

Topic: Dimensional Analysis (Day 3)

Objective: use unit fractions to convert measurements in both the numerator and denominator

(ex) Speed of light

$$299,792,458 \frac{\text{meters}}{\text{second}} = \frac{\text{miles}}{\text{hour}}$$

① convert meters \rightarrow miles

$$\frac{299,792,458 \text{ meters}}{1} \cdot \frac{3.28 \text{ feet}}{1 \text{ meters}} \cdot \frac{1 \text{ miles}}{5,280 \text{ feet}}$$

$$\frac{(299,792,458)(3.28)}{5,280} \text{ miles}$$

$$186234.7 \text{ miles}$$

② convert seconds \rightarrow hours

$$\frac{1 \text{ sec}}{1} \cdot \frac{1 \text{ min}}{60 \text{ sec}} \cdot \frac{1 \text{ hours}}{60 \text{ min}} = \frac{1}{(60)(60)} \text{ hours}$$

$$0.00027 \text{ hours}$$

③ combine them into one fraction (rate)

$$\frac{186234.7 \text{ miles}}{0.00027 \text{ hours}} = \boxed{670,444,920 \frac{\text{miles}}{\text{hour}}}$$

(ex) Flow rate of the Colorado River

$$17,660 \frac{\text{ft}^3}{\text{sec}} = \frac{\text{gallons}}{\text{day}}$$

$$* 7.48052 \text{ gallons} = 1 \text{ ft}^3$$

① convert $\text{ft}^3 \rightarrow$ gallons

$$\frac{17,660 \cancel{\text{ft}^3}}{1} \cdot \frac{7.48052 \text{ gallons}}{1 \cancel{\text{ft}^3}} = \frac{(17,660)(7.48052)}{1} \text{ gal.}$$

$$132,105.98 \text{ gallons} \approx 132,106 \text{ gallons}$$

② convert $\text{sec} \rightarrow$ days

$$\frac{1 \cancel{\text{sec}}}{1} \cdot \frac{1 \cancel{\text{min}}}{60 \cancel{\text{sec}}} \cdot \frac{1 \cancel{\text{hrs}}}{60 \cancel{\text{min}}} \cdot \frac{1 \text{ day}}{24 \cancel{\text{hrs}}} =$$

$$\frac{1}{(60)(60)(24)} \text{ days} = \frac{1}{86400} \text{ days}$$

$$0.000011574 \text{ days}$$

③ Put them together ☺

$$\frac{132,106 \text{ gallons}}{0.000011574 \text{ days}} =$$

$$11,413,958,400 \frac{\text{gallons}}{\text{day}}$$