

Units, prefixes and reliable measurements

Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Worksheet

Name: _____ Date: _____ Class: _____

These problems train you to handle units and numbers like a scientist. You will convert between prefixes, use standard form, count and round significant figures, read an instrument and judge how reliable a set of readings is.

They suit GCSE and IGCSE students, O Level and Class 9-10 learners, and they start with recall before moving to multi-step work and error spotting.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE WS, IGCSE 1.1

Problem 1 Base units (easy)

Aarav in Pune lists the quantities length, mass, time, electric current and temperature.

1. Name the SI base unit for each quantity.
2. Give the symbol of each unit.
3. State which base unit already contains a prefix.

Problem 2 Prefix factors (easy)

Write each prefix as a power of ten.

1. kilo
2. milli
3. micro
4. giga

Problem 3 Simple conversions (easy)

Convert.

1. 2.5 km to metres
2. 340 mm to metres
3. 75 cm to metres
4. 0.8 kg to grams

Problem 4 Standard form (easy)

1. Write 45 000 000 in standard form.
2. Write 0.00062 in standard form.
3. Write 3.8×10^3 as an ordinary number.

4. Write 7.1×10^{-2} as an ordinary number.

Problem 5 Counting significant figures (easy)

State the number of significant figures in each value.

1. 502
2. 0.0405
3. 1.050
4. 0.0090

Problem 6 Rounding (easy)

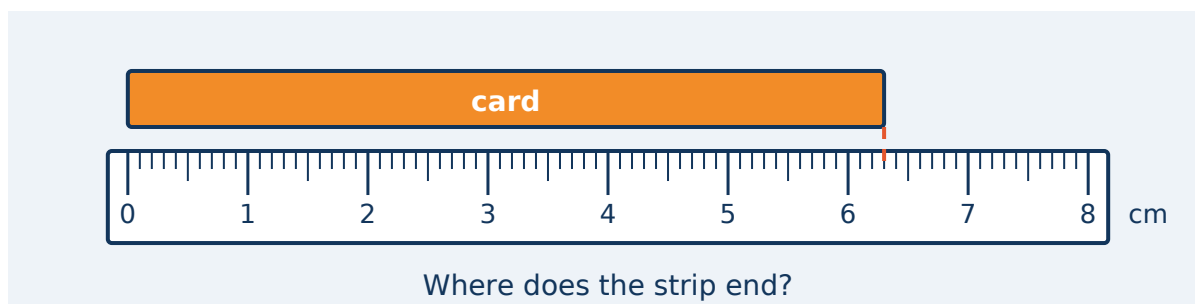
Round each value to the number of significant figures in brackets.

1. 3.14159 (3)
2. 0.0067892 (2)
3. 25 481 (2)
4. 9.996 (3)

Problem 7 Reading a ruler (medium)

Chiamaka in Lagos measures a strip of card with the ruler shown.

1. State the resolution of the ruler.
2. Record the length of the strip.
3. Give the reading in metres.



A ruler with millimetre divisions.

Problem 8 Area of a tile (medium)

Aarav measures a tile as 18.4 cm by 12.5 cm.

1. Calculate the area in cm^2 .
2. Give the area in m^2 .
3. State the number of significant figures in each measurement.

Problem 9 Area and volume units (medium)

1. Convert 3.2 m^2 to cm^2 .
2. Convert 450 cm^3 to m^3 in standard form.

3. Explain why 1 m^2 is not 100 cm^2 .

Problem 10 Time conversions (medium)

Convert each time to seconds.

- 2.4 hours
- 45 minutes 30 seconds
- 0.5 milliseconds (standard form)

Problem 11 Averaging a pendulum (medium)

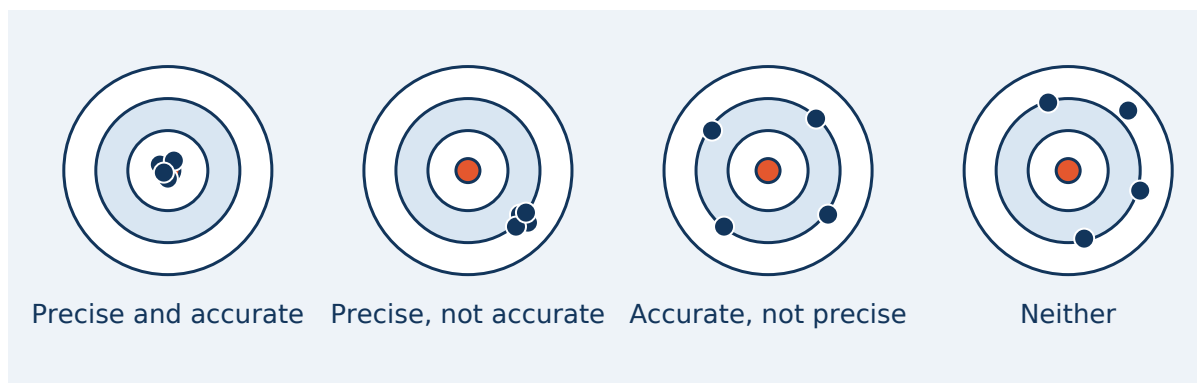
Kofi in Accra times 10 swings of a pendulum five times: 14.8 s, 15.2 s, 15.0 s, 14.9 s, 15.1 s.

- Calculate the mean time for 10 swings.
- Calculate the time for one swing.
- State the uncertainty in the mean, using half the range.

Problem 12 Two balances (medium)

Mei in Singapore checks balances with a standard mass of true value 5.00 g. Balance A reads 5.31 g, 5.30 g, 5.32 g. Balance B reads 4.9 g, 5.2 g, 5.0 g, 4.9 g.

- Calculate the mean for each balance.
- State which balance is more precise.
- State which balance is more accurate.



Use the targets to describe each balance.

Problem 13 Percentage uncertainty (medium)

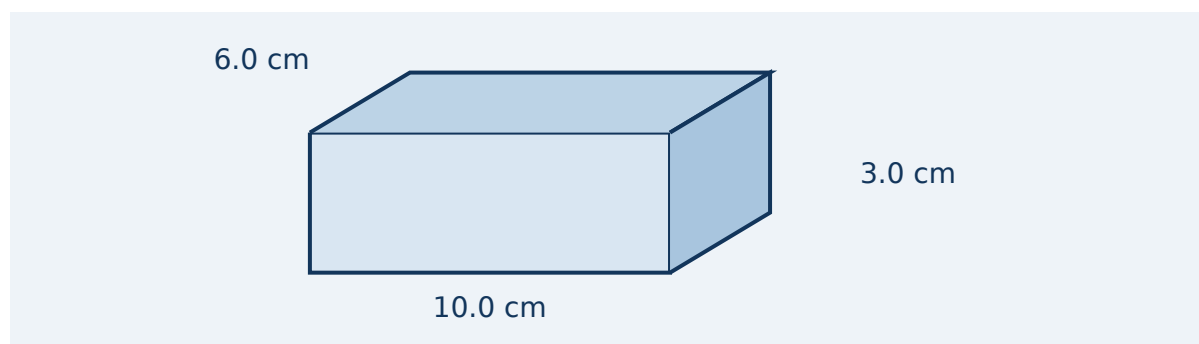
- A length is recorded as $25.0 \text{ cm} \pm 0.5 \text{ cm}$. Calculate the percentage uncertainty.
- A time is recorded as $0.40 \text{ s} \pm 0.01 \text{ s}$. Calculate the percentage uncertainty.
- State which measurement has the smaller percentage uncertainty.

Problem 14 Density from a block (hard)

Bilal in Lahore has a metal block of mass 540 g with the edges shown.

- Calculate its volume in cm^3 .

2. Calculate its density in g/cm^3 .
3. Convert the density to kg/m^3 .



A block of edges 10.0 cm, 3.0 cm and 6.0 cm.

Problem 15 Thickness of a sheet (hard)

Diego in Texas measures a stack of 200 sheets of paper as $2.0 \text{ cm} \pm 0.1 \text{ cm}$ thick.

1. Calculate the thickness of one sheet in mm.
2. Calculate the percentage uncertainty of the stack.
3. State the thickness of one sheet with its uncertainty in mm.
4. Write the thickness in metres in standard form.

Problem 16 Speed and sensible rounding (hard)

A sprinter in Nairobi covers 100.0 m in 12.4 s.

1. Calculate the average speed with a calculator.
2. Give it to a sensible number of significant figures.
3. Explain your choice.

Problem 17 Speed unit change (hard)

1. Convert 90 km/h to m/s.
2. Convert $1.2 \times 10^{-3} \text{ m}^3$ to litres, given $1 \text{ m}^3 = 1000 \text{ L}$.
3. Convert 20 m/s to km/h.

Problem 18 Distance light travels in a year (hard)

Light travels at $3.0 \times 10^8 \text{ m/s}$. A year contains about $3.2 \times 10^7 \text{ s}$.

1. Calculate the distance light travels in a year, in standard form.
2. Convert your answer to kilometres.
3. State the number of significant figures you used.

Problem 19 Spot the errors (hard)

A student writes: " $5.6 \text{ mm} = 5600 \text{ m}$ " and " $0.75 \mu\text{A} = 7.5 \times 10^{-3} \text{ A}$ ".

1. Explain the error in the first statement and correct it.

2. Explain the error in the second statement and correct it.
3. Convert $0.75 \mu\text{A}$ to milliamperes.

Problem 20 Which result to trust (hard)

Three groups measure the length of a corridor whose true length is 12.40 m. Group 1: 12.41 m, 12.40 m, 12.42 m. Group 2: 12.78 m, 12.80 m, 12.79 m. Group 3: 12.1 m, 12.7 m, 12.4 m.

1. Calculate the mean for each group.
2. Compare the precision of the groups.
3. Compare the accuracy of the three means.
4. Suggest a cause of the error in Group 2.