Objective 13

WP: Determine the process for solving a multi-step problem using the units involved

1. Light travels 9.00×10^{8} m in 3 seconds in a vacuum. Which calculation would give the approximate time for light to travel 2.37 miles in a vacuum?

[A] $\left(\frac{3\text{ s}}{9.00\times10^{8}\text{ m}}\right)\left(\frac{1000\text{ m}}{\text{km}}\right)\left(\frac{\text{km}}{0.6214\text{ mi}}\right)(2.37\text{ mi})$

[B] $\left(\frac{9.00\times10^{8}\text{ m}}{3\text{ s}}\right)\left(\frac{\text{km}}{1000\text{ m}}\right)\left(\frac{0.6214\text{ mi}}{\text{km}}\right)(2.37\text{ mi})$

[C] $\left(\frac{9.00\times10^{8}\text{ m}}{3\text{ s}}\right)\left(\frac{1000\text{ m}}{\text{km}}\right)\left(\frac{0.6214\text{ mi}}{\text{km}}\right)(2.37\text{ mi})$

[D] $\left(\frac{3\text{ s}}{9.00\times10^{8}\text{ m}}\right)\left(\frac{1000\text{ m}}{\text{km}}\right)\left(\frac{0.6214\text{ mi}}{\text{km}}\right)(2.37\text{ mi})$

2. Light travels 558,140 miles in 4 seconds in water. How many seconds would it take for light to travel 13,000 m in water? Write the steps that would approximate this value. Use the fact that 1 m is approximately 39.37 inches.

3. A sample of zinc has a volume of 4.67 cm^3 and a mass of 33.30 g. Which calculation would give the approximate weight in pounds of 1.72 cubic feet of zinc?

[A] $\left(\frac{33.30\text{ g}}{4.67\text{ cm}^3}\right)\left(\frac{453.6\text{ g}}{\text{lb}}\right)\left(\frac{\text{in}^3}{16.39\text{ cm}^3}\right)\left(\frac{\text{ft}^3}{1728\text{ in}^3}\right)(1.72\text{ ft}^3)$

[B] $\left(\frac{33.30\text{ g}}{4.67\text{ cm}^3}\right)\left(\frac{\text{lb}}{453.6\text{ g}}\right)\left(\frac{16.39\text{ cm}^3}{\text{in}^3}\right)\left(\frac{1728\text{ in}^3}{\text{ft}^3}\right)(1.72\text{ ft}^3)$

[C] $\left(\frac{33.30\text{ g}}{4.67\text{ cm}^3}\right)\left(\frac{\text{lb}}{453.6\text{ g}}\right)\left(\frac{16.39\text{ cm}^3}{\text{in}^3}\right)\left(\frac{\text{ft}^3}{1728\text{ in}^3}\right)(1.72\text{ ft}^3)$

[D] $\left(\frac{33.30\text{ g}}{4.67\text{ cm}^3}\right)\left(\frac{453.6\text{ g}}{\text{lb}}\right)\left(\frac{16.39\text{ cm}^3}{\text{in}^3}\right)\left(\frac{1728\text{ in}^3}{\text{ft}^3}\right)(1.72\text{ ft}^3)$

4. A sample of nickel has a volume of 3.13 cm^3 and a mass of 27.86 g. Write the steps that would approximate the weight in pounds of 1.07 cubic feet of nickel. Use the fact that 1 pound is approximately 453.6 g and that 1 cubic inch is approximately 16.39 cm^3.

Light travels 279,070 miles in 2 seconds in water. Which calculation would give the approximate time for light to travel 15,000 m in water?

[A] $\left(\frac{279{,}070\text{ mi}}{2\text{ s}}\right)\left(\frac{\text{mi}}{5280\text{ ft}}\right)\left(\frac{\text{ft}}{12\text{ in.}}\right)\left(\frac{\text{m}}{39.37\text{ in.}}\right)(15{,}000\text{ m})$

[B] $\left(\frac{2\text{ s}}{279{,}070\text{ mi}}\right)\left(\frac{5280\text{ ft}}{\text{mi}}\right)\left(\frac{\text{ft}}{12\text{ in.}}\right)\left(\frac{39.37\text{ in.}}{\text{m}}\right)(15{,}000\text{ m})$

[C] $\left(\frac{279{,}070\text{ mi}}{2\text{ s}}\right)\left(\frac{5280\text{ ft}}{\text{mi}}\right)\left(\frac{12\text{ in.}}{\text{ft}}\right)\left(\frac{39.37\text{ in.}}{\text{m}}\right)(15{,}000\text{ m})$

[D] $\left(\frac{2\text{ s}}{279{,}070\text{ mi}}\right)\left(\frac{\text{mi}}{5280\text{ ft}}\right)\left(\frac{\text{ft}}{12\text{ in.}}\right)\left(\frac{39.37\text{ in.}}{\text{m}}\right)(15{,}000\text{ m})$

There is a 0.60 cubic foot sample of zinc. The sample weighs 267.00 pounds. Which calculation would give the approximate weight in grams of 13.46 cm^3 of zinc?

[A] $\left(\frac{267.00\text{ lb}}{0.60\text{ ft}^3}\right)\left(\frac{453.6\text{ g}}{\text{lb}}\right)\left(\frac{\text{ft}^3}{1728\text{ in}^3}\right)\left(\frac{\text{in}^3}{16.39\text{ cm}^3}\right)(13.46\text{ cm}^3)$

[B] $\left(\frac{267.00\text{ lb}}{0.60\text{ ft}^3}\right)\left(\frac{453.6\text{ g}}{\text{lb}}\right)\left(\frac{1728\text{ in}^3}{\text{ft}^3}\right)\left(\frac{16.39\text{ cm}^3}{\text{in}^3}\right)(13.46\text{ cm}^3)$

[C] $\left(\frac{267.00\text{ lb}}{0.60\text{ ft}^3}\right)\left(\frac{\text{lb}}{453.6\text{ g}}\right)\left(\frac{1728\text{ in}^3}{\text{ft}^3}\right)\left(\frac{\text{in}^3}{16.39\text{ cm}^3}\right)(13.46\text{ cm}^3)$

[D] $\left(\frac{267.00\text{ lb}}{0.60\text{ ft}^3}\right)\left(\frac{\text{lb}}{453.6\text{ g}}\right)\left(\frac{\text{ft}^3}{1728\text{ in}^3}\right)\left(\frac{\text{in}^3}{16.39\text{ cm}^3}\right)(13.46\text{ cm}^3)$

A motor makes 8775 complete rotations in 3.9 minutes. Which calculation would give the number of degrees the motor rotates in 19.8 seconds?

[A] $\left(\frac{8775\text{ rotations}}{3.9\text{ min}}\right)\left(\frac{\text{min}}{60\text{ s}}\right)\left(\frac{\text{rotation}}{360\text{ degrees}}\right)(19.8\text{ s})$

[B] $\left(\frac{8775\text{ rotations}}{3.9\text{ min}}\right)\left(\frac{60\text{ s}}{\text{min}}\right)\left(\frac{360\text{ degrees}}{\text{rotation}}\right)(19.8\text{ s})$

[C] $\left(\frac{8775\text{ rotations}}{3.9\text{ min}}\right)\left(\frac{\text{min}}{60\text{ s}}\right)\left(\frac{360\text{ degrees}}{\text{rotation}}\right)(19.8\text{ s})$

[D] $\left(\frac{8775\text{ rotations}}{3.9\text{ min}}\right)\left(\frac{60\text{ s}}{\text{min}}\right)\left(\frac{\text{rotation}}{360\text{ degrees}}\right)(19.8\text{ s})$