METRIC MANIA

The metric system, science, and you!
In science class, we will be using the Metric System. The metric system is a system of measurement that is used by scientists all over the world.

The metric system is simpler and easier to use and understand than traditional measurement systems.

Most countries only use the metric system.

In the United States, we use the English or Standard measurement System.
There are different metric units depending on what we want to measure:

- **Meter (m):** Length
- **Liter (l):** Volume
- **Gram (g):** Mass
- **Celsius (C):** Temperature

These are called base units!
Which is longer?

A. 1 mile or 1 kilometer
B. 1 yard or 1 meter
C. 1 inch or 1 centimeter

1 kilometer = 1.6 miles
1 yard = 0.9444 meters
1 inch = 2.54 centimeters
When you add a prefix to a base unit you change it’s value.

- Kilo- = 1000
- Hecta- = 100
- Deca- = 10
- Deci- = .1 (1/10)
- Centi- = .01 (1/100)
- Milli- = .001 (1/1000)
The basic unit of length in the metric system is 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

To measure length, we use a **ruler**.

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](http://www.k12math.com/math-concepts/measurement/ruler-cm.jpg)
Mass refers to the amount of matter in an object.

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

Standard: 1 kilogram is equal to the mass of the International Prototype Kilogram (IPK), a platinum-iridium cylinder kept by the BIPM at Sèvres, France.

**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
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
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?

\[ \text{mass} = \text{block} + \text{piece} + \text{other} \]

\[ = \ \text{g} \]
Measuring Mass – Triple-Beam Balance

1st – Place the film canister on the scale.

2nd – Slide the large weight to the right until the arm drops below the line. Move the rider back one groove. Make sure it “locks” into place.

3rd – Repeat this process with the top weight. When the arm moves below the line, back it up one groove.

4th – Slide the small weight on the front beam until the lines match up.

5th – Add the amounts on each beam to find the total mass to the nearest tenth of a gram.

Click here to try an online activity.
English vs. Metric Units

Which is larger?

A. 1 liter or 1 gallon
B. 1 liter or 1 quart
C. 1 milliliter or 1 fluid ounce

1 gallon = 3.79 liters

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

1 fl oz = 29.573 ml

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

1 quart = 0.946 liters
**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*

* When referring to water

Liter Image: http://www.dmturner.org/Teacher/Pictures/liter.gif
Measuring Volume

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.
Sometimes we need to convert cm to meters or meter to kilometers. How do we do that?
CONVERSION LADDER METHOD

To convert to a larger unit, move decimal point to the left or divide.

To convert to a smaller unit, move decimal point to the right or multiply.

Basic Unit
Convert 3m to Km

To convert to a smaller unit, move decimal point to the right or multiply.

To convert to a larger unit, move decimal point to the left or divide.
Convert 5m to mm
YOUR TURN!
CONVERT 7000 KM TO M

7000 km
700 hm
70 dkm
Basic Unit
5 m

To convert to a smaller unit, move decimal point to the right or multiply.

To convert to a larger unit, move decimal point to the left or divide.
YOUR TURN!
CONVERT 450KM TO M

Convert 5m to mm
YOUR TURN!
CONVERT 65M TO MM

To convert to a smaller unit, move decimal point to the right or multiply.

To convert to a larger unit, move decimal point to the left or divide.
REFERENCES

- The slide show was adapted from the following sources:
  - Science Spot
    - http://www.sciencespot.net/Media/metric_Length.ppt
    - http://www.sciencespot.net/Media/metric_Mass.ppt
    - http://www.sciencespot.net/Media/metric_Volume.ppt
    - http://www.sciencespot.net/Media/metric_metc.ppt