

# DIMENSIONAL ANALYSIS PROBLEMS

## Conversions Factors

1 hr = 60 min	1 min = 60 sec	1 ton = 2000 lbs	7 days = 1 week
24 hrs = 1 day	1 kg = 2.2 lbs	1 gal = 3.79 L	264.2 gal = 1 cubic meter
1 mi = 5,280 ft	1 kg = 1000 g	1 lb = 16 oz	20 drops = 1 mL
365 days = 1 yr	52 weeks = 1 yr	2.54 cm = 1 in	1 L = 1000 mL
0.621 mi = 1.00 km	1 yd = 36 inches	1 cc is 1 cm <sup>3</sup>	1 mL = 1 cm <sup>3</sup>

\*1g = 1000mg  
\*1m = 100cm

**DIRECTIONS:** Solve each problem using dimensional analysis. Show your work including units for each step. Conversion factors are given above.

1. How many miles will a person run during a 10 kilometer race?

$$\frac{10 \text{ km}}{1} \times \frac{0.621 \text{ mi}}{1 \text{ km}} = \boxed{6.21 \text{ miles}}$$

2. The moon is 250,000 miles away. How many feet is it from earth?

$$\frac{250,000 \text{ mi}}{1} \times \frac{5280 \text{ ft}}{1 \text{ mi}} = \boxed{1,320,000,000 \text{ ft}}$$

3. A family pool holds 10,000 gallons of water. How many cubic meters is this?

$$\frac{10,000 \text{ gallons}}{1} \times \frac{1 \text{ m}^3}{264.2 \text{ gallons}} = \boxed{37.85 \text{ m}^3}$$

4. The average American student is in class 330 minutes/day. How many hours/day is this?

$$\frac{330 \text{ min}}{1 \text{ day}} \times \frac{1 \text{ hr}}{60 \text{ min}} = \boxed{5.5 \text{ hr/day}}$$

5. Lake Michigan holds  $1.3 \times 10^{15}$  gallons of water. How many liters is this?

$$\frac{1.3 \times 10^{15} \text{ gallons}}{1} \times \frac{3.79 \text{ L}}{1 \text{ gallon}} = \boxed{4.927 \times 10^{15} \text{ L}}$$

6. Coca Cola puts 355 ml of soda in a can. How many drops is this?

$$\frac{355 \text{ mL}}{1} \times \frac{20 \text{ drops}}{1 \text{ mL}} = \boxed{7100 \text{ drops}}$$

7. Chicago uses  $1.2 \times 10^9$  gallons of water /day. How many gallons per second must be pumped from the lake every second to supply the city?

$$\frac{1.2 \times 10^9 \text{ gallons}}{1 \text{ day}} \times \frac{1 \text{ day}}{24 \text{ hrs}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ s}} = \boxed{13889 \text{ gallons/s}}$$

8. How many feet per second is a wave going if it travels a distance of one mile in 7.35 seconds?

$$\frac{1 \text{ mile}}{7.35 \text{ s}} \times \frac{5280 \text{ ft}}{1 \text{ mile}} = \boxed{718 \text{ ft/s}}$$

9. Lake Michigan holds  $1.3 \times 10^{15}$  gallons of water. If just Chicago removed water from the lake and it never rained again, how many days would the water last? Chicago uses  $1.2 \times 10^9$  gallons of water /day

$$\frac{1.3 \times 10^{15} \text{ gallons}}{1} \times \frac{1 \text{ day}}{1.2 \times 10^9 \text{ gallons}} = \boxed{1.083 \times 10^6 \text{ days}} \\ \boxed{1,083,333 \text{ days}}$$

\* 10. If a woman weighs 125 lbs and 8 oz., how many mg does she weigh?

$$\frac{125 \text{ lbs}}{1} \times \frac{2.2 \text{ kg}}{1 \text{ lb}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{*1000 \text{ mg}}{1 \text{ g}} = \boxed{275,000,000 \text{ mg}} \\ \boxed{2.75 \times 10^8 \text{ mg}}$$

11. The distance from Santa Maria to Los Alamos is 16.25 mi. What is the distance in cm?

$$\frac{16.25 \text{ miles}}{1} \times \frac{5280 \text{ ft}}{1 \text{ mile}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = \boxed{2,615,184 \text{ cm}}$$

12. If a projectile travels  $3.00 \times 10^3$  feet in one second, how far will it travel in 18 minutes?

$$\frac{18 \text{ min}}{1} \times \frac{60 \text{ s}}{1 \text{ min}} \times \frac{3.00 \times 10^3 \text{ ft}}{1 \text{ s}} = \boxed{3,240,000 \text{ ft}}$$

13. A small herd of cattle consumes fourteen bales of hay in two weeks. How many bales will this herd consume in a year?

$$\frac{1 \text{ year}}{1} \times \frac{52 \text{ wks}}{1 \text{ year}} \times \frac{14 \text{ bales}}{2 \text{ wks}} = \boxed{364 \text{ bales}}$$

\* 14. If a swimmer swims 85.4 yards in five minutes, how many meters will he swim in 70.0 seconds?

$$\frac{85.4 \text{ yards}}{5 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ s}} \times \frac{36 \text{ inches}}{1 \text{ yard}} \times \frac{2.54 \text{ cm}}{1 \text{ inch}} \times \frac{*1 \text{ m}}{100 \text{ cm}} = \boxed{0.260 \text{ m}}$$

15. A gas station is charging \$2.43 per gallon of gas. What would be the price for a liter of gas?

$$\frac{2.43 \text{ dollars}}{1 \text{ gallon}} \times \frac{1 \text{ gallon}}{3.79 \text{ L}} = \boxed{\$0.641/\text{L}}$$