CHAPTER 9

PERCENT AND PERCENTAGE

9.1 BASIC CONCEPT

The word **CENT** means ***hundred***.

Hence, the word *percent* means, *per hundred* or *out of hundred.*

The notation for percent is "%".

Thus, 5 percent = 5%.

9.2 TO EXPRESS AN ORDINARY GIVEN STATEMENT AS PERCENT

Steps : 1. Express the given statement as a fraction.

2. Convert this fraction into an equivalent fraction with denominator 100.

Example 1 :

7 out of 35 children in a class are absent. Express this statement as a percent.

Solution :

7 out of 35 means $\frac{7}{35} = \frac{1}{5}$ [Step 1]

$= \frac{1}{5} \times \frac{20}{20}$ [Step 2]

$= \frac{20}{100} = 20\% \Rightarrow$ **20% children are absent.** **(Ans.)**

OR, directly : **7 out of 35** means $\frac{7}{35} = \frac{7}{35} \times 100\% = 20\%$ **(Ans.)**

Therefore, to express a fraction or a decimal as percent, multiply it by 100 and in the same step write the sign of percent (%).

For example :

(i) $\frac{4}{10} = \frac{4}{10} \times 100\% = 40\%$ (ii) $0{\cdot}3 = 0{\cdot}3 \times 100\% = \frac{3}{10} \times 100\% = 30\%$

Conversely, to change a percent to a fraction or to a decimal, divide it by 100 and at the same time remove percent sign.

For example :

(i) $\frac{3}{4}\% = \frac{3}{4 \times 100} = \frac{3}{400}$ (as fraction) = 0·0075 (as decimal)

(ii) $12{\cdot}5\% = \frac{12{\cdot}5}{100} = \frac{1}{8}$ (as fraction) = 0·125 (as decimal) and so on.

9.3 TO EXPRESS ONE QUANTITY AS A PERCENT OF THE OTHER

1. If necessary, convert the quantities into the same units.
2. Form the fraction with the number to be compared as numerator and the number with which it is to be compared as denominator.
3. Multiply the fraction obtained by 100 and at the same time write the percent sign (%).

Example 2 :

Express 40 p as a percent of ₹ 6.

Solution :

$$\text{Fraction} = \frac{40\text{ p}}{600\text{ p}} = \frac{1}{15} \qquad [₹\ 6 = 600\text{ p}]$$

$$\text{Hence, required percent} = \frac{1}{15} \times 100\% = \frac{20}{3}\% = 6\frac{2}{3}\% \qquad \textbf{(Ans.)}$$

Direct method :

$$40\text{ p as percent of } ₹\ 6 = \frac{40}{600} \times 100\% \qquad [\because ₹\ 6 = 600\text{ p}]$$

$$= \frac{20}{3}\% = 6\frac{2}{3}\%$$

∴ If two quantities x and y are in the same unit, then

$$x \text{ as percent of } y = \frac{x}{y} \times 100\%$$

$$\text{and, } y \text{ as percent of } x = \frac{y}{x} \times 100\%$$

Example 3 :

A pudding is made of 400 g sugar, 200 g of eggs, 800 g of flour and 100 g of dry fruits. What percent of sugar is present in the whole pudding ?

Solution :

Here, the total weight of the pudding = (400 + 200 + 800 + 100) g = 1500 g

Weight of sugar = 400 g

$$\therefore \textbf{ Percentage of sugar in the pudding} = \frac{400}{1500} \times 100\% = 26\frac{2}{3}\% \qquad \textbf{(Ans.)}$$

9.4 TO FIND PERCENTAGE OF A QUANTITY

1. $20\% \text{ of } 60 = \frac{20}{100} \times 60 = 12$

2. $40\% \text{ of } 7{\cdot}5 = \frac{40}{100} \times 7{\cdot}5 = 3$ and so on.

Example 4 :

In a class of 50 children, 10% are taking part in dramatics. How many children are not taking part ?

Solution :

$$\text{Since, } 10\% \text{ of } 50 = \frac{10}{100} \times 50 = 5$$

Hence, 5 children are taking part and 50 – 5 = **45 are not taking part.** **(Ans.)**

Alternative method :

If 10% of the children are taking part

⇒ (100 – 10)% = 90% are not taking part

∴ **Number of children not taking part** = 90% of 50

$$= \frac{90}{100} \times 50 = 45 \qquad \textbf{(Ans.)}$$

EXERCISE 9 (A)

1. Express each of the following as percent :

   (i) $\frac{3}{4}$ (ii) $\frac{2}{3}$ (iii) 0·025 (iv) 0·125

2. Express the following percentages as fractions and as decimal numbers :

   (i) $7\frac{1}{2}\%$ (ii) 2·50% (iii) 0·02% (iv) 175%

3. What percent is :

   (i) 16 hours of 2 days ? (ii) 40 paisa of ₹ 2 ?

   (iii) 25 cm of 4 metres ? (iv) 600 gm of 5 kg ?

4. Find the value of :

   (i) 5% of ₹ 350 (ii) 10% of ₹ 400·40 (iii) 1% of ₹ 500

   (iv) $12\frac{1}{2}\%$ of 80 kg (v) $\frac{5}{8}\%$ of ₹ 600 (vi) $33\frac{1}{3}\%$ of 27 m

5. In a class of 60 children, 30% are girls. How many boys are there ?

6. In an election, two candidates A and B contested. A got 60% of the votes. The total votes polled were 8000. How many votes did each get ?

7. A person saves 12% of his salary every month. If his salary is ₹ 2,500, find his expenditure.

8. Seeta got 75% marks out of a total of 800. How many marks did she loose ?

9. A shop worth ₹ 25,000 was insured for 95% of its value. How much would the owner get in case of any mishappening ?

10. A class has 30 boys and 25 girls. What is the percentage of boys in the class ?

Example 5 :

Out of 50 apples, 20% were eaten and 20% of the remaining were rotten. Find the number of apples left.

Solution :

$\because$ Total number of apples = 50

$\therefore$ No. of apples eaten = 20% of 50 = $\frac{20}{100} \times 50 = 10$

No. of remaining apples = 50 – 10 = 40

No. of apples rotten = 20% of 40 = $\frac{20}{100} \times 40 = 8$

$\therefore$ **No. of apples left = 40 – 8 = 32** **(Ans.)**

Example 6 :

The salary of a person is ₹ 2,000. Provident fund deducted is 8% of the salary. Of the remaining salary, he spends 10% on house rent and 20% on education of the children.

How much is the provident fund deducted ?

How much does he spend on the house rent and on education ?

Solution :

$\because$ Total Salary = ₹ 2,000

And, provident fund = 8% of ₹ 2,000 = $\frac{8}{100} \times$ ₹ 2,000 = ₹ 160.

$\therefore$ Money left after deduction of provident fund = ₹ 2,000 – ₹ 160 = ₹ 1,840.

$\therefore$ Money spent on house rent = 10% of ₹ 1,840 = $\frac{10}{100}$ × ₹ 1,840 = ₹ 184

And, Money spent on education = 20% of ₹ 1,840 = $\frac{20}{100}$ × ₹ 1,840 = ₹ 368

$\therefore$ **Provident fund** = ₹ 160, money spent on **house rent** = ₹ 184

and **money spent on education** = ₹ 368 **(Ans.)**

Example 7 :

A girl does 25% of her home work in the morning and 45% of the home work in the evening. What percent of the work is still left ?

Solution :

Home work done in the morning = 25%

and, home work done in the evening = 45%

$\therefore$ Total home work done = 25% + 45% = 70%

Hence, percentage of **home work left** = (100 – 70)% = **30%** **(Ans.)**

The whole quantity, whole work, etc., is always taken as 100%

Example 8 :

20% of a number is 80. Find the number,

Solution :

Let the number be x.

$\therefore$ 20% of x = 80 $\Rightarrow$ $\frac{20}{100} \times x = 80$

$\Rightarrow$ $x = \frac{80 \times 100}{20} = 400$

Hence, **the required number** = 400 **(Ans.)**

EXERCISE 9(B)

1. Deepak bought a basket of mangoes containing 250 mangoes. 12% of these were found to be rotten. Of the remaining, 10% got crushed. How many mangoes were in good condition ?
2. In a Maths Quiz of 60 questions, Chandra got 90% correct answers and Ram got 80% correct answers. How many correct answers did each give ? What percent is Ram's correct answers to Chandra's correct answers ?
3. In an examination, the maximum marks are 900. A student gets 33% of the maximum marks and fails by 45 marks. What is the passing mark ? Also, find the pass percentage.
4. In a train, 15% people travel in first class, 35% travel in second class. The balance travel in the A.C. class ? Calculate the percentage of A.C. class travellers ?
5. A boy eats 25% of the cake and gives away 35% of it to his friends. What percent of the cake is still left with him ?
6. What is the percentage of vowels in the English alphabet ?
7. (i) $6\frac{1}{4}$% of what number is 375 ? (ii) 0·2% of a number is 5. Find the number.

   (iii) 30 is $16\frac{2}{3}$% of a number. Find the number.

8. The money spent on the repairs of a house was 1% of its value. If the repair costs ₹ 5,000, find the cost of the house.

9. In a school, out of 300 students, 70% are girls and 30% are boys. If 30 girls leave and no new boy is admitted, what is the new percentage of girls in the school ?

10. Kumar bought a transistor for ₹ 960. He paid $12\frac{1}{2}$% cash money. The rest he agreed to pay in 12 equal monthly instalments. How much will he pay each month ?

11. An ore contains 20% zinc. How many kg of ore will be required to get 45 kg of zinc ?

9.5 PERCENTAGE CHANGE

1. Percentage change = $\frac{\text{Decrease (or increase) in the value}}{\text{Original value}} \times 100\%$

2. The change percent is always calculated on the original value.

Example 9 :

A bicycle costs ₹ 800. After six months its value became ₹ 650. By what percent has the price decreased ?

Solution :

Original price = ₹ 800 and reduced price = ₹ 650

$\therefore$ Decrease in price = ₹ 800 – ₹ 650 = ₹ 150

And, **percentage decrease** = $\frac{\text{Decrease in price}}{\text{Original price}} \times 100\%$

$= \frac{150}{800} \times 100\% = \frac{75}{4}\% = 18\frac{3}{4}\%$ **(Ans.)**

Example 10 :

A line of length 1·5 metres was measured 1·55 metres by mistake. Find the error percent.

Solution :

Actual length = 1·5 m and wrong length = 1·55 m

$\therefore$ Error = 1·55 m – 1·5 m = 0·05 m

And, **error %** = $\frac{\text{Error}}{\text{Actual length}} \times 100\% = \frac{0{\cdot}05}{1{\cdot}5} \times 100\% = \frac{10}{3}\% = 3\frac{1}{3}\%$ **(Ans.)**

Example 11 :

(i) Increase 80 by 25% (ii) Decrease 60 by 10%.

Solution :

(i) Since, original number = 80

Increase = 25% of 80 = $\frac{25}{100} \times 80 = 20$

$\therefore$ **new** (increased) **number** = 80 + 20 = **100** **(Ans.)**

(ii) Since, original number = 60

Decrease = 10% of 60 = $\frac{10}{100} \times 60 = 6$

$\therefore$ **new** (decreased) **number** = 60 – 6 = **54** **(Ans.)**

Example 12 :

What number when increased by 25% becomes 150 ?

Solution :

Let the number be 100.

$\because$ Increase in number = 25% of 100 = $\frac{25}{100} \times 100 = 25$

$\therefore$ Increased number = 100 + 25 = 125

When increased no. = 125, the original no. = 100

When increased no. = 1, the original no. = $\frac{100}{125}$

When increased no. = 150, the **original no.** = $\frac{100}{125} \times 150 = 120$ **(Ans.)**

Alternative method :

Let the original number be x.

$\therefore$ Increase in number = 25% of $x = \frac{25}{100} \times x = \frac{x}{4}$

And, so $x + \frac{x}{4} = 150 \Rightarrow \frac{4x + x}{4} = 150$

$\Rightarrow 5x = 150 \times 4$

$\Rightarrow x = \frac{600}{5} = 120$ **(Ans.)**

EXERCISE 9(C)

1. The salary of a man is increased from ₹ 600 per month to ₹ 850 per month. Express the increase in salary as percent.
2. Increase :
   (i) 60 by 5% (ii) 20 by 15% (iii) 48 by $12\frac{1}{2}$%
   (iv) 80 by 140% (v) 1000 by 3·5%
3. Decrease :
   (i) 80 by 20% (ii) 300 by 10% (iii) 50 by 12·5%
4. What number :
   (i) when increased by 10% becomes 88 ?
   (ii) when increased by 15% becomes 230 ?
   (iii) when decreased by 15% becomes 170 ?
   (iv) when decreased by 40% becomes 480 ?
   (v) when increased by 100% becomes 100 ?
   (vi) when decreased by 50% becomes 50 ?
5. The price of a car is lowered by 20% to ₹ 40,000. What was the original price ? Also, find the reduction in price.

6. If the price of an article is increased by 25%, the increase is ₹ 10. Find the new price.
7. If the price of an article is reduced by 10%, the reduction is ₹ 40. What is the old price?
8. The price of a chair is reduced by 25%. What is the ratio of :
   (i) change in price to the old price.
   (ii) old price to the new price.
9. If x is 20% less than y, find :
   (i) $\frac{x}{y}$ (ii) $\frac{y - x}{y}$ (iii) $\frac{x}{y - x}$

(i) Given : $x = y - 20\%$ of y

$\Rightarrow \quad x = y - \frac{20y}{100} = \frac{100y - 20y}{100} = \frac{80y}{100} = \frac{4y}{5}$

$\therefore \quad x = \frac{4y}{5} \Rightarrow 5x = 4y \Rightarrow \frac{x}{y} = \frac{4}{5}$ **(Ans.)**

(ii) $\frac{x}{y} = \frac{4}{5} \Rightarrow$ if $x = 4, y = 5$

$\therefore \quad \frac{y - x}{y} = \frac{5 - 4}{5} = \frac{1}{5}$ **(Ans.)**

(iii) Again, $\frac{x}{y} = \frac{4}{5} \Rightarrow$ if $x = 4, y = 5 \Rightarrow \frac{x}{y - x} = \frac{4}{5 - 4} = 4$ **(Ans.)**

10. If x is 30% more than y; find :
    (i) $\frac{x}{y}$ (ii) $\frac{y + x}{x}$ (iii) $\frac{y}{y - x}$
11. The weight of a machine is 40 kg. By mistake, it was weighed as 40·8 kg. Find the error percent.
12. From a cask, containing 450 litres of petrol, 8% of the petrol was lost by leakage and evaporation. How many litres of petrol was left in the cask ?
13. An alloy consists of 13 parts of copper, 7 parts of zinc and 5 parts of nickel. What is the percentage of each metal in the alloy ?
14. In an examination, first division marks are 60%. A student secures 538 marks and misses the first division by 2 marks. Find the total marks of the examination.
15. Out of 1200 pupils in a school, 900 are boys and the rest are girls. If 20% of the boys and 30% of the girls wear spectacles, find :
    (i) how many pupils in all wear spectacles ?
    (ii) what percent of the total number of pupils wear spectacles ?