LESSON 1

Name: _____ School: _____

HOW BIG IS A BILLION?

OVERVIEW

A short demonstration of how much 1 billion is, using increasing amounts of rice to represent the world's population.

OBJECTIVES

Students will:
- *Observe a demonstration of how much 1 billion is*
- *Gain an understanding of the significance of global population*

MATERIALS **(if you don't have these, just do it on paper!)**:

- 1 cup of uncooked rice
- 1 cup measuring cup
- Teaspoon/tablespoon measuring spoons

INTRODUCTION QUESTIONS:

1. How many humans currently populate the earth? What is the global human population? What is your guess?

2. Which number is bigger? One thousand million, or one billion?

LET'S FIND OUT WHAT THE EARTH'S POPULATION IS AND DO A DEMONSTRATION →

LESSON 1

THE EARTH CURRENTLY HAS A POPULATION OF APPROXIMATELY **7.5 BILLION PEOPLE**!

DEMONSTRATION PROCEDURE:

1. Scoop out a level teaspoon of rice from a bag of uncooked grains. **There are about 200 grains of rice in 1 teaspoon.**
2. Now measure out one cup of rice. **There are approximately 9,600 grains of rice (48 teaspoons) in 1 cup**. Do you know many cups are in a gallon? 16 cups. So how many grains of rice there are in 16 cups?
   - Do the math: 9,600 X 16 = **153,600 grains of rice**

QUESTION: How many gallons of rice would equal one million grains of rice (1,000,000)?

YOU DO THE MATH: 1,000,000 grains ÷ 153,600 grains per gallon = _____

3. Did you get 6.5 gallons? That's a lot of rice!

QUESTION: How many gallons would you have to fill to get ONE BILLION grains of rice?

Hint: 1 billion = 1 thousand million

YOU DO THE MATH: 6.5 x 1000 = _____

4. Now we want to represent the total global population (7.5 billion).

QUESTION: How many gallons would you have to fill to get 7.5 BILLION grains of rice?

YOU DO THE MATH: 6,500 x 7.5 = _____

48,750 gallons?!?!? That's huge, and each grain of rice represents a person!

Bonus Information: *If you count 1 million seconds, it would take 1 week 4 days 13 hours 46 minutes 40 seconds. If you count 1 billion seconds, it would take 31 years, 8 months, 15 days, 17 hours, 46 minutes and 40 seconds, which is equal to 3.171 decades!!*

REFLECTION QUESTIONS

1. What is the significance of having 7.5 billion people in the world (resources, exponential growth, etc.)?

2. Of the 7.5 billion people on the planet, how many live in the United States (328 million), China (1.4 billion), and India (1.35 billion). Consider the physical size of India as compared to the United States. This is a difference in **population density**.
   How might this difference in population density affect daily life?

3. How could population growth and population density affect how a virus spreads throughout the world?

4. How many people do you think our planet could support?

LESSON 2

DEDUCTIVE REASONING

Deductive reasoning means we can draw a conclusion based on at least two true statements, or premises. Because the statements are true, we know that the conclusion we make based on those two statements is also true. Sherlock Holmes, the detective character from books and movies, is a great example of someone who uses deductive reasoning all of the time. He draws conclusions by observing the situation, and he uses these observations to find the criminal and solve the crime.

ACTIVITY: Read the scenario and complete the table below.

Six friends each took a turn weighing them on the same scale. None of the six weighed exactly the same. The weights were 77 pounds, 81 pounds, 83 pounds, 88 pounds, 95 pounds, and 110 pounds. ***Use the information given to determine the weight of each person. Mark an X in a space when you have eliminated it as a possibility. Mark an O in the space to show that person's weight.***

1. Dianne weighs more than 88 pounds.
2. Barb weighs less than Abe.
3. Faye weighs less than 85 pounds.
4. Carla weighs more than Abe or Faye.
5. Elmer weighs the least of all.
6. Faye weighs more than Barb.
7. Dianne weighs less than Carla.

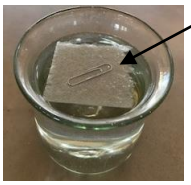
	77 pounds	81 pounds	83 pounds	88 pounds	95 pounds	110 pounds
Abe						
Barb						
Carla						
Dianne						
Elmer						
Faye						

LESSON 3

SURFACE TENSION AND WATER STRIDERS!

Materials:

- 1 Water glass
- 1 large bowl or frying pan
- 1 Toothpick or pine needle
- 1 Paper clip
- Dish Soap
- Piece of tissue paper or paper towel
- Water



Experiment #1:

1. Fill a glass with water.
2. Place your paperclip on the tissue paper and gently float it on top of the water.
3. Carefully remove the tissue so the paperclip floats on the surface of the water.
4. Put some dish soap on the tip of your finger and dip it in the water. Watch the paperclip sink!

WHY DOES THIS HAPPEN?

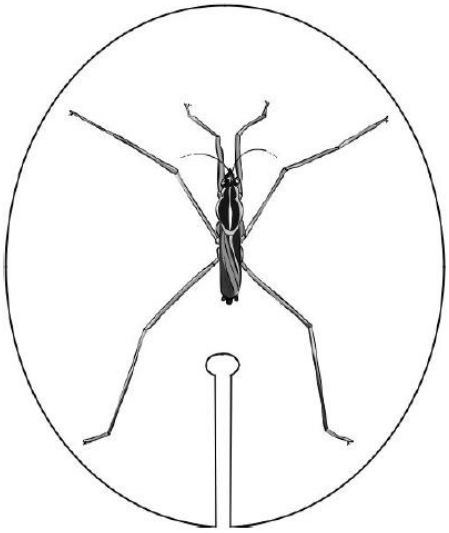
Surface Tension exists in water because water molecules stick each other. Water has high surface tension, which means the molecules are strongly pulling each other together on the surface.

Even though the paperclip has higher density than the water, the strong attraction between the water molecules on the surface forms a type of "skin" that supports the paperclip. When you put a drop of dish soap in the water, it binds with the water molecules, interfering with the surface tension, and allowing the higher density paperclip to sink.

Experiment #2:

1. Cut out the WATER STRIDER along the lines, making sure to cut out the notch at the bottom.
2. Fill your large bowl or frying pan with water (we want something with a lot of surface area, like a lake for our water strider), and float your water strider on top.
3. Put some dish soap on the tip of your toothpick (or pine needle) and dip it in the water

   ⇒ Dip it right at the inner edge of the notch, near the abdomen of the water strider.



Did you see the water strider zip around in the water?

WHY DOES THIS HAPPEN?

Water striders are small insects that are adapted for life on top of still water, using **surface tension** to their advantage so they can "walk on water." The attraction between water molecules creates tension and a very delicate membrane. Water striders walk on this membrane.

The dish soap is a surfactant, which breaks up the surface tension of the water, allowing the water molecules to move, pushing away from each other and moving toward areas with more surface tension, thus pushing our strider forward!

SURFACE TENSION *It is the reason that water collects in drops, but it's also why plant stems can drink water and cells can receive water through the smallest blood vessels!*

LESSON 4

NUMBER JUGGLING (II)

Use any three of the four numbers 2, 4, 8, and 10 to make the number sentences true. Use each number only once in a problem.

1. ◯ + ◯ − ◯ = 6
2. ◯ × ◯ − ◯ = 12
3. ◯ × ◯ + ◯ = 34
4. ◯ × ◯ − ◯ = 22
5. ◯ ÷ ◯ + ◯ = 13
6. ◯ ÷ ◯ + ◯ = 12
7. ◯ × ◯ × ◯ = 64
8. ◯ × ◯ ÷ ◯ = 5
9. ◯ × ◯ ÷ ◯ = 16
10. ◯ × ◯ ÷ ◯ = 4
11. ◯ ÷ ◯ − ◯ = 1
12. ◯ × ◯ ÷ ◯ = 40

LESSON 5

TAKE A PICTURE AND EMAIL IT!

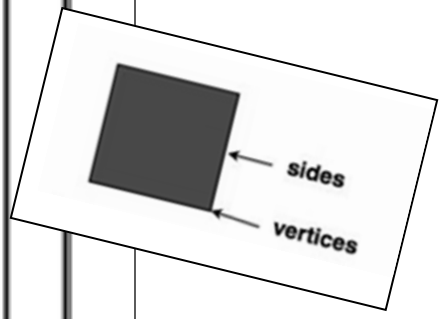
Challenge: Build a 3-D shape out of marshmallows and toothpicks.. Then, tell about your shape

My Shape:

Drawing:

Sides ?

Vertices?



Was this shape challenging to build? Why or Why Not?