



The Metric System

Experimental Design Unit

August 28th, 2006

What will this unit cover?

- Direct Measurements
 - Standard Units, Prefixes, Labels, Instruments
- Derived Measurements
- Unit Conversions
 - How to convert from one unit to another

Direct Measurements

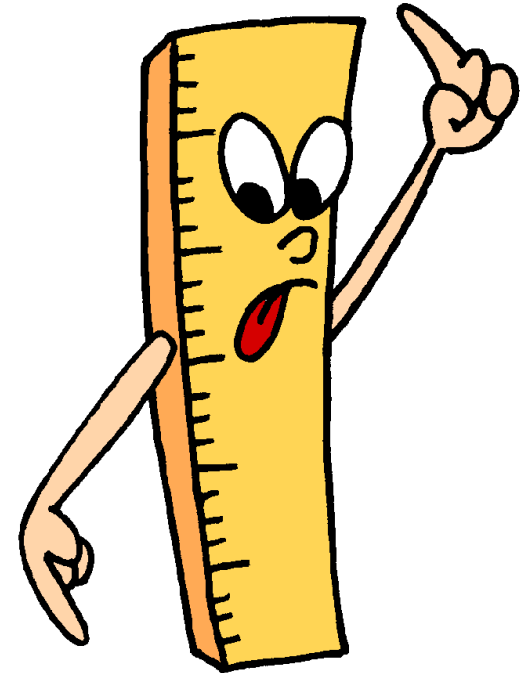
- Can be made with no calculations
- It is recorded in one step

What are some examples?

Direct Measurements (continued)

1. Length

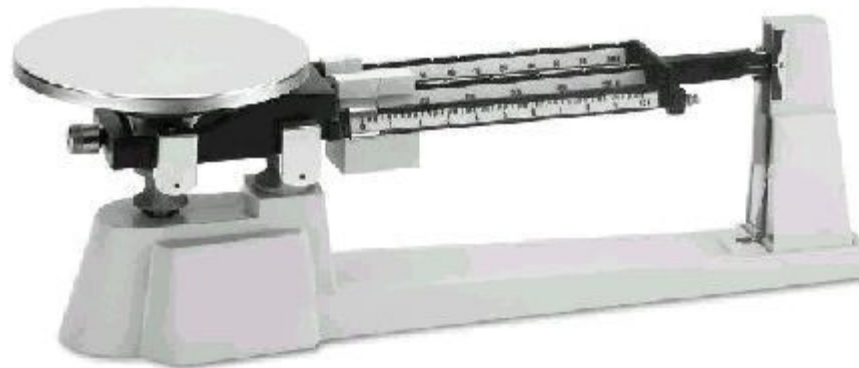
- Unit (label): meter
- Abbreviation: m
- Instrument: Ruler or meter stick



Direct Measurements (continued)

2. Mass

- Unit (label): kilogram
- Abbreviation: kg
- Instrument: triple beam balance



Direct Measurements (continued)

3. Time

- Unit (label): second
- Abbreviation: s or sec
- Instrument: stopwatch or clock



Direct Measurements (continued)

4. Temperature

- Unit (label): degrees Kelvin or Celcius
- Abbreviation: K or C
- Instrument: thermometer



Direct Measurements (continued)

5. Weight

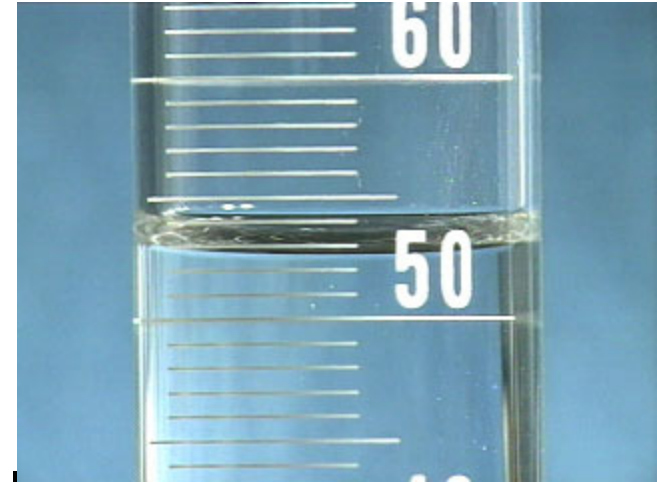
- Unit (label): Newton
- Abbreviation: N
- Instrument: spring scale



Direct Measurements (continued)

6. Volume of a Liquid

- Unit (label): Liter
- Abbreviation: L
- Instrument: Graduated Cylinder



Derived Quantities

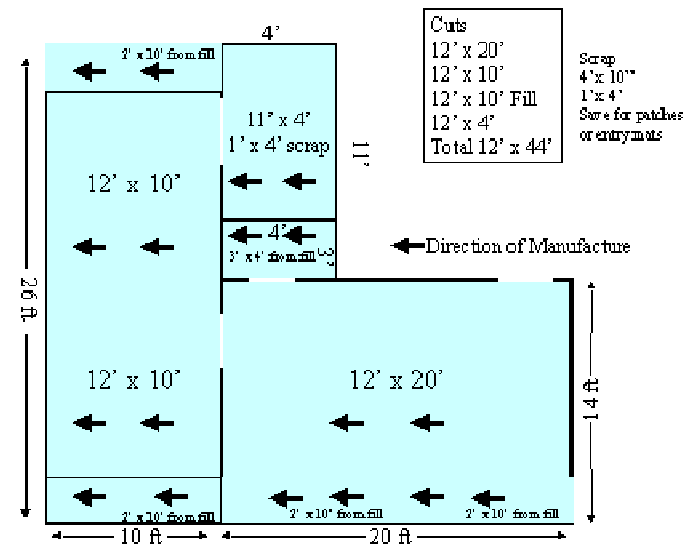
- Must be *calculated*
- Cannot be recorded in one step

What are some examples?

Derived Units (continued)

1. Area

- Formula: Length x Width (L x W)
- Unit (label): meters squared
- Abbreviation: m²
- Instrument: ruler or meter stick



Derived Units (continued)



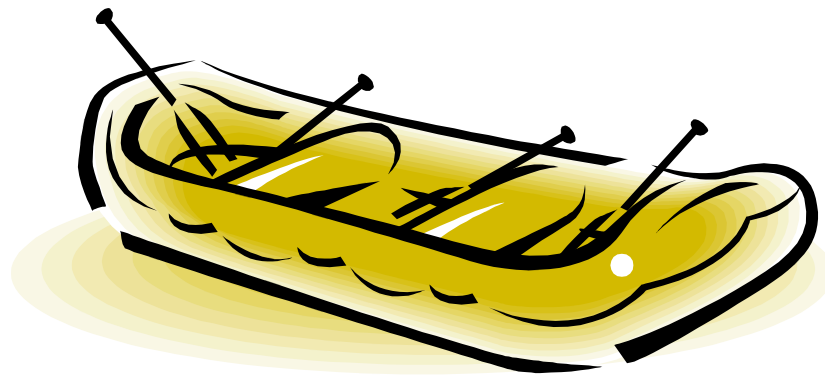
2. Volume of a Solid

- Formula: $(L \times W \times H)$
- Unit (label): meters or centimeters cubed
- Abbreviation: cm^3 or m^3
- Instrument: ruler or meter stick

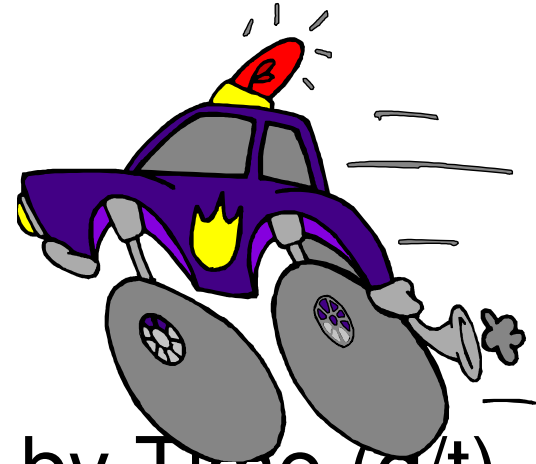
Derived Units (continued)

3. Density

- Formula: Mass divided by Volume (m/v)
- Unit (label): grams per cubic centimeter
- Abbreviation: g/cm^3
- Instrument: balance and ruler or meter stick



Derived Units (continued)



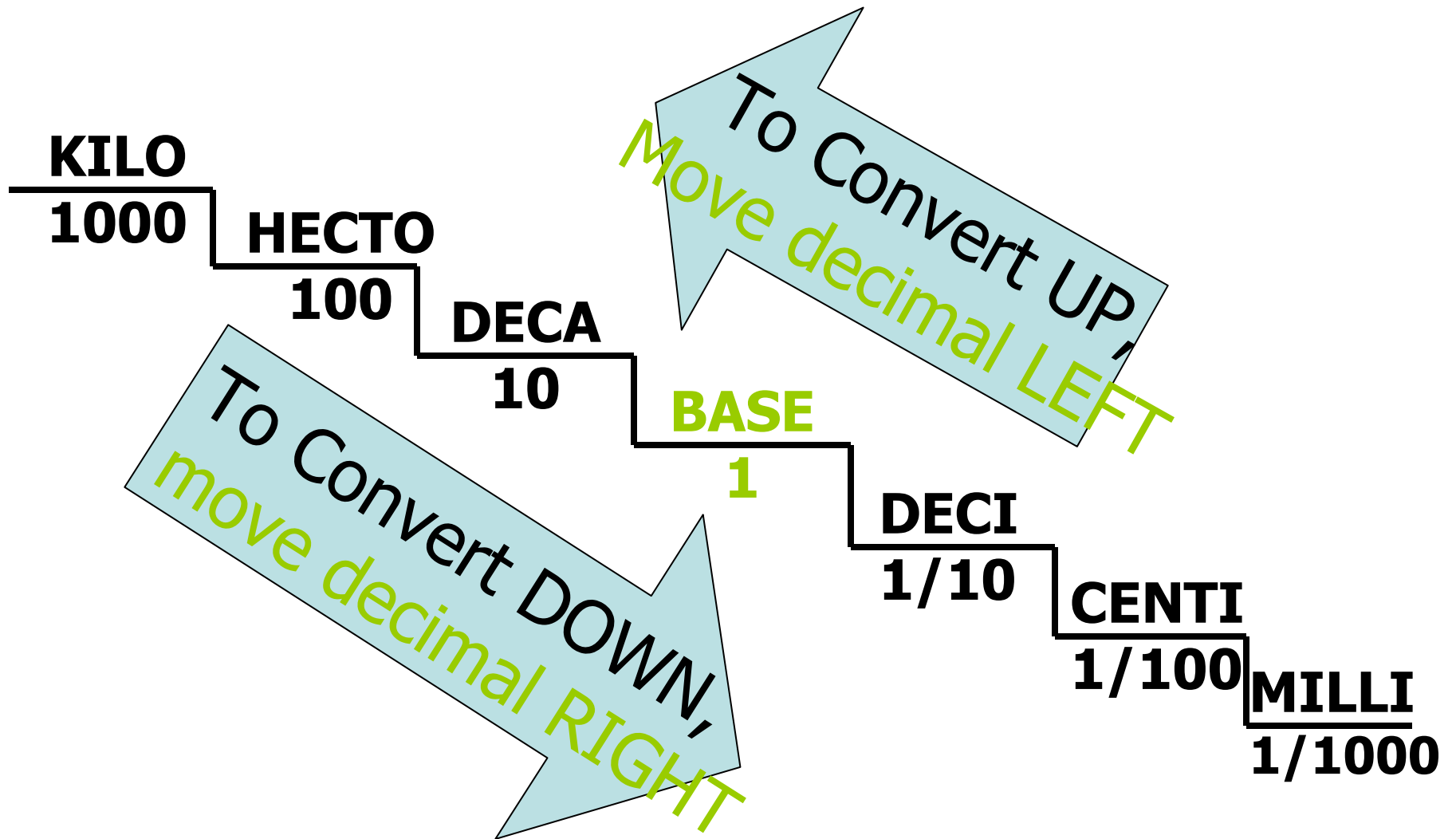
4. Speed

- Formula: Distance divided by Time (d/t)
- Unit (label): meters per second
- Abbreviation: m/s
- Instrument: ruler or meter stick and stopwatch

Metric Conversions

- Converting from one prefix to another or from a base unit to a prefix
- Example:
 - How many centimeters in a meter?
 - How many centimeters in a kilometer?

Metric Prefixes Graphic Organizer



Example

To convert 1000 milligrams to grams, you are moving which way on the stairs?

UP

If you are up, you must

Move the decimal LEFT

How many places will you move?

3

Answer?

Answer...

Since you are moving three steps up, then you will move left three times

Set up the equation:

1. 1000. Is what you're starting with
- 2. When the decimal is moved left three times: 1g**

More Examples...Work on #1

1. How many grams are in 5 kilograms?

– Which way are you moving on the steps?

DOWN

– If you are moving DOWN, which way do you move?

RIGHT

– How many steps?

3

5.0 with the decimal moved left three times =

5000 grams

More examples...

- Work on #2 quietly...
- Meters to Kilometers means we're moving UP: Move LEFT
- How many steps? 3
- 25.0 with the decimal moved left three times:
- Answer: **0.025 kilometers**
- **Don't forget the label!**

Last Example

- Work on #3 quietly...
- Hectometers to Centimeters means we're moving DOWN so we move RIGHT
- How many steps? 4
- 45.0 with the decimal moved RIGHT 4 times.
- Answer: **450,000 centimeters**
- *Don't forget the label!*