

- 1.6** (a) Solving $KE = \frac{p^2}{2m}$ for the momentum, p , gives $p = \sqrt{2m(KE)}$ where the numeral 2 is a dimensionless constant. Dimensional analysis gives the units of momentum as:

$$[p] = \sqrt{[m][KE]} = \sqrt{\text{M}(\text{M} \cdot \text{L}^2/\text{T}^2)} = \sqrt{\text{M}^2 \cdot \text{L}^2/\text{T}^2} = \text{M}(\text{L}/\text{T})$$

Therefore, in the SI system, the units of momentum are $\boxed{\text{kg} \cdot (\text{m}/\text{s})}$.

- (b) Note that the units of force are $\text{kg} \cdot \text{m}/\text{s}^2$ or $[F] = \text{M} \cdot \text{L}/\text{T}^2$. Then, observe that

$$[F][t] = (\text{M} \cdot \text{L}/\text{T}^2) \cdot \text{T} = \text{M}(\text{L}/\text{T}) = [p]$$

From this, it follows that force multiplied by time is proportional to momentum: $\boxed{Ft = p}$. (See the impulse–momentum theorem in Chapter 6, $F \cdot \Delta t = \Delta p$, which says that a constant force F multiplied by a duration of time Δt equals the change in momentum, Δp .)

1.7 $\text{Area} = (\text{length}) \times (\text{width}) = (9.72 \text{ m})(5.3 \text{ m}) = \boxed{52 \text{ m}^2}$

- 1.8** (a) Computing $(\sqrt{8})^3$ without rounding the intermediate result yields

$$(\sqrt{8})^3 = \boxed{22.6} \text{ to three significant figures.}$$

- (b) Rounding the intermediate result to three significant figures yields

$$\sqrt{8} = 2.8284 \rightarrow 2.83$$

Then, we obtain $(\sqrt{8})^3 = (2.83)^3 = \boxed{22.7}$ to three significant figures.

- (c) $\boxed{\text{The answer 22.6 is more reliable}}$ because rounding in part (b) was carried out too soon.

1.9 (a) 78.9 ± 0.2 has $\boxed{3 \text{ significant figures}}$ with the uncertainty in the tenths position.

(b) 3.788×10^9 has $\boxed{4 \text{ significant figures}}$

(c) 2.46×10^{-6} has $\boxed{3 \text{ significant figures}}$

(d) $0.0032 = 3.2 \times 10^{-3}$ has $\boxed{2 \text{ significant figures}}$. The two zeros were originally included only to position the decimal.

1.10 $c = 2.997\,924\,58 \times 10^8 \text{ m/s}$

(a) Rounded to 3 significant figures: $c = \boxed{3.00 \times 10^8 \text{ m/s}}$

(b) Rounded to 5 significant figures: $c = \boxed{2.997\,9 \times 10^8 \text{ m/s}}$

(c) Rounded to 7 significant figures: $c = \boxed{2.997\,925 \times 10^8 \text{ m/s}}$

- 1.11** Observe that the length $\ell = 5.62 \text{ cm}$, the width $w = 6.35 \text{ cm}$, and the height $h = 2.78 \text{ cm}$ all contain 3 significant figures. Thus, any product of these quantities should contain 3 significant figures.

(a) $\ell w = (5.62 \text{ cm})(6.35 \text{ cm}) = \boxed{35.7 \text{ cm}^2}$

(b) $V = (\ell w)h = (35.7 \text{ cm}^2)(2.78 \text{ cm}) = \boxed{99.2 \text{ cm}^3}$

continued on next page

Solution Manual For College Physics 8th

Lauren Gardner



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