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2.2 Test: Precision, Scientific Notation, Vectors, Kinematics Intro

1. Round each value to three significant figures.

   (a) 0.004872   (c) 9.1245

   (b) 76.438   (d) 24,670

2. Write each number in proper scientific notation ($a \times 10^k$ with $1 \le a < 10$, k an integer).

   (a) 0.000735   (c) 905,000,000

   (b) 45,800   (d) 0.00710

3. Express in standard (long) form.

   (a) 4.91×10^{-3} (b) 8.35×10^4

4. Perform each operation and give the answer to 3 significant figures in scientific notation.

   (a) $(2.85 \times 10^3) + (6.30 \times 10^4)$ (c) $\dfrac{5.67 \times 10^5}{7.09 \times 10^2}$

   (b) $(4.50 \times 10^{-2}) \times (3.15 \times 10^6)$

5. A board's length is measured as 8.6 ± 0.3 cm.

   (a) What is the range of possible values?

   (b) What is the percent uncertainty? (show work)

6. A mass is measured as 2.240 kg with an uncertainty of ±0.035 kg.

    (a) Calculate the percent uncertainty.

    (b) Which measurement (the board or this mass) is more precise? Explain briefly.

Unit Conversions

7. Convert each value. Show one line of work using unit factors.

    (a) 3.42 meters to cm   (d) 0.780 kg to grams

    (b) 5.85 km to meters   (e) 3.65×10^3 grams to kg

    (c) 22.0 in to cm   (1 in = 2.54 cm)   (f) 12.8 lb to kg   (1 lb = 0.454 kg)

8. Convert each speed.

    (a) 62.0 miles/hour to meters/second   (1 mile = 1609 meters)

    (b) 3.80 m/s to km/hour

    (c) A car moves at 25.0 m/s. How long does it take to travel 2 kilometers?

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Order of Magnitude Estimation

9. Choose the best order of magnitude.

    (a) Mass of a smartphone: A) 10^{-3} kg   B) 10^{-1} kg   C) 10^1 kg   D) 10^3 kg

    (b) A pen's length in centimeters: A) 10^{-2} cm   B) 10^0 cm   C) 10^1 cm   D) 10^3 cm

One-Dimensional Motion and Vectors

10. A student walks down a hallway (forward is +). Start $x_0 = 1.5$ meters.

    (a) To $x = 9.0$ m, find displacement Δx.

    (b) From $x = 9.0$ m back to $x = 3.5$ m, find Δx.

    (c) Total displacement from start to finish.

11. A cart moves from $x_1 = 0.8$ m at $t_1 = 0$ to $x_2 = 6.0$ m at $t_2 = 2.5$ seconds.

    (a) Find displacement.

    (b) Find average velocity v_{avg}.

12. A cyclist rides east, then west. Assume east is +.

    (a) From $x = 0$ m to $x = 30$ kilometers in 2.0 hours. Find the average velocity.

    (b) Then back to $x = 20$ km taking another hour. Find the average velocity for this leg.

    (c) Find the total displacement and total distance traveled.

13. One-dimensional vector additions: find the total displacement.

    (a) $\Delta x_1 = +15$ m, $\Delta x_2 = -8$ m   (b) $+1.10$ km, $+0.75$ km, -0.40 km

14. A car travels at 96 km/h. The driver looks away for 2.0 seconds.

    (a) Convert 96 km/h to m/s.

    (b) How far does the car move in meters over the 2 seconds?

15. A cart starts from rest and accelerates at 1.5 m/s^2.

    (a) Find its speed after 4.0 seconds.

    (b) Given that the displacement is 12.0 meters over the four seconds, find average velocity.

16. A drone flies north at 15 m/s for 5 minutes.

    (a) Convert 15 m/s to km/h.

    (b) Find distance traveled.

    (c) If north is positive, what sign would you assign to this displacement?