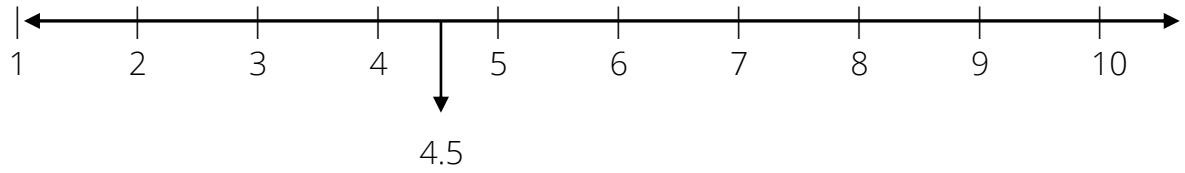
Maths in Science
Decimals

Decimals

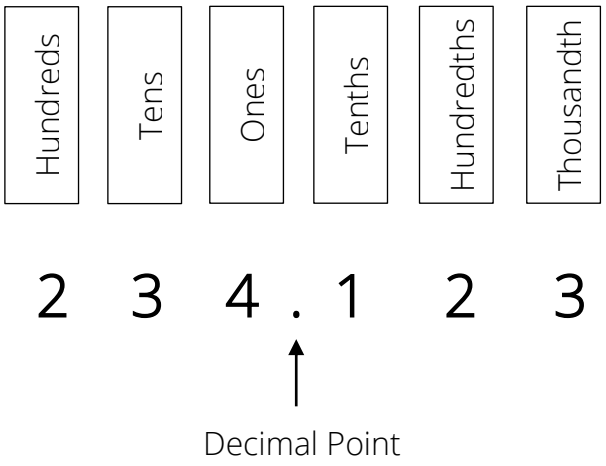
Decimal numbers are a way of representing numbers that are not whole. They are numbers that are in between whole numbers. A decimal point, often shown as a dot (.) is used to show the separation in a whole number. Decimals are essential in science to allow scientists to express measurements with a high degree of precision.

It can be helpful to look at decimals on a number line. For example, the number line below goes from 1 to 10.



The number 4.5 has been marked on the number line. Its position is between 4 and 5.

One-way decimals can be split is into tenths, hundredths, and thousandths.



This shows the number 234.123 has:

2 Hundreds, 3 Tens, 4 Ones, 1 Tenth, 2 Hundredths and 3 Thousandths.

Maths in Science
Decimals

Numbers with decimals can also be looked at as a whole number plus a fraction. The number 2.6 has 2 Ones and 6 Tenths. This can also be written as 2 and $\frac{6}{10}$.

Another example is 12.43, this has 1 Ten, 2 Ones, 4 Tenths and 3 Hundredths. This can also be written as 12 and $\frac{43}{100}$.

Therefore, decimals can be written as fractions and percentages. For example, 0.75 can be written as $\frac{75}{100}$ which is the same as 75%. Another example is 0.1, this can be written as $\frac{1}{10}$ which is the same as 10%.

Decimals are essential in everyday life, including for measuring and calculating money. For this reason, it can be useful to know how to add and subtract numbers with decimals. Special care must be taken to ensure that the decimal points line up with each other.

$$\begin{array}{r} 13.52 \\ +\ 2.46 \\ \hline 15.98 \end{array} \qquad \begin{array}{r} 24.36 \\ -\ 2.13 \\ \hline 22.23 \end{array}$$

Worked Example

A student measures the mass of a sample of salt to be 24.876 g. After adding it to a beaker of water, the total mass of the beaker and water is measured to be 148.542 g. What is the mass of the water in the beaker before the salt was added? Round you answer to two decimal places.

Answer:

To find the mass of the water, you would subtract the mass of the salt from the total mass.

Total mass = 148.542 g

Mass of salt = 24.876 g

$$\begin{array}{rr} \text{Mass of water} = & 148.542 \\ - & \underline{24.876} \\ & 123.666 \end{array}$$

Now, rounding to two decimal places: 123.67 g

Maths in Science
Decimals

Decimals: Checking understanding

Question 1:

A nutrient label indicates that a food item contains 15.5 g of protein, 1.24 g of fat and 83.3 g of carbohydrates. Calculate the total mass of the food nutrients listed.

Question 2:

Use the experimental data below to calculate:

a) The mass of hydrated salt

b) The mass of anhydrous salt

Mass of crucible	43.54
Mass of crucible and hydrated salt	45.76
Mass of crucible and anhydrous salt after first heating	45.11
Mass of crucible and anhydrous salt after second heating	44.62
Mass of crucible and anhydrous salt after third heating	44.62

Question 3:

An object has a mass of 42.4 g and a volume of 14.6 cm^3. Calculate the density of the object in g/cm^3, using the equation density = $\frac{mass}{volume}$. Your answer should be given to 1 decimal place.

Maths in Science
Decimals

Decimals: Checking understanding (Answers)

Question 1:

Protein	15.50
Carbohydrate	83.30
Fat	1.24
	100.04

Question 2:

a) Hydrated salt = mass of crucible and hydrated salt – mass of crucible

45.76
- 43.54
2.22

b) Anhydrous salt = Mass of crucible and anhydrous salt after third heating – mass of crucible

44.62
- 43.54
1.08

Question 3:

density = $\frac{mass}{volume}$

density = $\frac{42.4}{14.6}$ = 2.90410959

To 1 decimal place = 2.9 g/cm^3