

## Ooey Gooey Gak!

This lesson is designed to help students explore fraction division. It will include the topics of measurement and fraction division to formulate the common children's toy Gak! This lesson will also include ample amount of practice with fraction division and the use of pattern blocks.

### Professional Standards Addressed:

This lesson addresses the following NYS-MST standards:

- 6.N.17 Multiply and divide fractions with unlike denominators
- 6.M.2 Identify customary units of capacity (cups, pints, quarts, and gallons)
- 6.M.3 Identify equivalent customary units of capacity (cups to pints, pints to quarts, and quarts to gallons)

This lesson addresses the following NCTM standards:

- Communication Standard Grade 6 - 8
  - Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- Representation Standard Grade 6 - 8
  - Create and use representations to organize, record, and communicate mathematical ideas

### Instructional Objectives:

Following the conclusion of the lesson students should be able to:

- Work together by helping each other through these types of hands on activities
- Complete division problems using measurement techniques
- Model fraction division using pattern blocks

### Instructional Protocol/Itinerary:

This lesson is going to begin with the making of the Gak. To prepare for this, lay out all of the materials in the front of the room. There should be a container of Borax. Borax is a laundry booster that can be used to help brighten your colors and can be found in Wal-Mart. You also need two containers of water, one container of Elmer's glue, a spoon, two bowls and a set of measuring cups for each group. Split the students into groups of four. The recipe for the Gak is doubled, so there will be enough of the finished product for each person in the group. Work with the students and perform the measurement division. There are enough responsibilities in this activity that each student can be involved. After completing each step of the measurement division, mix the ingredients together and reveal the finished product. After the measurement division is complete and the students have their Gak, once again, you need to split the students into two groups. In the groups, the students are going to be playing Pattern Block Wars! Place the problems on the board one by one and have one person from each team come to the board. Next, explain the rules and let the games begin! If the student gets it right, have the team move on, but if it is incorrect, the team must choose another person to complete the problem. Once the game has been completed, announce the winner and hand out the candy prize to the winning team.



Conversion Review:

- 1 cup = 8 fl. oz.
- 1 lb. = 16 oz.
- 1 fl. oz. = 1.04 oz.
- 16 fl. oz. = 2 cups
- 1 gallon = 16 cups
- $\frac{1}{2}$  gallon = 8 cups

To make Gak using measurement division, follow the steps below:

1. Place the Students into groups of four
2. Collect the needed materials
  - a. 2 Bowls - Label one A and the other B
  - b. 3 containers with the ingredients needed
  - c. A mixing spoon
  - d. Food coloring is optional
  - e. A set of Measuring Cups
  - f. Zip Lock Bags
3. Perform the Measurement Division
4. Mix the ingredients together to get your finished product!

**HERE WE GO!! Perform Measurement Division to answer the Questions Below and to Make Gak!**

**Question:**

When given a box of Borax that is 2 lbs., how many people are able to make the Gak if the recipe calls for  $\frac{1}{4}$  cup per person?

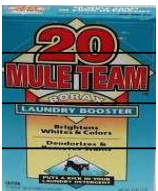
To perform measurement division, to find out how many of the  $\frac{1}{4}$  cups in the 2 lbs. container can be distributed between the students, follow the steps below:

1. Show the students the 2 lbs. container of Borax.
2. Work with the students and go through the measurement conversions. Since we want to measure in cups, we have to change the 2 lbs. to cups.

**Conversion:** If 1 lb. equals 16 oz., then 2 lbs. equals 32oz.. If 1 cup equals 8 fl.oz. (we know that 1 fl.oz. equals 1.04 oz., in this case we will assume that 1 fl.oz. is equal to 1 oz.), then 2 lbs., which equals 32oz., will then equal 4 cups.

**Teacher Reference:** 
$$\frac{2lbs.}{1} \cdot \frac{16oz.}{1lb.} \cdot \frac{1fl.oz.}{1oz} \cdot \frac{1cup}{8fl.oz} = \frac{(2 \cdot 16)cups}{8} = 4cups$$

3. Once the conversion has been completed, ask the students to draw their own model of the Borax container. The model will be of a rectangular prism.
4. Since you know that this container has 4 cups of Borax in it, use horizontal lines to mark 4 equal sections on the container. Each section will represent 1 cup. Because the recipe calls for  $\frac{1}{4}$  cup to make the Gak, maybe we should mark off sections to represent  $\frac{1}{4}$  cup. That way, we can find out how many people can use this ingredient.



Each section represents 1 cup



Now each section represents  $\frac{1}{4}$  of a cup

5. Once the students have their model complete with the sections, place your model on the board. Have one student from each group come up to the board and with their measuring cup, measure out  $\frac{1}{4}$  cup from the 2 lb. container. Once all of the groups have their  $\frac{1}{4}$  cup, the rest of the students may come up and measure out  $\frac{1}{4}$  cup. These can be placed on a front table and are used as a visual. As the students come up and take out  $\frac{1}{4}$  cup, rip off your sections from your model and place them on the board so that all the students can see the representation of how many  $\frac{1}{4}$  cups are in the 2 lb. container. (See below)



$$4\text{cups} \div \frac{1}{4} \text{ cup/person} = 16\text{people}$$

6. After going through the division, have the students place their  $\frac{1}{4}$  cup that they measured out into Bowl A.

**\*\*Follow those 6 steps for the second ingredient water, the third ingredient Elmer's glue and the fourth ingredient water!\*\***

The second ingredient for bowl A is water.

**Question:**

Given a  $\frac{1}{2}$  gallon of water, and the recipe calls for 4 cups of water to make the Gak, how many people can use this  $\frac{1}{2}$  gallon of water?

**Conversion:** If 1 gallon equals 16 cups, then  $\frac{1}{2}$  gallon equals 8 cups.



**Teacher Reference:**

$$\frac{\frac{1}{2} \text{ gallon}}{1} \cdot \frac{16\text{cups}}{1\text{gallon}} \cdot \frac{16\text{fl.oz}}{2\text{cups}} \cdot \frac{1\text{cup}}{8\text{fl.oz}} = \frac{\left(\frac{1}{2} \cdot 16 \cdot 16 \cdot 1\right)}{(1 \cdot 2 \cdot 8)} = 8\text{cups}$$

Each section represents 4 cups.  
Since each section represents 4 cups, our answer is 2 people.



$$8\text{cups} \div 4\text{cups/person} = 2\text{people}$$

**\*\*These 4 cups get placed into Bowl A\*\***

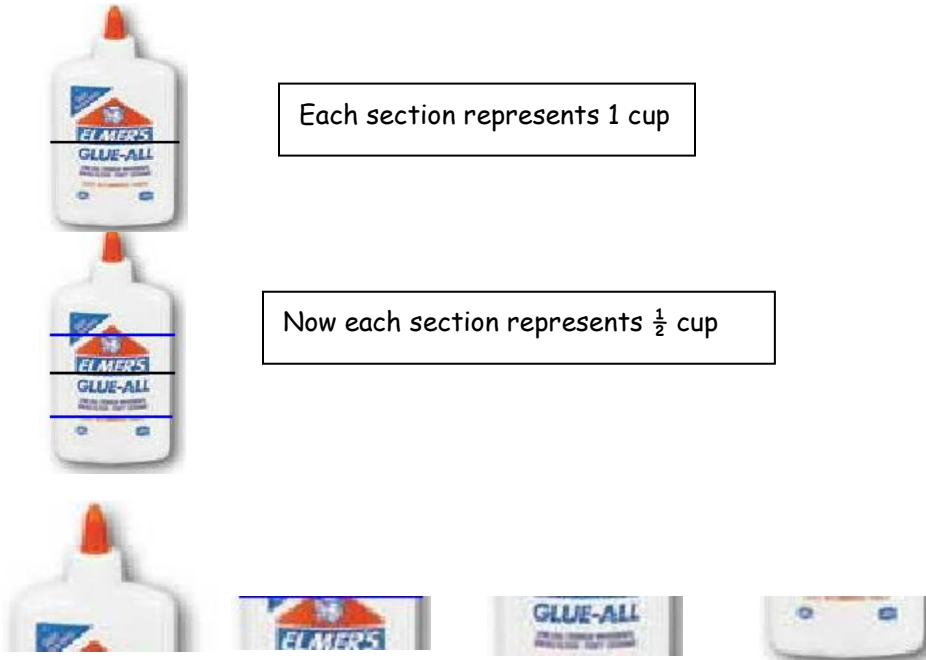
The third material needed to create the Gak is Elmer's Glue. Now, we are going to begin working with Bowl B.

**Question:**

When given a container of Elmer's Glue that is 16 fl.oz., and the recipe calls for  $\frac{1}{2}$  cup of glue to make the Gak, how many people can use this container of Elmer's Glue?

**Conversion:** If 1 cup equals 8 fl.oz. then 2 cups equals 16 fl.oz.

**Teacher Reference:**  $\frac{16\text{fl.oz}}{1} \cdot \frac{1\text{cup}}{8\text{fl.oz}} = \frac{16\text{cups}}{8} = 2\text{cups}$



$$2\text{cups} \div \frac{1}{2}\text{cup/person} = 4\text{people}$$

**\*\*This  $\frac{1}{2}$  cup of glue gets placed into Bowl B\*\***

The next ingredient for Bowl B is water.

**Question:**

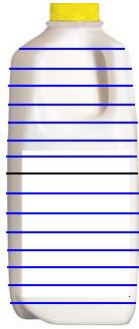
Given another  $\frac{1}{2}$  gallon of water and the recipe calls for  $\frac{1}{2}$  cup, how many students can use the  $\frac{1}{2}$  gallon of water?

**Conversion:** If 1 gallon equals 16 cups, then  $\frac{1}{2}$  gallon equals 8 cups.

$$\frac{\frac{1}{2}\text{gallon}}{1} \cdot \frac{16\text{cups}}{1\text{gallon}} \cdot \frac{16\text{fl.oz}}{2\text{cups}} \cdot \frac{1\text{cup}}{8\text{fl.oz}} = \frac{\left(\frac{1}{2} \cdot 16 \cdot 16 \cdot 1\right)}{(1 \cdot 2 \cdot 8)} = 8\text{cups}$$



Each section represents 2 cups



Each section represents  $\frac{1}{2}$  cup of  $\frac{1}{2}$  gallon



$$8 \text{ cups} \div \frac{1}{2} \text{ cup/person} = 16 \text{ people}$$

**\*\*Take this  $\frac{1}{2}$  cup and place it into Bowl B\*\***

Checking in:

Here are the ingredients that you should have in each Bowl before you begin creating your Gak!

**Bowl A:**

- $\frac{1}{4}$  cup of Borax Laundry Detergent
- 4 cups of water

**Bowl B:**

- $\frac{1}{2}$  cup of glue
- $\frac{1}{2}$  cup of water

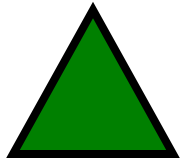
Once each of these ingredients are in your bowls, you are ready to create your Gak!!

**Follow the steps below to finish your activity to get a hand full of Ooey Gooey Gak!**

1. The Gak is going to come out white. If you desire another color, mix in some drops of food coloring into Bowl B, which contains the water and the glue.
2. The next step is to mix Bowl A together.
3. Once mixed together, take your measuring cup that reads  $\frac{1}{2}$  of a cup and measure out  $\frac{1}{2}$  of a cup of the mixture from Bowl A.
4. Then, pour that mixture into Bowl B, which contains, water, glue and food coloring if you chose to add color to your Gak.
5. Lastly, stir your resulting mixture together. Once the Gak is not sticking to the sides of the bowl, your Gak is complete.
6. Split the Gak among the group of four and place it into the zip lock bags that were provided. This will keep it from drying out!



## Pattern Block Wars



The green **triangle** has the smallest area of all the shapes.



The blue **rhombus's** size or area is exactly twice that of the triangle.



The red **trapezoid's** size or area is exactly three times that of the triangle.





The yellow **hexagon**, the largest of the shapes, has a size that is exactly six times that of the triangle.



Practice with the pattern blocks:

1. How many  are in a  ?

**Solution:** 6, so 1 triangle is  $\frac{1}{6}$  of a hexagon.

2. How many  are in a  ?

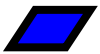

**Solution:** 2, so 1 trapezoid is  $\frac{1}{2}$  of a hexagon.

3. How many  are in a  ?

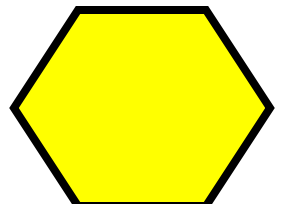
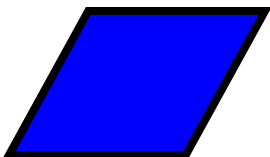
**Solution:** 2, so 1 triangle is  $\frac{1}{2}$  of a rhombus.

4. How many  are in a  ?

**Solution:** 3, so 1 triangle is  $\frac{1}{3}$  of a trapezoid.


5. How many  in a  ?

**Solution:** 3, so 1 rhombus is  $\frac{1}{3}$  of a trapezoid.

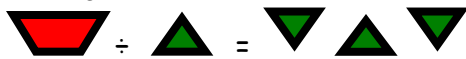


The classroom will be split into two teams and the teacher will write fraction division problems on the board one by one. The students will solve the problems given by the teacher with the use of pattern blocks. If the student answering the problem gets it wrong, then the next team player will have to attempt to answer the problem. Once the problem is correct, another team player must move on to the next problem. The first team to complete the problems wins! When a tie results, give the students the tie breaker question.

**Teacher Reference:**

Let  = 1 unit

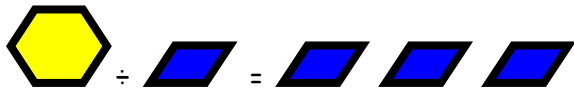
1.  $\frac{1}{2} \div \frac{1}{6} = ?$



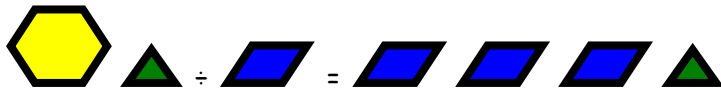
2.  $\frac{1}{3} \div \frac{1}{6} = ?$



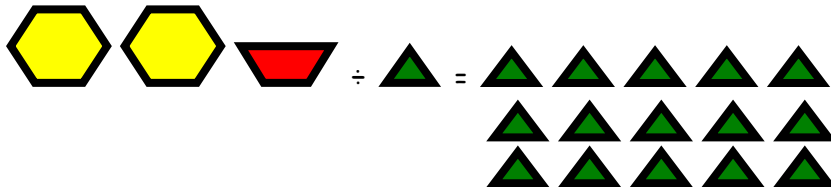
3.  $1 \div \frac{1}{3} = ?$



4.  $1\frac{1}{6} \div \frac{1}{3} = ?$



5.  $2\frac{1}{2} \div \frac{1}{6} = ?$



Tie Breaker Question: Given the pictures below, write the division problem.



$3\frac{1}{3} \div \frac{1}{3} = 10$