount of 10% on cash payment. His gain percent is . **[IMO - 2012]**
 (A) 10% (B) 8% (C) 6% (D) 5%
16. If 5% more is gained by selling an article for Rs. 350 than by selling it for Rs 340. What is the cost of the article **[NSTSE - 2013]**
 (A) Rs. 50 (B) Rs. 160 (C) Rs. 200 (D) Rs. 225

17. Two students appeared in an examination. One of them secured 9 marks more than the other and his marks were 56% of the sum of their marks. The lesser marks obtained are **[Aryabhata -2013]**
(A) 30 (B) 34 (C) 32 (D) 33
18. A's salary is half that of B. If A got a 50% rise in his salary and B got a 25% rise in his salary, then the percentage increase in combined salaries of both is **[Aryabhata - 2013]**
(A) 25 (B) $33\frac{1}{3}$ (C) 75 (D) None of these
19. A candidate get 20% marks fails by 10 marks but another candidate who gets 42% marks gets 12 more than the passing marks. Find the maximum marks. **[Aryabhata -2013]**
(A) 150 (B) 100 (C) 200 (D) 250
20. A student has to secure 40% marks to pass a test. He got 30 marks and failed by 50 marks. What is the maximum marks of the test ? **[NSTSE - 2014]**
(A) 160 (B) 180 (C) 200 (D) 320
21. A man bought goods worth Rs. 6000 and sold half of them at a gain of 10%. At what gain percent must be sell the remainder to get a gain of 25% on the whole ? **[NSTSE - 2014]**
(A) 40% (B) 25% (C) 35% (D) 20%

Answer Key

Exercise-1

SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ans.	C	A	D	A	D	B	C	B	A	B	C	A	D	B	B	C

FILL IN THE BLANKS

1. 0.0625 2. 10 3. 90 4. 8
5. 120 6. 240 7. 150 8. profit
9. Rs. 1400

TRUE / FALSE

1. True 2. True 3. True 4. False
5. False 6. True 7. True 8. False
9. True

MATCH THE COLUMN

1. (A) – r, (B) – p, (C) – s, (D) – t, (E) – q 2. (A) – p, (B) – s, (C) – q, (D) – r

SECTION -B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. 50 2. 25% 3. $16\frac{2}{3}\%$ 4. 5%.

SHORT ANSWER TYPE

5. 400 6. 23 : 33 : 60 7. Rs. 300 8. 4% or Rs. 48
9. 12.5 % 10. 25 %

LONG ANSWER TYPE

11. 78% 12. 21.6% 13. $14\frac{2}{3}\%$ loss 14. Rs. 90 loss
15. 9.4 %

Exercise-2

SECTION -A (COMPETITIVE EXAMINATION QUESTION)

MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12
Ans.	C	D	D	B	D	B	D	B	A	B	A	B

Exercise-3

PREVIOUS YEAR EXAMINATION QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	D	B	B	C	A	D	C	A	B	B	A	B	B	C	B	C	D	B	B	C
Ques.	21																			
Ans.	A																			