Scientific Method & Density

Mass vs. Weight

- _____ – anything that has mass & takes up space
- _____ – measurement that tell how much matter you have (kg)
- _____ – measurement of the amount of matter you have **with the effect of gravity**

For Example…

- Let's say a guy weighs 150 pounds
- This is about 54 kg in mass
- What would his mass be on the moon if the moon's gravity is about 1/6 that of the Earth?

Hmmmm…

- Would it be 1/6 of 150 pounds?
- Would it be 1/6 of 54 kg?
- Would it be 150 pounds
- Or would it be 54 kg?

The answer is …

Some of you are scratching your heads…

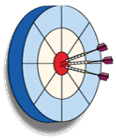
- The reason is because gravity has **NOTHING** to do with mass – *that's only for weight*
- His mass did not change only his weight changed

Accuracy vs. Precision

- _____ – How close you are to the correct answer
- _____ – How close your answers are together

For Example…

- Let's say we had the following dart board

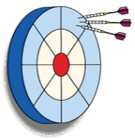


Is the accuracy good or bad? _____

Is the precision good or bad? _____

Try this one

- Let's say we had the following dart board



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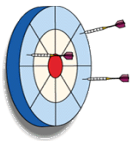

Is the accuracy good or bad? _____

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The Scientific Method

- _____ – a systematic approach used in scientific study
- It is an organized approach for scientists to do _____
- Provides a method for scientists to verify their work and the work of others

Steps for the Scientific Method

Step # 1 – _____

- _____ – the act of gathering information (_____)
  - – _____ **data** – information with **NO** numbers
    - (hot, blue, rainy, cold)
  - – _____ **data** – information with numbers
    - (98°F, 80% humidity, 0°C)

Steps for the Scientific Method

Step # 2 – Form a _____

- _____ – tentative explanation for what has been observed
  - – There is no formal evidence at this point
  - – It is just a _____

Steps for the Scientific Method

Step # 3 – _____ _____– a set of controlled observations that test the hypothesis

- _____ **variable** – the thing that **you** change in the experiment
- _____ **variable** – the thing that changes because you changes the independent variable
- _____ – something that does not change during the experiment
- _____ – the standard for comparison

For example…

- Let's say we are going to do an experiment testing what happens when you heat and cool a balloon…

We will start with a balloon at room temperature

Now we will change something…

I will add heat to one balloon

What will happen to the balloon's size?

_____

Now let's cool things down

I will add cool down the balloon

What will happen to the balloon's size?

_____

So what is what?

- What variable did **YOU** change?
  - _____ (_____Variable)
- What variable changes **BECAUSE** you changed the temperature?
  - _____ (_____Variable)
- What is did not change in the experiment?
  - _____ (_____)
- What balloon did you use to compare the others to?
  - _____ (_____)

Steps for the Scientific Method

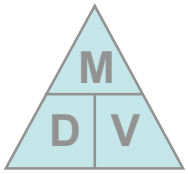
Step # 4 – _____

- _____ – judgment based on the information obtained

Density

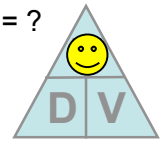
- Density **- mass per unit volume (g/cm^3)**

$$D = \frac{M}{V}$$



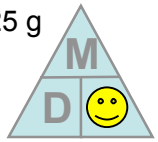
Density

- **An object has a volume of 825 cm^3 and a density of 13.6 g/cm^3. Find its mass.**

GIVEN:	WORK:
V = 825 cm^3 D = 13.6 g/cm^3 M = ? 	M = DV

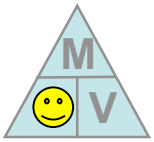
Density

A liquid has a density of 0.87 g/mL. What volume is occupied by 25 g of the liquid?

GIVEN:	WORK:
D = 0.87 g/mL V = ? M = 25 g 	$V = \frac{M}{D}$

Density

You have a sample with a mass of 620 g & a volume of 753 cm^3. Find density.

GIVEN:	WORK:
M = 620 g V = 753 cm^3 D = ? 	$D = \frac{M}{V}$

Density

- The good thing about density is that it is an _____ property
- That means that the density of a substance is the _____ regardless of the _____
- If you find the _____ of an unknown material, you can look it up in a density chart to find its identity

Density

- I have a block that measures 5.25 cm by 2.25 cm by 8.50 cm.
- I weigh the block and find its mass to be 5.85 g
- Calculate the density of the block in g/cm^3

What of you have an odd shaped object?

- The density of an odd shaped object can be found by the same equation
- D = M / V
- To find the mass, you just weigh the odd shaped object
- To find the volume, you place water in a graduated cylinder and get an initial volume
- Then you place the object into the graduated cylinder.
- The volume of the object is the difference in the two volumes

For example

- A chunk of metal has a mass of 5.25 g. It is placed in a graduated cylinder containing 25.0 ml of water. Once the metal is placed in the graduated cylinder, the water rises to 38.2 ml. What is the density of the metal?