How Trustworthy Is a Number?

Student Worksheet | g09_u01_w03

Name: _____ Date: _____

Today I can: choose sensible SI units and tools, read a scale, distinguish accuracy from precision, and report measurement uncertainty.
Time and use: 100 minutes; class, homework, tutoring, club, or independent study.
Vocabulary / prerequisites: SI, mass, volume, meniscus, accuracy, precision, uncertainty, average, range, tare; use Week 1 data-table habits.

A. Quick checks

1. Match: length, mass, volume, time, temperature to m, g, mL, s, and °C.

2. Choose a tool for 0.15 g powder: beaker, balance, or ruler. Explain.

3. A cylinder has 0.1-mL marks and the bottom of the meniscus is at 18.6 mL. Record the reading.

4. A balance displays 12.34 g. What is a reasonable reading uncertainty?

5. State the correct eye position and meniscus location for clear water.

6. True volume is 10.0 mL. Which set is accurate and precise: A 9.9, 10.0, 10.1 or B 8.1, 8.2, 8.1?

7. Complete: 1 kg = _____ g and 1 mL = _____ cm^3.

B. Guided application

8. Find mean and range of 10.2, 10.4, 10.3 g.

9. Target is 25.00 mL. Results A: 24.98, 25.01, 25.00; B: 24.40, 24.41, 24.39. Describe each set.

10. Classify: a balance not tared; a reader who views the scale from changing angles.

11. Should 2.347 g measured to 0.001 g be written 2.347 g, 2.35 g, or 2.3470 g? Explain.

12. A ruler has 1-mm marks. State an estimated reading uncertainty.

13. Make a data table for container mass, container-plus-sample mass, and calculated sample mass; include units.

14. Why is a 50-mL beaker a poor first choice for measuring 12.0 mL?

C. Apply to evidence

15. A phone sensor gives nearly identical readings but disagrees with a calibrated reference. What quality does it have, and what quality does it lack?

16. A package says net mass 340 g. Why is this not an invitation to report every kitchen measurement as 340.000 g?

17. A kitchen scale reads to nearest 1 g. Can it resolve a 0.3-g change? Explain.

Competition Corner

18. A 5.00-g standard is measured by A: 4.98, 5.00, 5.02 g and B: 5.20, 5.21, 5.19 g. Compare accuracy and precision; recommend one next step.

19. A student reports 15.23 and 15.26 mL from a cylinder with 1-mL marks. Diagnose the report.

20. Masses are 2.13, 2.16, 2.15, and 2.87 g; the last sample was wet outside. Find mean and median, then make a transparent follow-up plan.