

1.3 Use scientific units and notation to check a measurement claim

Name: _____ Class: _____ Date: _____

Total: 24 marks

KEY WORDS units 单位 • precision 精密度 • accuracy 准确度

Objective

Use scientific units and notation to check a measurement claim. This is original GAC013-aligned practice, not an official assessment. All supplied case data and review records are fictional; explicitly cited historical context is factual. The case data are invented for learning; they are not findings about a real school, country or population. Use the supplied evidence and do not invent missing observations.

1 Key knowledge and worked examples

■ Key knowledge: a quantity needs its definition, unit and sensible reported precision

Units 单位 identify the scale used for a physical quantity. Conversions preserve the quantity while changing its numerical representation. Average speed is distance travelled divided by elapsed time. **Precision** 精密度 concerns closeness of repeated measurements, while **accuracy** 准确度 concerns closeness to a suitable reference or true value. Close repeats do not prove accuracy. Report digits supported by the measurements and avoid claiming uncertainty that was not established.

■ Source A: text or task brief

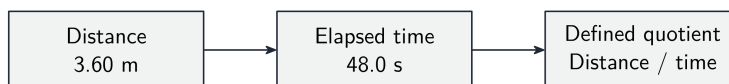
Fictional trolley record: total travelled distance 3.60 m; elapsed time 48.0 s. The written task assumes these supplied values and asks for average speed. Three repeated timer readings for a separate fixed event are 10.1 s, 10.1 s and 10.2 s. A suitable independent reference measures that event as 12.0 s.

A separate paper square has side length 10.0 cm. Use $1\text{ m} = 100\text{ cm}$ and $1\text{ m}^2 = 10,000\text{ cm}^2$. No uncertainty budget or acceleration measurements are supplied.

■ Source B: response or review record

Student notes: “Average speed = time divided by distance = 13.3 m/s. Ten centimetres is 0.010 m, so the square area is 0.010 m². The three timer readings are close, therefore accurate. Every calculated result should show eight decimal places. The trolley’s average speed proves it travelled at a constant speed.”

■ **Worked example:** write the equation before the conversion and substitution



Known: distance 3.60 m and elapsed time 48.0 s. Why divide distance by time?
Average speed is the distance travelled per unit time.

$$v_{\text{avg}} = \frac{d}{t}$$

$$v_{\text{avg}} = \frac{3.60 \text{ m}}{48.0 \text{ s}} = 0.0750 \frac{\text{m}}{\text{s}}$$

This is an average for the whole interval. It does not state the speed at every moment.

2 Practice

2.1 State the equation for average speed and its SI unit. [2]

2.2 Convert 10.0 cm to metres and calculate the square's area in m². [2]

2.3 Calculate the trolley's average speed with a suitable number of significant figures. [3]

2.4 Explain what the repeated timer readings show about precision and accuracy. [3]

3 Exam-style questions

3.1 Evaluate the student notes with six corrections or limits. [6]

[8]