

# Chapter 1 Part 3

Dr. Turner

# Buying Pizza

Eight UGA fans are in an apartment, watch an away game, and decide to order pizza. Everyone is pretty hungry, so they all want 3 slices each. They decide to get larges from Papa John's, which all have 8 slices per pizza. The large pizzas at Papa John's all cost \$10. How much will it cost to get enough pizza to feed everyone?

# Solution using Dimensional Analysis

$$8 \text{ people} \left( \frac{3 \text{ slices}}{1 \text{ person}} \right) \left( \frac{1 \text{ pizza}}{8 \text{ slices}} \right) \left( \frac{10 \text{ dollars}}{1 \text{ pizza}} \right) = 30 \text{ dollars}$$



Starting value

Conversion Factors

# Conversion Factors (memorize)

## Length

- 1 mile = 5280 feet
- 1 yard = 3 feet
- 1 foot = 12 inches
- 1 inch = 2.54 centimeters

## Mass

- 1 kilogram = 2.2 pounds
- 1 pound = 16 ounces
- 1 ton = 2000 pounds

## Volume

- 1 mL = 1 cm<sup>3</sup>
- 1 liter = 1.06 quarts
- 1 gallon = 4 quarts
- 1 quart = 2 pints
- 1 pint = 2 cups
- 1 cup = 8 (fluid) ounces

The standard to metric conversions are highlighted

# Common Unit Prefixes (memorize)

Common Unit Prefixes

Prefix	Symbol	Factor	Example
femto	f	$10^{-15}$	1 femtosecond (fs) = $1 \times 10^{-15}$ s (0.000000000000001 s)
pico	p	$10^{-12}$	1 picometer (pm) = $1 \times 10^{-12}$ m (0.000000000001 m)
nano	n	$10^{-9}$	4 nanograms (ng) = $4 \times 10^{-9}$ g (0.000000004 g)
micro	$\mu$	$10^{-6}$	1 microliter ( $\mu$ L) = $1 \times 10^{-6}$ L (0.000001 L)
milli	m	$10^{-3}$	2 millimoles (mmol) = $2 \times 10^{-3}$ mol (0.002 mol)
centi	c	$10^{-2}$	7 centimeters (cm) = $7 \times 10^{-2}$ m (0.07 m)
deci	d	$10^{-1}$	1 deciliter (dL) = $1 \times 10^{-1}$ L (0.1 L)
kilo	k	$10^3$	1 kilometer (km) = $1 \times 10^3$ m (1000 m)
mega	M	$10^6$	3 megahertz (MHz) = $3 \times 10^6$ Hz (3,000,000 Hz)
giga	G	$10^9$	8 gigayears (Gyr) = $8 \times 10^9$ yr (8,000,000,000 Gyr)
tera	T	$10^{12}$	5 terawatts (TW) = $5 \times 10^{12}$ W (5,000,000,000,000 W)

# Dimensional Analysis

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Express 1.47 miles in inches.

# Dimensional Analysis

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A football field 120 yards long. Express the length of the football field in meters.

# Dimensional Analysis

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How many cubic centimeters are there in 8.34 cubic meters?



# Dimensional Analysis



If you are traveling at 65 miles per hour, how many feet are you traveling per second?

# Dimensional Analysis

Suppose your automobile gas tank holds 18 gallons, and the price of gasoline is \$0.293 per liter. How many dollars would it cost you to fill your gas tank?

# Dimensional Analysis

A certain chemical process requires 75 gallons of pure water each day. The available water contains 11 milligrams of salt per kilogram of water. If a gallon of water has 3.67 kilograms of mass, how many milligrams of salt must be removed each day?

# Density

- Density is a measure of how much mass something has relative to how much space it takes up (volume).
- Density is an intensive property
- Can be used as a conversion factor relating mass to volume

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

# Dimensional Analysis

The density of silver is 10.5 g/mL Which conversion is set up correctly to determine the volume of a 0.71g block of silver?

A.  $0.71 \text{ g} \times \frac{10.5 \text{ g}}{1 \text{ mL}} =$

B.  $0.71 \text{ g} \times \frac{1 \text{ g}}{10.5 \text{ mL}} =$

C.  $0.71 \text{ g} \times \frac{1 \text{ mL}}{10.5 \text{ g}} =$

D.  $0.71 \text{ g} \times \frac{10.5 \text{ mL}}{1 \text{ g}} =$

# Dimensional Analysis

(A) Calculate the volume of a rectangular box with the dimensions 42.6 cm by 4.41 cm by 19.32 mm. (B) Calculate the number of pounds of mercury (density = 13.63 g/mL) that can fit into that box.