PERCENTAGE AND ITS APPLICATIONS

CONTENTS

- Ratio
- Equivalent Ratio
- Proportion
- Percentage
- Profit and Loss
- Profit and Loss Percent
- Simple Interest

We can compare two quantities by two methods.

1. **By finding the differences of their magnitudes :**

   When we want to see how much more or less one quantity is than the other, we find the difference of their magnitudes and such a comparison is known as comparison by difference.

2. **By finding the division of their magnitudes:**

   If we want to see how many times more (or less) one quantity is than the other, we find the ratio (or division) of their magnitudes and such a comparison is known as the comparison by division.

➢ RATIO

Ratio is the comparison by division of same kind of quantities or the ratio of two quantities of same kind and in same units is a fraction that shows how many times the one quantity is of the other.

The ratio a is to b is the fraction $\frac{a}{b}$, and is written as a : b.

We call 'a' as the first term or antecedent and 'b' the second term or consequent.

Note :

1. A ratio remains unchanged if both of its terms are multiplied by the same non-zero quantity. Let $k \neq 0$, then clearly,

   (i) $\frac{a}{b} = \frac{ka}{kb}$ and therefore a : b = ka : kb

   (ii) $\frac{a}{b} = \frac{a/k}{b/k}$ and therefore a : b = $\left(\frac{a}{k} : \frac{b}{k}\right)$

2. The ratio a : b is said to be in simplest form if HCF of a and b is 1.

❖ EXAMPLES ❖

Ex.1 Express 60 : 90 in its simplest form.

Sol. In order to express the given ratio in its simplest form we divide its first and second term by their HCF.

We have $60 = 2 \times 2 \times 3 \times 5$

$90 = 2 \times 3 \times 3 \times 5$

So, HCF of 60 and 90 is $2 \times 3 \times 5$ i.e., 30.

$$\therefore \quad 60 : 90 = \frac{60}{90} = \frac{60 \div 30}{90 \div 30} = \frac{2}{3} = 2 : 3$$

Hence, the simplest form of 60 : 90 is 2 : 3.

◈ Comparison of Ratios

In order to compare two given ratios, we express each of them in simplest form and then compare these fractions by making their denominators equal.

Ex.2 Compare 5 : 12 and 3 : 5

Sol. Writing, the given ratio as fractions, we have

$$5 : 12 = \frac{5}{12} \text{ and } 3 : 5 = \frac{3}{5}$$

LCM of 12 and 5 is 60.

Making the denominator of each fraction equal to 60, we have

$$\frac{5}{12} = \frac{5\times5}{12\times5} = \frac{25}{60} \text{ and } \frac{3}{5} = \frac{3\times12}{5\times12} = \frac{36}{60}$$

Clearly, 36 > 25.

$$\therefore \quad \frac{36}{60} > \frac{25}{60} \Rightarrow \frac{3}{5} > \frac{5}{12}$$

➢ EQUIVALENT RATIO

A ratio obtained by multiplying or dividing the numerator and denominator of a given ratio by the same non zero number is called an equivalent ratio.

❖ EXAMPLES ❖

Ex.3 Find two equivalent ratio of 12 : 8.

Sol. We have $\frac{12}{8} = \frac{12\div4}{8\div4} = \frac{3}{2}$

$\therefore$ 3 : 2 is an equivalent ratio of 12 : 8.

Also, $\frac{12}{8} = \frac{12\times2}{8\times2} = \frac{24}{16}$

So, 24 : 16 is an equivalent ratio of 12 : 8.

Hence, 3 : 2 and 24 : 16 are two equivalent ratio of 12 : 8.

◈ Unitary Method

Ex.4 If 12 bowls cost ₹ 72, What will be the cost of 20 such bowl ?

Sol. Θ cost of 12 bowl = ₹ 72

$\therefore$ cost of 1 bowl = ₹ $\frac{72}{12}$ = ₹ 6

Hence, cost of 20 bowl = ₹ 6 × 20 = ₹ 120

➢ PROPORTION

Four numbers a, b, c, d are said to be in proportion, if a : b = c : d and we write a : b :: c : d or in other words we can say that an equality of two ratios is called a proportion.

(i) The first and fourth terms are called extreme terms, second and third terms are called mean terms.

If product of means = product of extremes, then given numbers are in proportion.

(ii) d is called the fourth proportional to a, b, c.

❖ EXAMPLES ❖

Ex.5 Are 25, 15, 6, 5 in proportion ?

Sol. We have a = 25, b = 15, c = 6, d = 5

a : b = 25 : 15 = 5 : 3

c : d = 6 : 5

as a : b ≠ c : d

$\therefore$ 25, 15, 6, 5 are not in proportion.

Alternative method

Product of extemes = ad = 25 × 5 = 125

Product of means = bc = 15 × 6 = 90.

as ad ≠ bc.

$\Rightarrow$ 25, 15, 6, 5 are not in proportion.

Ex.6 Find the ratio of

(i) ₹ 5 to 50 paise (ii) 15 kg to 210 gm

(iii) 9 m to 27 cm (iv) 30 days to 36 hours.

Sol. (i) ₹ 5 to 50 paise

= 5 × 100 paise to 50 paise

= 500 : 50

= 10 : 1 (dividing first and second term by their HCF i.e. by 50)

(ii) 15 kg to 210 gm

= 15 × 1000 gm to 210 gm

= 15 × 1000 : 210 = 15000 : 210

= 500 : 7 (HCF of 15000 and 210 is 30, so dividing I and II terms by 30)

(iii) 9 m to 27 cm

= 9 × 100 cm to 27 cm

= 900 : 27

= 100 : 3 (dividing I and II terms by the HCF of 900 and 27 which is 9)

(iv) 30 days to 36 hours

= 30 × 24 hours to 36 hours

= 30 × 24 : 36 = 720 : 36

= 20 : 1 (dividing I and II terms by the HCF of 720 and 36 which is 36)

Ex.7 In a computer lab, there are 3 computer for every 6 students. How many computer will be needed for 24 students ?

Sol. 6 students have = 3 computers

$$1 \text{ student has} = \frac{3}{6} \text{ computers}$$

$$24 \text{ students have} = \frac{3}{6} \times 24 \text{ computers}$$

$$= 12 \text{ computers}$$

Hence, 24 students will be needed 12 computers

Ex.8 Population of Rajasthan is 570 lakh and population of UP is 1660 lakh. Area of Rajasthan is 3 lakh km^2 and area of UP is 2 lakh km^2.

(i) How many people are there per km^2 in both these state ?

(ii) Which state is less populated ?

Sol. (i) Population of Rajasthan = 570 lakh

Area of Rajasthan = 3 lakh km^2.

$$\therefore \text{ Number of people in per } km^2 = \frac{570}{3} = 190$$

and population of U.P. = 1660 lakh

Area of U.P. = 2 lakh km^2.

$$\therefore \text{ Number of people in per } km^2 = \frac{1660}{2} = 830.$$

(ii) As population of Rajasthan per km^2 is less than the population of U.P. per km^2 so Rajasthan state is less populated.

Ex.9 The daily pocket expenses of X and Y are ₹ 45 and ₹ 90 respectively. What is the ratio of their expenses in simplest form ?

Sol. HCF of 45 and 90 = 45

Required ratio = 45 : 90

$$= \frac{45}{90} = \frac{45 \div 45}{90 \div 45} = \frac{1}{2}$$

Hence, required ratio is 1: 2.

Ex.10 Are 63 42, 33, 22 in proportion ?

Sol. Let a = 63, b = 42, c = 33, d = 22.

As product of extremes = 63 × 22 = 1386

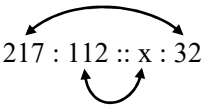
Product of means = 33 × 42 = 1386.

So, Product of extremes = Product of means

Hence, 63, 42, 33, 22 are in proportion.

Ex.11 The first, second and fourth terms of a proporiton are 217, 112, 32. Find the third term.

Sol. Let the third term of the proportion be x.



We know that if numbers in proportion, then product of means = product of extremes

$$\Rightarrow \quad 112 \times x = 217 \times 32$$

$$\Rightarrow \qquad x = \frac{217 \times 32}{112} \; ; \; x = 62$$

Hence, the third term of the given proportion is 62.

Ex.12 Express the ratio (i) 24 to 48 (ii) 12 cm to 1 m in their simplest form.

Sol. (i) $24 \text{ to } 48 = \frac{24}{48} = \frac{1}{2}$

(dividing both the numbers by 24)

(ii) before comparing 12 cm and 1 m they must be expressed in the same unit.

$$\therefore \quad \frac{12\text{cm}}{1\text{m}} = \frac{12\text{cm}}{1 \times 100\text{cm}} = \frac{12}{100} = \frac{3}{25}$$

So 12 cm : 1 m = 3 : 25

Ex.13 Express the following ratios in their simplest form :

(i) $2 : \frac{3}{4}$

(ii) $\frac{6}{7} : \frac{15}{14}$

Sol. (i) $2 : \frac{3}{4} = 2 \times 4 : \frac{3}{4} \times 4$

(Multiplying both the numbers by 4)

= 8 : 3

(ii) $\frac{6}{7} : \frac{15}{14} = \frac{6}{7} \div \frac{15}{14} = \frac{6}{7} \times \frac{14}{15} = \frac{4}{5}$

$$\therefore \quad \frac{6}{7} : \frac{15}{14} = \frac{4}{5} = 4 : 5$$

Ex.14 Which ratio is greater, 5 : 4 or 7 : 6 ?

Sol. To compare 5 : 4 and 7 : 6 we need to compare $\frac{5}{4}$ and $\frac{7}{6}$ so that we may express both of them with the same denominator.

$$\therefore \quad \frac{5}{4} = \frac{5\times 6}{4\times 6} = \frac{30}{24} \text{ and } \frac{7}{6} = \frac{7\times 4}{6\times 4} = \frac{28}{24}$$

Clearly, $\frac{30}{24} > \frac{28}{24}$ or 5 : 4 > 7 : 6.

Ex.15 A family has 15 pets of which 6 are cats or kittens, 3 are dogs and the rest are birds. Find the ratio of the numbers of

(i) birds to dogs (ii) birds to pets

Sol. (i) Total no. of pets = 15

No. of cats or kittens = 6

No. of dogs = 3

No. of birds = Total no. of pets

– (No. of cats + No. of dogs)

= 15 – (6 + 3) $\Rightarrow$ 15 – 9 = 6

So, the no. of birds = 6

There are 6 birds and 3 dogs.

So, the number of birds : number of dogs

= 6 : 3 = 2 : 1

(ii) There are 6 birds and 15 pets

So, the number of birds : number of pets

= 6 : 15 = 2 : 5

Ex.16 Find the missing numbers in the following ratios :

(i) $\square$: 15 = 8 : 10 (ii) $\frac{\square}{4} = \frac{15}{10}$

Sol. (i) Let the missing number be x.

therefore, x : 15 = 8 : 10

$$\Rightarrow \frac{x}{15} = \frac{8}{10} \Rightarrow x = \frac{15\times 8}{10} = \frac{3\times 8}{2} = 3\times 4 = 12$$

(ii) Let the missing number be x

Therefore, $\frac{x}{4} = \frac{15}{10}$

$$\Rightarrow \quad x = \frac{15\times 4}{10} = \frac{60}{10} = 6$$

Ex.17 Two length are in the ratio 3 : 7. The second length is 42 cm. Find the first length.

Sol. Let the first length be x cm. Then we write the ratio of the length as x : 42; but it must be equal to the given ratio 3 : 7

$$\therefore \qquad 3 : 7 = x : 42 \Rightarrow \frac{x}{42} = \frac{3}{7}$$

$$x = \frac{3}{7} \times 42 = \frac{3\times 6}{1} = 18$$

Hence, the first length is 18 cm.

Ex.18 In a class of 60 pupils the ratio of the number of boys to the number of girls is 7 : 8. How many boys and girls are there ?

Sol. Given that 7 are boys and 8 are girls so they are 15 together.

Therefore, boys are 7 out of 15, i.e., $\frac{7}{15}$ of 60.

and girls are 8 out of 15, i.e. $\frac{8}{15}$ of 60.

$\therefore$ The number of boys = $\frac{7}{15}$ of 60

$$= \frac{7}{15} \times 60 = 7 \times 4 = 28$$

and the number of girls = $\frac{8}{15} \times 60 = 8 \times 4 = 32$

Check : 28 + 32 = 60

Ex.19 Divide ₹2600 amongst three people so that their shares are in the ratio 4 : 5 : 4.

Sol. Given ratio is 4 : 5 : 4

Now sum of the rations = 4 + 5 + 4 = 13

Therefore, the share of first person is 4 out of 13.

i.e., $\frac{4}{13} \times$ ₹2600 = 4 × ₹200 = ₹800

Similarly, the share of the second person is 5 out of 13.

i.e., $\frac{5}{13} \times$ ₹2600 = 5 × ₹200 = ₹1000

and the share of the third person is 4 out of 13

i.e., $\frac{4}{13} \times$ ₹2600 = 4 × ₹200 = ₹800

Check : ₹800 + ₹1000 + ₹800 = ₹2600

Alternative Method :

Let the shares be 4x, 5x and 4x

Now the sum of shares = 4x + 5x + 4x = 13x

According to the questions 13x = ₹ 2600

$\Rightarrow x = \frac{₹\,2600}{13} = ₹\,200$

Hence the share of first person is

$4x = 4 \times 200 = ₹\,800$

Share of second person

$= 5x = 5 \times ₹\,200 = ₹\,1000$

and share of the third person

$= 4x = 4 \times ₹\,200 = ₹\,800$

Check : Sum of shares

$= ₹\,800 + ₹\,1000 + ₹\,800 = ₹\,2600$

➢ PERCENTAGE

When we take 100 as the denominator of fractions, the numerators are called percentages. For convenience, the symbol % is used for percent.

Or

''A percentage is simply a ratio in which the second term is arranged to be 100''. Also percent is an abbreviation of the Latin phrase per centum, meaning per hundred or hundredths.

(i) A fraction may be converted into a percentage by multiplying that fraction by 100%. This does not change its value, since 100% is 1.

(ii) A decimal may be converted into a percentage by multiplying it by 100%.

❖ EXAMPLES ❖

Ex.20 Express $\frac{7}{20}$ as a percentage.

Sol. $\frac{7}{20} = \frac{7}{20} \times 100\% = 35\%$

Ex.21 Express 0.625 as a percentage.

Sol. $0.625 = 0.625 \times 100\% = 62.5\%$

Ex.22 Write (a) $\frac{1}{4}$ (b) $\frac{22}{44}$ (c) $\frac{4}{25}$ as percent.

Sol. (a) We have $\frac{1}{4} = \left(\frac{1}{4} \times 100\right)\% = \left(\frac{100}{4}\right)\% = 25\%$

(b) $\frac{22}{44} = \left(\frac{22}{44} \times 100\right)\% = 50\%$

(c) $\frac{4}{25} = \left(\frac{4}{25} \times 100\right)\% = 16\%$

Ex.23 Out of 50 students in a class, 15 like to play cricket. What is percentage of students who like to play cricket ?

Sol. Total students = 50

Students who like to play cricket = 15

So, % age of students who like to play cricket

$= \left(\frac{15}{50} \times 100\right)\% = 30\%$.

Ex.24 Convert the given decimals to percent :

(a) 0.6 (b) 0.75

(c) 0.08 (d) 0.56

Sol. We have

(a) $0.6 = (0.6 \times 100)\% = 60\%$

(b) $0.75 = (0.75 \times 100)\% = 75\%$

(c) $0.08 = (0.08 \times 100)\% = 8\%$

(d) $0.56 = (0.56 \times 100)\% = 56\%$

Ex.25 Convert a percentage into fraction

(i) 45% (ii) 65% (iii) 42.5%

Sol. We have

(i) $45\% = \frac{45}{100} = \frac{9}{20}$

(ii) $65\% = \frac{65}{100} = \frac{13}{20}$

(iii) $42.5\% = \frac{42.5}{100} = \frac{425}{1000} = \frac{85}{200} = \frac{17}{40}$.

Ex.26 Convert each of the following into decimal fraction :

(a) 53% (b) 0.38% (c) 4.7%

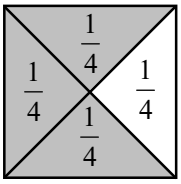
Sol. (a) $53\% = \frac{53}{100} = 0.53$

(b) $0.38\% = \frac{0.38}{100} = 0.0038$

(c) $4.7\% = \frac{4.7}{100} = \frac{47}{1000} = 0.047$.

Ex.27 What percentage of the adjoining figure is shaded and what percentage is unshaded ? Find it.

Sol. First we find the fraction of the figure that is shaded or unshaded. From this fraction we will find the percentage of the shaded and unshaded regions.



So, shaded region $= \left(\frac{1}{4}+\frac{1}{4}+\frac{1}{4}\right)=\frac{3}{4}$

Now, percentage of shaded region

$$= \left(\frac{3}{4}\times 100\right)\% = 75\%$$

Unshaded region $= \frac{1}{4}$

Now, percentage of unshaded region

$$= \left(\frac{1}{4}\times 100\right)\% = 25\%$$

◈ Uses of Percentages

1. Interpreting percentages.
2. Converting percentage to 'How many'.
3. Converting ratio to percentage.
4. Increase or decrease as percent.

Eg. : Raju invests 10% of his pocket money in buying toffees means ₹ 10 out of ₹ 100 are invested by Raju in buying the toffees.

Eg. : A local cricket team played 20 matches in one season. It won 25% of them. How many matches did they win ?

Here, the total number of matches played are 20. Out of these 25% are won by the team.

I method (direct). Out of 100, 25 matches are won by the team. So, out of 20, number of matches won by the team

$$= \frac{25}{100}\times 20$$

= 5 matches.

II method (using percentage).

$$25\% \text{ of } 20 = \frac{25}{100}\times 20 = 5\,.$$

❖ EXAMPLES ❖

Ex.28 Convert each of the following ratios into a percentage :

(i) 15 : 45

(ii) 3 : 5

Sol. We have,

$$\text{(i) } 15:45 = \frac{15}{45} = \left(\frac{15}{45}\times 100\right)\%$$

$$= \left(\frac{3}{9}\times 100\right)\%$$

$$= \left(\frac{1}{3}\times 100\right)\%$$

$$= \frac{100}{3}\% = 33\frac{1}{3}\%$$

$$\text{(ii) } 3:5 = \left(\frac{3}{5}\times 100\right)\% = 60\%$$

Ex.29 Arun bought a car for ₹ 3,50,000. The next year, the price went upto ₹ 3,70,000. What was the percentage of price increase?

Sol. Original price = ₹ 3,50,000

Change in price = ₹ 3,70,000 – ₹ 3,50,000 = ₹ 20,000.

Percentage increase

$$= \frac{\text{Amount of change in price}}{\text{Original price}}\times 100$$

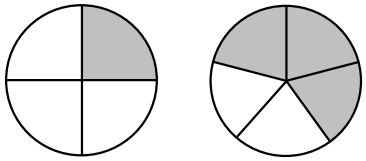
$$= \frac{20,000}{3,50,000}\times 100 = \frac{2}{35}\times 100$$

$$= \frac{2}{7}\times 20 = \frac{40}{7} = 5\frac{5}{7}$$

Percentage increase $= 5\frac{5}{7}\%$

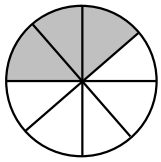
Hence, percentage increase in price of car $= 5\frac{5}{7}\%$

Ex.30 Estimate what region of the following figures is shaded and hence find percentage of that shaded region.



(i)

(ii)



(iii)

Sol. We have,

(i) Shaded region $= \frac{1}{4}$

$$\% \text{ of shaded region} = \left(\frac{1}{4}\times 100\right)\% = 25\%$$

(ii) Shaded region $= \frac{3}{5}$

$$\% \text{ of shaded region} = \left(\frac{3}{5}\times 100\right)\% = 60\%$$

(iii) Shaded region $= \frac{3}{8}$

$$\% \text{ of shaded region} = \left(\frac{3}{8}\times 100\right)\%$$

$$= \left(\frac{3}{2}\times 25\right)\% = \frac{75}{2}\% = 37.5\%$$

Ex.31 Find

(i) 15% of 250 (ii) 1% of 1 hour

(iii) 20% of ₹ 2500 (iv) 75% of 1kg

Sol. (i) $15\% \text{ of } 250 = \frac{15}{100}\times 250 = \frac{15}{4}\times 10 = 37.5$

(ii) $1\% \text{ of 1 hour} = \left(\frac{1}{100}\times 1\right)\text{hour}$

$$= \left(\frac{1}{100}\times 60\right) = \frac{3}{5}\text{ min or } \left(\frac{3}{5}\times 60\right)\text{sec}$$

$$= \frac{3}{5}\text{ min or 36 sec}$$

(iii) 20% of ₹ $2500 = \frac{20}{100}\times 2500 = \frac{1}{5}\times 2500$

$$= ₹\ 500$$

(iv) $75\% \text{ of } 1\text{ kg} = \left(\frac{75}{100}\times 1\right)\text{kg} = 0.75\text{ kg}$

Ex.32 Convert given percents to decimal fractions and also to fractions in simplest form :

(i) 25% (ii) 150% (iii) 20% (iv) 5%

Sol.

S.No.	Percentage	Fraction	*Decimal*
(i)	25%	$\frac{25}{100}=\frac{1}{4}$	*0.25*
(ii)	150%	$\frac{150}{100}=\frac{3}{2}$	*1.50*
(iii)	20%	$\frac{20}{100}=\frac{1}{5}$	*0.20*
(iv)	*5%*	$\frac{5}{100}=\frac{1}{20}$	*0.05*

Ex.33 Convert each of the ratio to percentage :

(i) 3 : 1 (ii) 2 : 3 : 5

Sol. (i) Given, 3 : 1

Total $= 3 + 1 = 4$

Which shows in fractions : $\frac{3}{4}$ and $\frac{1}{4}$

Also, $\frac{3}{4} = \left(\frac{3}{4}\times 100\right)\% = 75\%$

$$\frac{1}{4} = \left(\frac{1}{4}\times 100\right)\% = 25\%.$$

(ii) Given 2 : 3 : 5

Total $= 2 + 3 + 5 = 10$

Which shows in fraction : $\frac{2}{10}, \frac{3}{10}, \frac{5}{10}$.

Also $\frac{2}{10} = \left(\frac{2}{10}\times 100\right)\% = 20\%$

$$\frac{3}{10} = \left(\frac{3}{10}\times 100\right)\% = 30\%$$

$$\frac{5}{10} = \left(\frac{5}{10}\times 100\right)\% = 50\%$$

Ex.34 The population of a city decreased from 25,000 to 24,500. Find the percentage decrease.

Sol. Percentage decrease

$$= \frac{\text{Decrease in population}}{\text{Initial population}} \times 100$$

$$= \frac{25000 - 24500}{25000}$$

$$= \left(\frac{500}{25000} \times 100\right)\% = 2\%$$

Ex.35 In a city 30% are females, 40% are males and remaining the children. What % are children ?

Sol. Percentage of females = 30%

Percentage of males = 40%

Percentage of children = (100 – 30 – 40)% = 30%

Ex.36 (i) Chalk contains calcium, carbon and oxygen in the ratio 10 : 3 : 12. Find the percentage of carbon in chalk.

(ii) If in a stick of chalk, carbon is 3g, what is the weight of the chalk stick ?

Sol. (i) As chalk contains,

Calcium : Carbon : Oxygen = 10 : 3 : 12

Total = 10 + 3 + 12 = 25

Carbon in chalk = $\frac{3}{25}$

percentage of carbon in chalk

$$= \left(\frac{3}{25} \times 100\right)\% = 12\%$$

(ii) As ratio of Calcium, Carbon and oxygen in chalk is

10 : 3 : 12

Total = 10 + 3 + 12 = 25

If Carbon = 3g

$$3\text{gm} = \frac{3}{25} \times \text{chalk}$$

$$\text{Chalk} = \frac{3 \times 25}{3}\text{ gm}$$

So, weight of chalk = 25 gm

Ex.37 If in a school 45% are girls, what percentage are boys ?

Sol. If 45% are girls, then (100 – 45)% are boys i.e., 55% are boys

Ex.38 In a particular town if 85% houses have a telephone, what percentage do not have

Sol. All house (i.e. 100% of houses) either have or do not have a telephone.

If 85% have a telephone, then (100 – 85)% do not, i.e., 15% do not have telephone

Ex.39 Express 15 cm as a percentage of 3 m.

Sol. First express 3m in cm to bring both quantities to the same unit.

$\therefore$ 3 m = 3 × 100 cm = 300 cm

Then the first quantity as a percentage of the second quantity is

$$\frac{15}{300} \times 100\% = \frac{1}{20} \times 100\% = 5\%$$

Ex.40 Express 33.6 g as a percentage of 80g.

Sol. The first quantity as a percentage of the second quantity is

$$\frac{33.6}{80} \times 100\% = \frac{3360}{80}\% = \frac{336}{8}\% = 42\%$$

Ex.41 Find the value of

(i) 44% of 650 km (ii) $3\frac{1}{8}\%$ of 64 kg

Sol. (i) $44\%\text{ of }650\,\text{km} = \frac{44}{100} \times 650 = \frac{44 \times 65}{10} = 286\,\text{km}$

(ii) $3\frac{1}{8}\%\text{ of }64\text{ kg} = \frac{25}{8}\%\text{ of }64\text{ kg}$

$$= \frac{25}{8} \times \frac{1}{100} \times 64 = \frac{200}{100} = 2\text{ kg}$$

Ex.42 Find the value of $82\frac{1}{2}\%$ of 16 mm.

Sol. $82\frac{1}{2}\%\text{ of }16\text{ mm} = \frac{165}{2}\%\text{ of }16\text{mm}$

$$= \frac{165}{200} \times 16\text{ mm}$$

$$= \frac{165 \times 2}{25}\text{ mm} = \frac{33 \times 2}{5}\text{ mm} = \frac{66}{5}\text{ mm} = 13.2\text{ mm}$$

Ex.43 William travelled a distance of 10 km. He covered 70% of the distance by bus and the remaining on foot. What distance did he travel by bus ? How much distance did he cover on foot ?

Sol. Distance covered by bus = 70% of 10 km

$$= \frac{70}{100} \times 10 = 7 \text{ km}$$

Distance covered on foot = 10 km – 7 km

= 3 km

Ex.44 55% of the population of a town is male. If the total population of the town is 128200, find the female population of the town.

Sol. Male population of the town = 55% of 128200

$$= \frac{55}{100} \times 128200 = 70510$$

Therefore, the female population of the town

= 128200 – 70510 = 57690

Ex.45 A person donates 6% of his total savings to the Prime Minister's Relief Fund. He divides the remaining money equally between his one son and one daughter. If the total saving of the person is ₹ 1500000, find the amount donated to the Prime Minister's Relief Fund. Find the amounts received by his son and daughter respectively

Sol. Amount donated to the Prime Minister's Relief Fund = 6% of ₹ 15,00,000

$$= \frac{6}{100} \times ₹\ 15,00,000$$

= ₹ 90000

Amount of savings left after donation to P.M.'s Relief Fund = ₹ 15,00,000 – ₹ 90,000

= ₹ 14,10,000

Amount of received by his son

= ₹ 14,10,000 ÷ 2 = ₹ 7,05,000

because the remaining amount of his savings has been divided between his son and daughter equally. So amount of received by his daughter = ₹ 7,05,000.

Ex.46 There are 800 students in a school, out of which 560 are girls. Find the percentage of girl students in the school.

Sol. Required percentage of girl students

$$= \frac{560}{800} \times 100 = 70\%$$

Ex.47 Out of an income of ₹ 15000, Hardik spends ₹ 10200. What percentage of his income does be save ?

Sol. Hardik's total income is ₹ 15000.

Hardik's spending is ₹ 10200.

His saving is ₹ (15000 – 10200)

= ₹ 4800

Therefore, required percentage of his saving

$$= \frac{4800}{15000} \times 100 = 32\%$$

Ex.48 The population of India is 113 crore. If it increases by 1.7% every year, Find India's population after one year.

Sol. India's population = 113 crore

Increased by 1.7%

$$= 113 \text{ crore} + \left(\frac{1.7}{100} \times 113\right) \text{crore}$$

$$= 113 \text{ crore} + \frac{192.1}{100} \text{crore}$$

= 113 crore + 1.921 crore

= 14.921 crore

➢ PROFIT AND LOSS

◈ Cost Price

The price that a person spends to purchase or manufacture some goods is called the cost price. In short, we write C.P. for cost price.

◈ Selling Price

The price at which a shopkeeper or a person sells his good is called the selling price. In short, we write S.P. for selling price

In case of profit	In case of Loss
• Profit = S.P. – C.P.	• Loss = C.P. – S.P.
• S.P. = Profit + C.P.	• C.P. = Loss + S.P.
• C.P. = S.P. – Profit	• S.P. = C.P.– Loss

❖ EXAMPLES ❖

Ex.49 Find the profit or loss :

(i) C.P. = ₹ 176.50 ; S.P. = ₹ 215.80

(ii) C.P. = ₹ 499 ; S.P. = ₹ 357

(iii) C.P. = ₹ 44,450 ; S.P. = ₹ 38,578

Sol. (i) Here S.P. > C.P., therefore

Profit = S.P. – C.P. = ₹ 215.80 – ₹ 176.50

= ₹ 39.30

(ii) Here S.P. < C.P., therefore

Loss = C.P. – S.P.

= ₹ 499 – ₹ 357 = ₹ 142

(iii) Here C.P. > S.P.

So, Loss = C.P. – S.P.

= ₹ 44,450 – ₹ 38,578

= ₹ 5,872

Ex.50 A trade purchased 10 quintals of wheat from a farmer for ₹ 8,750. He sold it at ₹ 11.50 per kg. Find the amount of profit/ loss of the trader.

Sol. We know that 1 quintal = 100 kg

∴ 10 quantials = 10 × 100 kg = 1000 kg

So, the cost price of 1000 kg wheat = ₹ 8,750

Also the selling price of 1kg wheat = 11.50

Therefore, the S.P. of 1000 kg wheat

= 1000 × 11.50

= ₹ 11,500.00

Since S.P. > C.P.

So, the profit = S.P. – C.P.

= ₹ 11,500 – ₹ 8750

= ₹ 2750

Thus, the profit of the trader is ₹ 2750.

Ex.51 A shopkeeper earns a profit of ₹ 325.75 on each sewing machine. If the C.P. of a machine is ₹ 2018.50, what is the selling price ?

Sol. Profit = ₹ 325.75, Cost Price = ₹ 2018.50

∴ S.P. = Profit + C.P.

= ₹ 325.75 + ₹ 2018.50

= ₹ 2344.25

Ex.52 A milkman buys 20 litres of milk from a dairy for ₹ 370. He sells it at the rate of ₹ 21.50 per litre. Find his profit or loss.

Sol. C.P. of 20 litre milk = ₹ 370

S.P. of 1 litre milk = ₹ 21.50

Therefore, S.P. of 20 litres milk

= ₹ 21.50 × 20

= 430

Clearly, S.P. > C.P., so profit

= ₹ 430 – ₹ 370

= ₹ 60

Ex.53 A girl purchased 12 packet for ₹ 156. Each packet contains 10 pencils. She sold all the pencils at a price of ₹ 2 per pencil. Find the profit or loss.

Sol. 12 packets have 12 × 10 = 120 pencils.

C.P. for 120 pencils = ₹ 156

Selling price for 1 pencil = ₹ 2

Therefore, the S.P. of 120 pencil

= 120 × 2 ₹ = ₹ 240

Since S.P. > C.P., therefore, there will be the profit.

Profit = ₹ 240 – ₹ 156

= ₹ 84.

Ex.54 Bela purchased a second hand car for ₹ 89,000. She spent ₹ 21,000 on its repair and sold it to Aman for ₹ 1,10,000. Find her profit or loss in this transaction.

Sol. The amount at which the Bela purchased the car = ₹ 89,000

The amount he spent on repair = ₹ 21000

Therefore, the cost price

= ₹ 89000 + ₹ 21,000

= ₹ 1,10,000

Note : Total C.P. = actual cost price + overheads.

Since S.P. = 1,10,000

⇒ S.P. = C.P.

Therefore Bela neither suffered loss nor gained any profit.

➢ PROFIT OR LOSS PERCENT

In order to calculate profit or loss in percent, we use the following formulae :

1 (i) $\text{Profit \%} = \frac{\text{Amount of profit}}{\text{C.P.}} \times 100$

i.e. $\text{Profit\%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$

(ii) $\text{Loss \%} = \frac{\text{Loss}}{\text{C.P.}} \times 100$

2. Profit or loss percent is always calculated on the C.P.

Also we can find

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

In case of profit %

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

In case of Loss %

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

In case of Profit %

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

In case of Loss %

❖ EXAMPLES ❖

Ex.55 Find the profit or loss percent if :

(i) C.P. = ₹ 500; S.P. = ₹ 600

(ii) C.P. = ₹ 600; S.P. = ₹ 500

Sol. (i) We have, C.P. = ₹ 500, S.P. = ₹ 600

Clearly S.P. > C.P.

Therefore profit = 600 – 500 = 100

Hence, **Profit percent** $= \frac{\text{Profit}}{\text{C.P.}} \times 100$

$$= \frac{100}{500} \times 100 = 20\%$$

So, Profit percent = 20%

(ii) We have, C.P. = ₹ 600, S.P. = ₹ 500

Clearly C.P. > S.P.

Loss = C.P. – S.P. = 600 – 500 = ₹ 100

Therefore, **Loss percent**

$$= \frac{\text{Loss}}{\text{C.P.}} \times 100 = \frac{100}{600} \times 100 = \frac{50}{3} = 16\frac{2}{3}$$

So Loss percent $= 16\frac{2}{3}\%$

Ex.56 Karim bought 150 dozens of pencils at ₹ 20 a dozen. He sold them at ₹ 2.50 per pencil. Find the profit or loss percent.

Sol. C.P. of one dozen of pencils = ₹ 20

C.P. of 150 dozens of pencils

$$= 20 \times 150 = ₹ 3000$$

Now, S.P. of 1 pencil = ₹ 2.50

S.P. of 1 dozen (i.e. 12) pencils

$$= 2.50 \times 12 = ₹ 30$$

Therefore, S.P. of 150 dozen pencils

$$= 150 \times 30 = ₹ 4500$$

Profit = S.P. – C.P. = ₹ (4500 – 3000)

$$= ₹ 1500$$

$$\text{Profit (\%)} = \frac{1500}{3000} \times 100 = 50\%$$

Ex.57 Neelu bought 2400 bananas at ₹ 15 a dozen. She sold 1350 of them at ₹ 4 for 2 and remaining at ₹ 8 for 5. Find her gain or loss percent.

Sol. C.P. of 12 bananas = ₹ 15

C.P. of 1 banana $= \frac{15}{12}$

C.P. of 2400 bananas $= \frac{15}{12} \times 2400 = ₹ 3000$

S.P. of 2 bananas = ₹ 4

S.P. of 1 banana $= \frac{4}{2}$

S.P. of 1350 bananas $= \frac{4}{2} \times 1350 = ₹ 2700$

Remaining bananas = 2400 – 1350 = 1050

S.P. of 5 remaining bananas = ₹ 8

S.P. of 1 remaining bananas = $\frac{8}{5}$

S.P. of 1050 remaining bananas = $\frac{8}{5} \times 1050$

= ₹ 1,680

Total S.P. = ₹ 2700 + ₹ 1680 = ₹ 4380

Gain = ₹ (4380 – 3000) = ₹ 1380

Gain (%) = $\frac{1380}{3000} \times 100 = 46\%$

Ex.58 A book wholesaler sold 300 copies of a book at a profit of 15%. If C.P. of a book is ₹ 48, find the selling price of the books.

Sol. C.P. of 1 copy of the book = ₹ 48

C.P. of 300 copies of the book = 300 × 48

= ₹ 14400

Profit (%) = 15%, Profit = $\frac{15}{100} \times 14400$

= ₹ 2160

Therefore, S.P. of books = 14400 + 2160

= ₹ 16560

Ex.59 A horse bought for ₹ 8000 was sold at a loss of 6%. At what price was the horse sold ?

Sol. C.P. = ₹ 8000, Loss (%) = 6%

Loss = $\frac{6}{100} \times 8000$ = ₹ 480

Therefore, S.P. = C.P. – Loss

= 8000 – 480 = ₹ 7520

Ex.60 Shweta bought 1200 eggs at ₹ 16 a dozen. At what price per hundred must she sell the eggs so as to earn a profit of 15% ?

Sol. C.P. of a dozen i.e. 12 eggs = ₹ 16

Therefore, C.P. of 1200 eggs = $\frac{16}{12} \times 1200$

= ₹ 1600

Profit (%) = 15%

Profit = $\frac{15}{100} \times 1600$ = ₹ 240

S.P. = ₹ 1600 + ₹ 240 = ₹ 1840

Therefore, S.P. of 1200 eggs = ₹ 1840

S.P. of 1 egg = ₹ $\frac{1840}{1200}$

S.P. of 100 eggs = ₹ $\frac{1840}{1200} \times 100$

= $\frac{460}{3}$ = ₹ $153\frac{1}{3}$.

Ex.61 An article is sold for ₹ 420 at a profit of 12%. Find the C.P.

Sol. Let the cost price of the article be 100

Given Profit = ₹ 12

S.P. = ₹ 100 + ₹ 12 = 112.

Using unitary method, we have

When S.P. is ₹ 112, C.P. = ₹ 100

When S.P. is ₹ 1, C.P. = ₹ $\frac{100}{112}$

When S.P. is ₹ 420, C.P. = ₹ $\frac{100}{112} \times 420$

= ₹ 375

Hence, C.P. = ₹ 375.

Ex.62 An old bike bought for ₹ 2000 is sold for ₹ 2200. Find the profit and the profit % (or Gain%).

Sol. C.P. of the old bike = ₹ 2000

S.P. of the old bike = ₹ 2200

Clearly, S.P. > C.P.

So, Profit = S.P. – C.P.

= ₹ 2200 – ₹ 2000 = ₹ 200

Therefore, gain %

$= \left(\frac{\text{Gain}}{\text{C.P.}} \times 100\right)\% = \left(\frac{200}{2000} \times 100\right)\% = 10\%$

Ex.63 If a man were to sell his hand cart for ₹ 720, he would loss 25%. What must be the selling price if he were to gain 25% ?

Sol. Given S.P. of the hand-cart = ₹ 720,

Loss = 25%

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

So, C.P. = $\frac{720 \times 100}{100 - 25} = \frac{720 \times 100}{75}$ = ₹ 960

Desired gain = 25%

In this case, S.P. $= \frac{\text{C.P.} \times (100 + \text{Gain}\%)}{100}$

$= \frac{960 \times (100 + 25)}{100} = \frac{960 \times 125}{100}$

= ₹ 1200

Ex.64 Nandan sells a quintal of wheat for ₹ 308 thereby, gaining a profit of 12%.

By selling a quintal of rice for the same amount, he losses 12%. Find the C.P. of both rice and wheat. Also his total gain or loss.

Sol. Given S.P. of wheat = ₹ 308, Gain = 12%

We know, $\text{C.P.} = \frac{\text{S.P.} \times 100}{(100 + \text{gain}\%)}$

Therefore, C.P. $= \frac{308 \times 100}{100 + 12} = \frac{308 \times 100}{112}$

= ₹ 275

Now, S.P. of rice = ₹ 308

Loss = 12%

We know, $\text{C.P.} = \frac{100 \times \text{S.P.}}{(100 - \text{Loss}\%)}$

Therefore, C.P. of rice $= \frac{100 \times 308}{(100 - 12)}$

$= \frac{100 \times 308}{88}$

= ₹ 350

Total C.P. of wheat and rice

= ₹ (275 + 350) = ₹ 625

Total S.P. = ₹ (308 × 2) = ₹ 616

We can see that S.P. < C.P.

Loss = ₹ 625 – ₹ 616 = ₹ 9

➢ SIMPLE INTEREST

Interest : Interest is the amount paid in lieu of using some money which is not owned by us.

- The amount of money deposited, lent or borrowed is called principal (P).
- The additional money given at the end of a period for using the principal is called interest.
- The total money we receive or pay is called the amount due at that time. Thus the sum of principal and interest is called amount.

  i.e. amount = principal + interest
- The time for which the money is kept in the bank or for which the loan has been borrowed is called the time period.

To find the simple interest on a certain amount of money we need to know three quantities.

(i) Amount deposited or borrowed is called principal (P)

(ii) Rate of interest (R)

(iii) Time period (T)

So, simple Interest $= \frac{\text{P} \times \text{R} \times \text{T}}{100}$

Note : If the rate of interest is given per annum then the time period must be expressed in terms of year.

For Example

Time period T = 3 month should be written as

$\frac{3}{12} = \frac{1}{4}$ year

T = 6 month should be written as

$\frac{6}{12} = \frac{1}{2}$ year

T = 9 month should be written as

$\frac{9}{12} = \frac{3}{4}$ year

❖ EXAMPLES ❖

Ex.65 Find the simple interest when; Principal = ₹ 600, Rate = 2% per annum and Time = 20 months.

Sol. We have, P = Principal = ₹ 600, R = Rate percent per annum = 2

And T = Time = 20 months $= \frac{20}{12}$ year

Therefore, simple interest (S.I.)

$= \frac{\text{P} \times \text{R} \times \text{T}}{100} = ₹ \left(\frac{600 \times 2 \times 20}{100 \times 12} \right)$

Thus S.I. = ₹ 20.

Ex.66 Find the principal when Simple Interest = ₹ 72, Rate = 3% per annum and Time = 3 months.

Sol. We have, SI = ₹ 72, R = 3%,

$T = 3 \text{ months} = \frac{3}{12} = \frac{1}{4}$ year

Therefore, Principal (P) = $\frac{100 \times S.I.}{R \times T}$

$P = ₹\left(\frac{100 \times 72 \times 4}{3 \times 1}\right) = ₹(100 \times 24 \times 4)$

$= ₹ 9600$

Ex.67 Find the rate when Principal = ₹ 700, Simple Interest = ₹ 168 and Time = 16 months

Sol. We have, P = ₹ 700, SI = ₹ 168,

$T = 16 \text{ months} = \frac{16}{12}$ year

Therefore, Rate = $\frac{100 \times S.I.}{P \times T}\%$

$\text{Rate} = \frac{168 \times 100 \times 12}{700 \times 16}\% = \left(\frac{168 \times 12}{7 \times 16}\right)\%$

$= \frac{2016}{112}\% = 18\%$

Ex.68 Find the time when principal = ₹ 640, Rate $=12\frac{1}{2}\%$ per annum and Simple Interest = ₹ 40.

Sol. We have, P = ₹ 640,

$R = 12\frac{1}{2}\% = \frac{25}{2}$ per annum, SI = ₹ 40

Therefore, $T = \frac{S.I \times 100}{P \times R} = \frac{40 \times 100 \times 2}{640 \times 25} = \frac{1}{2}$

Thus, $T = \frac{1}{2}$ year or 6 months.

Ex.69 Neeraj borrowed a sum of money at $10\frac{1}{2}\%$ per annum from a bank. If he paid ₹ 1863.75 as interest for $2\frac{1}{2}$ years, find the sum.

Sol. We have, $R = 10\frac{1}{2}\% = \frac{21}{2}$, S.I.= ₹ 1863.75 and $T = 2\frac{1}{2} \text{ years} = \frac{5}{2} \text{ years}$.

We have to find the sum.

Now, Principal (P) = $\frac{S.I. \times 100}{R \times T}$

$= \frac{1863.75 \times 100 \times 2 \times 2}{21 \times 5} = 1775 \times 4$

$= ₹ 7100$

Hence, the required sum = ₹ 7100

Ex.70 A sum of money becomes $\frac{7}{4}$ of itself in 6 years at a certain rate of interest. Find the rate of interest.

Sol. Let the Principal be ₹ P. Then amount = ₹ $\frac{7}{4}$P

We have, principal = ₹ P, Amount = ₹ $\frac{7}{4}$P, T = 6 years.

We have to find the rate (R)

Then, Amount = Principal + S.I.

$\frac{7P}{4} = P + S.I.$

$S.I. = \frac{7P}{4} - P = \frac{7P - 4P}{4} = \frac{3P}{4}$

We know that,

$S.I. = \frac{P \times R \times T}{100}$

$\frac{3P}{4} = \frac{P \times R \times 6}{100}$

$3P \times 100 = 4 \times P \times R \times 6$

$300\ P = 24\ P \times R$

Therefore, Rate (R)

$= \frac{300P}{24P}\%$ or $R = \frac{300P}{24P} = \frac{300}{24}\%$

$\Rightarrow R = \frac{300 \div 12}{24 \div 12}\% = \frac{25}{2}\% = 12\frac{1}{2}\%$

Hence, required rate percent

$= 12\frac{1}{2}\%$ per annum

Ex.71 If Meena gives an interest of ₹ 45 for one year at 9% rate p.a., what is the sum she has borrowed ?

Sol. S.I. = 45, R = 9%, T = 1 year

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$45 = \frac{P \times 9 \times 1}{100}$$

$$P = \frac{45 \times 100}{9} = 500$$

Hence, Meena has borrowed ₹ 500

Ex.72 What rate gives ₹ 280 as interest on a sum of ₹ 56,000 in 2 years ?

Sol. We have, P = ₹ 56000, T = 2, R = ?

S.I. = ₹ 280

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$280 = \frac{56000 \times R \times 2}{100} \Rightarrow R = \frac{280 \times 100}{56000 \times 2}$$

Hence Rate (R) = 0.25%

Ex.73 Find the amount to be paid at the end of 3 years in each case :

(i) Principal = ₹ 1200 at 12% p.a.

(ii) Principal = ₹ 7500 at 5% p.a.

Sol. (i) We have, P = ₹ 1200, R = 12%,

T = 3 years

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{1200 \times 12 \times 3}{100}$$

S.I. = ₹ 432.

A = P + S.I. = ₹ (1200 + 432)

A = ₹ 1632.

(ii) We have, P = ₹ 7500, R = 5%, T = 3 years

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{7500 \times 5 \times 3}{100}$$

S.I. = 1125

A = P + S.I. = 7500 + 1125

A = ₹ 8625

Ex.74 Amina buys a book for ₹ 275 and sells it at a loss of 15%. How much does she sell it for ?

Sol. We have

C.P. = ₹ 275

Loss % = 15%

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

$$15 = \frac{\text{Loss}}{275} \times 100$$

$$\text{Loss} = \frac{15 \times 275}{100}$$

= ₹ 41.25.

S.P. = C.P. – Loss = 275 – 41.25

Hence, S.P. = ₹ 233.75

Ex.75 Juhi sells a washing machine for ₹ 13,500. She loses 20% in the bargain. What was the price at which she bought it ?

Sol. We have

S.P. = ₹ 13500

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

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

$$\text{C.P.} = \frac{100 \times \text{S.P.}}{(100 - \text{loss\%})} = \frac{100 \times 13500}{100 - 20}$$

$$= \frac{100 \times 13500}{80}$$

Hence C.P. = ₹ 16,875

Ex.76 I bought a T.V. for ₹ 10,000 and sold it at a profit of 20%. How much money do I get for it?

Sol. We have, C.P. = ₹ 10,000

Profit % = 20%

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

$$\text{Profit} = \frac{\text{Profit\%} \times \text{C.P.}}{100} = \frac{20 \times 10,000}{100}$$

Profit = ₹ 2000

S.P. = C.P. + Profit

= ₹ (10,000 + 2000)

= ₹ 12,000

Hence I got ₹ 12000 for T.V.

Ex.77 An article was bought for ₹ 400 and sold for ₹ 350. Find the loss and loss percent.

Sol. We have

C.P = ₹ 400

S.P = ₹ 350

As C.P. > S.P.

Loss = C.P. – S.P.

= ₹ (400 – 350)

Loss = ₹ 50

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

$$= \frac{50}{400} \times 100$$

Loss % = 12.5%

Ex.78 An article was purchased for ₹ 500 and sold for ₹ 550. Find the gain and gain percent.

Sol. We have, C.P. = ₹ 500

S.P. = ₹ 550

As S.P. > C.P.

∴ Profit = ₹ 50

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

$$= \frac{50}{500} \times 100 = 10\%$$

Hence, Profit % = 10%

EXERCISE # 1

Q.1 Find the ratio of

(i) 60 paise : 3 rupees

(ii) 2 m 7 cm : 36 cm

(iii) 2 years : 10 months

(iv) 3 kg 250 g : 5 kg

(v) 12 cm : $\frac{3}{2}$ cm

(vi) 65 g : 1 kg

(vii) 75 paise : ₹ 3

(viii) 50 m*l* : 1 *l*

Q.2 Express the following in the simplest form -

(i) 28 : 80 (ii) $\frac{1}{10} : \frac{1}{15}$

(iii) 80 : 480 (iv) $1\frac{1}{2} : 3 : 4\frac{1}{2}$

(v) $\frac{1}{6} : \frac{1}{8} : \frac{1}{12}$ (vi) $2\frac{2}{3} : \frac{8}{7}$

Q.3 Which ratio is greater ?

(i) (3 : 7) or (4 : 9)

(ii) (5 : 8) or (6 : 17)

(iii) (3 : 4) or (2 : 3)

Q.4 Show that 7, 6, 49, 36 are not in proportion.

Q.5 Are the following in proportion ?

(i) 45, 60, 30, 40

(ii) 84, 42, 44, 22

(iii) 43, 55, 65, 170

(iv) 450, 400, 350, 300

Q.6 The cost of 20 kg of milk is ₹ 500. Find the cost of 59 kg of milk.

Q.7 A bus travels 440 km is 8 hrs.

(i) How long will it take to travel 385 km ?

(ii) How far will it travel in $6\frac{1}{2}$ hours ?

Q.8 First, second and fourth terms of a proportion are 141, 75 and 25. Find its third term.

Q.9 Shreyansh works in a factory and earns ₹ 1500 per month. He saves ₹ 250 per month from his earnings. Find the ratio of

(i) His savings to his earnings

(ii) His earnings to his expenditure

(iii) His savings to his expenditure

Q.10 Find the value of x for which the following forms a proportion :

(i) 16 : 8 :: 7 : x (ii) 36 : 45 :: 16 : 2x

Q.11 In the following question, give your answer in the simplest form :

(i) A couple have 4 grandsons and 6 granddaughters. Find

(a) the ratio of number of grandsons to that of granddaughters

(b) the ratio of the number of granddaughters to that of all the grandchildren.

(ii) Square A has a side of 6 cm and Square B has a side of 12 cm. Find the ratio of -

(a) the length of the side of square A to that of square B.

(b) the perimeter of the square B to the perimeter of a square A.

(c) the area of square A to the area of square B.

(d) Can you find the ratio of area of square A to the perimeter of square B? If not, justify your answer.

Q.12 If p : q = 2 : 3 find the ratio 6p : 2q.

Q.13 A triangle has sides 4.2 cm, 4.9 cm and 6.3 cm respectively. Find the ratio of lengths of the sides to one another.

Q.14 Two angle of a triangle are 54º and 72º. Find the ratio of size of the third angle to the sum of the first two.

Q.15 Find the missing numbers

(i) $\square : 6 = 12 : 18$ (ii) $9 : 6 = \square : 4$

(iii) $\frac{6}{8} = \frac{\square}{12}$

Q.16 Find the unknown variable in the following :

(i) $\frac{x}{4} = \frac{7}{20}$ (ii) $x : 5 = 4 : 3$

(iii) $5 : 1 = 3 : x$ (iv) $3 : x = 2 : 5$

Q.17 Express the following percents into fraction in their lowest terms and also into decimals.

S.No.	Per cent	Fraction in Lowest Term	Ratio	*Decimals*
i	20%			
ii	45%			
iii	37%			
iv	$87\frac{1}{2}\%$			
v	$62\frac{1}{2}\%$			
vi	*125%*			

Q.18 A bike costing ₹40,000 one year ago now costs ₹30,000. Find the percent decrease.

Q.19 In a company of 100 workers, 20 were absent on a day. What percent of workers were present on that day ?

Q.20 If x% of 420 is 63, find x.

Q.21 Kanu scored 450 marks out of 600. Express this as percent.

Q.22 If $88\frac{1}{2}\%$ of households have a television set, what percentage do not have ?

Q.23 In a box of oranges, 8% are rotten. What percentage are good ?

Q.24 In a driving test, 15% fail to pass in first time. What percentage pass in the first time ?

Q.25 A team won 65% of their matches and draw 24% of them. What percentage did they lose ?

Q.26 A rugby team draws 15% of their matches and loses 25% of them. What percentage of did they win ?

Q.27 An alloy is made of 25% zinc, 30% copper and rest is nickle. Find the percentage of nickle.

Q.28 In a final year exam, Aman scored 378 out of 600. What was his percentage marks ?

Q.29 Seventy of the 120 choristers in a choir wear spectacles. What percentage do not ?

Q.30 Each weak a boy saves ₹45 out of ₹250 he earns. What percentage of earn does he not spend ?

Q.31 A secretary takes 92 letters to the post office for posting, 29 are registered and the remaining are ordinary mail. What percentage go by ordinary mail ?

Q.32 Arpit obtained 35 marks out of 40 in his end maths examination. What was him percentage marks ?

Q.33 If 9% of a crowd of 75,000 at a cricket match were females, how many females attended the game ?

Q.34 In a garage, 16 of the 30 cars, which are for sale are second hand. What percentage of the cars are :

(i) new ? (ii) second hand ?

Q.35 There are 125 houses in a village and 72% of them have a television. How many houses :

(i) have a televisions ?

(ii) do not have a television ?

Q.36 There are 120 shop in a street, 30% of which sell food. How many shops do not sell food ?

Q.37 A mathematics book has 320 pages, 40% of which are on algebra, 25% on geometry and the remaining on arithmetic. How many pages of arithmetic are there ?

Q.38 A man spends 92% of his monthly income. If he saves ₹220 per month, find his total monthly income.

Q.39 Jugal had 24 pages to write. By evening he had completed 25% of his work. How many pages were left ?

Q.40 A box contains 60 eggs. Out of which $16\frac{2}{3}\%$ are rotten ones. How many eggs are rotten ?

Q.41 Mr. Virmani saves 12% of his salary. If he receives ₹15,900 per month as salary, find his monthly expenditure.

Q.42 A lawyer willed his 3 sons ₹2,50,000 to be divided into portions 30%, 45% and 25%. How much did each of them inherit ?

Q.43 Rajdhani College has 2,400 students, 40% of them are girls. How many boys are there in the college ?

Q.44 Amar obtained 410 marks out of 500 in an examination while his friend Rajiv gets 536 marks out of 600. Find whose performance is better.

Q.45 In an orchard $16\frac{2}{3}\%$ of the trees are apple trees. If the number of trees in the orchard is 240, find the number of other type of trees in the orchard.

Q.46 Out of a total production of 50400 tons of a coal mine, a quantity of 5040 tons was lost during extraction. What percent of the total production was the net coal extracted ?

Q.47 A drum contained 250 litres of kerosene. 5 litres of kerosene was lost due to leakage. What is the percentage of the kerosene which remained in the drum ?

Q.48 A football team played 16 matches. The team won 6 matches and lost 2 and 8 matches ended in a draw. What percentage of the matches did the team :

(i) win ? (ii) lose ?

ANSWER KEY

1. (i) 1 : 5 (ii) 23 : 4 (iii) 12 : 5 (iv) 13 : 20
(v) 8 : 1 (vi) 13 : 200 (vii) 1 : 4 (viii) 1 : 20

2. (i) 7 : 20 (ii) 3 : 2 (iii) 1 : 6 (iv) 1 : 2 : 3 (v) 4 : 3 : 2 (vi) 7 : 3

3. (i) 4 : 9 (ii) 5 : 8 (iii) 3 : 4

5. (i) yes (ii) yes (iii) no (iv) no

6. ₹ 1475 **7.** (i) 7 hrs (ii) 357.5 km **8.** 47

9. (i) 1 : 6 (ii) 6 : 5 (iii) 1 : 5 **10.** (i) 3.5 (ii) 10

11. (i) (a) 2 : 3 (b) 3 : 5
(ii) (a) 1 : 2 (b) 2 : 1 (c) 1 : 4 (d) No, because both the quantities are not in same units

12. 2 : 1 **13.** 6 : 7 : 9 **14.** 3 : 7 **15.** (i) 4 (ii) 6 (iii) 9

16. (i) $\frac{7}{5}$ (ii) $\frac{20}{3}$ (iii) $\frac{3}{5}$ (iv) $\frac{15}{2}$

17.

Fraction in Lowest Term	$\frac{1}{5}$	$\frac{9}{20}$	$\frac{37}{100}$	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{5}{4}$
Ratio	1 : 5	9 : 20	37 : 100	7 : 8	5 : 8	*5 : 4*
Decimals	*0.2*	*0.45*	*0.37*	*0.875*	*0.625*	*1.25*

18. 25% **19.** 80% **20.** 15 **21.** 75% **22.** $11\frac{1}{2}\%$ **23.** 92%

24. 85% **25.** 11% **26.** 60% **27.** 45% **28.** 63% **29.** 41.67%

30. 18% **31.** 68.48% **32.** 87.5% **33.** 6750 **34.** (i) 46.67% (ii) 53.33%

35.(i) 90 (ii) 35 **36.** 84 **37.** 112 **38.** ₹ 2750 **39.** 18

40. 10 **41.** ₹ 13992 **42.** ₹ 75000, ₹ 112500, ₹ 62500

43. 1440 **44.** Rajiv **45.** 200 **46.** 90% **47.** 98%

48. (i) 37.5% (ii) 12.5%

EXERCISE # 2

Q.1 Noori's weight is increased by 15% between her fifteenth and sixteenth birthdays. If she weighed 65 kg on her fifteenth birthday, what did she weigh on her sixteenth birthday ?

Q.2 The water rates due on my house this year is 15% more than they were last year. Last year I paid ₹ 3250. What must I pay this year ?

Q.3 In a school there are 80 teachers. It is expected that the number of teaching staff next year will increase by 5%. How many staff members should there be next year ?

Q.4 A living room suite is priced at ₹ 5000 plus value added tax (VAT) at 15%. How much does the suite actually cost the consumer ?

Q.5 The cost of a meal is ₹ 150 plus service charge at 12.5%. How much should I pay for the meal?

Q.6 As a result of using a good quality fertilizer, my potato crop increased by 20% compared to the last year. If I grew 250 kg of potatoes last year, how many kg of potatoes did I grow this year ?

Q.7 Last year in a school there were 75 reported cases of measles. This year the number of reported cases has dropped by 16%. How many cases have been reported this year ?

Q.8 A car is valued at ₹ 5,25,000. It depreciates by 20% in the first year and thereafter each year by 15% of its value at the beginning of that year. Find its value (i) after 2 years, (ii) after 3 years.

Q.9 In any year the value of a motorcycle depreciates by 10% of the value at the beginning of that year. What is its value after two years, if purchase price was ₹ 45,000 ?

Q.10 When the petrol was ₹ 45 per litre, I used 500 litres in a year. The price of petrol rose by 20% so I reduced my yearly consumption by 20%. Find

(i) the new price of a litre of petrol

(ii) my reduced annual petrol consumption.

(iii) how much more (or less) my petrol bill is for the year.

Q.11 The speed of a train is 120 km/hr. It is increased by 10%. Find the increase in the speed. Also find its new speed.

Q.12 The excise duty on a certain item has been reduced to ₹ 3486 from ₹ 5229. Find the percentage reduction in the excise duty for that item.

Q.13 A grocer sells potato for ₹ 15.50 per kg. If he had purchased the potato for ₹ 14.20 per kg, find the amount of profit or loss.

Q.14 A shopkeeper sold apples for ₹ 30 per kg. If the shopkeeper made a loss of ₹ 5.50 per kg what was the cost price of 1 kg of apples ?

Q.15 A cloth merchant sells an old stock at ₹ 85,550. If he had a loss of ₹ 15,000 what was the value of his stock ?

Q.16 Raju has a cycle worth ₹ 2200 and spent ₹ 50 on its repair. If he wants to sell its at a profit of ₹ 220. What would cycle's selling price be ?

Q.17 A milkman earned a profit of ₹ 75 after selling some litres of milk for ₹ 825. Find the cost of the milk.

Q.18 A farmer bought a cow for ₹ 3520. He spent ₹ 250 in bringing the cow to his house. He sold it at a loss of ₹ 275. Find its selling price.

Q.19 A man bought eggs at ₹ 2 per egg. If he sells them at ₹ 25 a dozen, find his loss or profit on selling one dozen egg.

Q.20 A computer company manufactured computer for ₹ 65,550. The packaging cost is ₹ 520 per computer. If the company sold them at a profit of ₹ 450 per computers what was the selling price of each computer ?

Q.21 A farmer bought 100 hens for ₹ 4000, sells 20 of them at a gain of 5%. At a what gain % must he sell the remaining hens so as to gain 20% on the whole ?

Q.22 By selling a bucket for ₹ 24, a blacksmith loses 20% of his cost. If he sells it for ₹ 27, what is his profit or loss ?

Q.23 An article is sold at a profit of 10%. Had it been sold for ₹ 30 more, the profit would have been 25%, find the C.P.

Q.24 Ramesh purchased a house for ₹ 4,52,000 and spent ₹ 28000 on its repairs. He had to sell it for ₹ 4,68,000. Find his profit or loss percent.

Q.25 By selling a chair for ₹ 160, a carpenter loses 20%. How much percent would he gain or loss by selling it for ₹ 170 ?

Q.26 Mr. Siddharth sold two bicycles at ₹ 924 each. On one he gains 20% and on the other he loses 20%. How much does he gain or lose in the whole transaction ?

Q.27 If the selling price of 4 articles is equal to the cost price of 5 articles, find the gain percent.

Q.28 By selling 20 oranges, a vendor gains a profit equal to selling price of oranges. Find his gain percent.

Q.29 A tricycle is sold at a gain of 15%. Had it been sold for ₹ 27 more, the profit would have been 20%. Find its cost price.

Q.30 Mr. Shah sold a sofa at a gain of 15%. Had he sold it for ₹ 340 less, he would have lost 2%. At what price did Mr. Shah purchase it ?

Q.31 Paro purchased two ceiling fans for ₹ 1000 each. She sold one of them at a loss of 10%. At what should the other be sold so as to gain 20% on the whole transaction ?

Q.32 What sum lent out at 10% per annum simple interest would produce ₹ 150 as interest in 5 years ?

Q.33 Find the simple interest on ₹ 8500 from 12th October, 1999 to 6th March, 2000 at 15% per annum.

Q.34 Find the simple interest on ₹ 3285 from May 11, 1999 to 11 September, 1999 at 10% annum.

Q.35 Jeevan deposited ₹ 2500 in his bank for buying Magnum certificates issued by the State bank of India. Unfortunately, his application for the certificate was rejected. However, his money was refunded on March 28, 1988. He was paid interest on his money at the rate of 8% per annum for the period starting from Jan 15, 1988. How much did he get back in all ?

Q.36 For investing money in the firm Rosy and Mitthu, you get interest at the rate of 18% per annum. What amount will you get after 6 years if you deposit ₹ 10000 with the firm now and ₹ 5000 three year from hence ?

Q.37 What sum of money lent out at 6.25% per annum simple interest produces ₹ 37.50 as interest in 8 months ?

Q.38 Mohan borrowed some money at 12% per annum. He had to pay ₹ 168 as interest after 2 years and 4 months. What sum did he borrow ?

Q.39 I borrowed some money at 8% per annum. I had to pay ₹ 138.75 as interest after 3 year and one month. What sum did I borrow ?

Q.40 In how much time will the simple interest on ₹ 800 at 12.5% per annum be ₹ 125 ?

Q.41 In what time will a sum of money put as $13\frac{1}{3}\%$ simple interest triple itself ?

ANSWER KEY

1. 74.75 kg **2.** ₦3737.50 **3.** 84 **4.** ₦5750 **5.** ₦168.75 **6.** 300 kg

7. 63 **8.** (i) ₦357000 (ii) ₦303450 **9.** ₦36450 **10.** (i) ₦54 (ii) 400 (iii) less ₦900

11. 12 km, 132 km/h **12.** 33.33% **13.** profit ₦1.30 **14.** ₦35.50 **15.** ₦100550 **16.** 2470

17. ₦750 **18.** ₦3495 **19.** profit ₦1 **20.** ₦66520 **21.** 23.75% **22.** loss ₦3 **23.** ₦200

24. loss $\frac{5}{2}$% **25.** loss 15% **26.** loss 4% **27.** gain 25% **28.** 25% **29.** ₦540 **30.** ₦2000

31. ₦1500 **32.** ₦300 **33.** ₦510 **34.** ₦123 **35.** ₦2540 **36.** ₦28500 **37.** ₦900

38. ₦600 **39.** ₦562.50 **40.** $1\frac{1}{4}$ years **41.** 15 years