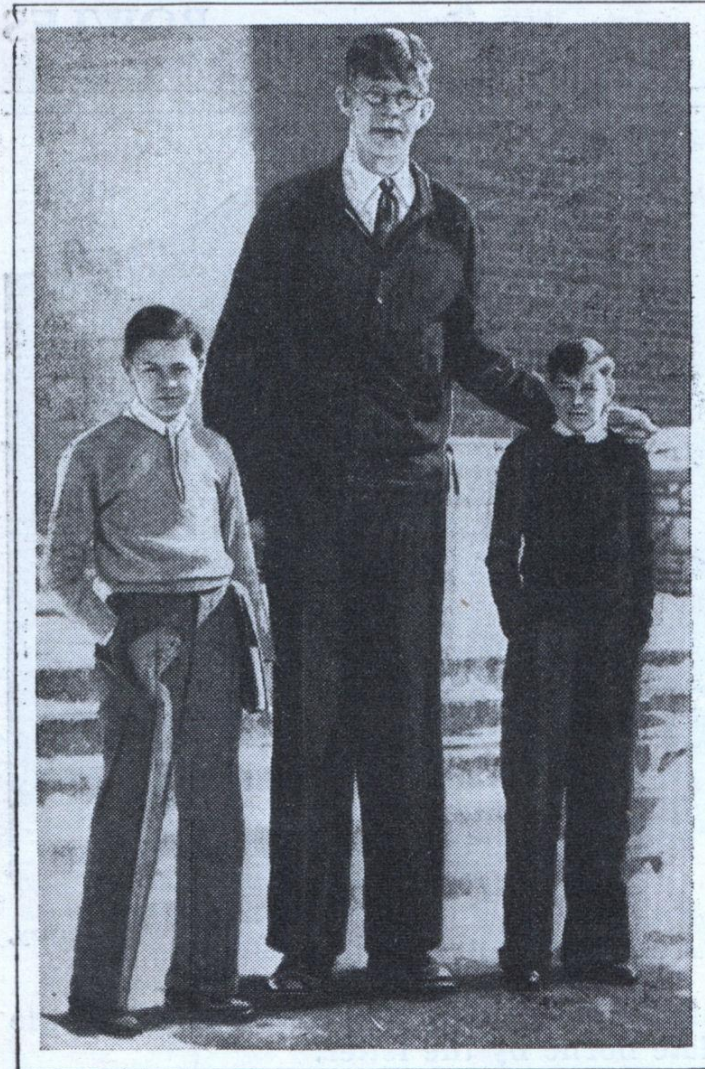


Standards of Measurement

Boy Giant, 8 Feet Tall, Weighs 365 Pounds



ALTHOUGH but sixteen years old, Robert Wadlow, Alton, Illinois, schoolboy giant is 7 feet, 10½ inches tall and weighs 365 pounds. Robert added two inches to his height in the last year, and gained twenty-five pounds. At this rate it will not be long before he will be holding world's records for tallest and heaviest men.

Doctors are watching him closely, trying to discover the reason for his unusual growth. They do not allow him to participate in high school sports.

Newspaper clipping -
can you find the
measurements in it?

Robert Wadlow, 16-year-old Alton, Illinois, schoolboy giant, towers high above his classmates. He now is 7 feet, 10½ in. tall. He weighs 365 lbs., and gains 25 lbs. a year.

Historically, body parts were used as measuring devices

The height of a horse was measured in hands

Foot comes from the average length of a person's foot.

A pace is the length of a person's step.

*What is the main problem with this kind of system?



Match the unit with the item...

A _____ of milk.

A _____ of material.

A _____ of potatoes.

A _____ of rope.

You are driving 60 _____ per hour.

a. pound

b. miles

c. foot

d. yard

e. gallon

The units above use an ENGLISH system of measurement - used mainly in U.S.A.

Most other countries use the METRIC system



You are probably also familiar with some of the metric system units. Match these...

A 2 _____ bottle of soda.

A _____ of sugar.

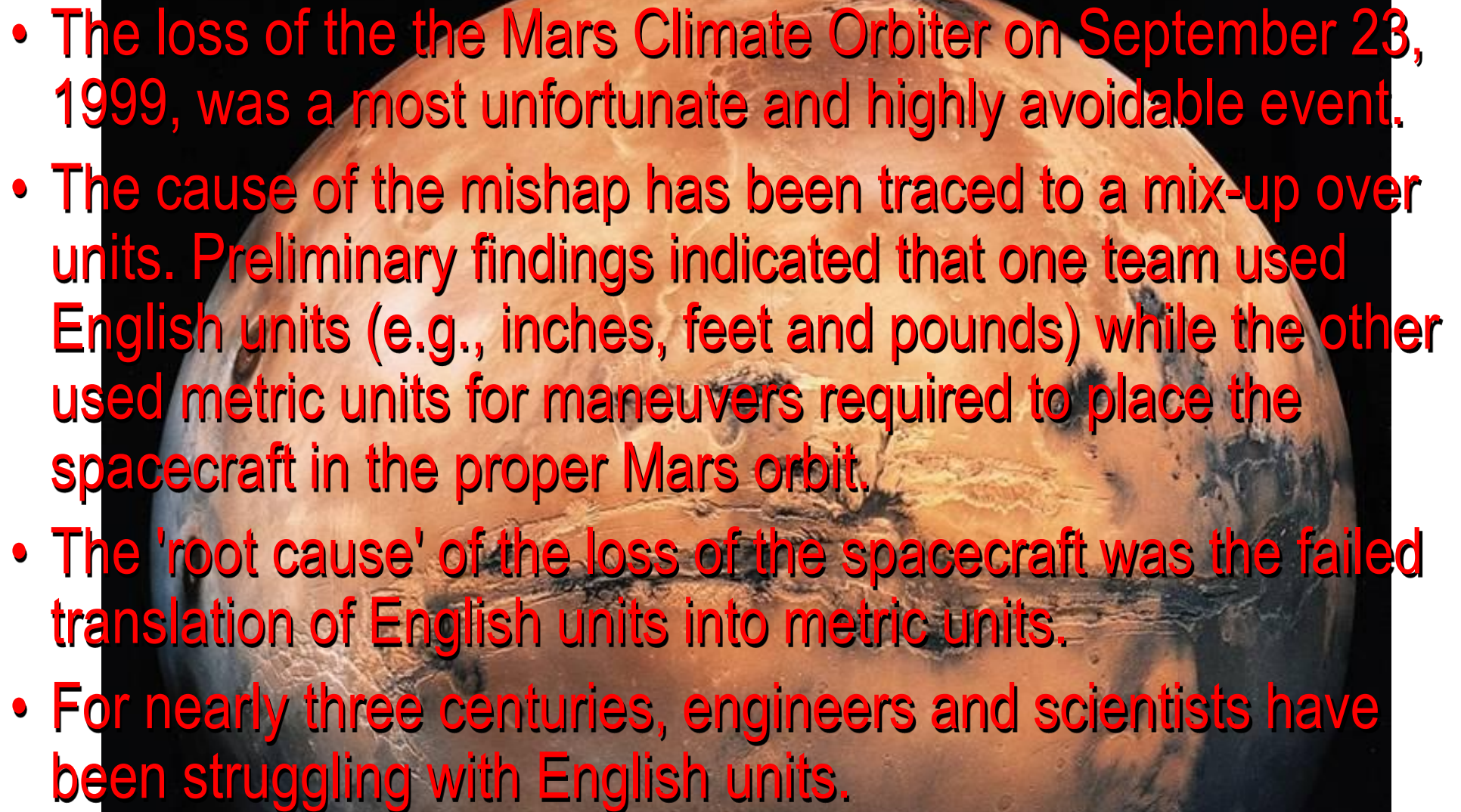
A _____ stick.

a. gram

b. liter

c. meter



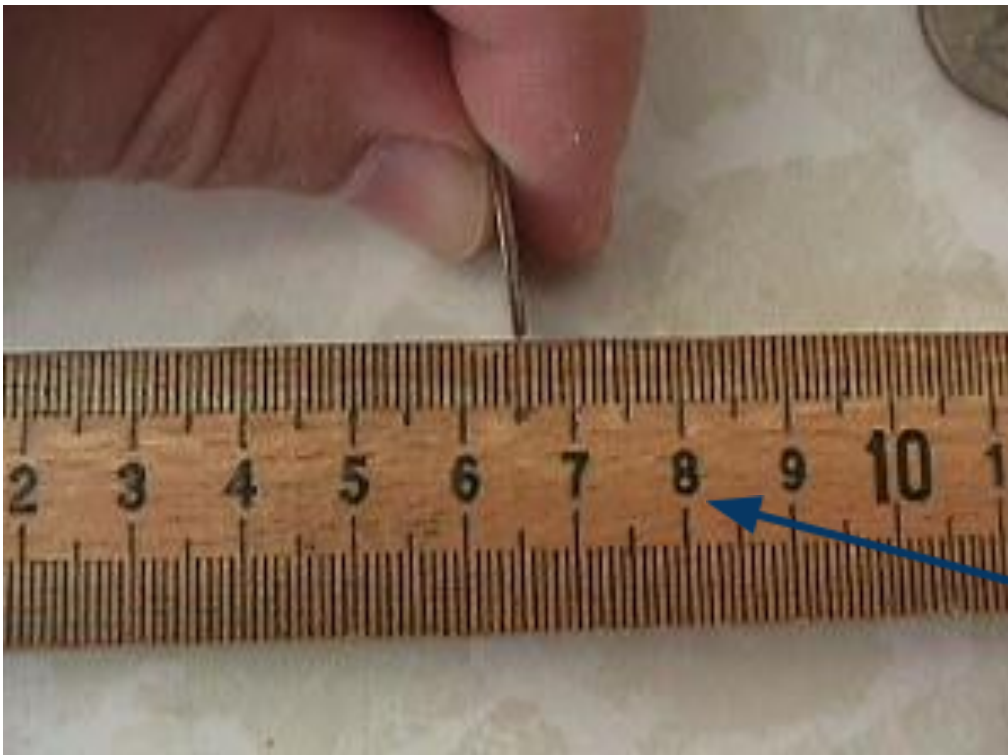
- 
- The loss of the the Mars Climate Orbiter on September 23, 1999, was a most unfortunate and highly avoidable event.
 - The cause of the mishap has been traced to a mix-up over units. Preliminary findings indicated that one team used English units (e.g., inches, feet and pounds) while the other used metric units for maneuvers required to place the spacecraft in the proper Mars orbit.
 - The 'root cause' of the loss of the spacecraft was the failed translation of English units into metric units.
 - For nearly three centuries, engineers and scientists have been struggling with English units.

Science uses the International System of units known as metric system

<u><i>Quantity</i></u>	<u><i>Unit</i></u>	<u><i>Symbol</i></u>
Length		
Mass		
Temperature		
Volume (s)		
Volume (l)		
Time		

Metric system units are base 10, so it is easy to convert

Ex. There are 10 millimeters in 1 centimeter
100 centimeters in 1 meter

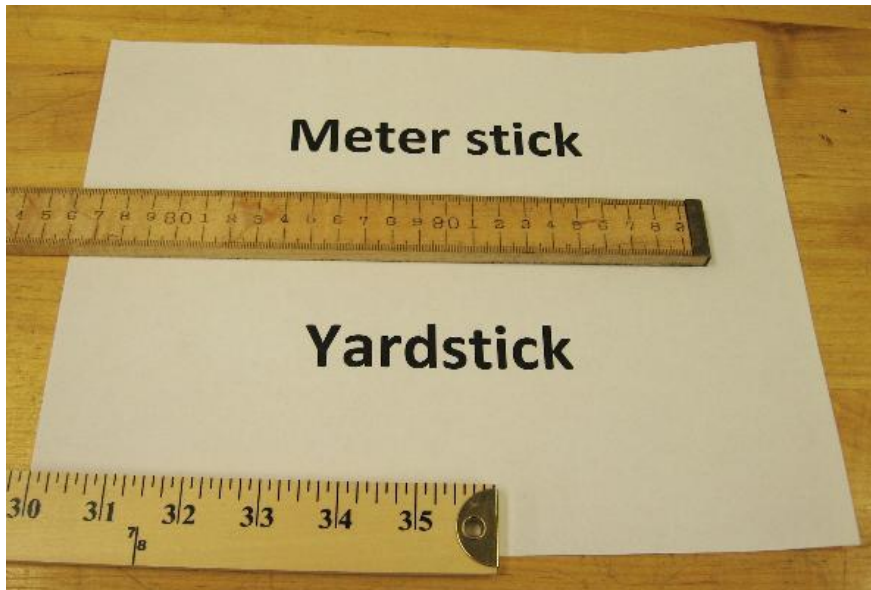


A mm is about as thick as a dime. Notice there are about 10 dimes between the 6 and the 7 on this photo.

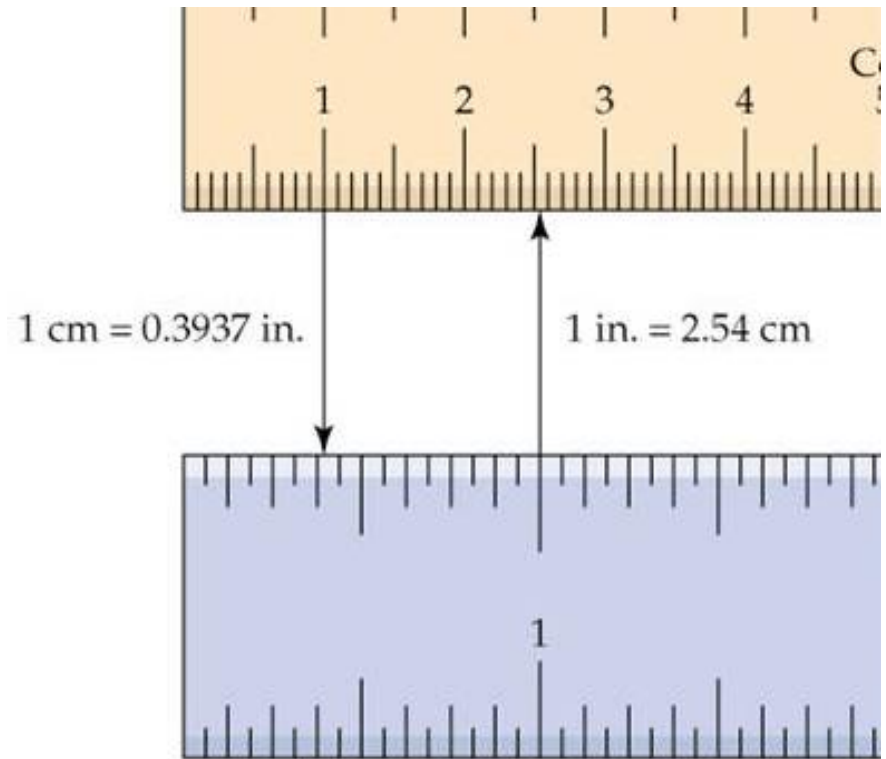
The large number represent centimeters.



length =



$1 \text{ yd} = 0.91 \text{ m}$ or
 $1 \text{ m} \approx 3.3 \text{ ft}$



Don't worry about converting inches to centimeters - just measure in centimeters to start with.

Use your ruler to calculate ..

1. Width of your desk _____ cm

2. Width of your desk _____ mm

3. Length of your index finger _____ cm

4. Length of your index finger _____ mm

- How to measure to the *NEAREST* unit.

A. Length Measurements

Millimeter = small objects, like a quarter

Centimeter = small objects, your foot or even your
Height

Decimeter

Meter = larger distances, the size of a room

Dekameter

Hectometer

Kilometer = much larger distances, St. Louis to
Springfield

What are the english units for the lengths above?

B. Volume Measurements

Volume measures the amount something, usually a liquid.

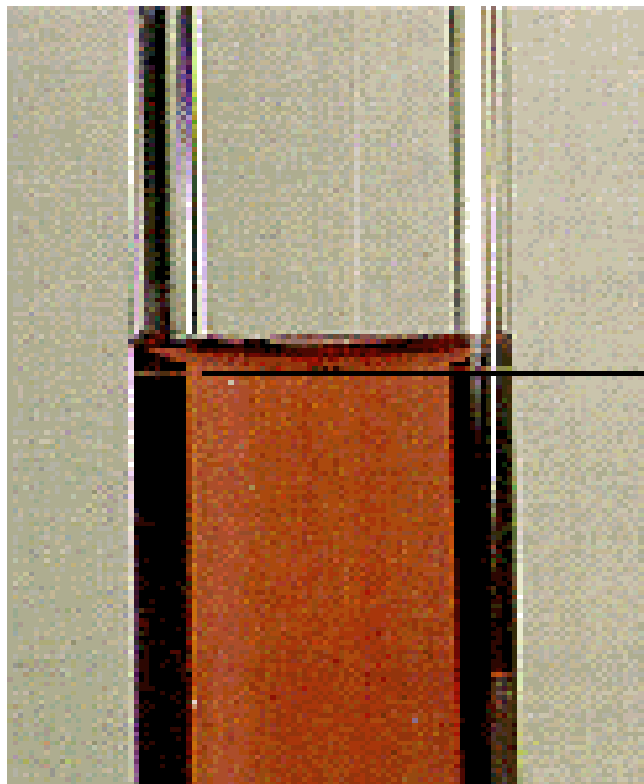
SI units for volume:

- Liter
- Milliliter

Beakers and Graduated cylinders used to measure

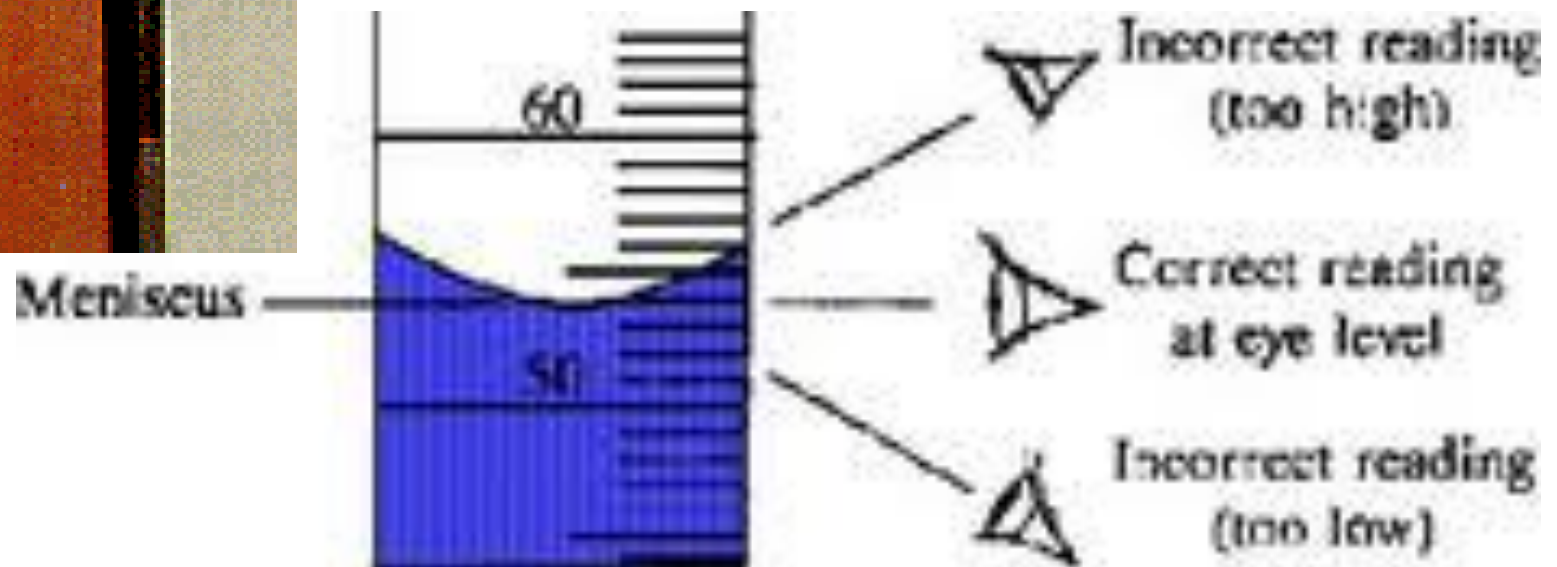


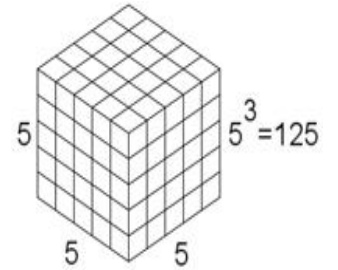
Reading the meniscus



Read the volume at the *bottom* of the meniscus

Read here...

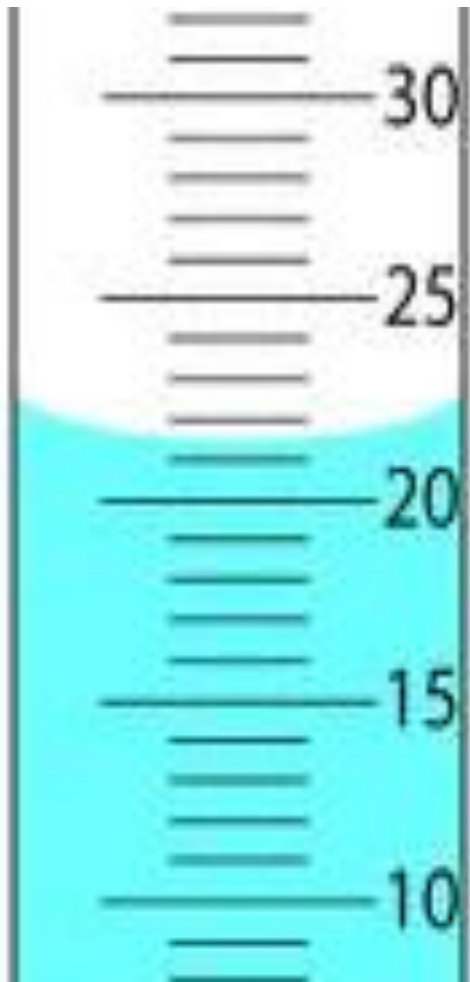




CC = cubic centimeter, which is the same as a ml

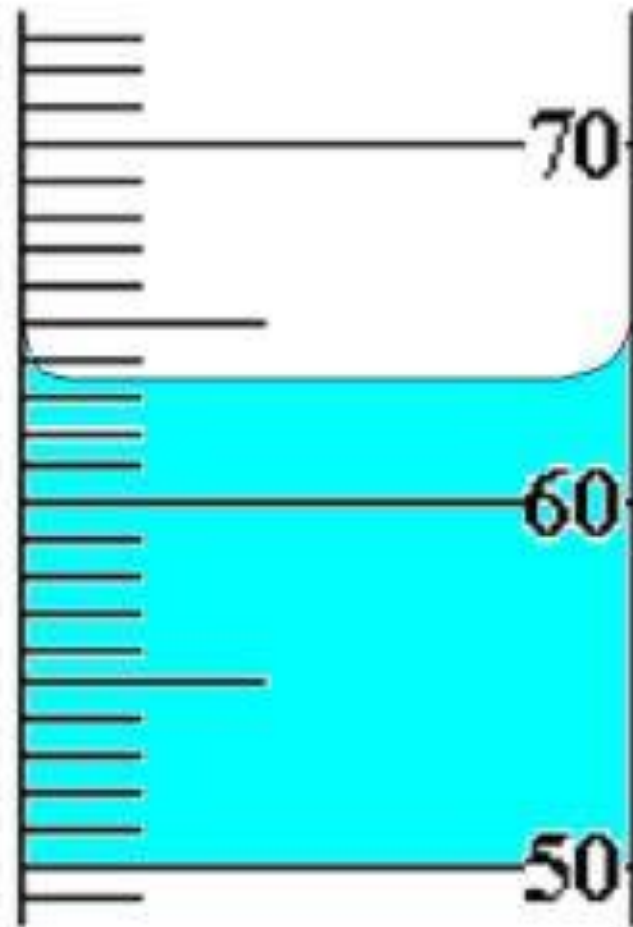
Used in medicine

A



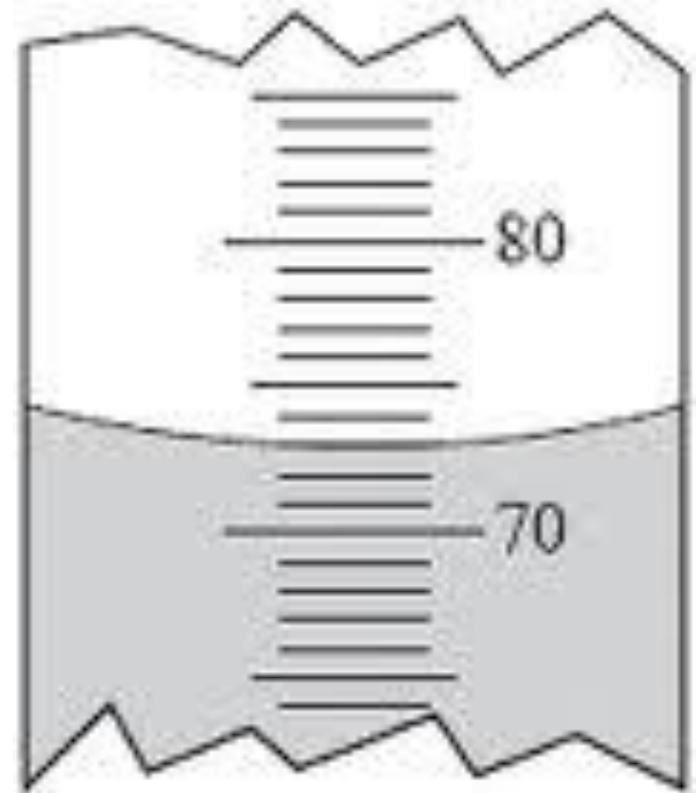
21.5 ml

B



63.5 ml

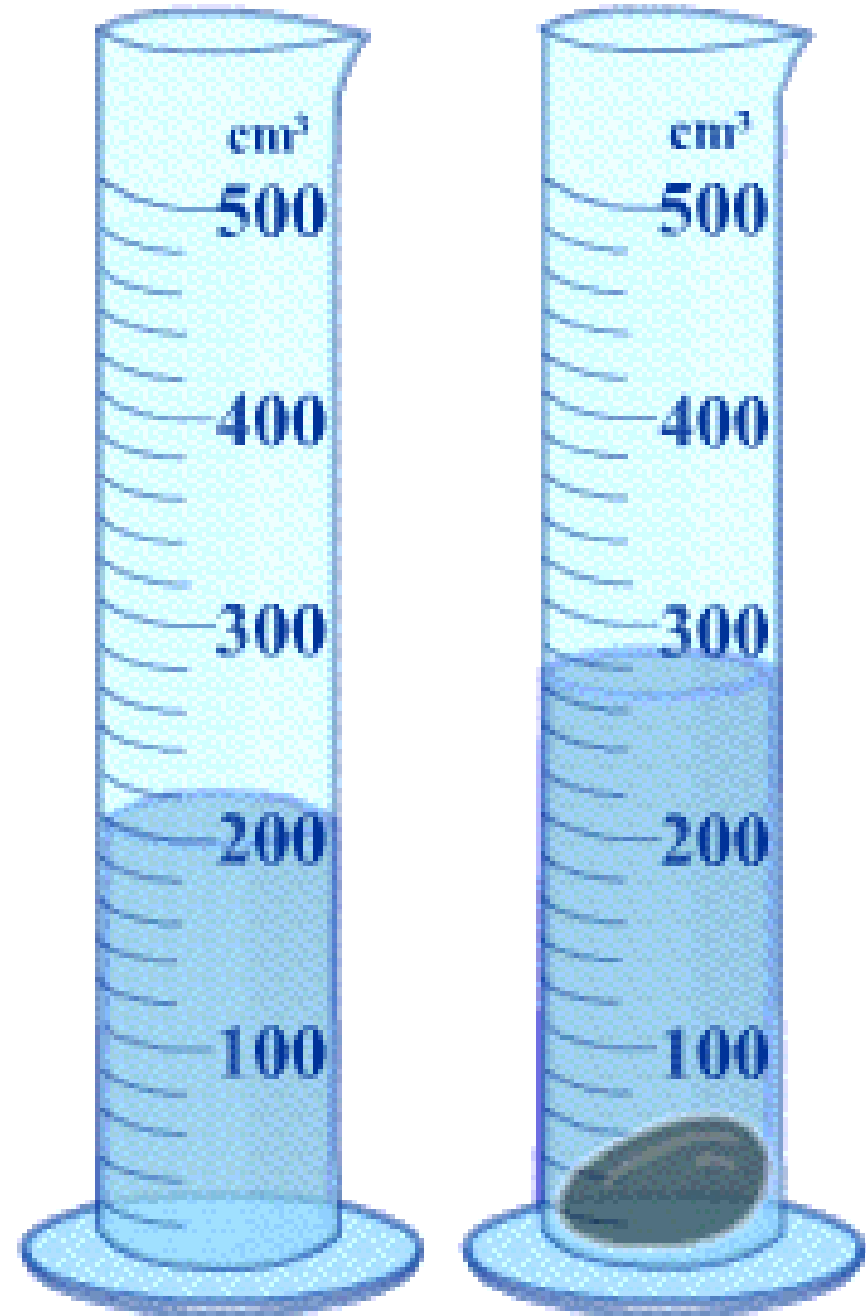
C



73.0 ml

Volume of
water **before**
rock is added –
200 ml

Volume of
water **after** rock
is added – *260 ml*

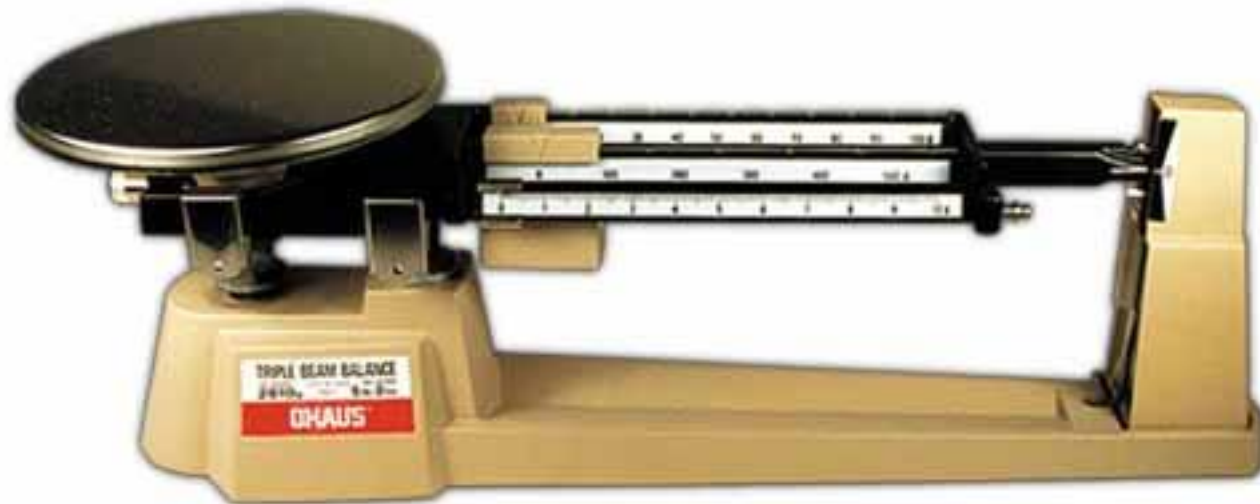


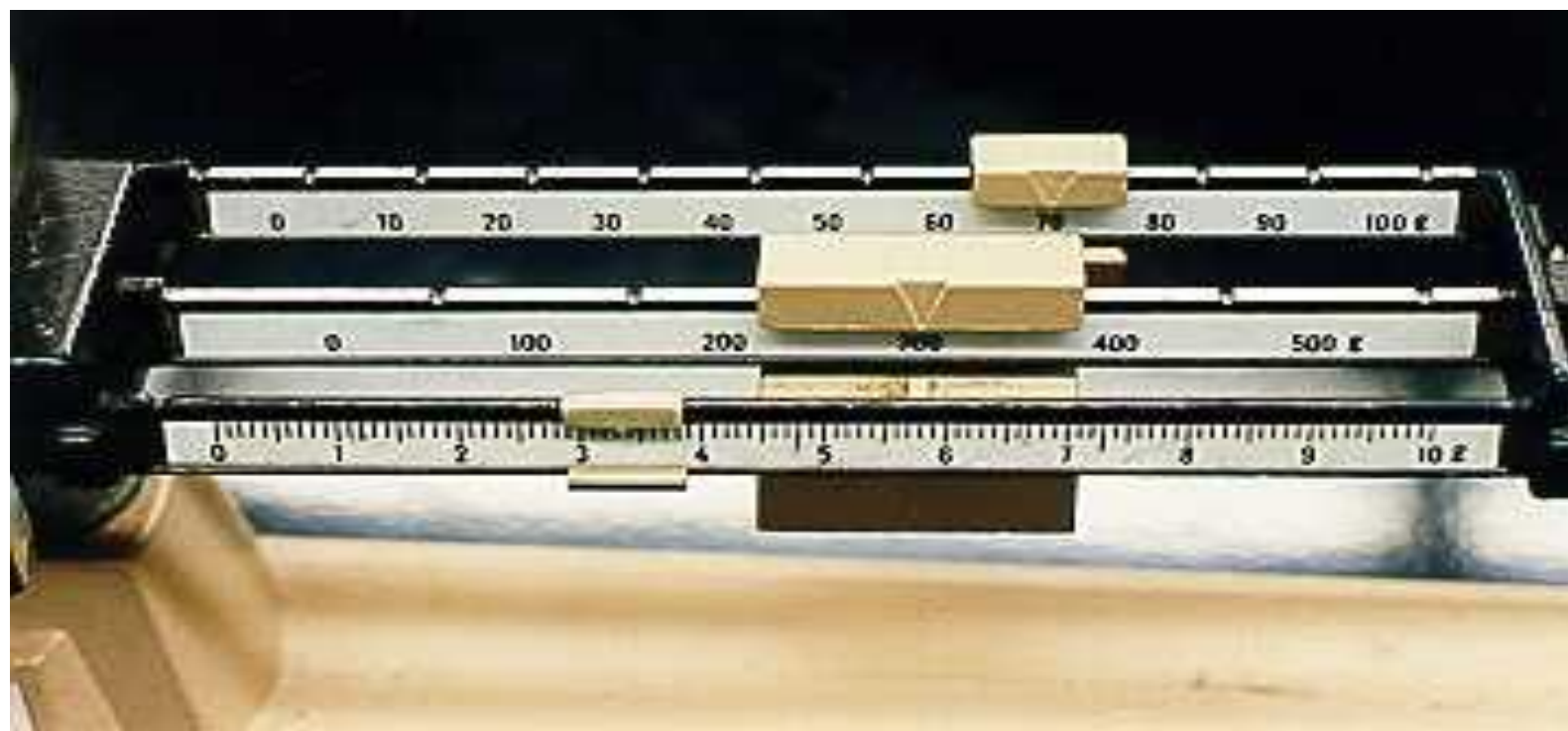
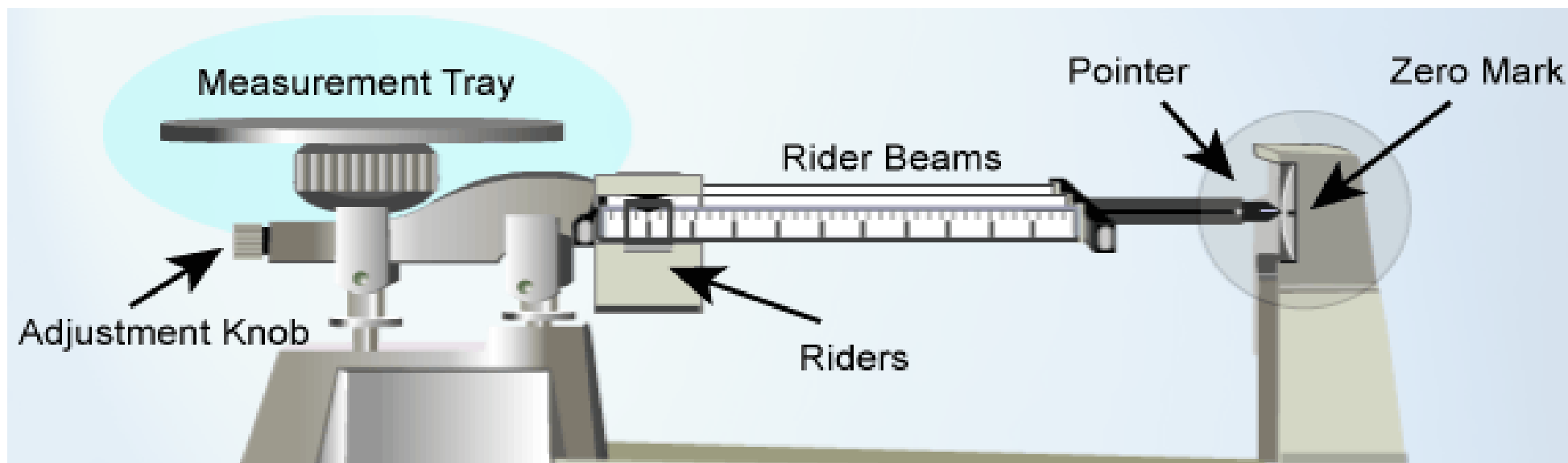
C. Mass Measurements

Mass: the amount of matter in an object

Measured in grams and kilograms

Weight measures mass + gravity





Units of Mass

Grams for small objects or foods

Kilograms for larger objects like people

1000 grams = 1 kilogram



Some scales show both pounds and kilograms. How much does this person weight?

1lb = .45 kilograms

What do I use to measure????



Tools of Measurement

If you are measuring:

- Length:
- Mass:
- Volume(s):
- Volume (s)-
- Volume- (l)-
- Temperature-

Use:

metric ruler

triple beam balance

$l \times w \times h$ (regular object)

measure the displacement of water

graduated cylinder

thermometer



Dimensional Analysis

- Process of converting units
- Steps:
 - 1.
 - 2.
 - 3.
 - 4.
 - 5.
 - 6.

Dimensional Analysis

Process of converting units

Steps:

- 1. Write down the number and the unit given (*you may want to put a line and 1 under it to signify it's a fraction*)
- 2. Write a multiplication sign and a line next to it
- 3. Write the unit you eliminating on the bottom of the new line (*to the right under the line*)
- 4. Write the unit you are converting to on top of the new line (*to the right on the line*)
- 5. Fill in the conversion factor (Ex. $100\text{cm} = 1 \text{ m}$)
- 6. Solve—by multiplying the fractions (multiply the numerators, then multiply the denominators). Give the correct units on your answer.

Useful Information

$$1 \text{ cm}^3 = 1 \text{ ml}$$

- Kilo- Hecta- Dekka-O- Deci- Centi-Milli
- O- is the unit without the prefix
 - Ex: meter, liter, or gram
- Remember: Each jump- add a zero!!!

Problems

- 2500 grams to kilograms

How many kilograms are equal to
1357 grams?

Convert 60mm to cm

Using dimensional analysis!!

- Convert 500 decimeters to kilometers

How many cm is equal to 4 inches?

I am 35 years old! How old am I in
days?

Some Practice Problems

- I drive 5 miles to school each morning. How many inches is that?

How many ml are equal to 5.43cm^3

If a ski pole is 3.0 feet in length, how long is the
ski pole in mm?

How many liters are equal to 3.184
ml?

Another one

- How many Kilometers are there in 5000 millimeters?

More than 2 steps

- Mr Simms wants to give all of his chemistry students enough chocolate to make them goofy for the rest of the day. It's a known fact that it takes 47 chocolate chips to make a student goofy. The average cookie contains 29 chocolate chips. Mr Simms has 5 classes and each class has an average of 32 students. How many toll house cookies does Mr Simms need to make?