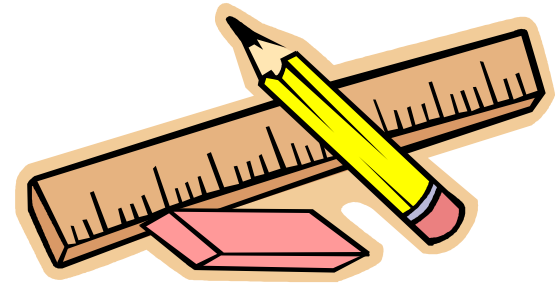# Metric Train Station Lab

STATION 1 - LENGTH

Directions: Measure the following items & write the answers down on your answer sheet.

1. Measure your height in centimeters.
   - What is your height in mm?
   - What is your height in m?
   - What is your height in km?

2. Use ten pennies and a metric ruler to complete this section.
   - How tall is a stack of ten pennies in centimeters?
   - How tall would a stack of 100 pennies be in centimeters?

3. Find the distance between the two index cards in the hallway in meters

4. What is the height of the door in meters? In cm?

5. What is the length of a pencil in cm? In mm?

CLEAN UP – *Put all the rulers, meter sticks, pencil, and pennies back the way you found them. Go to Station 2*
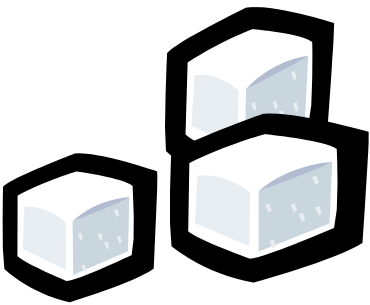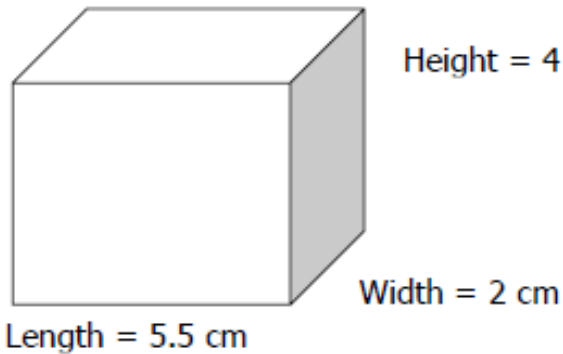
STATION 2: REGULAR VOLUME

To find the volume of squares or rectangles shape, multiply the length by the width by the height (l x w x h).

Height = 4
Width = 2 cm
Length = 5.5 cm

$5.5 \times 2 \times 4 = 44cm^3$

The volume of solids is measured in cm^3 or *cubic centimeters* (cc).

1 cc = 1 ml

WHAT TO DO:
There are 5 different objects at this station.

1. Pick up one of the objects (it doesn't matter which one). Write the name of the object on your answer sheet.

2. **Estimate the volume of the object in cc.**

3. Record this estimation in on your answer sheet.

4. Find the actual volume of the object using the formula L X W X H

5. Record the actual volume of the object on your answer sheet.

6. Repeat each step with each object.
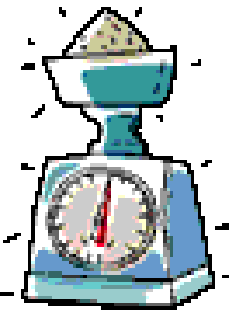
When finished go to station 3.

Station 3: Liquid Volume

Take a guess - How many drops of water will it take to equal 1 milliliter?

Follow the directions to find the number of drops in 1 milliliter of water, then answer the questions. You will need a small graduated cylinder (25 ml), a beaker of water, and an eyedropper for this section.

1. Fill a small graduated cylinder with 10 ml of water.

2. Count the number of drops it takes to raise the water to 11 ml. Record the number in the chart.

3. Leave the water in the graduated cylinder and count the number of drops it takes to raise the water to 12 ml. Record the number in the chart.

4. Leave the water in the graduated cylinder and count the number of drops it takes to raise the water to 13 ml. Record the number in the chart.

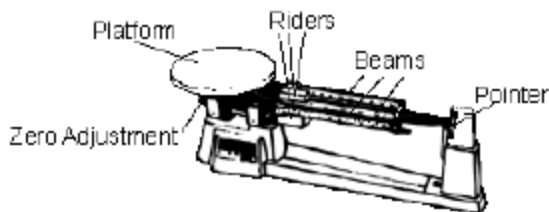5. Calculate your average and round to the nearest tenth.

CLEAN UP – *Empty both the graduated cylinder and eyedropper. If you dropped any water, please clean it up before you go to station 3.*

Station 4: Mass

1. With nothing on the platform, adjust all RIDERS so that each is at zero (the far left). Then check to make sure that the pointer swings to zero on the center mark. If the pointer is not even with the 0, then use the "ZERO ADJUSTMENT" to "zero it out" (make it even with the 0). *To do this make sure all of the movable weights are at their zero positions and then adjust. Turning the knob clockwise lowers the beam on the opposite end. Turning the knob counterclockwise raises the beam on the opposite end.*
2. After you place the object onto platform, first move the largest (the hundreds) rider across the beam until the pointer drops below the 0 line. Then move this rider back one notch. The rider must be in one of the notches on the beam. Follow this same procedure for the tens rider, then the ones rider, until the pointer swings to the zero mark.
3. To record the mass, add the masses shown by each rider. (Note: masses are in grams)

WHAT TO DO:

There are 5 different objects at this station.
1.   Pick up one of the objects (it doesn't matter which one). Write the name of the object on your answer sheet.
2.   Estimate the mass of the object
3.   Record this estimation on your answer sheet.
4.   List the objects in order from lightest to heaviest based on your estimations.
5.   Find the actual mass of the objects.
6.   Record the actual mass on your answer sheet.
7.   Repeat each step with each object.
8.   Sequence the objects in order from lightest to heaviest based on your measurements.

CLEAN UP – *Put the objects back on the table, and put the riders on the scale back to 0.*
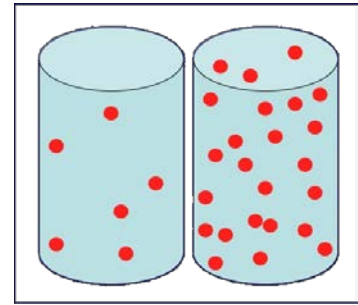
STATION 5:
IRREGULAR VOLUME

There are 5 different objects at this station.

1.   Pick up one of the objects (it doesn't matter which one). Write the name of the object on your answer sheet.

2.   Place some of the colored water into your graduated cylinder.

3.   Carefully read the **meniscus** and record the volume to the nearest mL. Record on your answer sheet.

4.   Place one object into the graduated cylinder and record the volume on your answer sheet.

5.   Subtract the Final volume from the initial volume and you will have the volume of that object.

6.   Pour the water back into the beaker and retrieve the object.

7.   Repeat with a new object

CLEAN UP – *Pour all the water back into the beaker. Dry off the objects. Throw the trash away. Go to station 6!*

Station 6: Density

There are 5 different objects at this station.

1. Pick up one of the objects (it doesn't matter which one). Write the name of the object on your answer sheet.

2. Mass/Weigh the object using the triple beam balance.

3. Record on your answer sheet.

4. Calculate the volume of the object. (To find out how to calculate volume, use your notes.)

5. Record on your answer sheet.

6. Calculate density by using this formula:

    Density = mass/volume

7. Record on your answer sheet.

8. Repeat each step with a new object.

Clean up – put all the objects back where you found them, empty out any graduated cylinders, and put the riders on the triple beam balance back to 0.
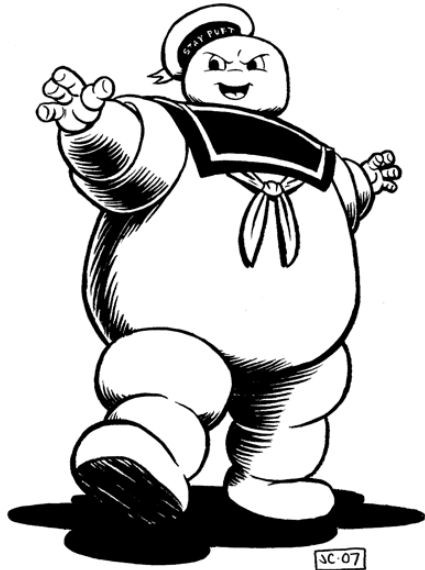
STATION 7:
COLOR CHALLENGE
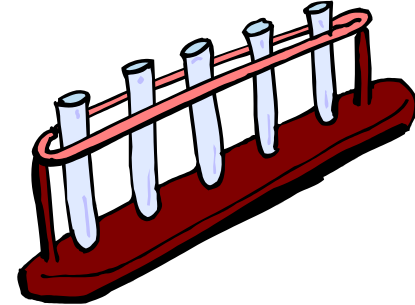
Perform each step outlined below using accurate measurements.

1.   Measure 17 ml of RED water from the beaker and pour into test tube A.

2.   Measure 21 ml of YELLOW water from the beaker and pour into test tube C.

3.   Measure 22 ml of BLUE water from the beaker and pour into test tube E.

4.   Measure 5 ml of water from test tube A and pour it into test tube B.

5.   Measure 6 ml of water from test tube C and pour it into test tube D.

6.   Measure 8 ml of water from test tube E and pour it into test tube F.

7.   Measure 5 ml of water from test tube C and pour it into test tube B.

8.   Measure 2 ml of water from test tube A and pour it into test tube F.

9.   Measure 4 ml of water from test tube E and pour it into test tube D.

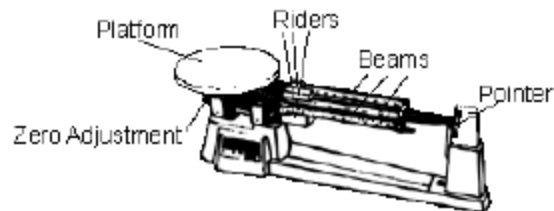Complete the chart on your answer sheet.

CLEAN UP – *Empty out all test tubes & graduated cylinders. Clean up any spills.*

STATION 8: MARSHMALLOW MADNESS

What to do

1. Estimate how many marshmallows it will take to equal 10g. Record this on your answer sheet.
2. Find the mass of the pie pan.
3. Set the balance to the mass of the pie pan plus 10g.
4. Put marshmallows in the pie pan until the balance is level.
5. Record the number of marshmallows on your answer sheet.

1. With nothing on the platform, adjust all RIDERS so that each is at zero (the far left). Then check to make sure that the pointer swings to zero on the center mark. If the pointer is not even with the 0, then use the "ZERO ADJUSTMENT" to "zero it out" (make it even with the 0). *To do this make sure all of the movable weights are at their zero positions and then adjust. Turning the knob clockwise lowers the beam on the opposite end. Turning the knob counterclockwise raises the beam on the opposite end.*
2. After you place the object onto platform, first move the largest (the hundreds) rider across the beam until the pointer drops below the 0 line. Then move this rider back one notch. The rider must be in one of the notches on the beam. Follow this same procedure for the tens rider, then the ones rider, until the pointer swings to the zero mark.
3. To record the mass, add the masses shown by each rider. (Note: masses are in grams)

Station 9: Conversion Game

Prefix	Mega	Kilo	Hecto	Deka	Base Unit	Deci	Centi	Milli	Micro
Means	10^6	1000	100	10	1	1/10	1/100	1/1000	$1/10^6$
Symbol	Mm	km	hm	dam *or* dkm	m (meter)	dm	cm	mm	μm
	Ml	kl	hl	dal *or* dkl	l (liter)	dl	cl	ml *or* cc	μl
	Mg	kg	hg	dag *or* dkg	g (gram)	dg	cg	mg	μg

Remember the prefixes with this acronym: Miss Kathy Has Dirty Underwear; Don't Check Mine, Mister

To convert from a smaller unit to a larger unit (moving left in the table shown above), you move the decimal place to the left in the number you are converting. If you are converting from a larger unit to a smaller unit (moving right in the table), the decimal is moved to the right. The number of places you move the decimal corresponds to the number of rows you are crossing in the table.

Example: Convert 43.1 cm to km. Move the decimal point 5 places to the left, adding zeros as needed. Answer: .000431 km. The decimal is moved 5 places to the left because kilo is 5 places to the left of centi.

WHAT TO DO:

The first player rolls the die and moves the number of spaces indicated on it if s/he can correctly answer the problem in the square where s/he would land. The other students check to see if the problem has been answer correctly. The first player home wins.
Record the answers on your answer sheet.