



Dimensional Analysis



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Equivalent Units

- When two quantities with different units can be related to each other by an “equal” sign, they are called equivalent units.
- Some examples are:
 - 12 eggs = 1 dozen
 - 1000 millimeters (mm) = 1 meter (m)
 - 1 lb = 0.454 kg
 - 1 mL = 1 cm³ **Note: 1 cm³ is also known as a “cc”**

Equivalent Units

- Equivalent units can be used as a conversion factor to convert from one unit to another unit.
- Examples of conversion factors are:

- 12 eggs = 1 dozen

$$\frac{12 \text{ eggs}}{1 \text{ dozen}} \text{ or } \frac{1 \text{ dozen}}{12 \text{ eggs}}$$

- 1 lb = 0.454 kg

$$\frac{0.454 \text{ kg}}{1 \text{ lb}} \text{ or } \frac{1 \text{ lb}}{0.454 \text{ kg}}$$

Conversion Factors

- Conversion factors are used to convert a quantity from one unit to another unit.
- Example: A sample of eggs contains 189 eggs. How many dozen eggs are in the sample?

- Recall: 12 eggs = 1 dozen

- The conversion factors are

$$\frac{12 \text{ eggs}}{1 \text{ dozen}} \text{ or } \frac{1 \text{ dozen}}{12 \text{ eggs}}$$

- Begin by writing the number given (that you want to convert)

189 eggs

- Next slide...

Conversion Factors

- Example: A sample of eggs contains 189 eggs. How many dozen eggs are in the sample?
 - After writing the number given (that you want to convert), multiply it by the conversion factor that has that unit (eggs) on the bottom.

$$189 \cancel{\text{eggs}} \left(\frac{1 \text{ dozen}}{12 \cancel{\text{eggs}}} \right) =$$

- Notice how the “eggs” unit cancels out, since it is found on both the top and the bottom of the fraction! 😊
- The only unit left is “dozen”, which is just what we want.
- Now, **do the math** by **multiplying numbers on the top** of the fraction (numerator) and **divide by numbers on the bottom** of the fraction (denominator).

Conversion Factors

- Example: A sample of eggs contains 189 eggs. How many dozen eggs are in the sample?

$$189 \cancel{\text{eggs}} \left(\frac{1 \text{ dozen}}{12 \cancel{\text{eggs}}} \right) =$$

- Multiply numbers on the top of the fraction (numerator) and divide by numbers on the bottom of the fraction (denominator)...

$$189 \times 1 \div 12 = 15.75 \text{ dozen}$$

(3 sig figs... 15.8 dozen)

Mini Quiz

- A certain human weighs 195 lbs. How much does this human weigh in kilograms (kg)?

Mini Quiz Solution

- A certain human weighs 195 lbs. How much does this human weigh in kilograms (kg)?

- Recall: 1 lb = 0.454 kg

- The conversion factors are

$$\frac{0.454 \text{ kg}}{1 \text{ lb}} \text{ or } \frac{1 \text{ lb}}{0.454 \text{ kg}}$$

- Begin by writing the number given (that you want to convert)

195 lbs

- Next slide...

Conversion Factors

- Example: A certain human weighs 195 lbs. How much does this human weigh in kilograms (kg)?
 - After writing the number given (that you want to convert), multiply it by the conversion factor that has that unit (lbs) on the bottom.

$$195 \cancel{\text{lbs}} \left(\frac{0.454 \text{ kg}}{1 \cancel{\text{lb}}} \right) =$$

- Notice how the “lbs” unit cancels out, since it is found on both the top and the bottom of the fraction! 😊
- The only unit left is “kg”, which is just what we want.
- Now, **do the math** by **multiplying numbers on the top** of the fraction (numerator) and **divide by numbers on the bottom** of the fraction (denominator).

Conversion Factors

- Example: A certain human weighs 195 lbs. How much does this human weigh in kilograms (kg)?

$$195 \cancel{\text{lbs}} \left(\frac{0.454 \text{ kg}}{1 \cancel{\text{lb}}} \right) =$$

- Multiply numbers on the top of the fraction (numerator) and divide by numbers on the bottom of the fraction (denominator)...

$$195 \div 1 \times 0.454 = 88.53 \text{ kg}$$

(3 sig figs... 88.5 kg)