Solutions 1/20

O-3: $\underbrace{23.4\,m}_{\text{uncertainty of } \sim \pm .1\,m} + 2 \times \underbrace{0.294\,m}_{\text{uncertainty of } \sim \pm .001\,m} = 23.998\,m$

$\underbrace{\qquad\qquad}_{\text{uncertainty of } \sim \pm .002\,m}$

$\underbrace{\qquad\qquad\qquad\qquad}_{\text{uncertainty of } \sim \pm .102\,m}$

Final answer: 24.0 m

O-8(a) $(5g + 7g)/2 = 6g$

$(5 \times 10^{-3}kg + 7 \times 10^{-3}kg)/2 = 6 \times 10^{-3}kg$

The means are equal. ✓

(b) $\sqrt{(5g)(7g)} = \sqrt{35}\,g \; (= 6g \text{ (1 sig fig)})$

(See p.863) $\sqrt{(5 \times 10^{-3}kg)(7 \times 10^{-3}kg)}$

$= \sqrt{35} \times 10^{-3}kg \; (= 6 \times 10^{-3}kg \text{ (1 sig fig)})$

The means are equal. ✓

(c) g^2 (or $gram^2$)

(d) This is unreasonable:

$\sqrt[3]{(5g)(7g)} = \sqrt[3]{35}\,g^{2/3} \; (= 3g^{2/3} \text{ (1 sig fig)})$

↑ not in units of grams

0-10 The metric version has 3 significant figures while the English version is little better than one sig fig.

0-14 $\frac{1}{2}at^2 = \frac{1}{2}(9.8\,m/s^2)(3.0\,s)^2$

$= 44\,m$ (2 sig figs)

$$\frac{1\,m}{1\,s} \times \frac{100\,cm}{1\,m} \times \frac{1\,in}{2.54\,cm} \times \frac{1\,ft}{12\,in} \times \frac{1\,mi}{5280\,ft} \times \frac{60\,s}{1\,min} \times \frac{60\,min}{1\,hr}$$

$$\frac{100 \times 60 \times 60}{2.54 \times 12 \times 5280} \frac{miles}{hour}$$

about 2.2

Interpreting implied precision:

5.77 kg means (roughly) 5.77 kg ± 0.01 kg

0.0038 s: 0.0038 s ± 0.0001 s

Certainty, or lack thereof:

uncertainty { absolute e.g. ±0.01m
relative e.g. ±5%

HW due 1/25:

Ch. 0: # 6, 13, 18, 20

Reading due 1/25: 0.2.

→ When adding or subtracting, add the absolute uncertainties. (See my solution to 0-3.)

When multiplying, dividing, squaring, taking square roots, etc, just keep track of sig. figs.:

$\underbrace{1.58}_{\text{3 sig figs}}\ \text{m} \ / \ \underbrace{0.0\boxed{32}\ \text{s}}_{\text{2 sig figs}} = 49\ \text{m/s}$

$\min(3,2) = \boxed{2}$ sig figs