

22

Percentages

By studying this lesson you will be able to,

- identify a percentage,
- use the symbol %, to indicate an amount as a fraction of 100, and
- write a fraction with denominator equal to a factor of 100, as a percentage.

22.1 Introduction to the concept of percentage

Some advertisements taken from a newspaper and a leaflet are shown below.



In all these advertisements the symbol % appears after a number. % is known as the **percentage sign**. The percentage sign is used in various instances.

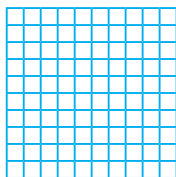


5% of the eggs in the basket are rotten. This means that 5 eggs out of 100 eggs are rotten. The ratio of the number of rotten eggs to the number of eggs in the basket is 5:100.

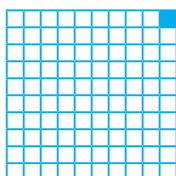


The yield from paddy seeds is 3500%. Accordingly, when you plant 100 paddy seeds you will get a yield of 3500. Therefore the ratio of the yield to the amount of seeds planted is 3500 : 100.

Let us study percentages using a 10×10 square grid.



The region of the 10×10 square grid is taken as 1 unit.



Considering it as one unit, the grid is divided into 100 small squares. Of these squares, exactly one is coloured. That is, $\frac{1}{100}$ of the entire grid is coloured. As a percentage, this is 1%. This is read as “**one percent**”. This indicates a portion of a unit as a percentage.

The below given table is prepared by taking the initial number of squares as 100.

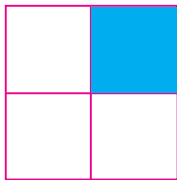
Figure	Coloured part	As a fraction	As a decimal number	As a percentage
	6 of the 100 squares	$\frac{6}{100}$	0.06	6%
	25 of the 100 squares	$\frac{25}{100}$	0.25	25%
	56 of the 100 squares	$\frac{56}{100}$	0.56	56%
	100 of the 100 squares	$\frac{100}{100}$	1.00	100%

Exercise 22.1

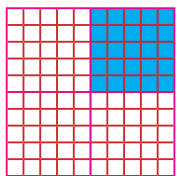
- (1) Write the percentages given in words using the percentage sign.
 - (i) Two percent
 - (ii) Twenty percent
 - (iii) Hundred percent
 - (iv) Hundred and seventy five percent
 - (v) Twelve and a half percent
 - (vi) Thirty point five percent
- (2) Write down how each of the percentages given below is read.
 - (i) 25 %
 - (ii) 180 %
 - (iii) 7.5 %
- (3) Write the percentage corresponding to each of the following fractions of a unit.
 - (i) $\frac{9}{100}$
 - (ii) $\frac{30}{100}$
 - (iii) $\frac{100}{100}$
 - (iv) $\frac{105}{100}$
- (4) Write the fraction corresponding to each of the percentages given below.
 - (i) 33 %
 - (ii) 100 %
 - (iii) 85 %
 - (iv) 1 %

22.2 More on representing fractions as percentages

Let us now consider a fraction which does not have 100 as the denominator. Let us learn to write it as a percentage.



Observe this figure. We see that $\frac{1}{4}$ of the whole figure is coloured.



This figure has been divided into 100 equal sized squares. Here $\frac{25}{100}$ of the whole figure is coloured. That is 25% of the whole figure is coloured.

See that the coloured parts of both figures are the same. So $\frac{1}{4} = \frac{25}{100}$. That is $\frac{1}{4} = 25\%$.

Thus, a given fraction can be written as an equivalent fraction with 100 as the denominator. Then we can represent the given fraction as a percentage.

Example 1

Write $\frac{3}{10}$ as a percentage.

As $100 \div 10 = 10$, let us multiply the denominator and the numerator by 10.

$$\frac{3}{10} = \frac{3 \times 10}{10 \times 10} = \frac{30}{100} = 30\%$$

Example 2

Write $\frac{5}{4}$ as a percentage.

As $100 \div 4 = 25$, let us multiply the denominator and the numerator of $\frac{5}{4}$ by 25.

$$\frac{5}{4} = \frac{5 \times 25}{4 \times 25} = \frac{125}{100} = 125\%$$

Example 3

Write 3 as a percentage.

$$3 = \frac{3}{1} = \frac{3 \times 100}{1 \times 100} = \frac{300}{100} = 300\%$$

Example 4

Write $2\frac{1}{2}$ as a percentage.

$$2\frac{1}{2} = \frac{5}{2} = \frac{5 \times 50}{2 \times 50} = \frac{250}{100} = 250\%$$

Example 5

Of the 25 students in a class, 13 are girls. Represent the number of girls, as a percentage of all the students in the class.

The number of girls, as a fraction of all the students in the class is $\frac{13}{25}$.

$$\frac{13}{25} = \frac{13 \times 4}{25 \times 4} = \frac{52}{100} = 52\%$$

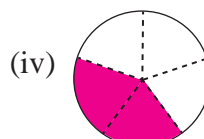
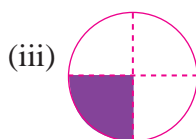
\therefore the number of girls, as a percentage of all the students in the class is 52%.


Exercise 22.2

(1) Write each of the fractions given below as a percentage.

(i) $\frac{3}{4}$ (ii) $\frac{1}{10}$ (iii) $\frac{15}{20}$ (iv) $\frac{3}{2}$ (v) $\frac{13}{10}$ (vi) $1\frac{2}{5}$ (vii) $1\frac{7}{20}$

(2) For each of the figures given below, write the shaded part as a fraction of the whole figure. Indicate this as a percentage.



- 
- (3) The total marks given for an assignment was 25. Prathapa got 21 for this assignment.
- Write her marks as a fraction of the total marks.
 - Write her marks as a percentage of the total marks.
- (4) A children's society has 20 members. Only 17 members attended a meeting on a certain day.
- Write the number that attended the meeting that day as a fraction of the total number of members.
 - Write the above fraction as a percentage.
- (5) The same Mathematics test paper was given to both Class A and Class B of grade 7. Malinda who was in Class A got 22 marks out of 25 for the test, while Suresh who was in Class B, got 18 marks out of 20.
- Express the marks Malinda got, as a percentage of the total marks.
 - Express the marks Suresh got, as a percentage of the total marks.
 - Of the two, who has shown more mathematical ability at the test?
- (6) A vendor bought 50 mangoes, of which 8 were spoilt.
- Express the number of spoilt mangoes as a percentage of the total number of mangoes.
 - Express the number of good mangoes as a percentage of the total number of mangoes.
- (7) 20 students attended an eye clinic. Of them, 5 had problems with their eye sight. Of all the students who came to the clinic find the percentage of students who didn't have problems with their eye sight.
- (8) Last year, Mr. Perera's salary was 50 000 rupees per month. This year his salary has increased to 65 000 rupees per month. Find the increment as a percentage of last year's monthly salary.
- (9) You can harvest 5 kg of ginger from 1 kg of ginger. Express the harvest as a percentage of the ginger that is planted.
- (10) For every 100 bean seeds that are planted from a packet, 85 germinate. Write the percentage of germinating seeds.

22.3 Representing decimal numbers as percentages

We have already learnt how to represent a decimal number as a fraction. Recalling what was learnt earlier, let us consider how a decimal number is represented as a percentage.



Activity 1

Copy the table given below in your exercise book and fill in the blanks.

Decimal number	The number as a fraction	The number as a fraction having 100 as the denominator	The number as a percentage of the original amount
0.5	$\frac{5}{10}$	$\frac{5 \times 10}{10 \times 10} = \frac{50}{100}$	50%
2.3	$\frac{23}{10}$
0.25	$\frac{25}{100}$	25%
1.75

A given decimal number with one or two decimal places can be represented as a percentage, by first representing it as a fraction having 100 as the denominator.

➤ **This can also be done by multiplying the given decimal number or fraction by 100 and placing the % symbol in the answer.**

- Let us represent 0.5 as a percentage.
Let us multiply 0.5 by 100 and then place the % symbol in the answer.
 $0.5 \times 100 = 50$
 \therefore 50% is 0.5 represented as a percentage.
- Let us represent 0.25 as a percentage.
0.25 represented as a percentage is 0.25×100 % ; that is, 25%.

Example 1

Let us represent 1.08 as a percentage.

1.08 represented as a percentage is 1.08×100 % ; that is, 108%.

Exercise 22.3

- (1) Write each of the given decimal numbers as a fraction. Then write it as a percentage.
- (i) 0.3 (ii) 0.5 (iii) 0.1 (iv) 0.33
(v) 0.45 (vi) 0.03 (vii) 0.08 (viii) 0.01
- (2) Multiply each of the given decimal numbers and fractions by 100, and represent it as a percentage of the original amount.
- (i) 0.7 (ii) $\frac{2}{5}$ (iii) 0.65 (iv) $\frac{3}{4}$
(v) 0.08 (vi) 0.05 (vii) 1.5 (viii) 1.25
- (3) A person spends $\frac{2}{5}$ of his monthly income on his children's education and 0.25 of his monthly income on food items.
- (i) Express the amount he spends on his children's education as a percentage of his income.
(ii) Express the amount he spends on food items as a percentage of his monthly income.
(iii) For which of the above two needs does he spend the greater portion of his monthly income?
- (4) Kamal had to pay a certain amount of money to an institution. He pays $\frac{1}{4}$ in January, 23% in February and 0.52 of the amount in March.
- (i) Express the amount of money he pays in January and March as a percentage of the total amount he had to pay.
(ii) Now compare your answers and decide in which month he has paid the most.

Summary

- When amounts which are parts of 100 are written with the percentage symbol %, we say that they are written as percentages.
- A given fraction or decimal number can be written as a percentage, by first writing it as a fraction having 100 as the denominator.
- A given decimal number can be represented as a percentage by multiplying it by 100 and placing the % symbol in the answer.