

The ABC's of Science

Day 1
Metric Introduction
Metrics: Length



Let's talk Metric

- Here in America we use ye olde **English** system: foot, yard, and mile.
- However, MOST countries use another system called the **International System of Units** or the **SI** system (which stands for *Système Internationale d'Unités*)
- This is the modern form of the **metric system**.

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.
- Think of Shaq's foot versus Mini-Me.



It all depends on the foot!

- In order to measure accurately, we have to use standard units.
- In other words, everyone has to use the **SAME** system or units.
- Otherwise, it just gets confusing.
- A **standard** is a fixed quantity used by everyone when measuring.



Advantages to the Metric System

There are two advantages to using the metric system:

1. It helps scientists **share & compare** their results & observations.
 - If I conducted an experiment here in America, even a scientist in Zimbabwe would be able to understand my measurements.
2. All units are based on the number **10**.
 - Changing from one unit to another is easy!

1. Metric Measurement



Math-terpiece Theater

BrainPop: Metric vs. Customary
go to <http://www.brainpop.com> BEFORE 5PM, log in: MMS308 password: marshall



August 9, 2011
Elaine

METRIC VS. CUSTOMARY

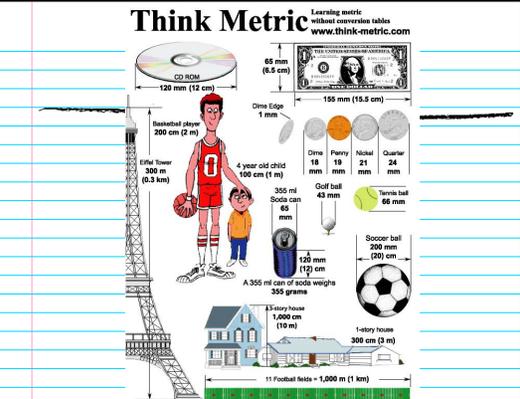
SCORE: 10/10

- Which units measure the same basic quantities?
 - A. Miles and liters
 - B. Cubes and kilograms
 - C. Chances and centimeters
 - D. Meters and feet
- Which is the system by which we can convert between metric and customary units?
 - A. None, it's different for every unit
 - B. Metric equations
 - C. A table of ratios
 - D. A mix between multiplication and division
- 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 always less than customary measurements and divided into 10ths
 - D. Metric measurements are measured in base 5, customary measurements are measured in base 8
- As a teacher, is there really only one way to teach these conversions? How many textbooks are in a teacher's?
 - A. 10
 - B. 93
 - C. 1,000
 - D. 10,000
- For the most part, the United States uses the customary system, while the rest of the world uses the metric system. Which of the following is true?
 - A. Measuring distances between cities and states
 - B. Serving large areas of food
 - C. Choosing clothing sizes
 - D. Dealing with other countries
- Which of the following describes the length of a football field with the metric system?
 - A. 100 yards
 - B. Approximately 100 meters
 - C. 100 feet
 - D. Roughly 1/3 of a mile
- If a bridge calls for 3 and 1/4 tons of steel, you can bet that it's made
 - A. In the customary system
 - B. In the metric system
 - C. With the customary system and the metric system
 - D. Neither the customary system nor the metric system
- If 10 US dollars are worth 1500 yen, how many yen are there in 100 dollars?
 - A. 12 meters
 - B. 100 meters
 - C. 1,200 meters
 - D. 15,000 meters
- Which of the following is a true statement?
 - A. In the customary system, measurements are often expressed as fractions
 - B. In the metric system, measurements are often expressed as fractions
 - C. In the customary system, measurements are often expressed as fractions
 - D. In the metric system, measurements are often expressed as fractions
- If a person has 5.7 grams of powder to use, how many milligrams of powder does it contain?
 - A. 57
 - B. 5.7
 - C. 570
 - D. 5,700

Common SI Units		
Length	 <p>meter (m) kilometer (km) decimeter (dm) centimeter (cm) millimeter (mm) micrometer (µm) nanometer (nm)</p>	<p>1 km = 1,000 m 1 dm = 0.1 m 1 cm = 0.01 m 1 mm = 0.001 m 1 µm = 0.000001 m 1 nm = 0.000000001 m</p>
Volume	 <p>cubic meter (m³) cubic centimeter (cm³) liter (L) milliliter (mL)</p>	<p>1 cm³ = 0.000001 m³ 1 L = 1 dm³ = 0.001 m³ 1 mL = 0.001 L = 1 cm³</p>
Mass	 <p>kilogram (kg) gram (g) milligram (mg)</p>	<p>1 g = 0.001 kg 1 mg = 0.000001 kg</p>
Temperature	 <p>Kelvin (K) Celsius (°C)</p>	<p>0°C = 273 K 100°C = 373 K</p>

Think Metric

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



Kilometer (kilometre) is pronounced KIL-oh-mee-ter, with the accent on the FIRST syllable
www.kilometer.com

Part 2: the UNIT

Here are some of the most important units, and you need to memorize these too.

What are we measuring?	Unit	Symbol
Length	meter	m
Volume	liter	l
Mass	gram	g
Temperature	Kelvin	K

Try this...

- 1 kilometer is equal to 1000 meters.
 - kilo-meter
 - prefix = kilo or 1000
 - unit = meter, measuring distance
 - Therefore: 1 kilometer = **1000** meters.
- 5 kilometers is equal to 5,000 meters
 - 5 x 1000 meters = **5,000** meters
- 10 kilometers is equal to 10,000 meters
 - 10 x 1000 meters = **10,000** meters
- Later, we'll practice converting from one to another.

Try this...

What unit would you use to measure each of the following?

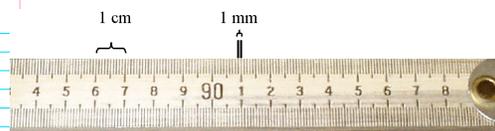
- Water in a bottle
 - **Liter**
- The distance from my classroom to the bathroom
 - **Meter**
- The amount of heat in the classroom?
 - **Kelvin** or **Celsius**
- How much matter is in a paperclip
 - **Gram**

2. If only American Chopper used the metric system...



Metric System: Length

- The **meter (m)** 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 **centimeters (cm)**.
- There are 100 centimeters in a meter:
 - $100 \text{ cm} = 1 \text{ m}$



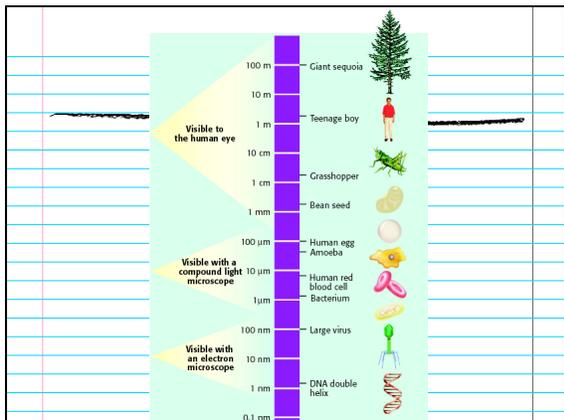
- An even smaller unit is a millimeter (**mm**).
- The prefix "milli-" means 1/1000, so...
 - ✓ $1000 \text{ mm} = 1 \text{ m}$
 - ✓ $10 \text{ mm} = 1 \text{ cm}$



- Long distances are measured in kilometers (**km**).
- In the US, we measure speed by miles per hour (**mph**). In most other countries, they measure in kilometers per hour (**km/h**).

You try it!

- Name 3 things that are about one meter long.
 - **Golf Club, Chair, Flag, 6th graders...**
- Name 3 things that are measured in centimeters
 - **Paperclips, babies, toes, fingernail**
- Name 3 things that are small enough to be measured in millimeters
 - **Camera film, pencil lead, wire diameter, insects**



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 = 49.4 cm or 494 mm
- Point B = 50.5 cm or 505 mm
- Point C = 52.0 cm or 520 mm

You try it! What is the most appropriate unit for a scientist to use to measure the following?

• Distance from San Diego to New York	• Length of your arm
• km	• cm
• Length of your eyelash	• Height of this building
• mm	• m
• Distance from A306 to the office	• Length of a grain of salt
• m	• μm

You try it! Practice Measuring

1. Measure the length of this paper in cm & mm.
_____ cm & _____ mm
2. Draw a square with sides measuring 11cm.
3. Measure the height of your desk from the floor to the top in meters & centimeters.
_____ cm & _____ m
4. Measure the length of your desk in meters & cm.
_____ cm & _____ m