

Objectives:

TSWBAT:

Use dimensional analysis to solve conversion problems.

Dimensional Analysis:

a way to analyze or solve problems using the units, or dimensions, of the measurements.

We use "conversion factors" with this method.

Conversion Factors:

these are any statement of equivalent terms.

For example, 1 dozen = 12

We write conversion factors as if they are fractions, but we do NOT treat them like fractions.

To write a conversion factor for a dozen:

1 dozen

12

An equivalent statement in conversion factors would be:

12

1 dozen

The steps in dimensional analysis:

1. Always start with what you are given, written alone.

2. Conversion factors need to be arranged so **UNITS CANCEL** leaving the units you desire on top in the last c.f.

Here is an example of using conversion factors to solve problems by canceling units:

How many eggs are in 3 dozen eggs?

Start with what you are given (3 dozen):

$$3 \text{ dozen eggs} \times \frac{12 \text{ eggs}}{1 \text{ dozen eggs}} = 36 \text{ eggs}$$

Another example:

Changes in weather can be predicted by barometric pressure. If the news reports a barometric pressure of 760. mm Hg, how many inches of Hg is that? (Hint: 1 inch = 2.54 cm)

Start with what you are given:

$$760. \text{ mm Hg} \times \frac{1 \text{ cm}}{10 \text{ mm}} \times \frac{1 \text{ inch}}{2.54 \text{ cm}} =$$

$$\frac{760}{25.4} = 29.9 \text{ inches}$$

Is this number reported in the correct significant figures?

Warm Up

How many significant figures are in the following measurements?

a. 0.9900 m

b. 7.009 m

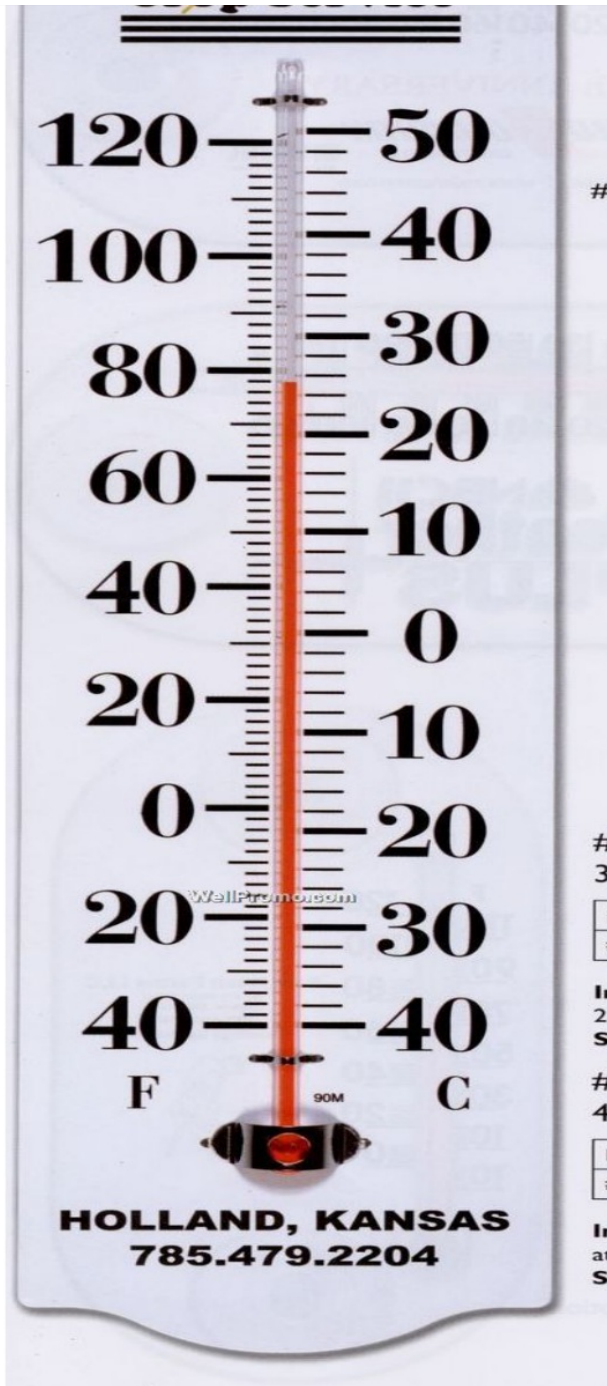
c. 0.0099 m

d. 9000 m

e. 9009 m

f. 90,000 m

g. 90,000. m



Pop Quiz

What is the temp. (in °C) on this thermometer?

Convert the weight of a 75 kg person to pounds. (2.2 lbs = 1 kg)

Solution:

$$75 \text{ kg} \times \frac{2.2 \text{ lbs}}{1 \text{ kg}} = 165 \text{ lbs}$$

What would we round to when following significant figure rules?

Warm Up

How many inches are in 27.2 feet?

Use dimensional analysis to solve this problem.

The elevation of a skyscraper is 565 ft.

What is the elevation in meters?

(1 meter = 3 feet)

Practice:

Show the calculation you would use to convert the following:

- a. 0.25 m to centimeters
- b. 9.8 g to kilograms
- c. 35 seconds to minutes
- d. 4.2 mL to liters

More practice:

1. What is the equivalent of 0.035 lb in grams?

(Remember: 2.2 lbs = 1 kg)

2. What is the equivalent of 454 g in kilograms?

Practice Problems

#1 A container can hold 65 g of water.

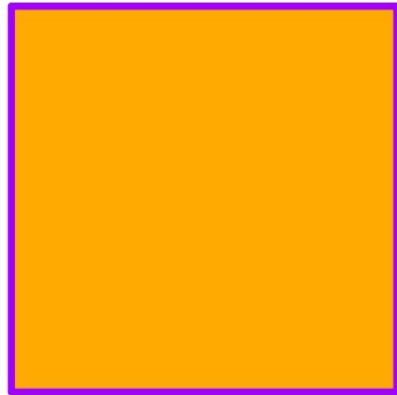
Which conversion factor is needed to find the mass of water in 5 identical containers.

- a. 5 containers/65 g water
- b. 1 container/65 g water
- c. 65 g water/1 container
- d. 65 g water/ 5 containers

#2 Circle the letter of the conversion factor that you would use to convert **tablespoons to milliliters**:

- a. 4 fluid ounces/1 Tablespoon
- b. 1 Tablespoon/4 fluid ounces
- c. 1 Tablespoon/15 mL
- d. 15 mL/1 Tablespoon

#3 Complex conversion between units may require using _____ conversion factors.



#4 Just for practice we will use made up terms. Here are some made up equivalent statements:

There are 13 frips in 42 fraps.

There are 2.2 fraps in 12 swings.

There are 62 swings in 1 flop.

How many frips are in 34.5 flops? Use dimensional analysis.

#5 How many seconds are in 43.7 years? (use 365 days per year in your calculation.)