

Conversions Review

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6 April 2005

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Outline

- Basic Conversions Review
- Length units
- Volume units
- Mass units

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Metric System

Based on 10s:

- Mega = $10^6 = 1,000,000$
- Kilo = $10^3 = 1,000$
- Hecto = $10^2 = 100$
- Deka = $10^1 = 10$
- Deci = $10^{-1} = 0.1$
- Centi = $10^{-2} = 0.01$
- Milli = $10^{-3} = 0.001$
- Micro = $10^{-6} = 0.000001$

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Basis of Conversions

1 kilogram of salt is EQUAL to how many grams?

Hint: kilo = 1000

1 kilogram = 1000 grams

$$1 \text{ kilogram} \times \frac{1000 \text{ grams}}{1 \text{ kilogram}} = \underline{1000 \text{ grams}}$$

KEY to conversions is to 2 main things:

1. Know the conversion rate (e.g., 1 kg = 1000 grams)
2. Set-up equation to where the units of measure cancel each other to get the units of measure desired.

"Canceling out" units of measure
are done by dividing each other.

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Basis of Conversions

20 grams of salt is EQUAL of how many kilograms?

1st Step: Know the conversion rate 1000 grams = 1 kilogram

2nd Step: Set-up equation to where the units of measure cancel each other to get the units of measure desired.

$$20 \cancel{\text{grams}} \times \frac{1 \text{ kilogram}}{1000 \cancel{\text{grams}}} = \underline{\underline{0.02 \text{ kilograms}}}$$

- Treat the units of measures like fractions
 - Add or subtract LIKE units of measure
 - When you divide LIKE units of measure, the units of measure equal 1 and become UNITLESS.

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Basis of Conversions

$$\frac{1}{3} + \frac{1}{3} = \frac{2}{3} \quad \longrightarrow \quad \text{meter} + \text{meter} = \text{meter}$$

$$\left(\frac{1}{3}\right)\left(\frac{1}{3}\right) = \frac{1}{9} \quad \longrightarrow \quad (\text{meter})(\text{meter}) = (\text{meter})^2$$

$$\frac{\left(\frac{1}{3}\right)}{\left(\frac{1}{3}\right)} = 1 \quad \longrightarrow \quad \frac{(\text{meter})}{(\text{meter})} = 1 \text{ (unitless)}$$

- Treat the units of measures like fractions
 - Add or subtract LIKE units of measure
 - When you divide LIKE units of measure, the units of measure equal 1 and become UNITLESS.

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Group Exercise on Simple Conversions

Using the given conversion factors, solve the following

1. Given that 2 pints equals 1 quart, how many pints do I need to fill a 6 quart container?
2. Given that 1 foot equals 12 inches, how many feet of plywood is needed if the design requires 245 inches of it?
3. Given that 2 pounds equals 454 grams, how many grams of chemical A do I need if the procedure requires 10 pounds of it.

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Group Exercise on Simple Conversions

Using the given conversion factors, solve the following

4. Given that 3 feet equals 1 yard, how many feet is there in a 500 yard firing range?
5. Given that 100 centimeters equals 1 meter, how much snow is reported in centimeters if there is 24 meters worth measured?
6. Given that 4 quarters equals 1 dollar, how many quarters do I need in a vending machine for a \$2.50 sandwich?

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More Conversions

- Converting through 2 or more different units of measure

$$\frac{\text{milligrams}}{\text{liter}} \longrightarrow \frac{\text{pounds}}{\text{cubic feet}} \quad \text{Examples}$$

- 1st Step: Know the conversion factors for all units involved.
- 2nd Step: Set-up equation so that the desired units are calculated.
- 3rd Step: Convert one unit of measure at a time.

Problem: Chemical A weighs 24 milligrams per liter of product.
How many pounds per cubic feet is that amount equivalent to?

Conversion Factor: 1 pound is equal to 454 grams
1 gram is equal to 1000 milligrams
1 liter of liquid is equal to 0.035 cubic feet of liquid

$$\frac{24 \text{ mg}}{1 \text{ liter}} \times \frac{1 \text{ gram}}{1000 \text{ mg}} \times \frac{1 \text{ pound}}{454 \text{ grams}} \times \frac{1 \text{ liter}}{0.035 \text{ ft}^3} = \frac{0.0015 \text{ pounds}}{\text{cubic feet}}$$

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More Conversions

Problem: A European car crashed into a telephone pole. The speedometer indicator is locked in place with a speed reading of 120 kilometers per hour. Convert to miles per hour.

1st Step: Know the conversions

1 kilometer = 1000 meters
1 meter = 100 centimeters
2.54 centimeters = 1 inch
12 inches = 1 foot
5280 feet = 1 mile

Do Long Method for Practice!!!

2nd Step: Set-up equation

$$\frac{120 \text{ km}}{\text{hour}} \times \frac{1000 \text{ meters}}{1 \text{ km}} \times \frac{100 \text{ cm}}{1 \text{ meter}} \times \frac{1 \text{ inch}}{2.54 \text{ cm}} \times \frac{1 \text{ foot}}{12 \text{ inches}} \times \frac{1 \text{ mile}}{5280 \text{ feet}}$$

$$= \underline{74.6 \text{ miles per hour}}$$

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Group Exercise - Conversions

Use your reference handout for conversion factors

1. *A sling is load tested at 2300 pounds. A steel beam is labeled to weigh 1400 kilograms. Can the sling lift this item?*
2. *In a 500 gallon water trailer, how much does the water weigh when filled to 500 gallons?
Hint: Weight Density of water is 62.4 lbs per cubic feet; 4 quarts = 1 gallon; 1.06 quarts=0.035 ft³*
3. *An attic flooring space is load rated at 62 lbs per square foot. If the total square footage is 42 square feet, what is the load rating for the entire attic space?*

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Group Exercise - Conversions

Use your reference handout for conversion factors

4. *A bridge is rated to 500 lbs per square feet. A heavy machinery taking 1 square feet of space is labeled to weigh 550 kilograms. Can this be placed on the bridge?*
5. *A human runner was clocked to have run a 150 meter relay in 45.6 seconds. How many miles per hour is that equivalent to? Hint: 5280 feet = 1 mile; 60 seconds=1 minute*
6. *A forklift is load tested to 450 lbs. In Europe, how many kilograms is that?*

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Length Conversions

1 inch = 2.54 centimeters

1 foot = 12 inches

3 feet = 1 yard

1 meter = 39.37 inches

5280 feet = 1 mile

1 micron = 0.0001 centimeters

1 millimeter = 1000 meters

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Volume Conversions

1 liter = 1.06 quarts

1 liter = 61.02 cubic inches

1 liter = 0.03531 cubic feet

1 cubic yard = 27 cubic feet

1000 liters = 1 cubic meter (m³)

- Volume can represent gas, vapor or liquid.

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Battle Drills: Conversions

- Convert 32.5 inches into meters.
 - 1.23 meters**
 - 3.22 meters**
 - 0.83 meters**
 - 2.42 meters**
- 2300 milligrams per liter of liquid is equivalent to how many pounds per gallon?
 - 1.2 lbs/gal**
 - 0.02 lbs/gal**
 - 0.05 lbs/gal**
 - 1.4 lbs/gal**
- 42,000 pounds per square inch is equivalent to how many kilograms per square foot?
 - 34582 kg/square foot**
 - 325291 kg/square foot**
 - 2749091 kg/square foot**
 - 438103 kg/square foot**
- Floor is load tested to be 45 lbs per square foot. If the floor total square footage is 320 square feet, how many total kilograms of weight is allowed on this floor?
 - 6545 kg**
 - 4530 kg**
 - 2348 kg**
 - 2341 kg**
- If a cement mixing bag requires 2 gallons of water for every 5 lbs of cement, how many liters of water do you need for 230 pounds of cement?
 - 234 liters**
 - 347.2 liters**
 - 231.2 liters**
 - 23 liters**