THE ABC's OF SCIENCE

Think Metric

Learning metric without conversion tables
www.think-metric.com

CD ROM
120 mm (12 cm)

65 mm (6.5 cm)

155 mm (15.5 cm)

Dime Edge 1 mm

Dime 18 mm
Penny 19 mm
Nickel 21 mm
Quarter 24 mm

Basketball player 200 cm (2 m)

Eiffel Tower 300 m (0.3 km)

4 year old child 100 cm (1 m)

355 ml Soda can 65 mm

Golf ball 43 mm

Tennis ball 66 mm

Soccer ball 200 mm (20) cm

120 mm (12) cm

A 355 ml can of soda weighs 355 grams

3-story house 1,000 cm (10 m)

1-story house 300 cm (3 m)

11 Football fields = 1,000 m (1 km)

Kilometer (kilometre) is pronounced KIL'-oh-met-er, with the accent on the FIRST syllable.
This sheet is standard international paper size ISO-A4, 210 by 297 mm

Name 3 things that are about one meter long.
1. _____
2. _____
3. _____

Name 3 things that are measured in centimeters
1. _____
2. _____
3. _____

Name 3 things that are small enough to be measured in millimeters
1. _____
2. _____
3. _____

Name: _____ Sci Number: _____
Class Period: _____ Total Points earned: _____ / _____

What are the ABC's Of Science?

1. the metric system 2. Lab safety 3. the scientific method

Let's Talk Metric: Here in America we use an English system: foot, yard, and mile. However, MOST people use another system called the **International System of Units or the ___** (which stands for *Système Internationale d'Unités*). This is the modern form of the _____.

It all depends on the foot! Numbers and units are used to make measurements. The distance from your desk to my desk could be 25 shoe lengths or 30 shoe lengths. It depends on how big the shoe is. A _____ is a fixed quantity used by everyone when measuring.

Advantages to using the metric system. 1: It helps scientists share & _____ their results & observations.

Video #1 Notes: Write 3 sentences about what you learned: _____
_____
_____

Try this: **1 kilometer is equal to _____ meters.**
kilo-meter: prefix=kilo or 1000 unit = meter, measuring distance
5 kilometers is equal to _____ meters   5 x 1000 meters = _____
10 kilometers is equal to _____ m   10 x 1000 m = ____

Metric System: Length   The _____ is the SI unit of length. A meter is about the distance from a doorknob to the floor. A driver golf club is also about a meter in length. The meter is divided into 100 equal parts called _____. There are 100 centimeters in a meter: 100cm = 1 m. An even smaller unit is a **millimeter (mm).** The prefix milli- means 1/1000, so… _____ _____

Long distances are measured in kilometers (km). Note: here is the US, we measure speed by miles per hour, (mph). In most other countries, they measure in kilometers per hour.
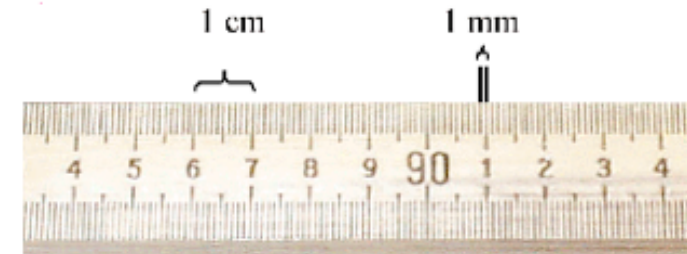
1 cm   1 mm

Length	meter (m)	
	kilometer (km)	1 km = 1,000 m
	decimeter (dm)	1 dm = 0.1 m
	centimeter (cm)	1 cm = 0.01 m
	millimeter (mm)	1 mm = 0.001 m
	micrometer (µm)	1 µm = 0.000001 m
	nanometer (nm)	1 nm = 0.000000001 m

METRIC VS. CUSTOMARY

(BrainPOP)

1 Which units measure the same basic quantities?

A Miles and liters

B Gallons and kilograms

C Ounces and centimeters

D Meters and feet

2 What is the system by which we can convert between metric and customary units?

A None; it's different for every unit

B A base-6 algorithm

C A base-10 system

D A mix between multiplication and division

3 How do metric measurements differ from customary measurements?

A Metric measurements are larger than customary measurements

B Metric measurements are based on powers of 10; customary measurements are not

C Metric measurements are divided into fractions; customary measurements are divided into decimals

D Metric measurements are measured in base-6; customary measurements are measured in base-8

4 A picoliter is three metric units larger than a femtoliter. How many femtoliters are in a picoliter?

A 10

B 100

C 1,000

D 10,000

5 For the most part, the United States uses the customary system. Under what circumstance might Americans use the metric system?

A Measuring distances between cities and states

B Surveying large areas of land

C Following cooking recipes

D Trading with other countries

6 Which of the following describes the length of a football field using the metric system?

A 100 yards

B Approximately 100 meters

C 300 feet

D Roughly 1/15 of a mile

7 If a recipe calls for 3 and 1/4 cups of flour, you can tell that it's using:

A The customary system

B The metric system

C Both the customary system and the metric system

D Neither the customary system nor the metric system

8 If it's 12 kilometers between your house and your school, how many meters is it between your house and your school?

A 1.2 meters

B 120 meters

C 1,200 meters

D 12,000 meters

9 Which of the following is a true statement?

A In the customary system, measurements are often expressed as decimals

B In the metric system, measurements are often expressed as fractions

C In the customary system, measurements are often expressed as fractions

D Fractions are equally common in both the metric and customary systems

10 If a granola bar has 5.7 grams of protein in it, how many centigrams of protein does it contain?

A 57

B 0.57

C 570

D 5,700

You Try It! Arrows A, B, & C are all pointing to a particular place on a meter stick.
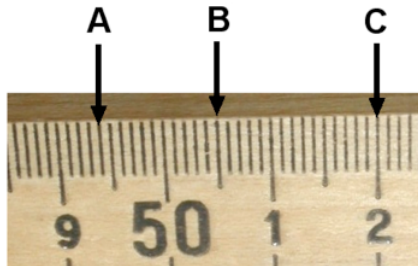
Name the value & *include units*.

Point A: _____ cm
_____ mm

Point B: _____ cm
_____ mm

Point C: _____ cm
_____ mm

You try it! What is the most appropriate unit for a scientist to use :

1. Distance from San Diego to NYC ____   4. Length of your arm ____
2. Length of your eyelash: ____   5. Height of this building ____
3. Distance from A306 to the office:____   6. Length of a grain of salt ____

Video #2 Notes: Write 3 sentences about what you learned: _____
_____
_____

ABC's of Science: Temperature, Volume, Mass

(BrainPOP) **MEASURING MATTER**

1 If a substance has a large mass and a small volume, what can you conclude about it?

A It's very dense

B It will float on water

C It is made out of rock or metal

D It has a low density

2 What is the difference between weight and mass?

A Weight depends on density and mass depends on gravity

B Weight depends on gravity and mass depends on volume

C Mass depends on gravity and weight is constant

D Weight depends on gravity and mass is constant

3 Which of the following units is rarely, if ever, used in science labs?

A Centimeter

B Gram

C Quart

D Milliliter

4 If you wanted to measure an irregular object's volume, which of the following devices could you use?

A [image]

B [image]

C

D [image]

5 One side of a cube is 5 cm long. What is the cube's volume?

A 5 cubic cm

B 15 cubic cm

C 25 cubic cm

D 125 cubic cm

6 In the context of the movie, what is the best synonym for "property"?

A Possession

B Attribute

C Virtue

D Quantity

7 What is always true of an object with a lot of mass?

A It contains a lot of matter

B It has a large volume

C It has a high density

D It cannot be accurately measured

8 Which of the following is a measurement of an object's weight?

A 10 centimeters

B 10 kilograms

C 10 newtons

D 10 grams per cubic cm

9 What is the relationship between cubic centimeters and milliliters?

A They are equivalent

B Cubic centimeters measure length; milliliters measure volume

C They are both dependent on an object's mass

D They are both unrelated to an object's density

10 If an object's mass is 50 g, and its volume is 10 cubic cm, what is its density?

A 500 g/cubic cm

B 5 g/cubic cm

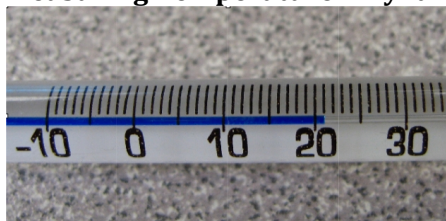C 60 g/cubic cm

D 40 g/cubic cm

Measuring Temperature

In science, temperature is measured using the _____ temperature scale. The temperature scale is based on the freezing and boiling points of water. The freezing point of water is given the value of _____. The boiling point of water is labeled at _____. Human body temp is about 37° C. In the International System (SI), temperature is measured in _____ The kelvin scale is based on absolute zero, the coldest possible temperature. This temp. corresponds to -273° C   0°C = _____   100°C = _____

Measuring Temperature! Try it!	**Measuring Temperature! Try it!**
Answer: _____	Answer: _____

Volume

Have you ever heard someone say "this shampoo gives my hair a lot of volume!!!" What does that mean? Volume means to _____.
Or, volume is the amount of space occupied by an object. So if someone's hair has a lot of volume that means it is full. It takes up a lot of space.

Volume of Solid Rectangular Objects: For solid rectangular objects, the volume is the length x width x height. _____. A cubic meter (m^3) is a unit of volume. A cubic meter is a very large unit - it contains 1,000,000 cubic centimeters.

| **You try it! 4.** What is the volume of this solid? V= L x W x H	**You try it! 5.** What is the volume of this solid? V= L x W x H
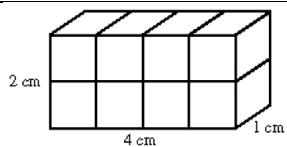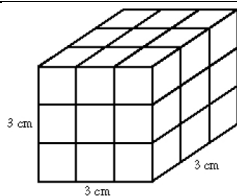
Measuring Volume of Liquid Objects

For liquid objects, we use _____
to measure the volume. In cooking, we may also use measuring cups, teaspoons or tablespoons. The level of a liquid in a graduated cylinder shows the volume of the liquid.
A _____ (L) is a unit that is usually used to express volume. A soft drink bottle is a 2-liter bottle. For smaller volume measurements, we also use: milliliter (ml), cubic centimeter (cm^3).
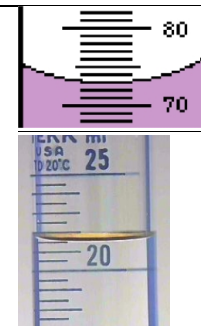1 liter contains 1000 milliliters or 1000 cubic centimeters.

Accuracy is Everything
To read the volume of the liquid, note the level at the _____ of the curve. We call this the _____.
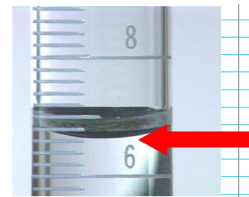
You try it!
What are the volume in ml

Volume of Liquids
Do these graduated cylinder have the same volume of liquid in them? YES! How can that be??? One is a 100-mL cylinder & the other is a 50-mL cylinder. Which one is better to use to measure this liquid? The smaller one!!! Why? Better Accuracy! The smaller the cylinder, the smaller the increments on the cylinder, which means a more accurate result.
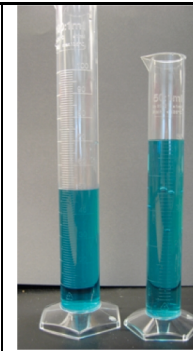
Volume of Liquids- But look at this!
Both of these cylinders have exactly 50 ml of water

Measuring Volume of Solid Irregular Objects
So, how would I measure the volume of an irregular object such as a piece of clay?
I can't measure the sides and I can't use a measuring cup. But I CAN still use a graduated cylinder. Simply submerge the object in the graduated cylinder and record the difference in water level. We call this measuring volume by _____
You will practice it during our lab this week.
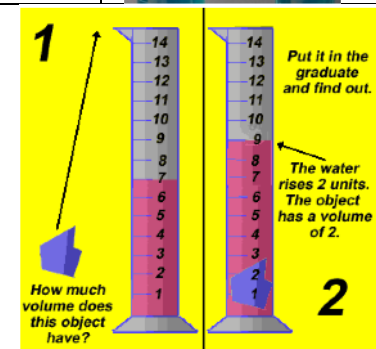
Video5: Volume of rectangular : Write 2 sentences about what you learned:
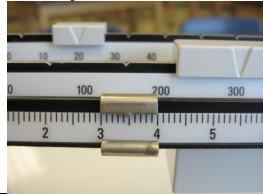_____
_____

Video6: Reading the Meniscus: Write 2 sentences about what you learned:
_____
_____

Video7:_Volume Displacement : Write 2 sentences about what you learned:
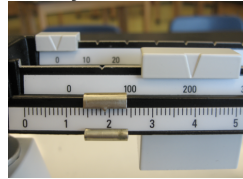_____
_____

Mass Review:

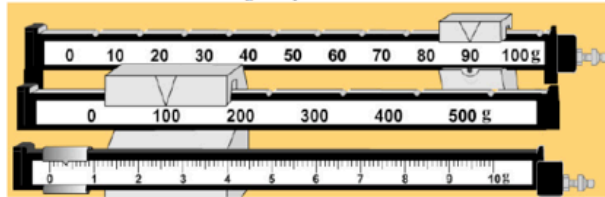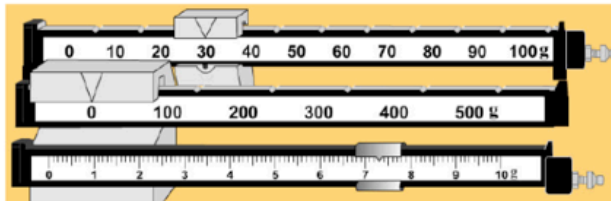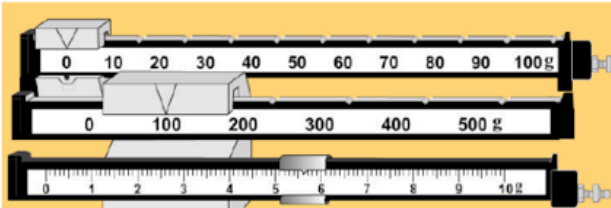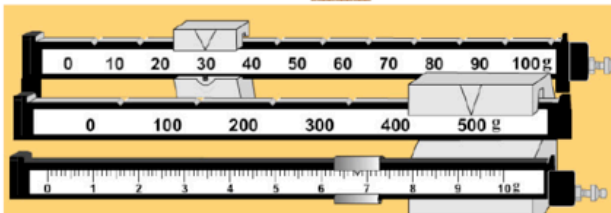| Mass is the amount of _____ in an object. It's measured on a _____ (also called a triple beam balance). Mass is measured in grams or kilograms. A science book is about 1.3 kilograms	**Reading the balance- You try it!**	**Reading the balance- You try it!**

_

Reading a Triple beam Balance

mass 1: _____

mass 2: _____

mass 3: _____

mass 4: _____

Video8: Weight vs Mass : Write 2 sentences about what you learned:

_____

_____

Now it's your turn to practice measuring with a metric ruler. In each box below, write the length from the zero edge to each arrow in both centimeters and millimeters. Check your answers below.

(b) (d) (f) (h) (j)

(a) (c) (e) (g) (i)

centimeters
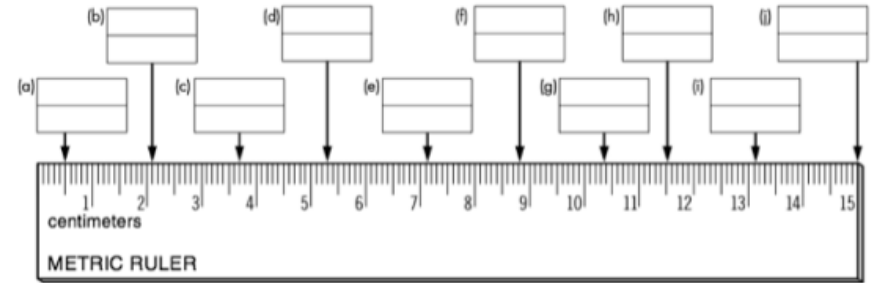
METRIC RULER

Metric Ruler: Be sure to answer both the measurement in cm & mm Example a: .5 cm / 5 mm

100 m	Giant sequoia
10 m	
1 m	Teenage boy
Visible to the human eye	
10 cm	
1 cm	Grasshopper
1 mm	Bean seed
100 µm	Human egg / Amoeba
Visible with a compound light microscope 10 µm	Human red blood cell
1µm	Bacterium
100 nm	Large virus
Visible with an electron microscope 10 nm	
1 nm	DNA double helix
0.1 nm	
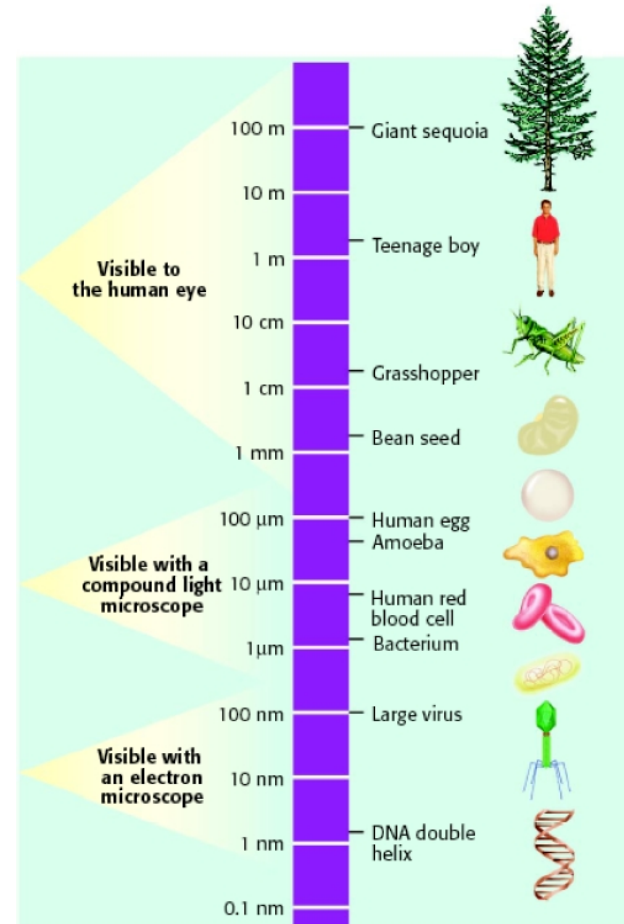
1. The following pictures show water in different graduated cylinders. What would be the correct measurement (in milliliters) for each picture? Record your answer in the space provided below each picture. Check your answers below after writing the four measurements.
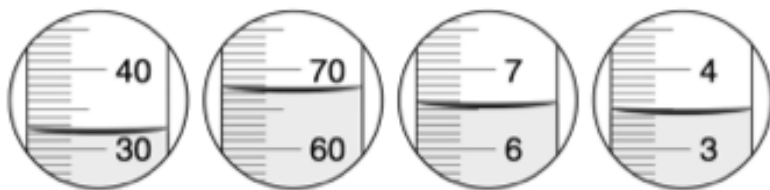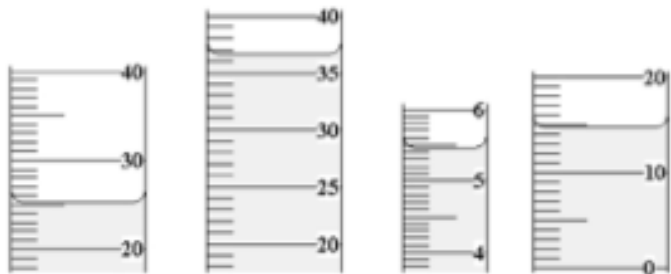

| (a) | (b) | (c) | (d) |

Volume =_____mL   Volume =_____mL   Volume =_____mL   Volume =_____mL

Note: If additional precision is desired, you can estimate an additional digit between the marks. For example, the bottom of the meniscus of cylinder (d) is a little less than halfway between 3.4 and 3.5. So, the next digit could be estimated and added to the reading, about 3.43 mL.

2) Determine the volume of the liquids in the following cylinders:

a) _____   b) _____   c) _____   d) _____

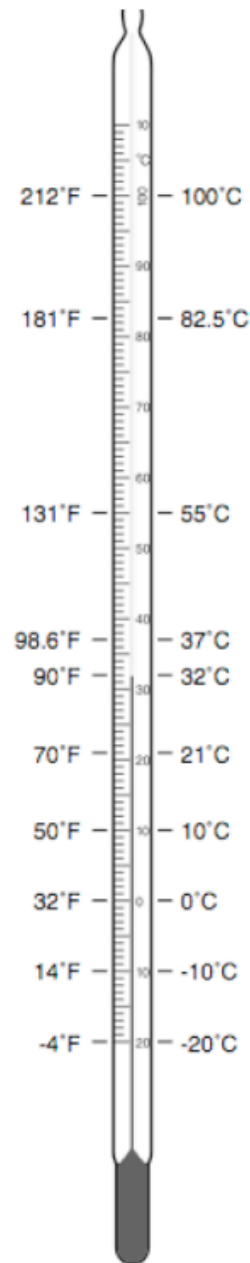3) Draw in the meniscus for the following readings:
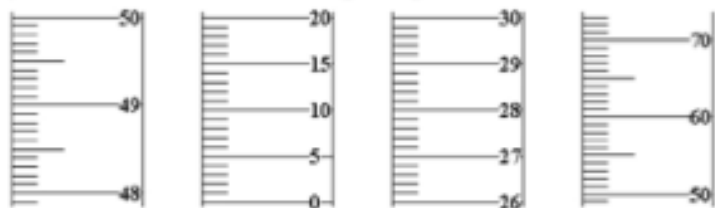
a) 49.21 mL   b) 18.2 mL   c) 27.65 mL   d) 63.8 mL

Think Celsius

Draw lines to join the temperatures on the right side of the thermometer (in degrees Celsius) to the correct descriptions on the left. To help you, the temperatures in degrees Fahrenheit are shown on the left side of the thermometer.

a) "It's hotter than a firecracker outside today."

b) "This room feels comfortable – not too hot and not too cold."

c) Isopropyl (rubbing) alcohol boils at this temperature.

d) "This is sweater weather!"

e) "Hey, the water on the stove is boiling."

f) Ice cream stays hard at this temperature.

g) "There are icicles on my nose!"

h) "Ouch – that water's hot!"

i) This is normal body temperature.

212°F — 100°C
181°F — 82.5°C
131°F — 55°C
98.6°F — 37°C
90°F — 32°C
70°F — 21°C
50°F — 10°C
32°F — 0°C
14°F — -10°C
-4°F — -20°C

Converting from Fahrenheit to Celsius Name:

Convert the temperatures from Fahrenheit to Celsius.

Ex) 77 °F = __25°__ C

1) Subtract 32 from the temperature.

$$77° - 32 = 45°$$

2) Multiply the temperature by 5.

$$45° X 5 = 225°$$

3) Divide the temperature by 9.

$$225° ÷ 9 = 25°$$

Converting from Celsius to Fahrenheit Name:

Convert the temperatures from Celsius to Fahrenheit.

Ex) 25 °C = __77°__ F

1) Multiply the temperature times 9.

$$25° X 9 = 225°$$

2) Divide the temperature by 5.

$$225° ÷ 5 = 45°$$

3) Add 32.

$$45° + 32 = 77°$$

1) 212 °F = _____ C

2) 176 °F = _____ C

3) 149 °F = _____ C

4) 104 °F = _____ C

5) 194 °F = _____ C

6) 77 °F = _____ C

1) 90 °C = _____ F

2) 60 °C = _____ F

3) 25 °C = _____ F

4) 75 °C = _____ F

5) 100 °C = _____ F

6) 30 °C = _____ F

Find the temperature!
Determine the Fahrenheit temperature

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____