Percent

The word percent is derived from the Latin word *Percentum*. *Per* means each and *centum* means hundred, therefore, *Percentum* means per hundred or hundredths. Fraction with hundred denominator are known as per cent. **For example**, there are 100 students in class. Out of these, if 70 students are boys, then it can be written as $\frac{70}{100}$ and it is expressed as a percentage of 70 or 70 per cent or 70%.

Percent means ''out of a hundred''

The symbol '%' is used for percent.

The percentage has many applications. It is used in business, industry, profit or loss, interest and different taxes like Income Tax, Sale Tax etc.

Changing a Fraction into a Percentage

In order to change a fraction into a percentage, build equivalent fractions with denominator 100 or multiply the given fraction by 100 and write the symbol % with it.

Example I : Express the following fractions into percentage.

a. $\frac{4}{5}$ b. $2\frac{1}{4}$ c. $\frac{6}{20}$

Solution : a. $\frac{4}{5} = \frac{4 \times 20}{5 \times 20} = \frac{80}{100} = 80\%$

b. $2\frac{1}{4} = \frac{9}{4} = \frac{9 \times 25}{4 \times 25} = \frac{225}{100} = 225\%$

c. $\frac{6}{20} = \frac{6 \times 5}{20 \times 5} = \frac{30}{100} = 30\%$

Example II : Express the following fractions into percentage.

        a. $\dfrac{3}{5}$ b. $\dfrac{1}{4}$ c. $\dfrac{11}{20}$

Solution : a. $\dfrac{3}{5} = \dfrac{3}{5} \times 100 = 60\%$

        b. $\dfrac{1}{4} = \dfrac{1}{4} \times 100 = 25\%$

        c. $\dfrac{11}{20} = \dfrac{11}{20} \times 100 = 55\%$

> *Facts to Know*
>
> ○ Decimal and whole numbers can be changed into per cent by multiplying by 100.

Change a Decimal into a Percentage

In order to change a decimal into a percentage, multiply the decimal by 100 and write the symbol % with it.

Example III : Convert the following decimal into percentage.

        a. 0.3   b. 0.04   c. 5.6   d. 0.18   e. 0.007

Solution : a. $0.3 = \dfrac{3}{10}$

        or $\dfrac{3}{10} \times 100\% = 30\%$

        b. $0.04 = \dfrac{4}{100}$

        or $\dfrac{4}{100} \times 100\% = 4\%$

        c. $5.6 = \dfrac{56}{10}$

        or $\dfrac{56}{10} \times 100\% = 560\%$

        d. $0.18 = \dfrac{18}{100}$

        or $\dfrac{18}{100} \times 100\% = 18\%$

        e. $0.007 = \dfrac{7}{1000}$

        or $\dfrac{7}{1000} \times 100\% = 0.7\%$

Example IV : Convert the following decimal into percentage by short cut method.

   a.   4.5   b. 0.6   c. 0.04   d.   0.017

Solution : a.   4.5   = $(4.5 \times 100)\,\%$ =   450 %

   b.   0.6   = $(0.6 \times 100)\,\%$ =   60 %

   c.   0.04   = $(0.04 \times 100)\,\%$ =   4 %

   d.   0.017 = $(0.017 \times 100)\,\%$ =   1.7 %

Changing a Percentage into a Fraction and a Decimal

In order to change a percentage into a fraction, divide given percentage by 100 and reduce it to the lowest fraction and remove the symbol %.

Example V : Change the following percentage into fraction :

   a.   4 %   b. 85 %   c. $\dfrac{1}{5}$ %   d. 15.5 %

Solution : a.   4 %   = $\dfrac{4}{100} = \dfrac{1 \times 4}{25 \times 4} = \dfrac{1}{25}$

   b.   85%   = $\dfrac{85}{100} = \dfrac{17 \times 5}{20 \times 5} = \dfrac{17}{20}$

   c. $\dfrac{1}{5}$%   = $\dfrac{1}{5 \times 100} = \dfrac{1}{500}$

   d.   15.5 %   = $\dfrac{155}{10} \times \dfrac{1}{100} = \dfrac{31 \times 5}{2 \times 5} \times \dfrac{1}{100} = \dfrac{31}{200}$

In order to change a percentage into decimal, divide the decimal by 100 and write the result as a decimal by removing the symbol %.
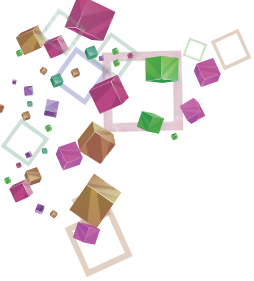
Facts to Know

   ○   **We can represent a per cent as a fraction whose denominator is 100.**

Example VI : Change the following percentage into decimal.

   a.   3 %   b. 35 %   c.   4.6 %   d. $\dfrac{1}{2}$ %

Solution : a.   3 %   = $\dfrac{3}{100}$ =   0.03

   b.   35 % = $\dfrac{35}{100}$ =   0.35

c. $4.6\% = \dfrac{4.6}{100} = 0.046$

d. $\dfrac{1}{2}\% = 0.5\% = \dfrac{0.5}{100} = 0.005$

Exercise 7.1

1. **Write each of the following as a percentage.**

   a. 7 hundredths
   b. 5 hundredths
   c. 17 hundredths
   d. 36 hundredths
   e. 30 hundredths
   f. 60 hundredths

2. **Write each of the following as a percentage.**

   a. $\dfrac{12}{100}$
   b. $\dfrac{24}{100}$
   c. $\dfrac{53}{100}$
   d. $\dfrac{21}{100}$
   e. $\dfrac{147}{100}$
   f. $\dfrac{325}{100}$

3. **Express each of the following fractions as a percentage.**

   a. $\dfrac{4}{10}$
   b. $\dfrac{1}{5}$
   c. $\dfrac{4}{5}$
   d. $\dfrac{7}{10}$
   e. $\dfrac{9}{6}$
   f. $\dfrac{19}{50}$

   g. $5\dfrac{1}{2}$
   h. $4\dfrac{1}{4}$
   i. $7\dfrac{1}{2}$
   j. $3\dfrac{3}{4}$
   k. $7\dfrac{3}{5}$
   l. $2\dfrac{4}{5}$

4. **Express each of the following decimals as percentage.**

   a. 0.9
   b. 0.02
   c. 0.04
   d. 0.49
   e. 0.55
   f. 5.4
   g. 1.12
   h. 1.05

5. **Change each of the following percentages into fractions.**

   a. 5 %
   b. 15 %
   c. 75 %
   d. 45 %
   e. $7\dfrac{1}{4}\%$
   f. 35 %
   g. .25 %
   h. $8\dfrac{1}{3}\%$

6. **Change each of the following percentages into decimals.**

   a. 21 %
   b. 30 %
   c. 60 %
   d. 850 %
   e. 7.25 %
   f. 4.5 %
   g. 12.6 %
   h. 0.8 %

Applications of Percentages

1. Application of Percentage in Money

We know that   100 paise = 1 rupee.

Then,   1 paisa $= \dfrac{1}{100}$ rupee.

But, we know that $\dfrac{1}{100}$ = 1 %.

Therefore,   1 paisa   =   1 % of ₹ 1.
Similarly,   4 paisa   =   4 % of ₹ 1.
                             9 paisa   =   9 % of ₹ 1.
                             10 paisa =   10 % of ₹ 1.
                             50 paisa =   50 % of ₹ 1 etc.

2. Application of Percentage in Measurement of Length

We know that   100 cm   =   1 m.

Then,   1 cm $= \dfrac{1}{100}$ m.

But, we know that $\dfrac{1}{100}$ =   1 %.

Therefore,   1 cm   =   1 % of 1 m.
Similarly,   4 cm   =   4 % of 1 m,
                             9 cm   =   9 % of 1 m,
                             10 cm   =   10 % of 1 m,
                             ....,
                             ....,
                             60 cm   =   60 % of 1 m etc.

3. Application of Percentage in Measurement of Weight

We know that   1000 g   =   1 kg.

Then,   1 g $= \dfrac{1}{1000}$ kg.

But, we know that $\dfrac{1}{1000}$ $= \dfrac{1}{10} \times \dfrac{1}{100} = 0.1 \times \dfrac{1}{100} = 0.1\%.$

Therefore,   1 g   =   0.1 % of 1 kg.
Similarly,   4 g   =   0.4 % of 1 kg,
                             9 g   =   0.9 % of 1 kg,
                             10 g   =   1 % of 1 kg,
                             ....,
                             ....,
                             50 g   =   5 % of 1 kg etc.

4. Application of Percentage in Measurement of Capacity

We know that $1000\ ml\ =\ 1\ l.$

Then, $1\ ml\ =\ \dfrac{1}{1000}\ l.$

But, we know that $\dfrac{1}{1000}\ =\ \dfrac{1}{10} \times \dfrac{1}{100} = 0.1 \times \dfrac{1}{100} = 0.1\%.$

Therefore, $1\ ml\ =\ 0.1\ \%$ of $1\ l.$

Similarly, $4\ ml\ =\ 0.4\ \%$ of $1\ l,$

                                    $9\ ml\ =\ 0.9\ \%$ of $1\ l,$

....,

$10\ ml\ =\ 1\ \%$ of $1\ l,$

....,

....,

$50\ ml\ =\ 5\ \%$ of $1\ l$ etc.

Example VII : Find the value of the following :

    a.   4 % of ₹ 75   b.   20 % of 25 kg

    c.   5 % of ₹ 120 km   d.   75 % of 128

Solution :

a.   4 % of ₹ 75 $=\ \dfrac{4}{100} \times ₹\ 75$

                              $=\ ₹\ \dfrac{4}{100} \times 75 = ₹\ 3$

b.   20 % of 25 kg $=\ \dfrac{20}{100} \times 25\,kg\ =\ 5\ kg$

c.   5 % of 120 km $=\ \dfrac{5}{100} \times 120\ km$

                              $=\ 6\ km$

d.   75 % of 128 $=\ \dfrac{75}{100} \times 128$

                              $=\ \dfrac{3 \times 25}{4 \times 25} \times 4 \times 32$

                              $=\ 96$

Example VIII : Aman secured 18 marks out of 25 in a test. Express his marks as a percentage.

Solution : 18 marks out of 25 can be written as $\dfrac{18}{25}$.

Therefore, percentage $= \dfrac{18}{25} \times 100$

$= \dfrac{18 \times 25 \times 4}{25}$

$= 72\,\%$.

Example IX : Vishal scored 90 % marks in Maths. If the test was of 60 marks, then how many marks did Vishal score ?

Solution : Vishal scored 90 % of 60 $= \dfrac{90}{100} \times 60 = 54$.

Therefore, Vishal scored 54 marks out of 60.

Example X : What per cent is 300 g of 2 kg ?

Solution : 2 kg = 2 × 1000 = 2000 g

To find the per cent, we write $\dfrac{300}{2000} \times 100 = 15\,\%$.

Exercise 7.2

1. **Evaluate the following.**

   a. 15 % of 200   b. 30 % of 60   c. 25 % of 40

   d. 75 % of 1300   e. 400 % of 5   f. $33\dfrac{1}{3}$ % of 15

   g. $12\dfrac{1}{2}$ % of 100   h. 200 % of 20

2. **Find the value of the following.**

   a. 25 % of 200 rupees   b. 5 % of 125 rupees   c. 25 % of 400 rupees

   d. 20 % of 400 grams   e. $1\dfrac{1}{5}$ % of 500 gram   f. $2\dfrac{1}{3}$ % of 300 kg

   g. 60 % of 100 *ml*   h. 40 % of 5 km   i. 60 % of 365 days
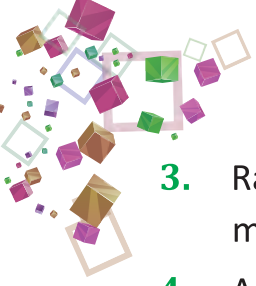
3. Ramjeet purchased 500 eggs to sell. He found that 10 % of them were broken. How many eggs were found to be broken ?

4. A family spends 60 % of its income on food. If their total income is ₹ 6000, then how much money do they spend on food ?

5. A girl has ₹ 1000. She spent 75 % of this money. How much money is left with her ?

6. Ratna gets a monthly salary of ₹ 6000. He pays 10 % of it as rent. What is the monthly rent he has to pay ?

7. A team won 70 % of the 20 games played by it. How many games did it win. How many games did it lose ?

8. In a Science test of 10 questions carrying equal marks, Manisha secured 80% marks. How many questions did she answer correctly ?

9. The airfare from Delhi to Mumbai is ₹ 7500 plus a 10 % surcharge. Find the total airfare of a round trip.

10. In a book shop there were 5000 books. Out of these books, 2500 books were damaged. What percentage of books was damaged ?

11. Payal gave away ₹ 20 out of ₹ 100 to a friend. How much per cent of her money did she give away ?

Points to Remember

❖ Per cent means "out of a hundred".
❖ The word per cent is derived from the Latin word Percentum.
❖ The symbol for per cent is '%'.
❖ The percentage has many applications. It is used in business, industry, profit or loss, interest and different taxes like income tax, sale tax etc.
❖ To change the fraction into percentage, we multiply by 100.
❖ To change percentage into fraction, we divide by 100.

(CCE Pattern)

1. **Multiple Choice Questions (MCQs)**

   Tick (☐) the correct option:

   a. A percentage is a way of expressing a number as a fraction of ....

   (i) 50 ☐ (ii) 100 ☐ (iii) 200 ☐ (iv) 400 ☐

   b. Rahul got 65 marks in Maths out of 100, what per cent did he get?

   (i) 65 ☐ (ii) 6.5 ☐ (iii) 650 ☐ (iv) none of these ☐

   c. Applications of percentage are in ....

   (i) business ☐ (ii) industry ☐

   (iii) profit and loss ☐ (iv) all of these ☐

   d. What percentage is 2 cm of 1 m?

   (i) 2% ☐ (ii) 20% ☐ (iii) 200% ☐ (v) 0.2% ☐

   e. What percentage is 1 m of 1 km?

   (i) 1% ☐ (ii) 10% ☐ (iii) 100% ☐ (iv) 0.1% ☐

2. **Write each of the following as a percentage.**

   a. $\dfrac{6}{100}$ b. $\dfrac{12}{100}$ c. $\dfrac{18}{100}$ d. $\dfrac{30}{100}$ e. $\dfrac{61}{100}$ f. $\dfrac{85}{100}$

3. **Express each of the following as a percentage.**

   a. $\dfrac{7}{5}$ b. $\dfrac{1}{4}$ c. $\dfrac{5}{8}$ d. $\dfrac{12}{15}$ e. $\dfrac{15}{25}$

   f. $1\dfrac{1}{4}$ g. $1\dfrac{45}{80}$

4. **Express each of the following decimals as percentage.**

   a. 0.7 b. 0.3 c. 0.15 d. 0.19 e. 0.75

5. **Change each of the following percentage into fractions.**

   a. 6% b. 30% c. 55% d. 80% e. $7\dfrac{1}{5}$%

6. **Evaluate the following.**

   a. 25% of 100 b. 15% of 300 c. 25% of 1000

   d. $33\dfrac{1}{3}$% of 45 e. 250% of 20 f. $12\dfrac{1}{2}$% of 450

7. Lalita secured 85% of marks in an examination. If the maximum marks were 1000, how many marks did she secure ?

8. Diana got 75% marks. The maximum marks for the test was 1000. How many marks did she get ?

HOTS

The population of town increases 10% annually. If its present population is 40,000, find its population after 2 years.

Lab Activity

Objective : To relate percentage to everyday life.

Materials Required : A sheet of squared paper per child, crayons, pencil and scale

Activities :

❖ Use the squared paper to estimate the per cent of the garden that is planted with :

Beans = 20%, Onions = 15%, Tomatoes = 30% and Carrots = 25%.

❖ Plant you favourite vegetables in the remaining part.

❖ Mark 100 squares on the squared paper.
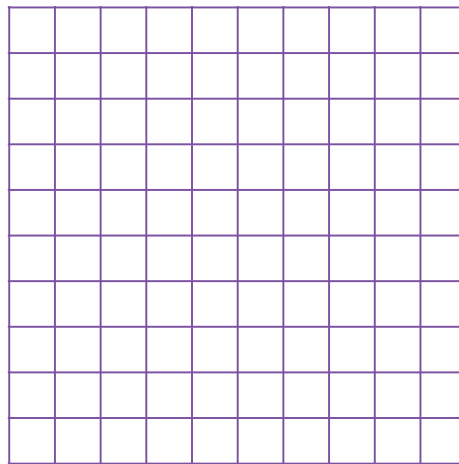
❖ Colour them according to the colour of the vegetable.

❖ After completing the sheet, make a key relating the colour with the particular vegetable.

For Example : ▮ for tomatoes

All sheets should be displayed in the class.