

Maths in Science

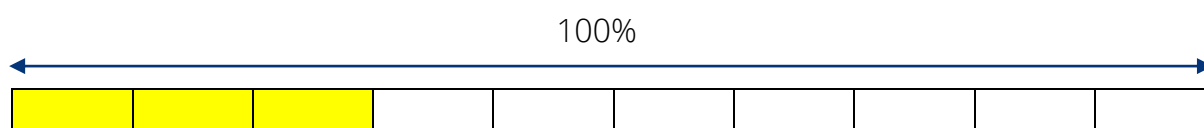
Percentages



Percentages

Percentages are an important tool in science that allow scientists to quantify, compare and interpret data.

A percentage is a way to express a number as a fraction of 100. It helps understand how much one quantity is in relation to another. Percent means 'out of one hundred.' The symbol for percentage is %. An easy way to look at percentages is using the diagram below:



If all 10 blocks were coloured, this equals 100%.

Each block is equal to 10%.

The three blocks coloured is equal to 30%.

Percentages are another way to represent a fraction out of 100, e.g., you can write $\frac{40}{100}$ which is the same as 40%, or $\frac{2}{5}$ in its simplest form. This can also be written as a decimal, 0.40. Another example is a half, which can be written in a number of different ways:

- As a fraction = $\frac{1}{2}$
- As a decimal = 0.5
- As a percentage = 50%

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Percentages



Expressing one number as a % of another

If you have 20 students in a class and 10 of them are girls, what percentage are girls:

$$\text{Percentage of girls} = \frac{10}{20} \times 100 = 50\%$$

To find the percentage of girls in the class:

The first step is to write the number of girls as a fraction of the total students in the class, $\frac{10}{20}$.

When typing this into a calculator, you would input 10 divided by 20 (*or use the fraction button on your calculator*) which equals 0.5.

The last step requires you to multiply this by 100, because percentage is out of 100; this equals 50%.

Finding a percentage

In a house, 60% of the energy used comes from solar panels in the roof. If the total energy consumption of the house is 1,000 kWh, how much energy is consumed from renewable sources?

Percentages of amounts can be calculated by writing the percentage as a decimal or fraction, then multiplying by the amount stated in the question.

60% as a fraction is $\frac{60}{100}$ or 0.6 as a decimal

To find 60% of 1,000 you would multiply $\frac{60}{100}$ or 0.6 by 1,000

$$0.6 \times 1,000 = 600 \text{ kWh}$$

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Percentages



Percentages: Checking understanding

Question 1:

In a population of 200 animals, 120 are found to be affected by a disease. What percentage of the population is affected by the disease?

Question 2:

A machine used in a factory converts 400 J of electrical energy into 260 J of useful kinetic energy. What is the percentage efficiency of the machine?

$$\text{Efficiency} = \frac{\text{useful energy}}{\text{total energy}} \times 100$$

Question 3:

A packet of cereal weighs 400 g and contains 50 g of sugar. What percentage of the cereal is sugar?

Question 4:

A chemical reaction had a theoretical yield of 48 g of product, but only 36 g was produced. What is the percentage yield of the product?

$$\text{Percentage yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

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Percentages



Percentages: Checking understanding (Answers)

Question 1:

In a population of 200 animals, 120 are found to be affected by a disease. What percentage of the population is affected by the disease?

$$\frac{120}{200} \times 100 = 60\%$$

Question 2:

A machine used in a factory converts 400 J of electrical energy into 260 J of useful kinetic energy. What is the percentage efficiency of the machine?

$$\text{Useful energy} = 260 \text{ J}$$

$$\text{Total input energy} = 400 \text{ J}$$

$$\text{Efficiency} = \frac{\text{useful energy}}{\text{total input energy}} \times 100$$

$$\frac{260}{400} \times 100 = 65\%$$

Question 3:

A packet of cereal weighs 400 g and contains 50 g of sugar. What percentage of the cereal is sugar?

$$\frac{50}{400} \times 100 = 12.5\%$$

Question 4:

A chemical reaction had a theoretical yield of 48 g of product, but only 36 g was produced. What is the percentage yield of the product?

$$\text{Theoretical yield} = 48 \text{ g}$$

$$\text{Actual yield} = 36 \text{ g}$$

$$\text{Percentage yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

$$\frac{36}{48} \times 100 = 75\%$$