



# METRIC MANIA

The metric system, science, and you!

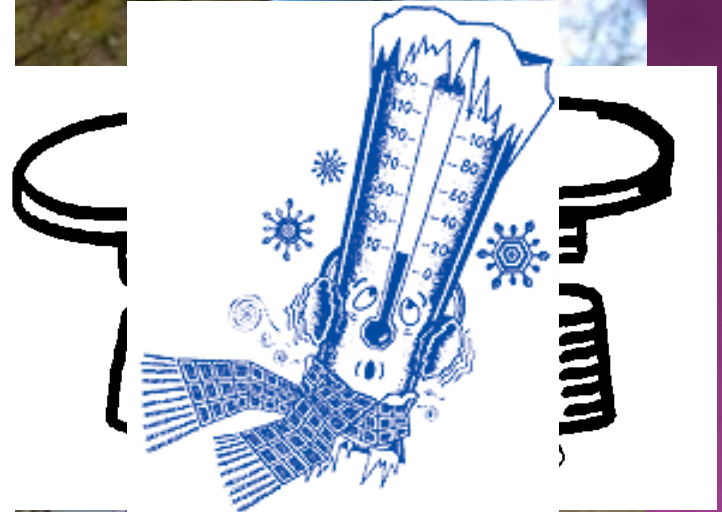
# WHY METRIC?

- ◉ 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**.



# METRIC UNITS

- 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!



# English vs. Metric Units

Which is longer?

A. 1 mile or 1 kilometer

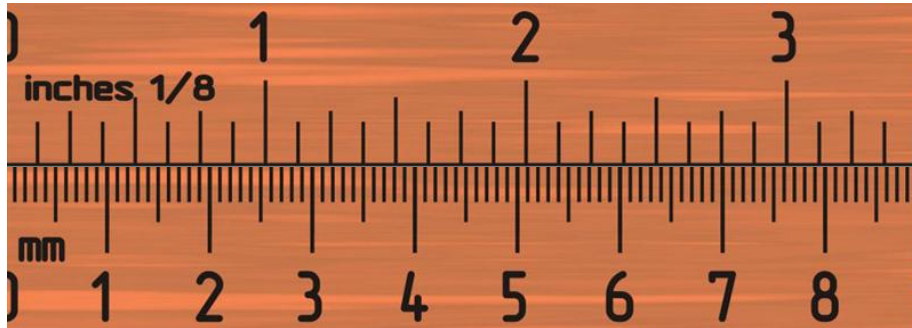
B. 1 yard or 1 meter

C. 1 inch or 1 centimeter

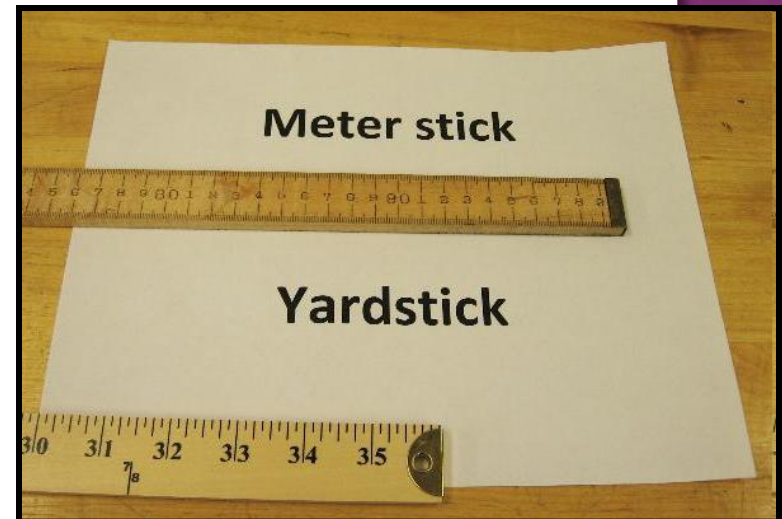
1  
mile



1.6  
kilometers



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>

# PREFIXES MATTER!!!

- 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)

km

m Length/Distance

cm

mm

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)

Click the image to watch a short video about the meter.



### Which is larger?

A. 1 meter or 105 centimeters

B. 4 kilometers or 4400 meters

C. 12 centimeters or 102 millimeters

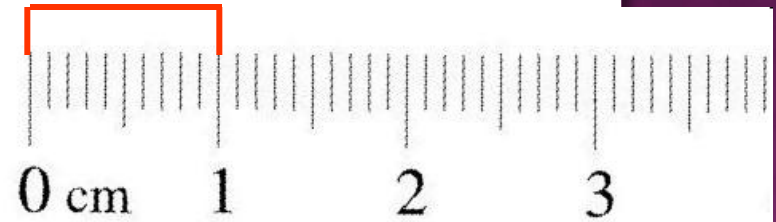
D. 1200 millimeters or 1 meter

# Measuring Length

To measure length, we use a ruler.

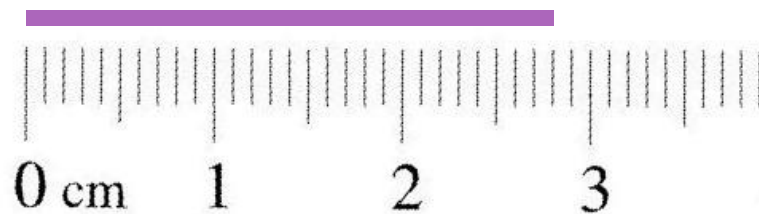
How many millimeters are in 1 centimeter?

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.

kg

g

Mass

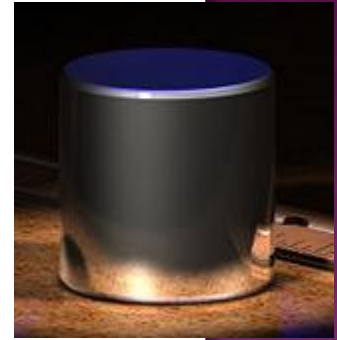
cg

mg

**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.



Kilogram Prototype

## Metric Units

1 Kilogram (kg) = 1000 Grams (g)

1 Gram (g) = 1000 Milligrams (mg)

Click the image to watch a short video about mass.



## Which is larger?

A. 1 kilogram or 1500 grams

C. 12 milligrams or 12 kilograms

B. 1200 milligrams or 1 gram

D. 4 kilograms or 4500 grams



# English vs. Metric Units

Which is larger?

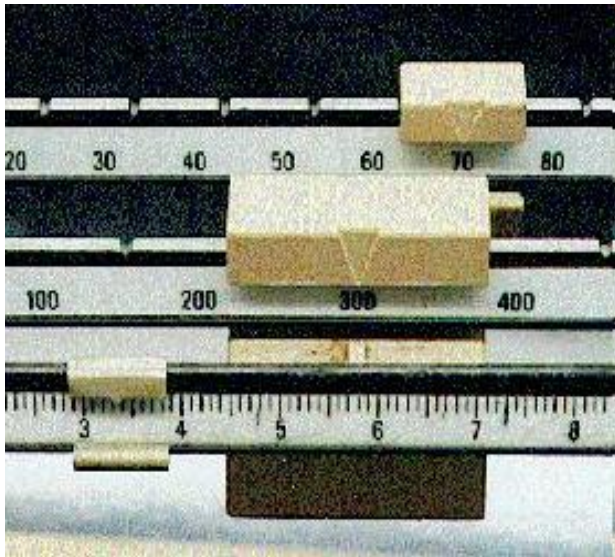
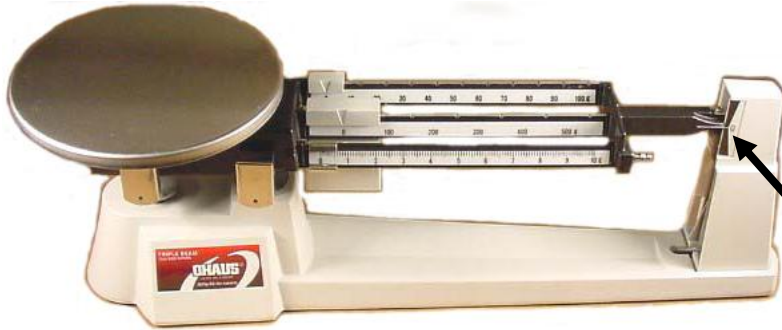
1. 1 Pound or 100 Grams
2. 1 Kilogram or 1 Pound
3. 1 Ounce or 1000 Milligrams



# 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?

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ g}$$

# Measuring Mass – Triple-Beam Balance

1<sup>st</sup> – Place the film canister on the scale.

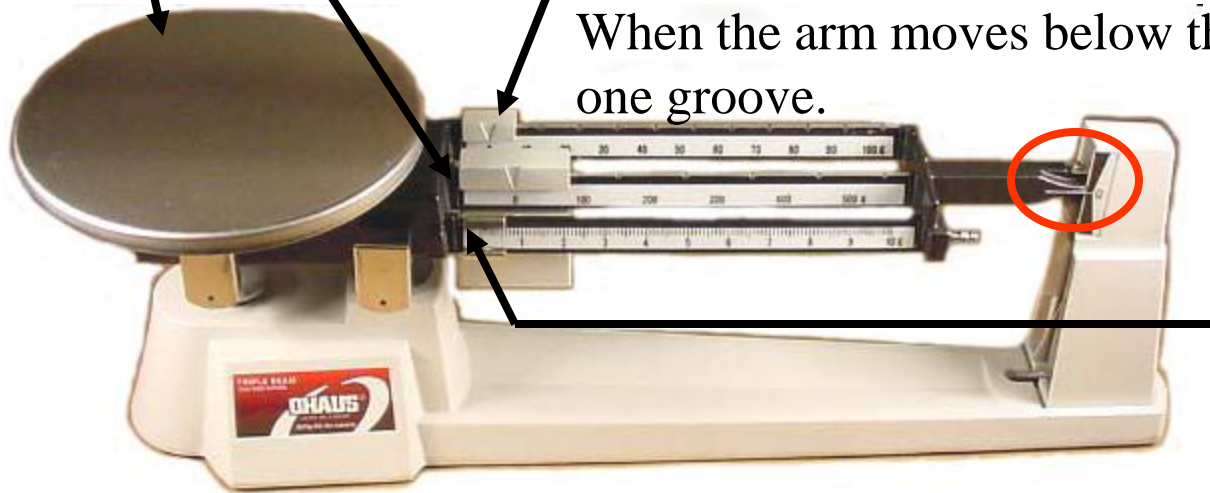
2<sup>nd</sup> – Slide the large weight to the right until the arm drops below the line. Move the rider back one groove. Make sure it “locks” into place.

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

4<sup>th</sup> – Slide the small weight on the front beam until the lines match up.

5<sup>th</sup> – 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 fl oz = 29.573 ml  
12-oz can of soda would equal approximately 355 ml.

1 quart = 0.946 liters

1 gallon = 3.79



It would take approximately  $3 \frac{3}{4}$  1-liter bottles to equal a gallon.



**KL****L**

# Volume

**CL****mL**

**Volume** is the amount of space an object takes up.

The base unit of volume in the metric system is 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<sup>3</sup> (or cc) = 1 gram\*

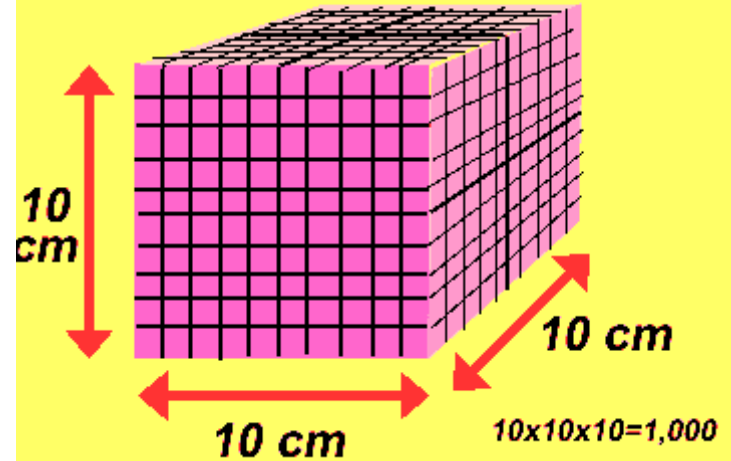
## Which is larger?

A. 1 liter or 1500 milliliters

B. 200 milliliters or 1.2 liters

C. 12 cm<sup>3</sup> or 1.2 milliliters\*

**A liter is the volume of a cube 10 cm on each side.**



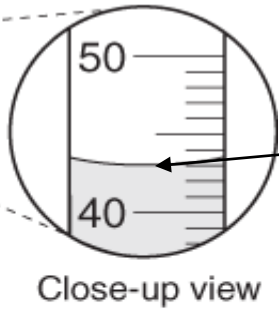
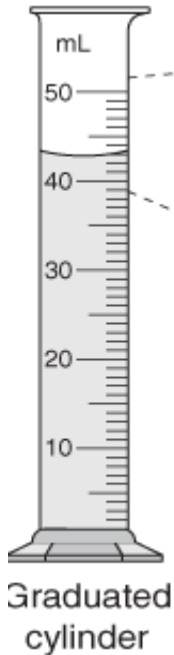
Click the image to watch a short video about volume.



\* When referring to water

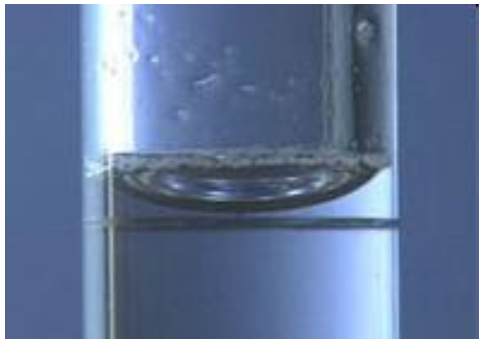
Liter Image: <http://www.dmtturner.org/Teacher/Pictures/liter.gif>

# 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

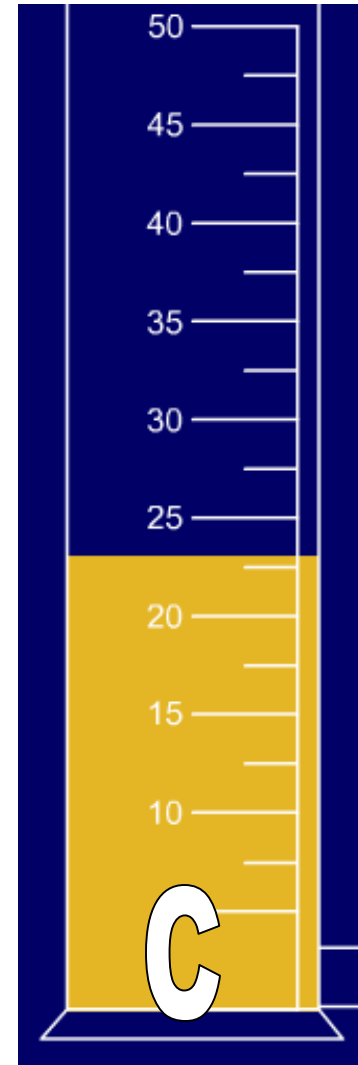
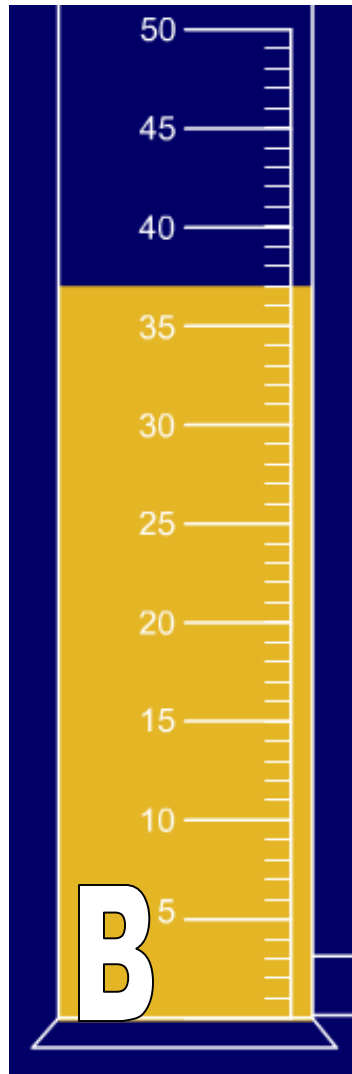
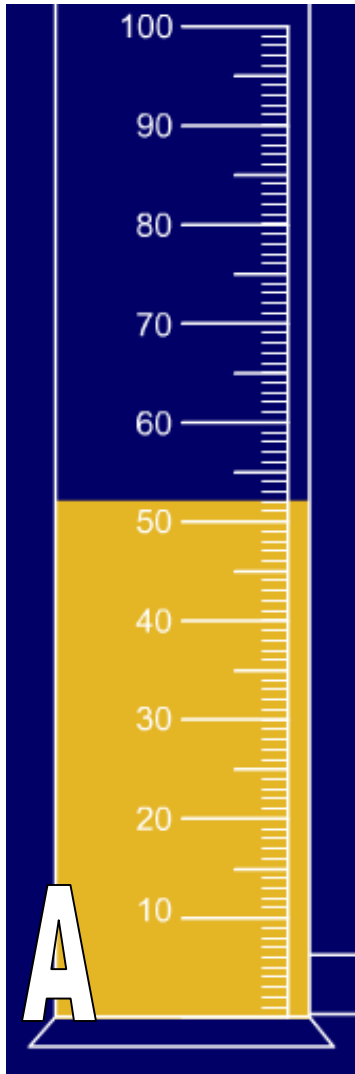


What causes the meniscus?

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?



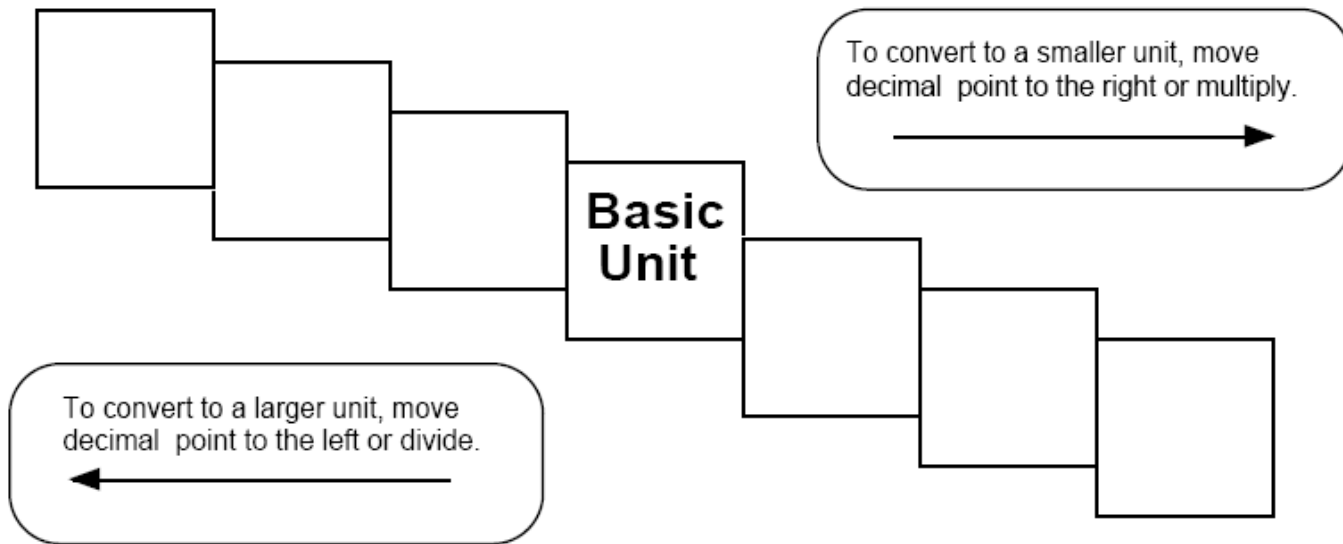
Pay attention to the scales for each cylinder.

# CONVERSION CHAOS

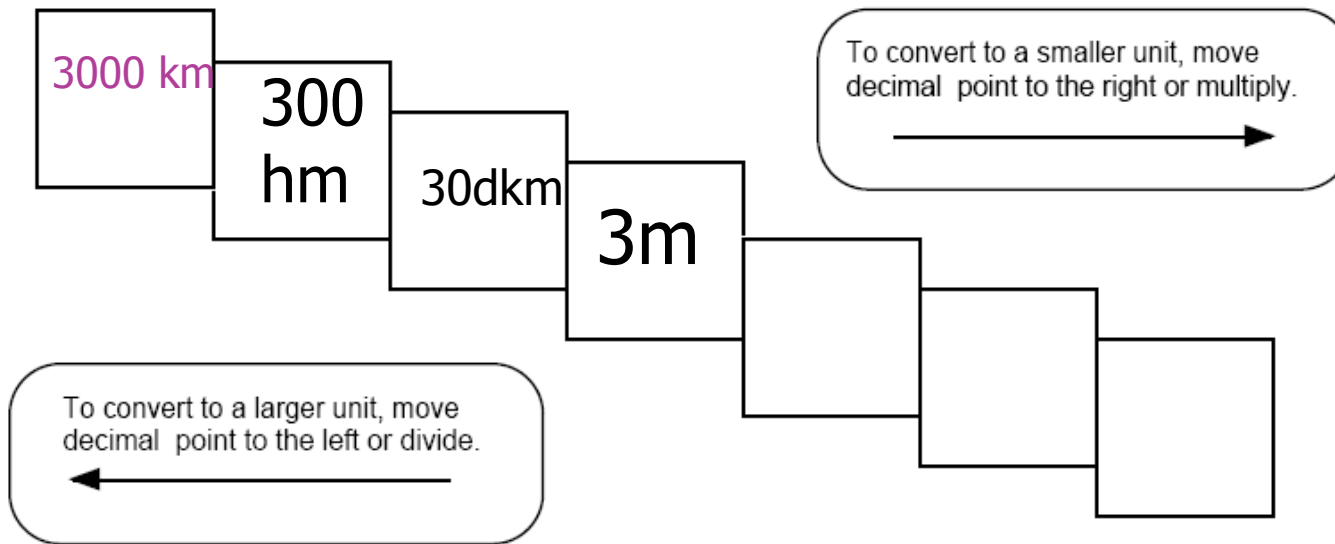
- ◉ Sometimes we need to convert cm to meters or meter to kilometers. How do we do that?



# CONVERSION LADDER METHOD

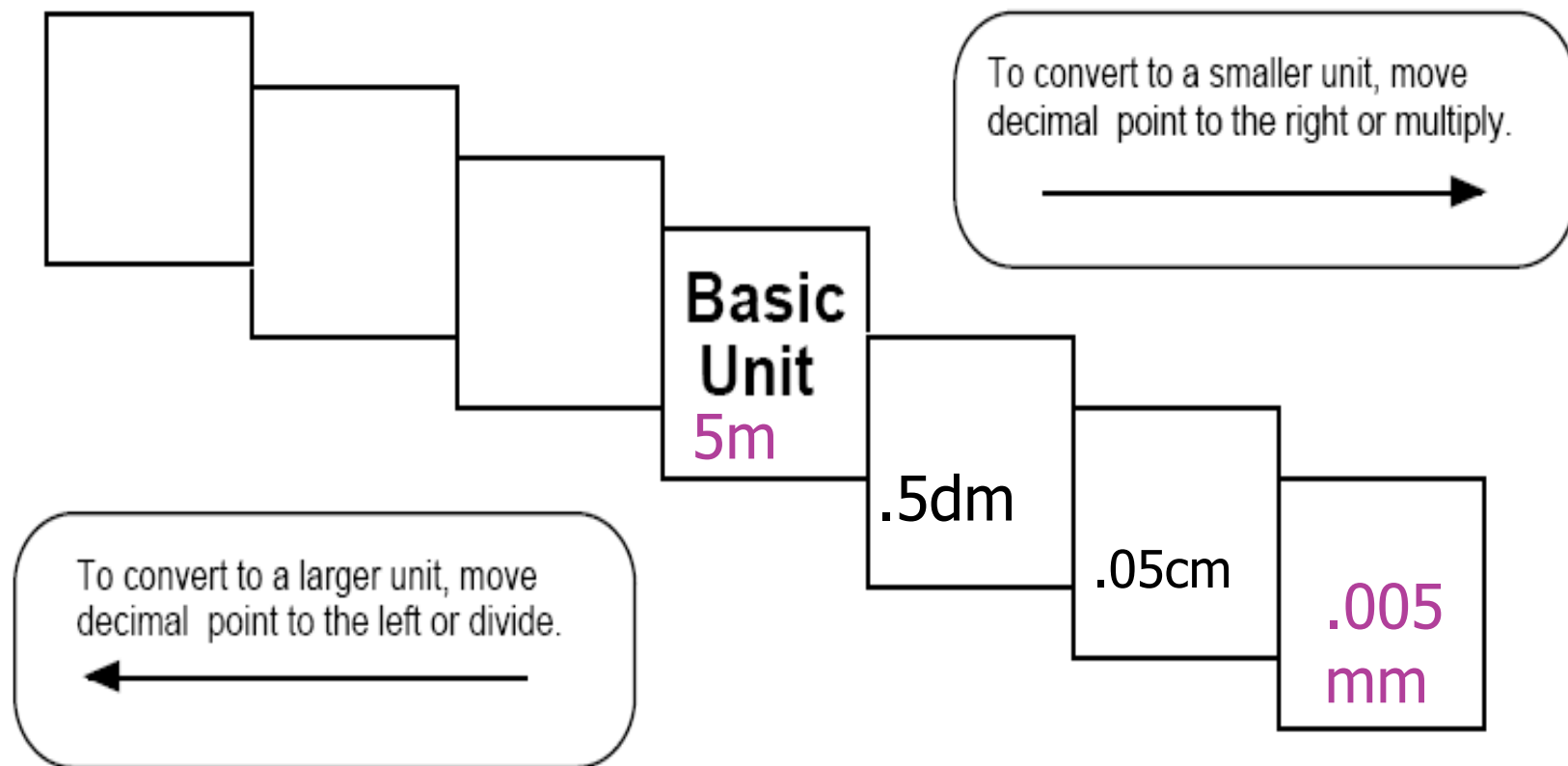


# CONVERSION LADDER METHOD PRACTICE



Convert 3m to Km

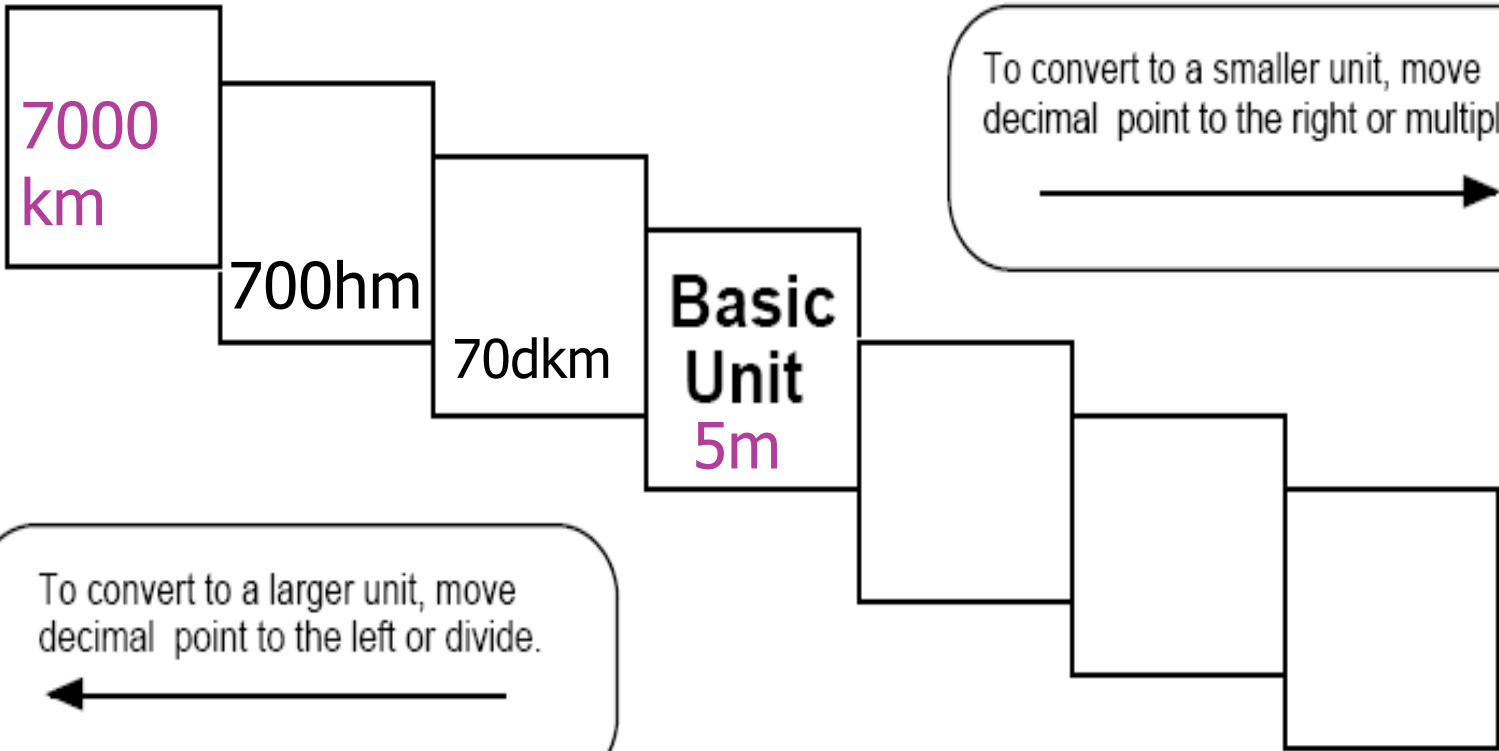
# CONVERSION LADDER METHOD PRACTICE



Convert 5m to mm

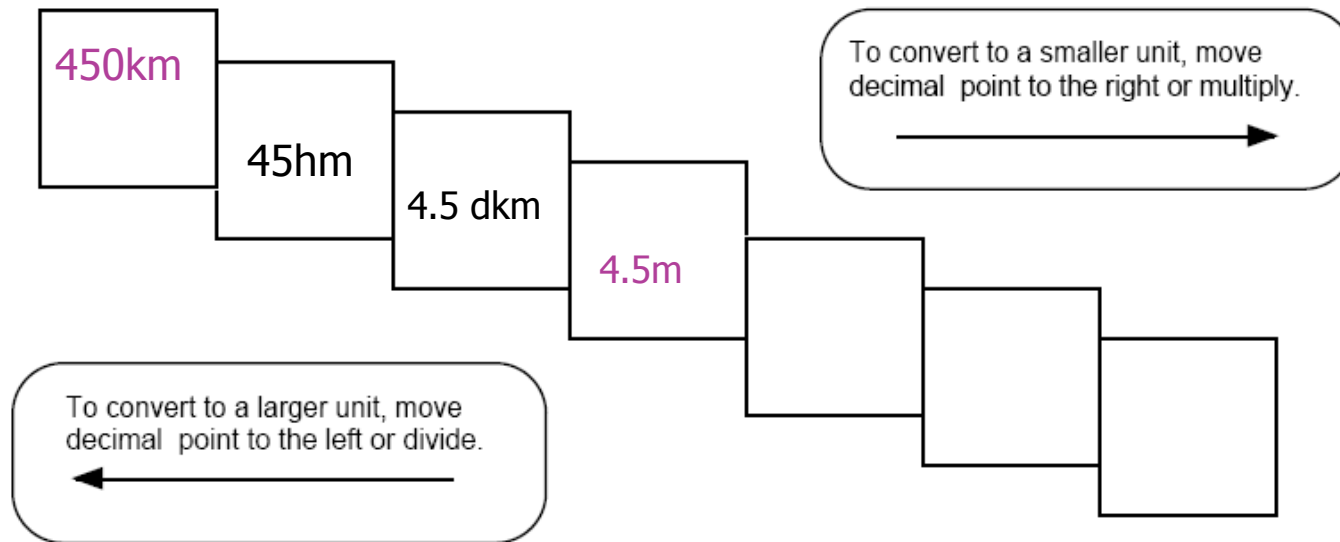
# YOUR TURN!

## CONVERT 7000 KM TO M



# YOUR TURN!

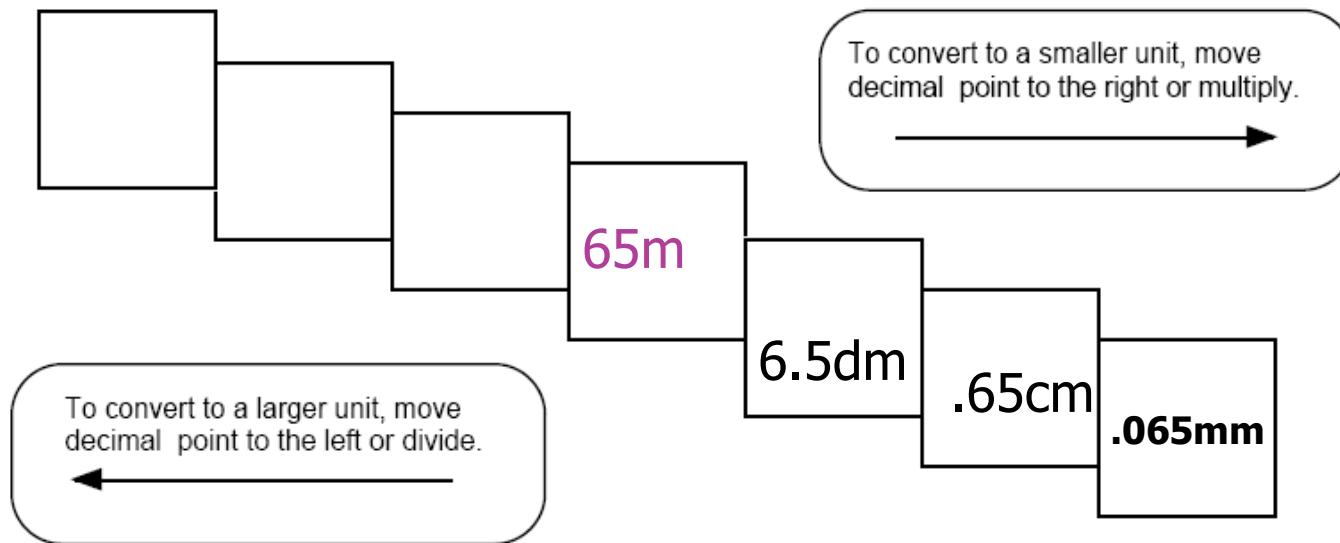
## CONVERT 450KM TO M



Convert 5m to mm

# YOUR TURN!

## CONVERT 65M TO MM



# 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_Length.ppt)
  - [http://www.sciencespot.net/Media/metric\\_Mass.ppt](http://www.sciencespot.net/Media/metric_Mass.ppt)
  - [http://www.sciencespot.net/Media/metric\\_Volume.ppt](http://www.sciencespot.net/Media/metric_Volume.ppt)
  - [http://www.sciencespot.net/Media/metric\\_metric.ppt](http://www.sciencespot.net/Media/metric_metric.ppt)