11

PERCENTAGE

11.1 INTRODUCTION

In this chapter, we shall introduce the concept of percentage and shall study percentage as a fraction and also as a ratio. We shall also learn about the conversion of a per cent into a fraction, ratio or decimal and vice-versa.

11.2 PER CENT

The word per cent is an abbreviation of the Latin phrase 'percentum' which means per hundred or hundredths.

Thus, the term per cent means per hundred or for every hundred.

When we say that a man gives 30 per cent of his income as income tax, this means that he gives Rs 30 out of every hundred rupees of his income.

'A trader makes a profit of 15 per cent' means that he gains Rs 15 on every hundred rupees of his investment.

'A boy scored 70 per cent marks in his final examination' means that he obtained 70 marks out of every hundred marks.

The term per cent is sometimes abbreviated as p.c. The symbol% is often used for the term per cent.

Thus, 15 per cent will be written as 15%.

We shall now study per cent as a fraction and also as a ratio.

11.2.1 PER CENT AS A FRACTION

In the previous section, we have discussed that per cent means per hundred or hundredths.

Now,

$$\frac{75}{100} = 75 \times \frac{1}{100} = 75 \text{ hundredths} = 75 \text{ per hundred} = 75\%$$

and, $\frac{42}{100} = 42 \times \frac{1}{100} = 42 \text{ hundredths} = 42 \text{ per hundred} = 42\%$

and so on.

It follows from this that:

A fraction with its denominator 100 is equal to that per cent, as the numerator.

11.2.2 PER CENT AS A RATIO

In the previous section, we have learnt that per cent can be treated as a fraction with its denominator as 100. Thus, we have

$$11\% = \frac{11}{100}$$

But, $\frac{11}{100} = 11:100$

$\therefore \quad 11\% = 11:100$

Similarly, $8\% = \frac{8}{100} = 8:100$, and $25\% = \frac{25}{100} = 25:100$ etc.

It follows from these that a per cent can also be expressed as a ratio with its second term 100 and first term equal to the given per cent.

11.2.3 CONVERSION OF A PER CENT INTO A FRACTION

In order to convert a per cent into a fraction, we follow the following steps:

STEP I *Obtain the given per cent. Let it be x%.*

STEP II *Drop the per cent sign (i.e %) and divide the number by 100. Thus,* $x\% = \frac{x}{100}$

ILLUSTRATION 1 Express the following per cents as fractions in the simplest forms:

(i) 57% (ii) 36% (iii) 115%

Solution We have,

(i) $57\% = \frac{57}{100}$ (ii) $36\% = \frac{36}{100} = \frac{9}{25}$ (iii) $115\% = \frac{115}{100} = \frac{23}{20}$.

ILLUSTRATION 2 Express each of the following per cents as fractions in the simplest forms:

(i) 0.375% (ii) 0.4% (iii) $16\frac{2}{3}\%$

Solution We have,

(i) $0.375\% = \frac{0.375}{100} = \frac{375}{100000} = \frac{3}{800}$ (ii) $0.4\% = \frac{0.4}{100} = \frac{4}{1000} = \frac{1}{250}$

(iii) $16\frac{2}{3}\% = \frac{50}{3}\% = \frac{(50/3)}{100} = \frac{50}{3} \times \frac{1}{100} = \frac{1}{6}$

11.2.4 CONVERSION OF A FRACTION INTO A PER CENT

In order to convert a fraction into a per cent, we follow the following steps:

STEP I *Obtain the fraction. Let it be* $\frac{a}{b}$.

STEP II *Multiply the fraction by 100 and put the per cent sign% to obtain the required per cent. Thus,* $\frac{a}{b} = \left(\frac{a}{b} \times 100\right)\%$

ILLUSTRATION 1 Express each of the following fractions as per cents:

(i) $\frac{4}{5}$ (ii) $\frac{9}{20}$ (iii) $5\frac{1}{4}$

Solution We have,

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

(ii) $\frac{9}{20}=\left(\frac{9}{20}\times 100\right)\%=45\%$

(iii) $5\frac{1}{4}=\frac{21}{4}=\left(\frac{21}{4}\times 100\right)\%=525\%$

ILLUSTRATION 2 Express each of the following into per cents:

(i) 0.375 (ii) 0.005 (iii) 2.45

Solution We have,

(i) $0.375=\frac{375}{1000}=\left(\frac{375}{1000}\times 100\right)\%=37.5\%$

(ii) $0.005=\frac{5}{1000}=\left(\frac{5}{1000}\times 100\right)\%=0.5\%$

(iii) $2.45=\frac{245}{100}=\left(\frac{245}{100}\times 100\right)\%=245\%$

NOTE: *From the above illustrations we observe that to convert a decimal into a per cent, we shift the decimal point by two places to the right. This is because the decimal number is multiplied by 100.*

EXERCISE 11.1

1. Express each of the following per cents as fractions in the simplest forms:

(i) 45% (ii) 0.25% (iii) 150% (iv) $6\frac{1}{4}\%$

2. Express each of the following fractions as a per cent:

(i) $\frac{3}{4}$ (ii) $\frac{53}{100}$ (iii) $1\frac{3}{5}$ (iv) $\frac{7}{20}$

ANSWERS

1. (i) $\frac{9}{20}$ (ii) $\frac{1}{400}$ (iii) $\frac{3}{2}$ (iv) $\frac{1}{16}$

2. (i) 75% (ii) 53% (iii) 160% (iv) 35%

11.2.5 CONVERSION OF A RATIO INTO PER CENT AND VICE VERSA

In order to convert a given ratio into a per cent, we proceed as follows:

STEP I *Obtain the ratio, say, a : b.*

STEP II *Convert the given ratio into the fraction* $\frac{a}{b}$.

STEP III *Multiply the fraction obtained in step II by 100 and put per cent sign%.*

ILLUSTRATION 1 Express the following as per cents:

(i) 6 : 5 (ii) 30 : 80 (iii) 3 : 12

Solution We have,

(i) $6:5=\frac{6}{5}=\left(\frac{6}{5}\times 100\right)\%=120\%$ (ii) $30:80=\frac{30}{80}=\left(\frac{30}{80}\times 100\right)\%=37.5\%$

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

In order to convert a given per cent into a ratio, we follow the following steps:

STEP I *Obtain the per cent.*

STEP II *Convert the given per cent into a fraction by dividing it by 100 and removing per cent sign%.*

STEP III *Express the fraction obtained in step II in the simplest form.*

STEP IV *Express the fraction obtained in step III as a ratio.*

ILLUSTRATION 2 Express each of the following per cents as a ratio in the simplest form:

(i) 28% (ii) 52% (iii) 0.4% (iv) $6\frac{2}{3}\%$.

Solution We have,

(i) $28\%=\frac{28}{100}=\frac{7}{25}=7:25$ (ii) $52\%=\frac{52}{100}=\frac{13}{25}=13:25$

(iii) $0.4\%=\frac{0.4}{100}=\frac{4}{1000}=\frac{1}{250}=1:250$ (iv) $6\frac{2}{3}\%=\frac{20}{3}\%=\frac{20}{3}\times\frac{1}{100}=\frac{1}{15}=1:15$.

EXERCISE 11.2

1. Express each of the following ratios as per cents:
   (i) 4 : 5 (ii) 1 : 5 (iii) 11 : 125
2. Express each of the following per cents as ratios in the simplest forms:
   (i) 2.5% (ii) 0.4% (iii) $13\frac{3}{4}\%$

ANSWERS

1. (i) 80% (ii) 20% (iii) $\frac{44}{5}\%$ 2. (i) $\frac{1}{40}$ (ii) $\frac{1}{250}$ (iii) $\frac{11}{80}$

11.2.6 CONVERSION OF PER CENT INTO DECIMAL AND VICE VERSA

In order to convert a given per cent into decimal form, we follow the following steps:

STEP I *Obtain the per cent which is to be converted into decimal.*

STEP II *Express the given per cent as a fraction with denominator as 100.*

STEP III *Write the fraction obtained in step II in decimal form.*

ILLUSTRATION 1 Express each of the following as a decimal:

(i) 65% (ii) 12% (iii) 7.4% (iv) 0.1%

Solution We have,

(i) $65\%=\frac{65}{100}=0.65$ (ii) $12\%=\frac{12}{100}=0\ 12$

(iii) $7.4\% = \frac{7.4}{100} = 0.074$ (iv) $0.1\% = \frac{0.1}{100} = \frac{1}{1000} = 0.001$.

To convert a given decimal into a per cent, we proceed as follows:

STEP I *Obtain the number in decimal form.*

STEP II *Convert it into a fraction by removing the decimal point. In order to remove decimal, divide by 10 or 100 or 1000 according to the number of digits on the right side of the decimal point 1 or 2 or 3 respectively.*

STEP III *Multiply by 100 and put% sign.*

ILLUSTRATION 2 Express each of the following as per cent :

(i) 0.037 (ii) 0.002 (iii) 1.2

Solution We have,

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

(ii) $0.002 = \frac{2}{1000} = \left(\frac{2}{1000} \times 100\right)\% = 0.2\%$

(iii) $1.2 = \frac{12}{10} = \left(\frac{12}{10} \times 100\right)\% = 120\%$

EXERCISE 11.3

1. Express each of the following per cents as decimals:
   (i) 12.5% (ii) 75% (iii) 128.8% (iv) 0.05%
2. Express each of the following decimals as a per cent:
   (i) 0.004 (ii) 0.24 (iii) 0.02 (iv) 0.275
3. Write each of the following as whole numbers or mixed numbers:
   (i) 136% (ii) 250% (iii) 300%

ANSWERS

1. (i) 0.125 (ii) 0.75 (iii) 1.288 (iv) 0.0005
2. (i) 0.4% (ii) 24% (iii) 2% (iv) 27.5%
3. (i) $\frac{34}{25}$ (ii) $\frac{5}{2}$ (iii) 3

11.3 FINDING A PERCENTAGE OF A GIVEN NUMBER

As we have discussed earlier that a per cent is a fraction with denominator as 100. So, we can determine what the exact value of a per cent is only when we know the value of the number it is part of. We can use the following stepwise procedure to find the per cent of a given number.

STEP I *Obtain the number, say x.*

STEP II *Obtain the required per cent, say $P\%$.*

STEP III *Multiply x by P and divide by 100 to obtain the required $P\%$ of x.*

i.e., $P\%$ of $x = \frac{P}{100} \times x$

Following examples will illustrate the above procedure.

ILLUSTRATIVE EXAMPLES

Example 1 Find:

(i) 30% of Rs 180 (ii) 16% of 25 litres

(iii) $4\frac{1}{2}\%$ of Rs 1800 (iv) 10% of 350 km (v) 120% of 20 kg

Solution We know that $P\%$ of x is equal to $\frac{P}{100} \times x$. So, we have

(i) 30% of Rs 180 = Rs $\left(\frac{30}{100} \times 180\right)$ = Rs 54

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

(iii) $4\frac{1}{2}\%$ of Rs 1800 = Rs $\left(\frac{4\frac{1}{2}}{100} \times 1800\right)$ = Rs $\left(\frac{\frac{9}{2}}{100} \times 1800\right)$

= Rs = $\left(\frac{9}{200} \times 1800\right)$ = Rs 81.

(iv) 10% of 350 km = $\left(\frac{10}{100} \times 350\right)$ km = 35 km

(v) 120% of 20 kg = $\left(\frac{120}{100} \times 20\right)$ kg = 24 kg

Example 2 Find a number whose 4% is 72.

Solution Let the required number be x. Then,

4% of $x = 72 \Rightarrow \frac{4}{100} \times x = 72 \Rightarrow x = \frac{100}{4} \times 72 = 1800$

Hence, the required number is 1800.

Example 3 What is the sum of money of which 8% is Rs 480?

Solution Let the required sum of money be Rs x. Then,

8% of Rs x = Rs 480

$\Rightarrow \frac{8}{100} \times x = 480$

$\Rightarrow x = \frac{480 \times 100}{8} = 6000$

Hence, the required sum of money is Rs 6000.

EXERCISE 11.4

1. Find each of the following:
   (i) 7% of Rs 7150 (ii) 40% of 400 kg (iii) 20% of 15.125 litres
   (iv) $3\frac{1}{3}$% of 90 km (v) 2.5% of 600 metres

2. Find the number whose $12\frac{1}{2}$% is 64.

3. What is the number, $6\frac{1}{4}$% of which is 2?

4. If 6 is 50% of a number, what is that number?

ANSWERS

1. (i) Rs 500.50 (ii) 160 kg (iii) 3.025 litres (iv) 3 km (v) 15 metres
2. 512 3. 32 4. 12

11.4 FINDING HOW MUCH PER CENT ONE QUANTITY IS OF ANOTHER QUANTITY

Sometimes we are given two quantities and we want to find what per cent of one quantity is of the other quantity. In other words, we want to find how many hundredths of one quantity should be taken so that it is equal to the second quantity. In such type of problems, we proceed as discussed below:

Let a and b be two numbers and we want to know: what per cent of a is b?

Let x% of a be equal to b. Then,

$$\frac{x}{100}\times a=b \quad\Rightarrow\quad x=b\times\frac{100}{a} \quad\Rightarrow\quad x=\frac{b}{a}\times 100$$

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

Following examples will illustrate the above procedure.

ILLUSTRATIVE EXAMPLES

Example 1 What per cent of 25 kg is 3.5 kg?

Solution We have,

$$\text{Required per cent}=\left(\frac{3.5\,\text{kg}}{25\,\text{kg}}\times 100\right)=\frac{3.5\times 100}{25}=\frac{35\times 100}{250}=\frac{35\times 2}{5}=7\times 2=14$$

Hence, 3.5 kg is 14% of 25 kg.

Aliter Let x% of 25 kg be 3.5 kg. Then,

x% of 25 kg = 3.5 kg

$$\Rightarrow\quad \frac{x}{100}\times 25=3.5$$

$$\Rightarrow\quad x=\frac{3.5\times 100}{25} \qquad \left[\text{Multiplying both sides by } \frac{100}{25}\right]$$

$$\Rightarrow \quad x=\frac{35\times100}{250}=\frac{35\times2}{5}=7\times2=14$$

Hence, 3.5 kg is 14% of 25 kg.

Example 2 What per cent of 750 metres is 125 metres?

Solution We have,

$$\text{Required per cent}=\frac{125\text{ metres}}{750\text{ metres}}\times100=\frac{125\times100}{750}=\frac{1\times100}{6}=\frac{50}{3}=16.66$$

Hence, 125 metres is 16.66% of 750 metres.

Aliter Let x% of 750 metres be 125 metres. Then,

x% of 750 = 125

$$\Rightarrow \quad \frac{x}{100}\times750=125$$

$$\Rightarrow \quad x=\frac{125\times100}{750} \qquad \left[\text{Multiplying both sides by } \frac{100}{750}\right]$$

$$\Rightarrow \quad x=\frac{1\times100}{6}=\frac{50}{3}=16.66$$

Hence, 125 metres is 16.66% of 750 metres.

Example 3 Express 75 paise as a per cent of Rs 5.

Solution We have, Rs 5 = 500 paise.

Let x% of Rs 5 be 75 paise. Then,

x% of Rs 5 = 75 paise

$\Rightarrow$ x% of 500 paise = 75 paise

$$\Rightarrow \quad \frac{x}{100}\times500=75 \Rightarrow x=\frac{75\times100}{500} \Rightarrow x=15$$

Hence, 15% of Rs 5 is 75 paise.

Aliter The required per cent $=\left(\frac{75}{500}\times100\right)\%=15\%$

Example 4 Express 18 hours as a per cent of 3 days.

Solution We have, One day = 24 hours

$$\therefore \quad 3\text{ days}=(24\times3)\text{ hours}=72\text{ hours}.$$

Let x% of 3 days be 18 hours. Then,

x% of 72 hours = 18 hours

$$\Rightarrow \quad \frac{x}{100}\times72=18$$

$$\Rightarrow \quad x=\frac{18\times100}{72} \qquad \left[\text{Multiplying both sides by } \frac{100}{72}\right]$$

$$\Rightarrow \quad x=\frac{1\times100}{4} \quad \Rightarrow \quad x=25$$

Hence, 25% of 3 days is equal to 18 hours.

Aliter We have, 3 days = 72 hours.

$\therefore$ Required per cent $= \left(\frac{18}{72} \times 100\right)\% = 25\%$.

Example 5 Find 10% more than Rs 90.

Solution We have,

$$10\% \text{ of Rs } 90 = \text{Rs}\left(\frac{10}{100} \times 90\right) = \text{Rs } 9$$

$\therefore$ 10% more than Rs 90 = Rs 90 + Rs 9 = Rs 99

Example 6 Find 20% less than Rs 70.

Solution We have,

$$20\% \text{ of Rs } 70 = \text{Rs}\left(\frac{20}{100} \times 70\right) = \text{Rs } 14$$

$\therefore$ 20% less than Rs 70 = Rs (70 – 14) = Rs 56

EXERCISE 11.5

1. What per cent of
   (i) 24 is 6? (ii) Rs 125 is Rs 10? (iii) 4 km is 160 metres?
   (iv) Rs 8 is 25 paise? (v) 2 days is 8 hours? (vi) 1 litre is 175 ml?
2. What per cent is equivalent to $\frac{3}{8}$?
3. Find the following:
   (i) 8 is 4% of which number? (ii) 6 is 60% of which number?
   (iii) 6 is 30% of which number? (iv) 12 is 25% of which number?
4. Convert each of the following pairs into percentages and find out which is more?
   (i) 25 marks out of 30, 35 marks out of 40.
   (ii) 100 runs scored off 110 balls, 50 runs scored off 55 balls.
5. Find 20% more than Rs 200.
6. Find 10% less than Rs 150.

ANSWERS

1. (i) 25% (ii) 8% (iii) 4% (iv) 3.125% (v) $16\frac{2}{3}\%$ (vi) 17.50%
2. 37.5% 3. (i) 200 (ii) 10 (iii) 20 (iv) 48
4. (i) 35 marks out of 40 (87.5%) is more than 25 marks out of 30 (83.33%)
   (ii) Both are same (90.91%)
5. Rs 240 6. Rs 135

11.5 SOME WORD PROBLEMS ON PERCENTAGE

In this section, we shall apply the concept of percentage to solve some real-life problems. We shall be using the following formulae for finding increase or decrease per cent:

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

Following examples will illustrate the use of the concept of percentage in solving some real-life problems.

ILLUSTRATIVE EXAMPLES

Example 1 Sarita secures 84% marks in Hindi paper. If the maximum marks in the paper are 150, find the marks secured by her in the paper.

Solution Maximum marks in the paper = 150.

Sarita secures 84% marks in the paper.

$\therefore$ Marks secured by Sarita = 84% of 150 $= \frac{84}{100} \times 150 = 126.$

Thus, Sarita secured 126 marks in the paper.

Example 2 55% of the population of a town are males. If the total population of the town is 64100, find the population of females in the town.

Solution We have,

Population of the town = 64100

$\therefore$ 55% of the population $= \frac{55}{100} \times 64100 = 35255$

It is given that 55% of the population are males.

$\therefore$ Number of males = 35255

Hence, number of females in the town = Total population – No. of males

$= 64100 - 35255 = 28845$

Example 3 In an election, out of 75000 eligible voters 50000 cast their votes. What was the percentage of people casting their votes?

Solution We have,

Total number of eligible voters = 75000

Number of voters who cast their votes = 50000

$\therefore$ Percentage of voters casting their votes $= \frac{50000}{75000} \times 100 = \frac{200}{3} = 66.66$

Hence, 66.66% voters cast their votes.

Example 4 A basket contains 350 eggs. If 12% of the eggs are rotten, find the number of eggs, good enough to be sold.

Solution We have,

Total number of eggs in the basket = 350

Number of rotten eggs $= 12\% \text{ of } 350 = \left(\frac{12}{100} \times 350\right) = 42$

$\therefore$ Number of good eggs = (350 – 42) = 308

Example 5 In a fabric, cotton and synthetic fibres are in the ratio of 2 : 3. What is the percentage of cotton fibre in the fabric?

Solution It is given that the cotton and synthetic fibres are in the ratio 2 : 3. So, let cotton and synthetic fibres be $2x$ and $3x$ respectively.

Total quantity of fibre = $2x + 3x = 5x$

Thus, in $5x$ fibres, cotton fibres = $2x$

$\therefore$ Percentage of cotton fibres $= \left(\frac{2x}{5x} \times 100\right)\% = 40\%$

Example 6 A man spends 92% of his monthly income. If he saves Rs 220 per month, what is his monthly income?

Solution Let the total income be Rs x.

We have, Expenditure = 92%

$\therefore$ Saving = (100 – 92)% = 8%

It is given that the man saves Rs 220. This means that 8% of the total income is Rs 220.

i.e., $\frac{8}{100}\times x = 220$

$\Rightarrow \quad x = \frac{220\times 100}{8} = 2750$

Hence, the man's monthly income = Rs 2750.

Aliter Let his monthly income be Rs 100

Then, his expenditure = Rs 92

$\therefore$ His saving = Rs (100 – 92) = Rs 8

Now, if the saving is Rs 8, then income = Rs 100

If the saving is Rs 220, then income $= \text{Rs}\left(\frac{100}{8}\times 220\right) = \text{Rs } 2750$

Hence, the man's monthly income = Rs 2750.

Example 7 In an examination, 94% of the condidates passed and 114 failed. How many candidates appeared?

Solution Suppose 100 candidates appeared in the examination.

Then, number of passed candidates = 94

Number of failed condidates = (100 – 94) = 6

Thus, if the number of failures is 6, candidates appeared = 100

If the number of failures is 114, candidates appeared $= \left(\frac{100}{6}\times 114\right) = 1900$

Hence, 1900 candidates appeared in the examination.

Aliter We have,

Pass percentage = 94%

$\therefore$ Percentage of failures = 6%

Let the number of candidates appeared be x.

It is given that 114 candidates failed in the examination and the percentage of failures is 6%.

$\therefore$ 6% of x = 114

$\Rightarrow \quad \frac{6}{100}\times x = 114 \quad \Rightarrow \quad x = \frac{114\times 100}{6} = 1900$

Hence, 1900 candidates appeared in the examination.

Example 8 12% of the employees in a factory are females and the number of male employees is 264. Find the total number of employees. Also, find the number of female employees.

Solution Let the total number of employees be 100

Then, the number of female employees = 12

$\therefore$ Number of male employees = (100 – 12) = 88

Now, if the number of male employees is 88, total number of employees = 100

If the number of male employees is 264,

$$\text{total number of employees} = \left(\frac{100}{88}\times 264\right) = 300$$

Hence, the total number of employees = 300

$\therefore$ Number of female employees = (300 – 264) =36

Aliter Let the total number of employees be x.

It is given that the number of female employees = 12%

Therefore, number of male employees = (100 – 12)% = 88%

It is also given that the total number of male employees is 264

$\therefore$ 88% of x = 264

$$\Rightarrow \frac{88}{100}\times x = 264 \quad \Rightarrow x = \frac{264\times 100}{88} = 300$$

Hence, the total number of employees = 300

$\therefore$ Number of female employees = 300 – 264 = 36

Example 9 In a school, 720 are boys and 40% are girls. Find the number of girls.

Solution Let the total number of students be 100. Then,

The number of girls = 40

$\therefore$ Number of boys = 60

Now, if the number of boys is 60, the total number of students = 100

If the number of boys is 720, the total number of students = $\frac{100}{60}\times 720 = 1200$

$\therefore$ Number of girls =1200 – 720 = 480

Aliter Number of girls = 40%

Number of boys = (100 – 40)% = 60%

Girls : Boys = 40 : 60 = 2 : 3

Thus,

If the number of boys is 3, the number of girls = 2

$\therefore$ If the number of boys is 720, the number of girls = $\frac{2}{3}\times 720 = 480$

Example 10 A student scored 3 marks more than what he did in the previous examination in which he had scored 12. Another student scored 12 marks more than he did in the previous examination in which he had scored 84. Who had shown more improvement?

Solution We have,

Percentage improvement in the first examination for the first student

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

Percentage improvement in the first examination for the second student

$$=\left(\frac{12}{84}\times 100\right)\%=14\frac{2}{7}\%$$

Clearly, $25\%>14\frac{2}{7}\%$. Thus, the first student had improved more.

Example 11 The size of a bag that could hold 5 kg of sugar has now been increased so that it can hold 6 kg. What is the percentage increase in size?

Solution We have,

Old capacity of the bag = 5 kg.

New capacity of the bag = 6 kg.

$\therefore$ Increase in capacity = New capacity – Old capacity = (6 – 5) kg = 1 kg.

$$\therefore \text{ Percentage increase in size } = \left(\frac{\text{Increase in capacity}}{\text{Old capacity}}\times 100\right)\%$$

$$=\left(\frac{1}{5}\times 100\right)\%=20\%.$$

EXERCISE 11.6

1. Ashu had 24 pages to write. By the evening, he had completed 25% of his work. How many pages were left?
2. A box contains 60 eggs. Out of which $16\frac{2}{3}\%$ are rotten ones. How many eggs are rotten?
3. Rohit obtained 45 marks out of 80. What per cent marks did he get?
4. Mr Virmani saves 12% of his salary. If he receives Rs 15900 per month as salary, find his monthly expenditure.
5. A lawyer willed his 3 sons Rs 250000 to be divided into portions 30%, 45% and 25%. How much did each of them inherit?
6. Rajdhani College has 2400 students, 40% of whom are girls. How many boys are there in the college?
7. Aman obtained 410 marks out of 500 in CBSE XII examination while his brother Anish gets 536 marks out of 600 in IX class examination. Find whose performance is better?
8. Rahim obtained 60 marks out of 75 in Mathematics. Find the percentage of marks obtained by Rahim in Mathematics.
9. 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.
10. Ram scored 553 marks out of 700 and Gita scored 486 marks out of 600 in science. Whose performance is better?
11. Out of an income of Rs 15000, Nazima spends Rs 10200. What per cent of her income does she save?
12. 45% of the students in a school are boys. If the total number of students in the school is 880, find the number of girls in the school.

13. Mr. Sidhana saves 28% of his income. If he saves Rs 840 per month, find his monthly income.
14. In an examination, 8% of the students fail. What percentage of the students pass? If 1650 students appeared in the examination, how many passed?
15. In an examination, 92% of the candidates passed and 46 failed. How many candidates appeared?

ANSWERS

1. 18 pages
2. 10 eggs
3. $56\frac{1}{4}\%$
4. Rs 13992
5. Rs 75000, Rs 112500, Rs 62500
6. 1440 boys
7. Anish's performance is better
8. 80%
9. 200
10. Gita's performance is better
11. 32%
12. 484 girls
13. Rs 3000
14. 92%, 1518
15. 575

OBJECTIVE TYPE QUESTIONS

Mark the correct alternative in each of the following:

1. $\frac{2}{5}$ as a per cent is

   (a) 30% (b) 35% (c) 40% (d) 45%

2. $\frac{5}{4}$ as a per cent is

   (a) 80% (b) 125% (c) 120% (d) 130%

3. The ratio 3 : 5 as a per cent is

   (a) 60% (b) 50% (c) 40% (d) 80%

4. 12% as a fraction is

   (a) $\frac{3}{25}$ (b) $\frac{4}{25}$ (c) $\frac{3}{20}$ (d) $\frac{6}{25}$

5. $1\frac{1}{4}\%$ as a fraction is

   (a) $\frac{1}{40}$ (b) $\frac{1}{60}$ (c) $\frac{1}{80}$ (d) $\frac{1}{70}$

6. Which of the following fractions is equivalent to 25% ?

   (a) $\frac{1}{4}$ (b) $\frac{1}{5}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$

7. If 25% of x is 100, then $x =$

   (a) 100 (b) 200 (c) 300 (d) 400

8. If 8% of a number is 6, then the number is

   (a) 96 (b) 60 (c) 96 (d) 75

9. If x% of 75 is 12, then $x =$

   (a) 8 (b) 10 (c) 12 (d) 16

10. If $\frac{5}{6}$ of 29% of x is 29, then $x =$

    (a) 290 (b) 58 (c) 120 (d) 100

11. What per cent of $\frac{2}{7}$ is $\frac{1}{35}$?

(a) 25 % (b) 20 % (c) 15 % (d) 10 %

12. If $x = 100$, then 120 % of x is
(a) 125 (b) 115 (c) 120 (d) 110

13. 40 % of 150 + 60 % of 150 =
(a) 200 (b) 150 (c) 250 (d) 180

14. 50 % of 150 + 70 % of 300 =
(a) 295 (b) 285 (c) 265 (d) 275

15. 55 % of 1000 ÷ 60% of 2000 =
(a) $\frac{11}{24}$ (b) $\frac{12}{25}$ (c) $\frac{13}{24}$ (d) $\frac{14}{25}$

16. If x % of 2000 = 600, then x =
(a) 60 (b) 30 (c) 40 (d) 50

17. If x % of $\frac{12}{5}$ is $\frac{18}{25}$, then x =
(a) 30 (b) 40 (c) 72 (d) 50

18. The value of 30 % of 60 % of 200 is
(a) 23 (b) 24 (c) 18 (d) 36

19. If $\frac{2}{5}$ of 50 % of x is 10, then x =
(a) 100 (b) 50 (c) 25 (d) 80

20. If $\frac{4}{7}$ of 49 % of x is 21, then x =
(a) 125 (b) 98 (c) 84 (d) 75

21. Which of the following fractions is equivalent to 12.5% ?
(a) $\frac{1}{8}$ (b) $\frac{1}{6}$ (c) $\frac{1}{5}$ (d) $\frac{1}{12}$

22. Ravish saves 55% of his income. If his income is ₹ 11000, then his expenditure is
(a) ₹ 6050 (b) ₹ 7450 (c) ₹ 4950 (d) ₹ 3550

23. If 35 % of a number added to 39 is the number itself, the number is
(a) 60 (b) 65 (c) 75 (d) 105

24. On increasing the salary of a man by 25%, it becomes ₹ 20,000. What was his original salary?
(a) ₹ 15000 (b) ₹ 16000 (c) ₹ 18000 (d) ₹ 25000

25. Rohit scored 180 marks in the first test and 150 marks in the second test. The maximum marks in each test is 200. What is the decrease in his performance in percentage points?
(a) 20 % (b) 15 % (c) 25 % (d) 23 %

ANSWSERS

1. (c)	2. (b)	3. (a)	4. (a)	5. (c)	6. (a)	7. (d)
8. (d)	9. (d)	10. (c)	11. (d)	12. (c)	13. (b)	14. (b)
15. (a)	16. (b)	17. (a)	18. (d)	19. (b)	20. (d)	21. (a)
22. (c)	23. (a)	24. (b)	25. (b)			

THINGS TO REMEMBER

1. *Per cent means per hundred or for every hundred.*
2. *By a certain per cent, we mean that many hundredths.*
3. *A fraction with its denominator as 100 is called a per cent and is equal to that per cent as is the numerator.*
4. *A ratio with its second term 100 is also called a per cent.*
5. *To convert a fraction into a per cent we multiply the fraction by 100.*
6. *To convert a ratio into a per cent, we write it as a fraction and multiply it by 100.*
7. *To convert a decimal into a per cent, we shift the decimal point two places to the right.*
8. *To convert a per cent into a fraction, we drop per cent sign (%) and divide the remainder by 100.*
9. *To convert a per cent into a ratio, we drop per cent sign (%) and form a ratio with the remaining number as the first term and 100 as the second term.*
10. *To convert a per cent into a decimal, we drop per cent sign (%) and shift the decimal point two places to the left.*
11. $\text{Increase}\% = \left(\frac{\text{Increase}}{\text{Original value}} \times 100\right)\%$

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