La Scuola d'Italia / Huson / Physics
4 November 2025

First & last name: Solutions
Grade:

2.1 PreTest: Precision, Scientific Notation, Vectors, Kinematics Intro

1. Round each value to three significant figures.

   (a) 0.003297 m 0.00330

   (b) 93.085 kg 93.1

   (c) 5.9998 s 6.00

   (d) 12,450 N $12,500$

2. Write each number in proper scientific notation ($1 \le a < 10$).

   (a) 0.00045 $= 4.5 \times 10^{-4}$

   (b) 38,200 $= 3.82 \times 10^{4}$

   (c) 602,000,000 $= 6.02 \times 10^{8}$

   (d) 0.00875 $= 8.75 \times 10^{-3}$

3. Express in standard (long) form.

   (a) 6.07×10^{-4} 0.000607

   (b) 1.002×10^{5} 100200

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

   (a) $(3.2 \times 10^{3}) + (7.5 \times 10^{2})$ $= 3,950$ 3.95×10^{3}

   (b) $(6.40 \times 10^{-2}) \times (2.5 \times 10^{3})$ 160

   (c) $\dfrac{4.5 \times 10^{5}}{9.0 \times 10^{2}} = 500$

5. A board's width is measured as 12.4 ± 0.2 cm.

   (a) What is the range of possible values? $12.6 - 12.2$ cm; 12.2 to 12.6 cm

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

$$\frac{0.2}{12.4} = 1.61 \approx 1.61\% \approx 2\%$$

6. A mass is measured as 0.815 kg with an uncertainty of ±0.005 kg.

   (a) Calculate the percent uncertainty. $\frac{0.005}{0.815} = 0.61349\ldots \approx 0.61\%$

   (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) 2.35 m to cm

   235cm

   (b) 7.20 km to m

   7200

   (c) 18.0 in to cm (1 in = 2.54 cm)

   $18.0\text{ in} \cdot \frac{2.54\text{ cm}}{1\text{ in}} = 45.72\text{ cm} \approx 45.7\text{ cm}$

   (d) 0.650 kg to g

   650 g

   (e) 4.20×10^3 g to kg

   4.20 kg

   (f) 15.5 lb to kg (1 lb = 0.454 kg)

   15.5 lb

   $= 7.037\text{ kg} \approx 7.04\text{ kg}$

8. Convert each speed.

   (a) 55.0 mi/h to m/s (1 mi = 1609 m)

   $55.0\text{ mi/hr} \cdot \frac{1609\text{ m}}{1\text{ mile}} \cdot \frac{1\text{ hr}}{3600\text{ s}} = \frac{88495}{3600} = 24.582\text{ m/s} \approx 24.6$

   (b) 4.20 m/s to km/h

   $4.20\text{ m/s} \cdot \frac{1\text{ km}}{1000\text{ m}} \cdot \frac{3600\text{ s}}{1\text{ h}} = 15.12\text{ km/h} \approx 15.1$

   (c) A car moves at 22.5 m/s. How long does it take to travel 1.00 km?

   1.00 km = 1000 m

   $t = \frac{d}{s} = \frac{1000}{22.5} = 44.4\text{ s}.$

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Order of Magnitude Estimation

9. Choose the best order of magnitude.

(a) Mass of a textbook: A) 10^{-3} kg B) 10^{-1} kg C) 10^{0} kg D) 10^{2} kg

A book weighs a couple pounds

(b) Length of a classroom: A) 10^{-2} m B) 10^{0} m C) 10^{1} m D) 10^{3} m

A large classroom might be 30 ft. long

(c) Time for light to cross 10 m: A) 10^{-8} s B) 10^{-6} s C) 10^{-3} s D) 10^{0} s

Light travels 300,000,000 m/s

One-Dimensional Motion and Vectors

10. A student walks along a straight hallway (forward is +). Start $x_0 = 2.0$ m.

(a) To $x = 7.5$ m, find displacement Δx.

$\Delta x = 7.5 - 2.0 = +5.5\text{m}$

(b) From $x = 7.5$ m back to $x = 4.0$ m, find Δx.

$\Delta = 4.0 - 7.5 = -3.5\text{m}$

(c) Total displacement from start to finish.

displacement

$d = |5.5| + |-3.5| = 9.0\text{m} = 4.5 - 2.0 = 2.0\text{m}$

11. A cart moves from $x_1 = 1.2$ m at $t_1 = 0.0$ s to $x_2 = 5.8$ m at $t_2 = 3.0$ s. (2 sig figs)

(a) Find displacement. $d = |5.8 - 1.2| = 4.6\text{m}$

(b) Find average velocity v_{avg}.

$\bar{V} = \frac{\Delta x}{\Delta t} = \frac{5.8 - 1.2}{3.0 - 0} = 1.5\bar{3} \approx +1.5\ \text{m/s}$

(c) State the units for v_{avg}.

meters per second

12. A cyclist rides east, then west: EAST Positive

(a) From $x = 0$ m to $x = 30$ m in 12 s.

$\bar{V} = \frac{\Delta x}{\Delta t} = \frac{30 - 0}{12} = 2.5\ \text{m/s}$

(b) Then back to $x = 18$ m at $t = 20$ s.

$\bar{V} = \frac{18 - 30}{20 - 12} = -1.5\ \text{m/s}$

(c) Find each displacement, total displacement, and total distance traveled.

30, −12; total +18m; distance = |30| + |−12| = 42m

13. One-dimensional vector additions (east is +).

(a) $\Delta x_1 = +12$ m, $\Delta x_2 = -5$ m

+12 → ← -5

$\Delta x = +12 - 5 = +7$ m

(b) +0.85 km, +1.40 km, −0.50 km

0.85 1.40 → → ← 0.50

$\Delta x = 0.85 + 1.40 - 0.50$
$= +1.75$ km

Why is distance not always equal to displacement?

Because when direction changes, the displacement can offset itself, but distance increases

14. A car travels at 88 km/h. The driver looks away for 1.6 s.

(a) Convert 88 km/h to m/s. 2 sig figs

$88 \frac{km}{hr} \cdot \frac{1000\,m}{1\,km} \cdot \frac{1\,hr}{3600\,s} = 24.\overline{4}\ m/s \approx 24\ m/s$

(b) How far does the car move in 1.6 s?

$24.\overline{4} \frac{m}{s} \cdot 1.6\,s = 39.\overline{1}\ m \approx 39\ m$
(or $38.4 \approx 38$ m)

15. A cart starts from rest and accelerates at 0.80 m/s^2.

(a) Find its speed after 5.0 s.

$V = 0.80 \frac{m}{s^2} \cdot 5\,s = 4.0\ m/s$

(b) Interpret physically what 0.80 m/s^2 means.

It's speed increases 0.8 m/s each second

(c) If displacement is 10.0 m, find average velocity.

$\bar{V} = \frac{\text{displacement}}{t} = \frac{10\,m}{5\,s} = 2\ m/s$

16. A drone flies north at 12.0 m/s for 45.0 s.

(a) Convert 12.0 m/s to km/h.

$12.0 \frac{m}{s} \cdot \frac{1\,km}{1000\,m} \cdot \frac{3600\,s}{1\,hr} = 43.2\ km/h$

(b) Find distance traveled.

$d = 12.0\ m/s \cdot 45.0\,s = 540\ m$

(c) If south is negative, what sign would you assign to this displacement?

positive