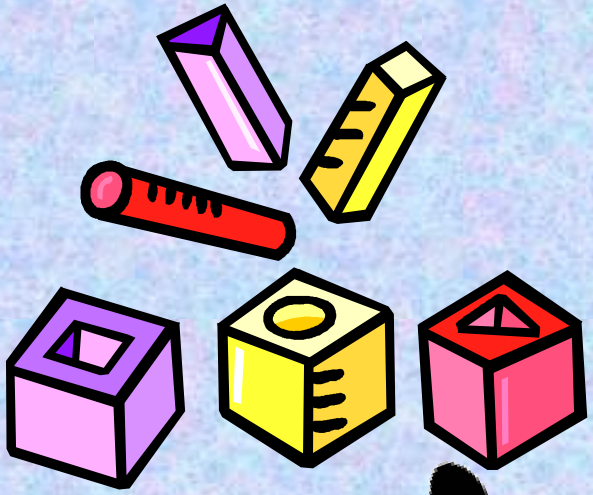
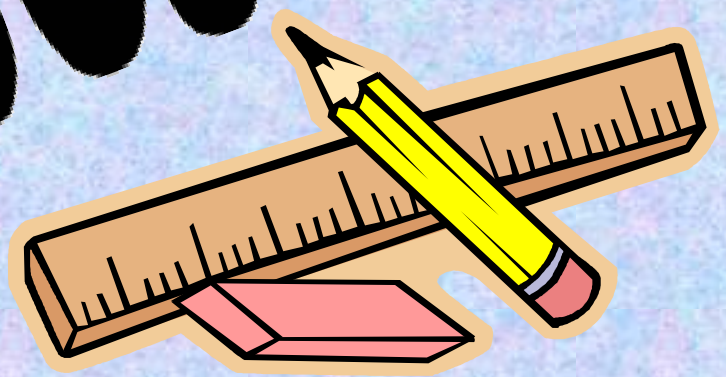
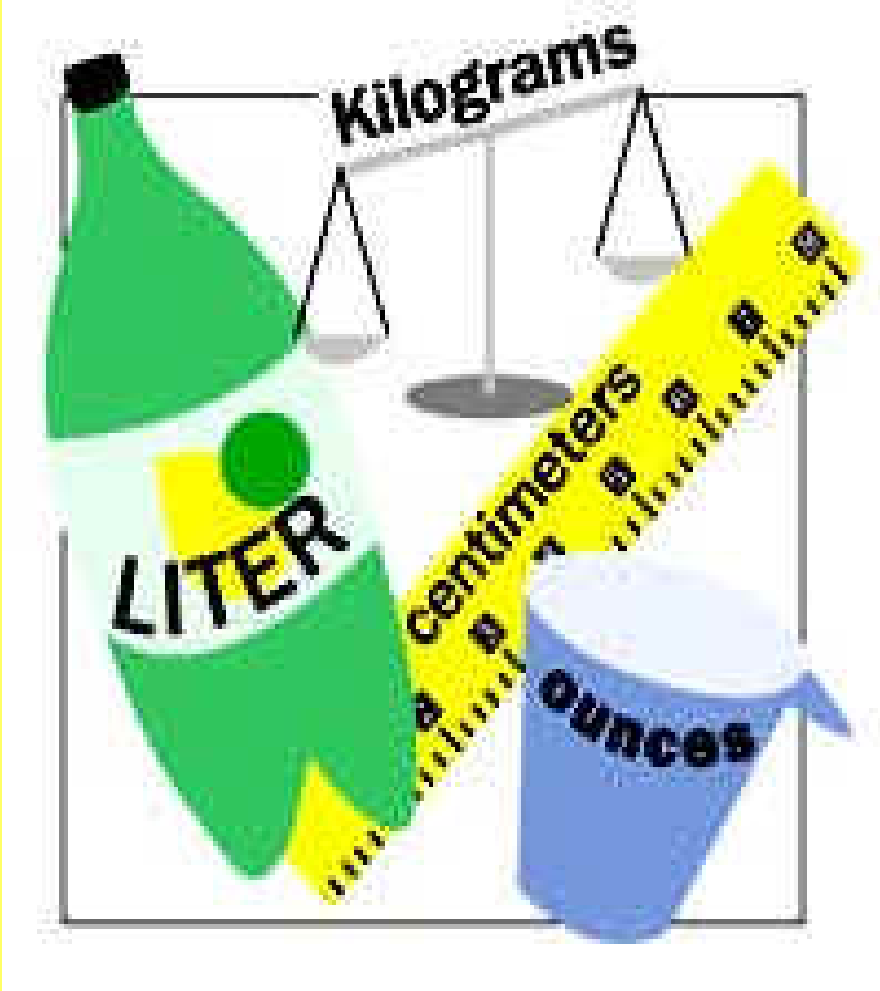


Metric Mania



Metric measurement???

- System based on the meter and gram
- Used by over 80% of the world
- Preferred by scientists

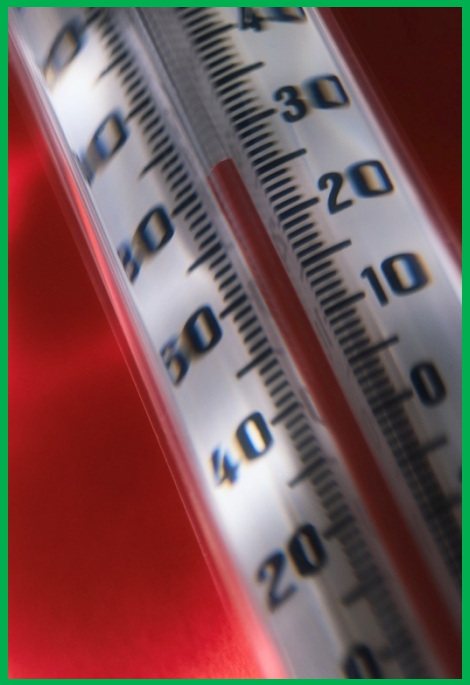


Customary versus Metric

- The United States uses the customary system.
- Science uses the metric system, so we will use the metric system only in class.

The metric system is used to measure:

***length**
***mass**
***volume**
***density**
***temperature**



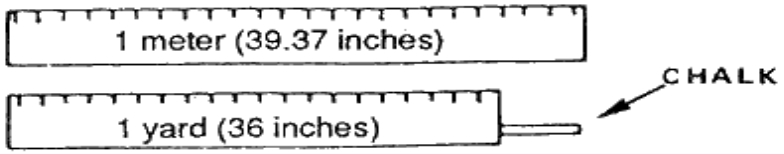
Length

Meter (m)

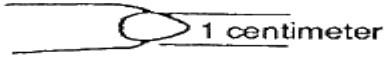
Centimeter (cm)

Kilometer (km)

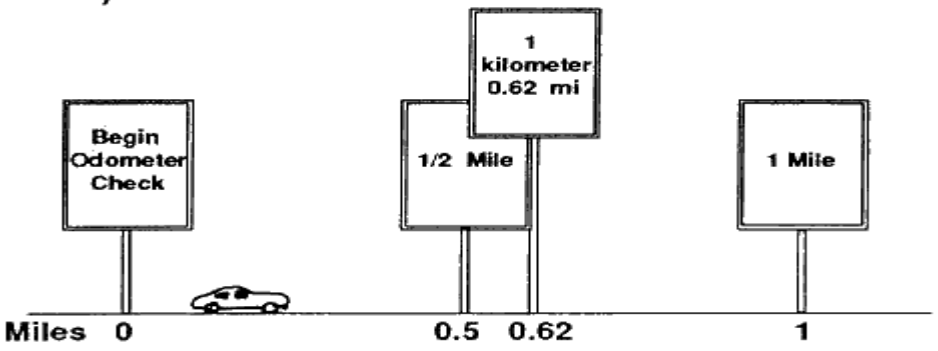
1 meter
(or 1 m) = about a yardstick plus the length of a piece of chalk



1 centimeter (or 1 cm) = the width of some part of your smallest finger or fingernail



1 kilometer (or 1 km) = a little more than half a mile (pronounced KILL-oh-meet-ur not kill-AHM-it-ur)



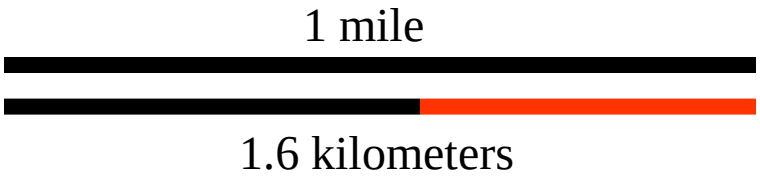
English vs. Metric Units

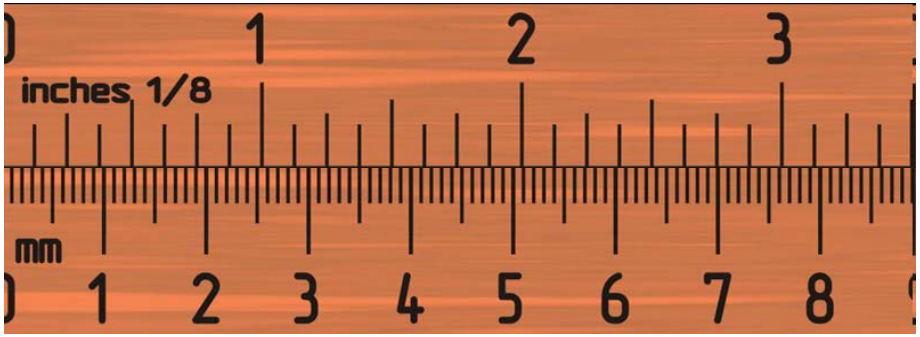
Which is longer?

A. 1 mile or 1 kilometer

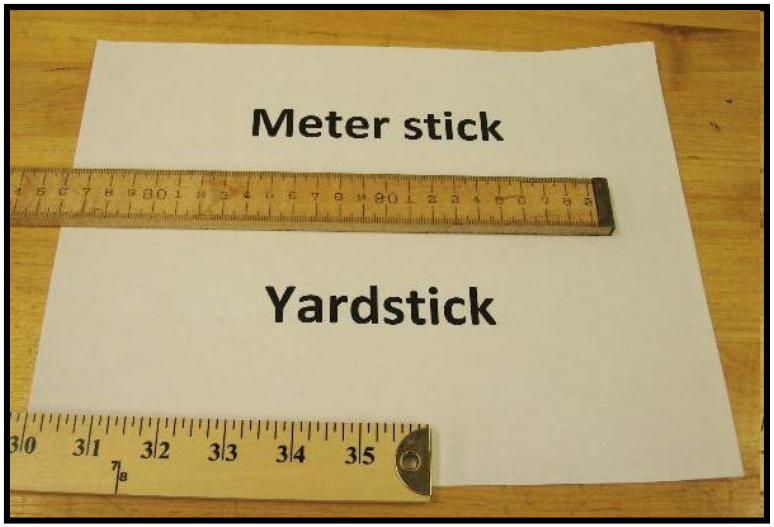
B. 1 yard or 1 meter

C. 1 inch or 1 centimeter





1 inch = 2.54 centimeters



1 yard = 0.9444 meters

Left Image: http://webapps.lsa.umich.edu/physics/demolab/controls/imagedemosm.aspx?picid=1167
Right Image: http://share.lancealan.com/N800%20ruler.jpg

Metric Units

The basic unit of length in the metric system in the **meter** and is represented by a lowercase **m**.

Standard: The **distance** traveled by **light** in absolute vacuum in 1⁄299,792,458 of a second.

Metric Units

1 Kilometer (km) = 1000 meters

1 Meter = 100 Centimeters (cm)

1 Meter = 1000 Millimeters (mm)

Which is larger?

A. 1 meter or 105 centimeters

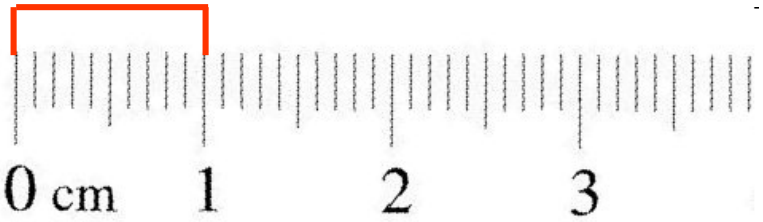
B. 4 kilometers or 4400 meters

C. 12 centimeters or 102 millimeters

D. 1200 millimeters or 1 meter

Measuring Length

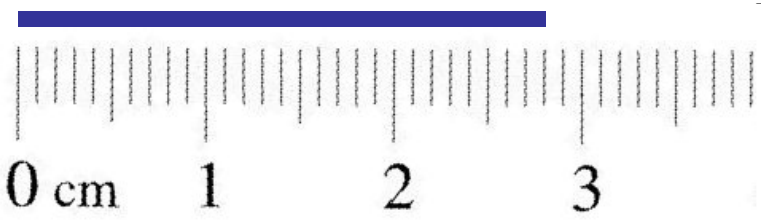
How many millimeters are in 1 centimeter?



1 centimeter = 10 millimeters

What is the length of the line in centimeters? _____cm

What is the length of the line in millimeters? _____mm



What is the length of the line to the nearest centimeter? _____cm

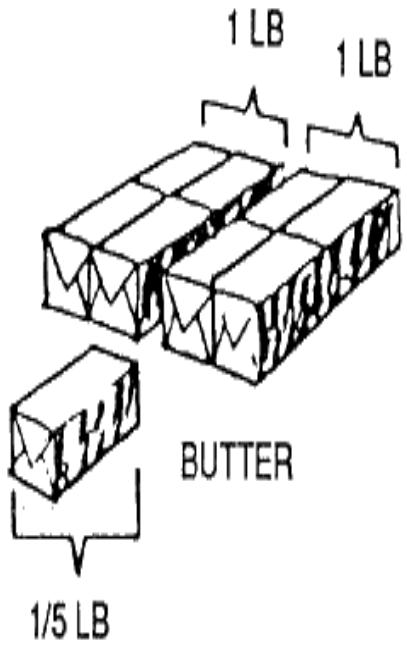
HINT: Round to the nearest centimeter – no decimals.

Ruler: http://www.k12math.com/math-concepts/measurement/ruler-cm.jpg

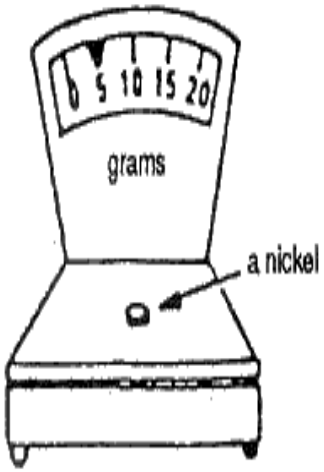
Mass

The amount of matter in an object

1 kilogram (or 1 kg) = about the mass of 2.2 pounds of butter



1 gram (or 1 g) = about the mass of a large thumbtack



a nickel = about 5 grams (or 5 g)

English vs. Metric Units

Which is larger?

1. 1 Pound or 100 Grams

2. 1 Kilogram or 1 Pound

3. 1 Ounce or 1000 Milligrams

1 pound = 453.6 grams

1 ounce of gold =
28,349.5 milligrams

100 kilogram =
220 pounds

kg g Metric Units cg mg

Mass refers to the amount of matter in an object.

The base unit of mass in the metric system in the **kilogram** and is represented by **kg**.

Kilogram Prototype

Metric Units

1 Kilogram (km) = 1000 Grams (g)

1 Gram (g) = 1000 Milligrams (mg)

Which is larger?

A. 1 kilogram or 1500 grams

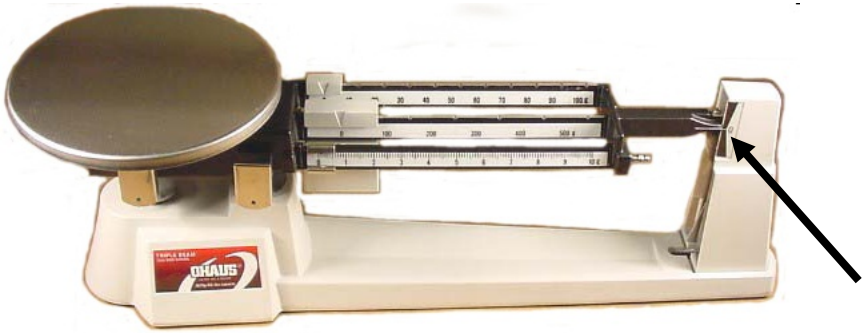
B. 1200 milligrams or 1 gram

C. 12 milligrams or 12 kilograms

D. 4 kilograms or 4500 grams

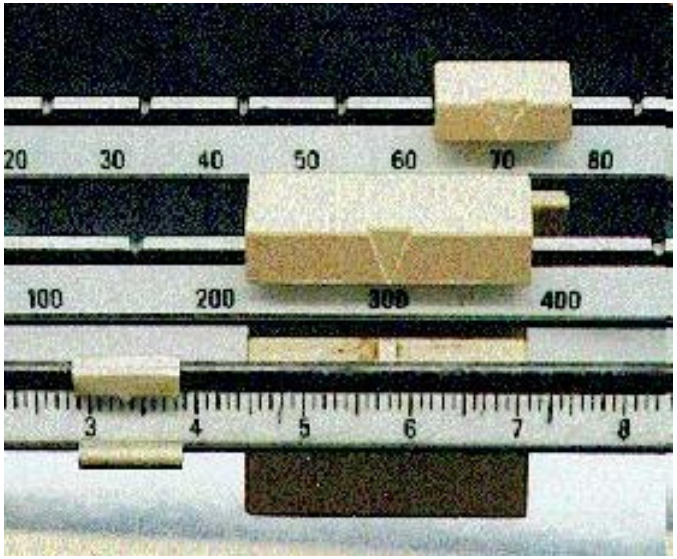
Kilogram Prototype Image - http://en.wikipedia.org/wiki/Kilogram

Measuring Mass



We will be using **triple-beam balances** to find the mass of various objects.

The objects are placed on the scale and then you move the weights on the beams until you get the lines on the right-side of the scale to match up.



Once you have balanced the scale, you add up the amounts on each beam to find the total mass.

What would be the mass of the object measured in the picture?

_____ + _____ + _____ = _____ g

Volume

The amount of space an object takes up

1 liter E Q U A L S **1 quart plus**
(or 1 L
or 1 l)
1/4 cup = 1 liter

1 milliliter
(or 1 mL or 1 ml) = 1/5 tsp

1 tsp = 5 milliliters (mL)

English vs. Metric Units

Which is larger?

A. 1 liter or 1 gallon

B. 1 liter or 1 quart

C. 1 milligram or 1 fluid ounce

1 fl oz = 29.573 ml

1 12-oz can of soda would equal approximately 355 ml.

1 gallon = 3.79 liters

It would take approximately 3 ¾ 1-liter bottles to equal a gallon.

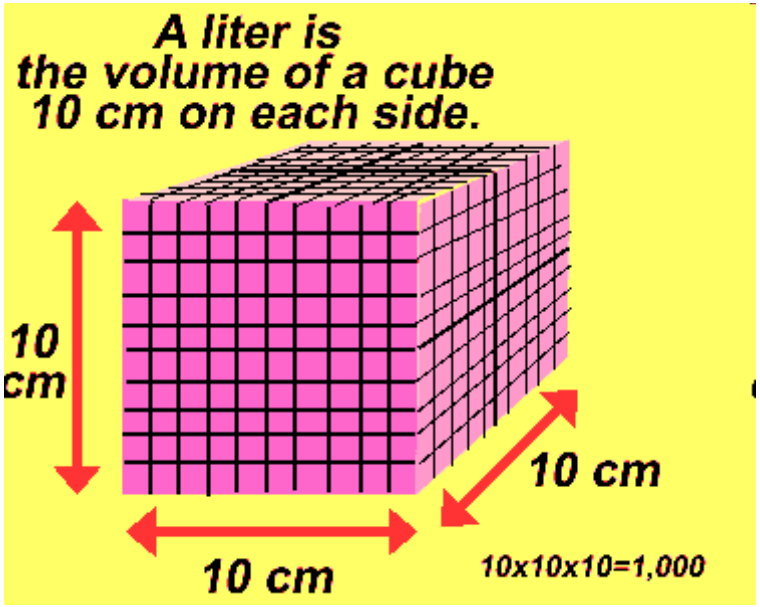
1 quart = 0.946 liters

Metric Units

Volume is the amount of space an object takes up.

The base unit of volume in the metric system in the **liter** and is represented by **L or l**.

Standard: 1 liter is equal to one cubic **decimeter**



Metric Units

1 liter (L) = 1000 milliliters (mL)

1 milliliter (mL) = 1 cm^3 (or cc) = 1 gram*

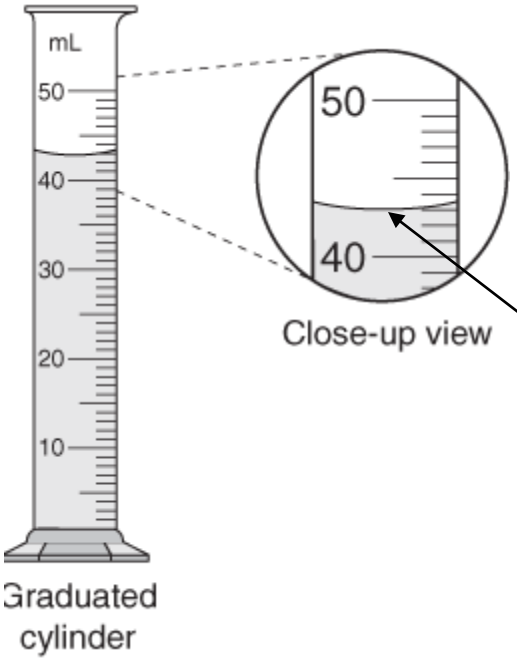
Which is larger?

A. 1 liter or 1500 milliliters

B. 200 milliliters or 1.2 liters

C. 12 cm^3 or 1.2 milliliters*

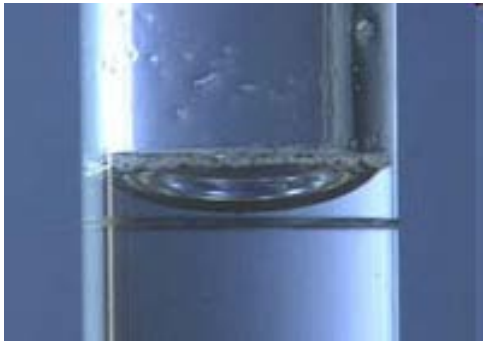
Measuring Volume



We will be using **graduated cylinders** to find the volume of liquids and other objects.

Read the measurement based on the bottom of the **meniscus** or curve. When using a real cylinder, make sure you are eye-level with the level of the water.

What is the volume of water in the cylinder? _____mL

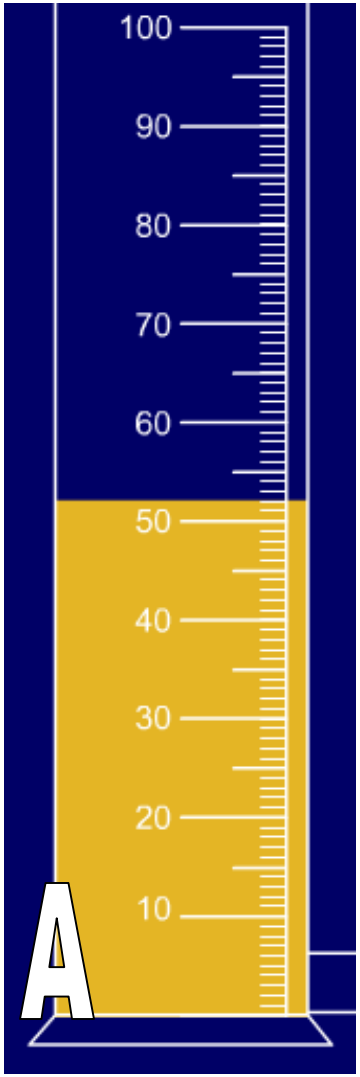


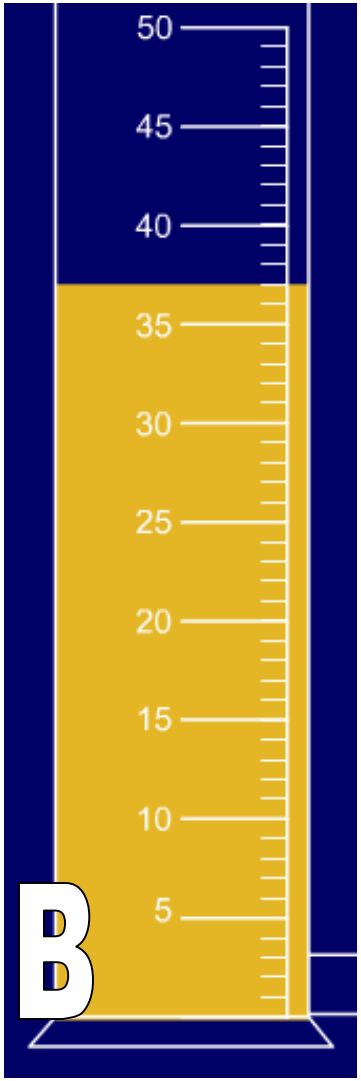
What causes the meniscus?

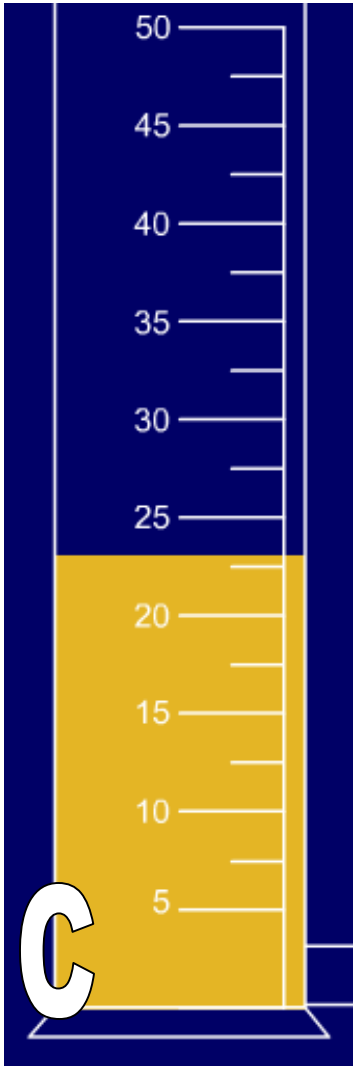
A concave meniscus occurs when the molecules of the liquid attract those of the container. The glass attracts the water on the sides.

Measuring Liquid Volume

What is the volume of water in each cylinder?

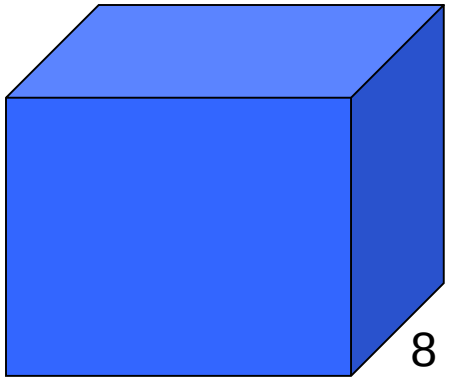






Pay attention to the scales for each cylinder.

Measuring Solid Volume



We can measure the volume of regular object using the formula **length x width x height**.

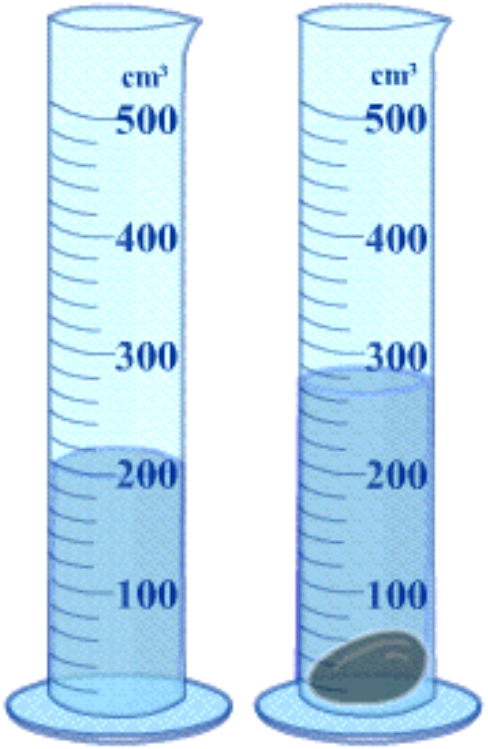
_____ X _____ X _____ = _____

We can measure the volume of irregular object using **water displacement**.

Amount of H_2O with object = _____

About of H_2O without object = _____

Difference = Volume = _____



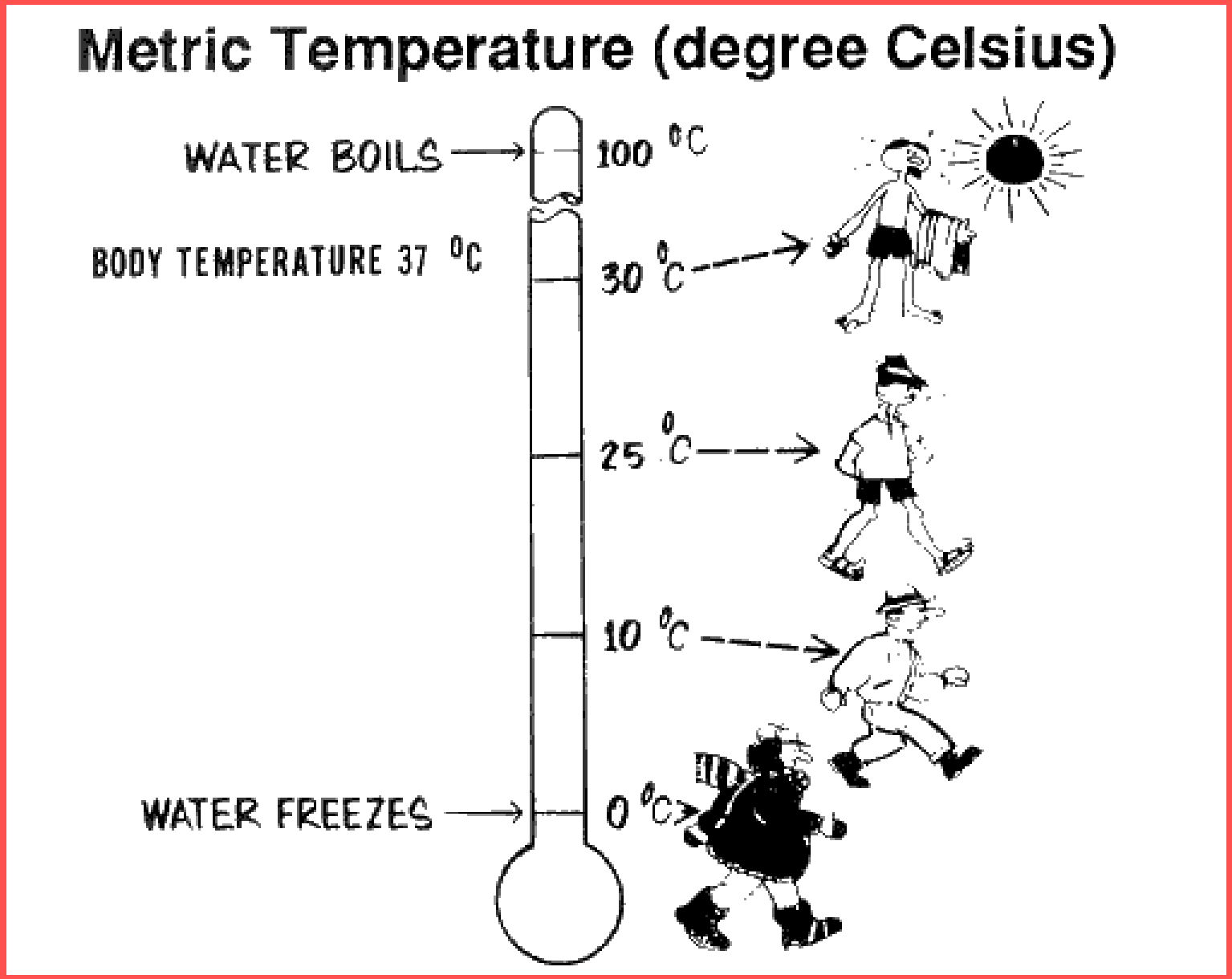
Density

- mass/volume
- unit is g/cm^3
- density of water is 1 g/cm^3
  - objects float if <1 g/cm^3
  - objects sink if >1 g/cm^3

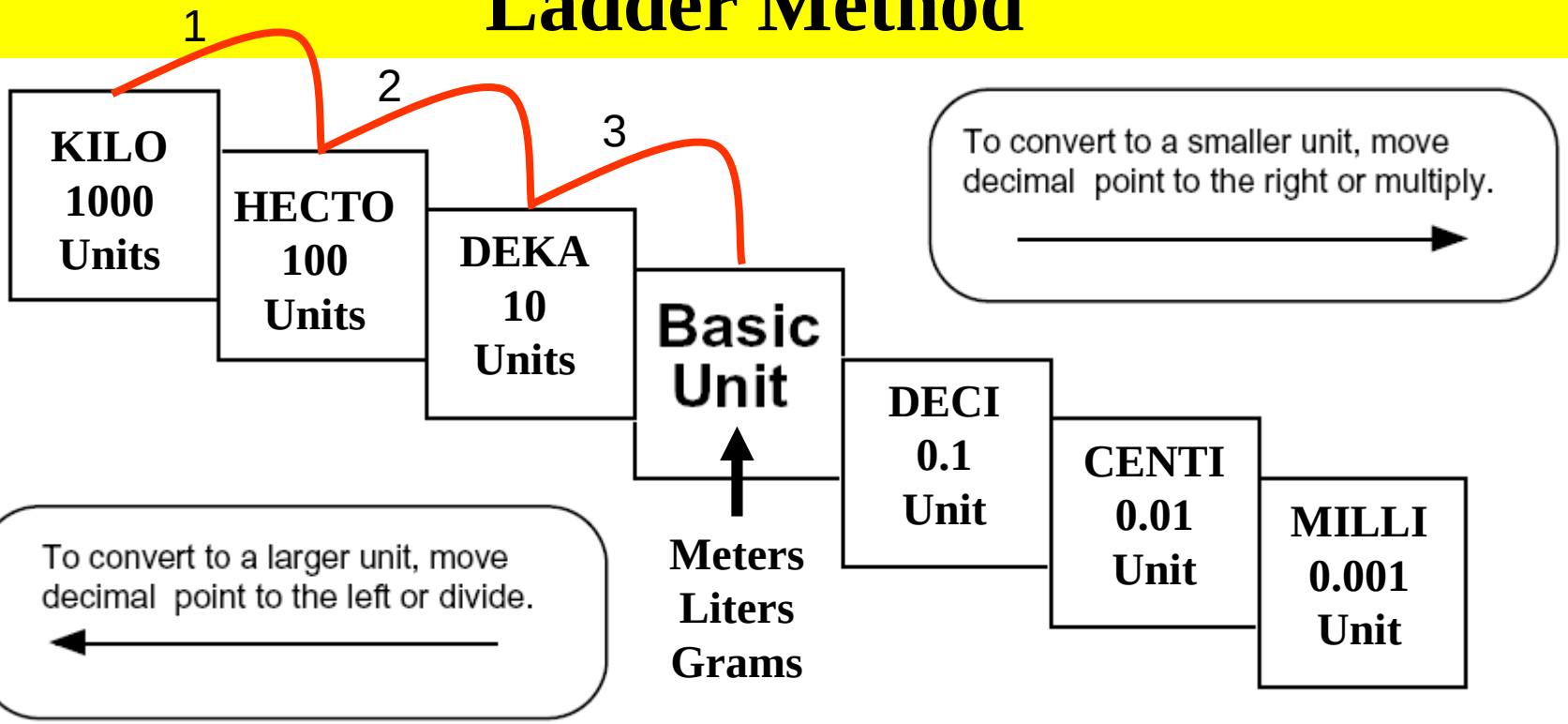
Why does Diet Coke float?

39 g=39,000 mg!!!

Temperature



Ladder Method



How do you use the "ladder" method?

1st – Determine your starting point.

2nd – Count the "jumps" to your ending point.

3rd – Move the decimal the same number of jumps in the same direction.

4 km = _____ m

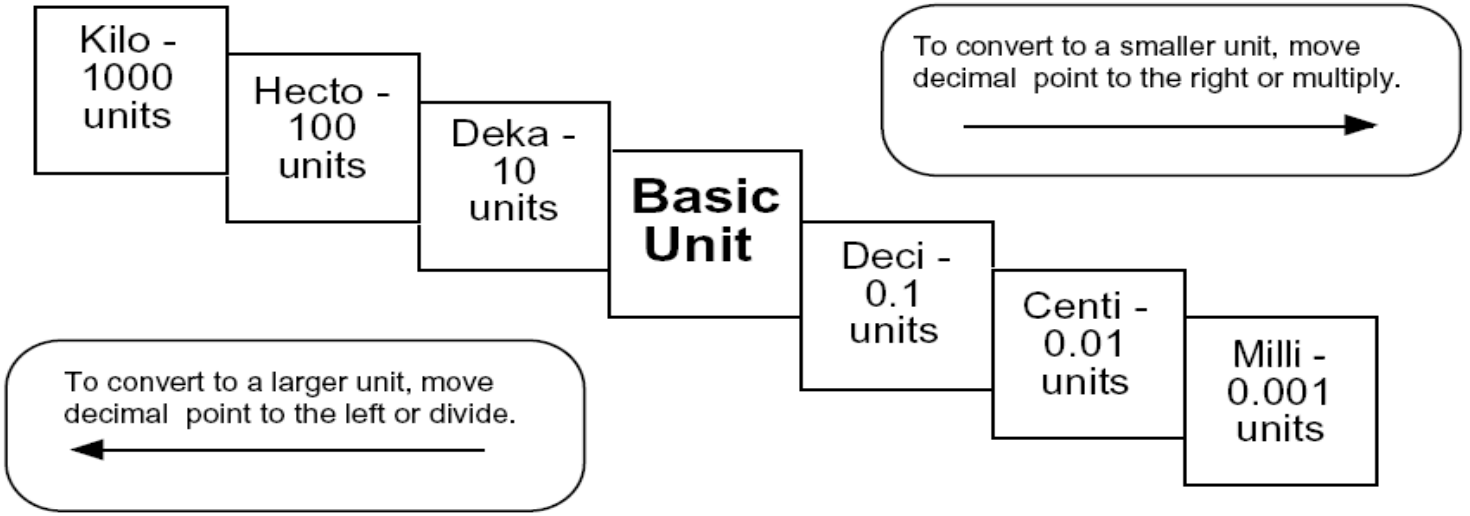
Starting Point Ending Point

How many jumps does it take?

4. _. _. _. = 4000 m

1 2 3

Conversion Practice



Try these conversions using the ladder method.

1000 mg = 1 g

1 L = 1000 mL

160 cm = 1600 mm

14 km = 14000 m

109 g = .109 kg

250 m = .25 km

Compare using <, >, or =.

56 cm < 6 m

7 g > 698 mg

Metric Conversion Challenge

Write the correct abbreviation for each metric unit.

1) Kilogram _____

2) Meter _____

3) Gram _____

4) Milliliter _____

5) Millimeter _____

6) Liter _____

7) Kilometer _____

8) Centimeter _____

9) Milligram _____

Try these conversions, using the ladder method.

10) 2000 mg = _____ g

11) 104 km = _____ m

12) 480 cm = _____ m

13) 5.6 kg = _____ g

14) 8 mm = _____ cm

15) 5 L = _____ mL

16) 198 g = _____ kg

17) 75 mL = _____ L

18) 50 cm = _____ m

19) 5.6 m = _____ cm

20) 16 cm = _____ mm

21) 2500 m = _____ km

22) 65 g = _____ mg

23) 6.3 cm = _____ mm

24) 120 mg = _____ g