



Significant figures and rounding

Learning objectives

- 1 Understand what rounding means and why it is used in science.
- 2 Understand what significant figures are and why they matter in science.
- 3 Round numbers to a given number of significant figures.
- 4 Choose an appropriate number of significant figures when recording measurements and calculation results.

Introduction

When scientists carry out experiments, they measure quantities like mass, volume and temperature using equipment such as balances, measuring cylinders and thermometers. Each piece of equipment can only measure to a certain level of precision. For example, a school balance might measure mass to the nearest 0.01 g, while a measuring cylinder might only measure volume to the nearest 1 cm³.

When we use these measurements in calculations, a calculator often gives an answer with many decimal places. But writing all those digits would be misleading – it would suggest our answer is more precise than the equipment allows. Equally, rounding too much would throw away useful information.

Significant figures give us a way to record our answers to the right level of precision. They tell the reader how confident we are in each digit of a number. Learning to identify and use significant figures correctly is an essential skill in science, because it ensures that our results honestly reflect the quality of our measurements.

Rounding to significant figures

- Find the first significant figure. Count to the required number of significant figures.
- Look at the next digit (the decider). If the decider is five or more, round up. If it is less than five, round down.

Choosing the right precision

- For multiplication and division, give your answer to the same number of significant figures as the least precise measurement.
- For addition and subtraction, give your answer to the same number of decimal places as the equipment used.



Questions

1. State the number of significant figures in each of the following values:

(a) 56 _____

(b) 3.04 _____

(c) 0.072 _____

(d) 8.0 _____

(e) 0.00310 _____

2. Round each number to 2 significant figures:

(a) 4.83 _____

(b) 0.0672 _____

(c) 345 _____

(d) 12.95 _____

3. A student measures the mass of a rock as 47.2 g and its volume as 18 cm³. They calculate the density on their calculator:

$$47.2 \div 18 = 2.622222222$$

(a) How many significant figures should the answer have? Explain your reasoning.

(b) Write the density to the correct number of significant figures.

4. A student records four mass readings from a balance: 12.4 g, 12.5 g and 12.7 g. They calculate the mean on their calculator:

$$(12.4 + 12.5 + 12.7) \div 3 = 12.5333333$$

(a) The balance reads to 1 decimal place. How should the student record the mean?

(b) Explain why they should not write 12.333 g.



5. A student dissolves 4.0 g of salt in water to make 150 cm³ of solution. They calculate the concentration:

$$4.0 \div 150 = 0.026666666\dots\text{g/cm}^3$$

- (a) How many significant figures should the answer have? Explain your reasoning.

- (b) Write the concentration to the correct number of significant figures.

- (c) Another student writes the answer as 0.026 g/cm³ using dot notation. Explain why this is not acceptable in science.
