



POPCORN MATH ACTIVITY BOOK

Group # _____ Popcorn Type _____

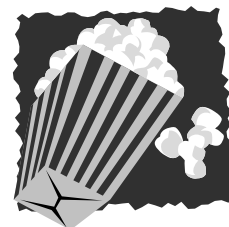
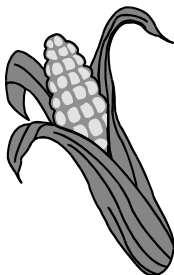
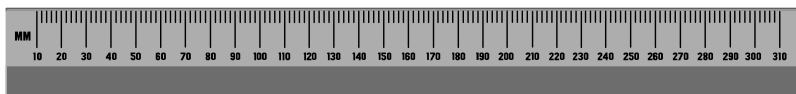


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GETTING STARTED

Answer the questions below on popcorn facts. Show all your work.

1. If Americans consume 17.36 billion quarts of popcorn a year and if each American consumes approximately 68 quarts of popcorn a year, about how many people live in the United States?

2. If a single popcorn plant produces one ear of corn containing 600 kernels, and 30,000 plants can be grown on one acre of land, how many kernels can be produced on a 400-acre farm?

3. If a 3.5-gallon canister of popcorn is marked down 30% to \$24.95, what is the regular price of the canister?

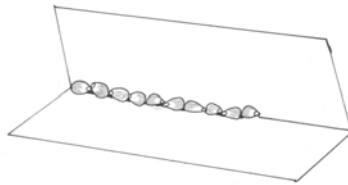
Group # _____ Type of popcorn _____

4. Fill the graduated cylinder to the 15 ml mark.
5. Count out 50 kernels of your popcorn and place in the graduated cylinder containing the 15 ml of water. Measure the amount of water displacement and subtract out for the 15 ml of water already in the graduated cylinder. Record the actual volume of the your popcorn in the data table below.

Data Table

Type of popcorn	Actual Volume of the 50 popcorn kernels

Fold the 3 x 5 index card in half (like a hot dog bun). Place a line of glue in the fold. Place the 10 kernels of your corn end to end in the glue. Be sure to place the kernels at the edge of the card. Allow the glue to dry.



1. What is the measurement in centimeters of your 10 kernels? _____
2. What do you predict would be the measurement in centimeters of 50 kernels? _____
3. What do you predict would be the measurement in centimeters of 75 kernels? _____
4. What do you predict would be the measurement in centimeters of 100 kernels? _____
5. What do you predict would be the measurement in centimeters of 300 kernels? _____

POPPED VS. UNPOPPED

Group # _____ Type of popcorn _____

Note: There is only one popcorn popper, one electronic balance scale, one digital thermometer and cork, one stopwatch, and one popcorn tub are provided for the class. Take turns with your classmates when using these items.

1. Place the digital thermometer, with the cork for support, in the hole on the top of the popcorn popper. Keep it as straight up and down as possible. Take an initial temperature of the cold popcorn popper and record in Data Table 1.
2. **Without** the popcorn tub under the spout, turn on the popcorn popper, start the stopwatch, and record the temperature every 30 seconds for 5 minutes. Record each reading in Data Table 1. Turn off and let the popcorn popper cool down by removing the spout portion.
3. **With** the popcorn tub under the spout, turn on the popcorn popper, start the stopwatch, and record the temperature every 30 seconds for 5 minutes. Record each reading in Data Table 1.

Data Table 1

Time in seconds	Temperature inside popper without the popcorn tub under the spout (°F)	Temperature inside the popper with the popcorn tub under the spout (°F)
Cold (turned off)		
30 seconds		
1 minute		
1 minute, 30 seconds		
2 minutes		
2 minutes, 30 seconds		
3 minutes		
3 minutes, 30 seconds		
4 minutes		
4 minutes, 30 seconds		
5 minutes		

4. Plot your findings for the two sets of temperatures on a line graph. Be sure to label and title your graph.

Make a comparison of the temperature between the popcorn popper without the tub under it and the popper with the tub under it.

5. As a class, find the mass of the plastic tumbler and record here: _____
6. Within your group, count out 300 kernels of your popcorn. Each one of you may want to count out 100 kernels (if there are 3 of you) and then you can combine them. Place the 300 kernels in the plastic tumbler and find the mass and then subtract out the mass of the plastic tumbler alone. Record your results in Data Table 2.
7. Turn on the popcorn popper and when it reaches 5 minutes, record your temperature. Place the popcorn tub underneath the spout and add the 300 kernels of your popcorn and start the stopwatch. Pop for 4 minutes and then turn off the popcorn popper.
8. Dump all of the remaining contents of the popcorn popper into the popcorn tub with the popped corn and return to your area.
9. Find the mass of the styrofoam tray and record here: _____
10. Pour out all the contents of the popcorn tub onto the styrofoam tray and find the mass of the tray and the contents. Subtract out for the mass of the tray and record your results in Data Table 2.
11. Count the number of popped kernels. Note: A kernel is considered popped when the kernel has cracked open, exposing any of the white starch inside. Record in Data Table 2.
12. Count the number of unpopped kernels. Record in Data Table 2.
13. Find the mass of the popped kernels. Record in Data Table 2.
14. Find the mass of the unpopped kernels. Record in Data Table 2.
15. Calculate the length of 300 kernels of each type of popcorn, based on the measurement of 10 kernels from Learning Experience 1.

Data Table 2

Type of popcorn	Total mass of the 300 kernels before popping	Total mass of the 300 kernels (popped and unpopped) after popping	# of popped kernels	# of unpopped kernels	Mass of popped kernels	Mass of unpopped kernels	Length of 300 kernels (end to end) in centimeters
300 kernels of your popcorn							

MATH USING REGULAR POPCORN

Group # _____ Type of popcorn _____

As a class, record your data from Learning Experience #2 on the Class Master Data Table and record all the others students information onto yours. Now use the class information to complete the data table and to answer the rest of the questions.

MASTER DATA TABLE

MASS

Group 1 Group 2 Group 3 Group 1 Group 2 Group 3

<u>Popcorn</u>	300 kernel mass	300 kernel mass	300 kernel mass	Avg. 300 kernel mass	<u>Mass</u> Popped Kernels	<u>Mass</u> Un-popped Kernels	<u>Mass</u> Popped Kernels	<u>Mass</u> Un-popped Kernels	<u>Mass</u> Popped Kernels	<u>Mass</u> Un-popped Kernels	Avg. Mass Popped	Avg. Mass Un-popped
Regular												
Dried												
Moist												

NUMBER

Group 1 Group 2 Group 3

<u>Popcorn</u>	Avg. 300 kernel mass	<u>Number</u> Popped Kernels	<u>Number</u> Un-popped Kernels	<u>Number</u> Popped Kernels	<u>Number</u> Un-popped Kernels	<u>Number</u> Popped Kernels	<u>Number</u> Un-popped Kernels	Avg. Mass Popped	Avg. Mass Un-popped
Regular									
Dried									
Moist									

Use the Master Data Table to answer the following questions:

1. Compare the average mass of the popped and unpopped popcorn. What do you think accounts for the difference in mass between the popped and unpopped popcorn?

2. Find the ratio of the mass of popped kernels to the total mass of 300 kernels of the regular of popcorn.

Popcorn	Group 1	Group 2	Group 3	Average
Regular				

3. Find the ratio of the average mass of unpopped kernels to the total mass of 300 kernels of the regular popcorn.

Popcorn	Group 1	Group 2	Group 3	Average
Regular				

4. Find the percent of kernels that popped for the regular popcorn by mass not number.

Popcorn	Group 1	Group 2	Group 3	Average
Regular				

5. Find the percent of kernels that were unpopped for the regular popcorn by mass not number.

Popcorn	Group 1	Group 2	Group 3	Average
Regular				

6. Using the results for regular popcorn, answer the following probability questions. Show your work.

What is the probability of getting a popped kernel?	
What is the probability of getting an unpopped kernel?	
Assuming you popped 2 kernels, based on your data, what is the probability of getting <u>at least one</u> popped kernel?	
What is the probability of getting 2 popped kernels?	
What is the probability of getting 0 popped kernels?	
What is the probability of getting 3 popped kernels?	
If you have 5 kernels, what is the probability that 6 will pop?	

MATH USING DRIED AND MOISTENED POPCORN

Group # _____ Type of popcorn _____

Use the Master Data Table to answer the following questions:

1. Find the ratio of mass of dried popped popcorn kernels to total mass for each group.

Popcorn	Group 1	Group 2	Group 3	Average
Dried				

2. Find the ratio of mass of dried popcorn kernels left unpopped to total mass for each trial.

Popcorn	Group 1	Group 2	Group 3	Average
Dried				

3. What is the percent of dried kernels that popped for each group by mass? Round to the nearest whole number. Show your work.

Popcorn	Group 1	Group 2	Group 3	Average
Dried				

4. What is the percent of dried popcorn kernels left unpopped for each group by mass? Round to the nearest whole number. Show your work.

Popcorn	Group 1	Group 2	Group 3	Average
Dried				

5. Find the ratio of mass of moistened popped popcorn kernels to total mass for each group.

Popcorn	Group 1	Group 2	Group 3	Average
Moistened				

6. Find the ratio of mass of moistened popcorn kernels left unpopped to total mass for each group.

Popcorn	Group 1	Group 2	Group 3	Average
Moistened				

7. What is the percent of moistened kernels that popped for each group by mass? Show your work.

Popcorn	Group 1	Group 2	Group 3	Average
Moistened				

8. What is the percent of moistened popcorn kernels left unpopped for each group by mass? Show your work.

Popcorn	Group 1	Group 2	Group 3	Average
Moistened				

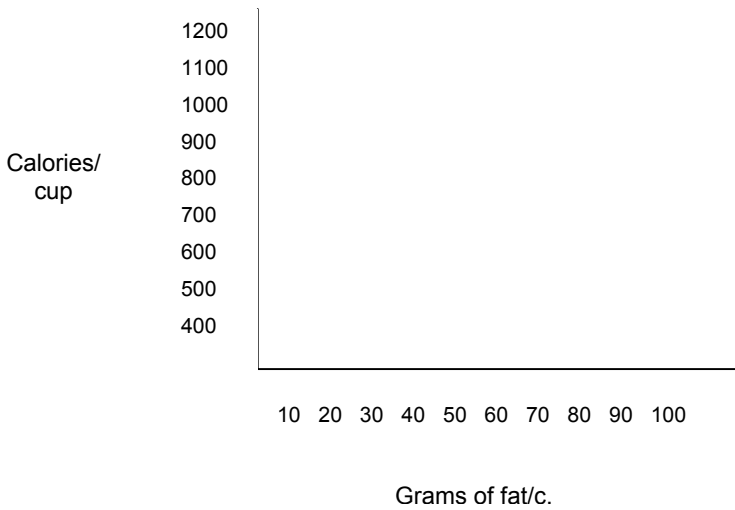
9. Write a statement to explain the differences in results between the dried and moistened popcorn and how each popped? Why do you think these differences occurred?

GRAPH NUTRITIONAL DATA

1. For the popcorn provided and the snack food labels, record the following nutritional data. Data from additional snack foods have been provided.

Snack	Fat grams/cup	Calories/cup
Popcorn		
Potato chips		
Doritos		
Pretzels		
Macadamia nuts	80	962
Mixed nuts	70	875
Snack cakes	40	600
Lunchable snacks	20	500
Pizza	50	700

2. Create a scatterplot using the data above.



3. Do you see any correlation of data on scatterplot? Do you see a positive correlation? Negative correlation?

4. What general statement can be made about nutritional value of the popcorn compared to other snack foods?

5. For the popcorn provided and the snack food labels on page 17-19 in this activity book, record the following nutritional data:

Snack	Fat grams/cup	Carbohydrate grams/cup	Protein grams/cup
Popcorn			
Potato chips			
Doritos			
Pretzels			
Macadamia nuts	80	20	12
Mixed nuts	70	25	10
Snack cakes	40	60	2
Lunchable snacks	20	65	6
Pizza	50	70	3

6. Create a stem-and-leaf plot with each piece of data.

Fat grams/cup

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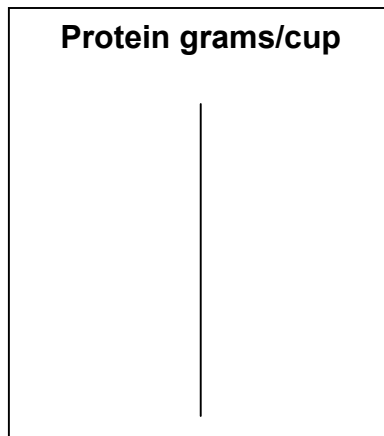
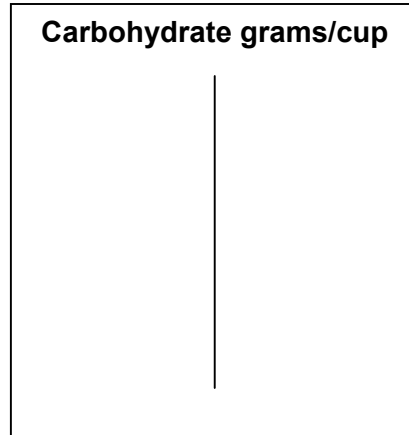
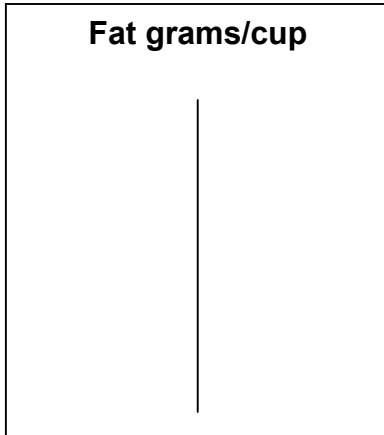
Carbohydrate grams/cup

|

Protein grams/cup

|

7. Rearrange the leaves on each step from least to greatest and write a key to help interpret the plot. An example of a key may be: 6/4 represents 64 grams of fat/cup.



8. Find the mean, median, and mode of the data on the stem and leaf plot showing fat grams/c.

Mean	
Median	
Mode	

9. Find the mean, median, and mode of the data on the stem and leaf plot showing carbohydrate grams/c.

Mean	
Median	
Mode	

10. Find the mean, median, and mode of the data on the stem and leaf plot showing protein grams/c.

Mean	
Median	
Mode	

11. Where are the numbers clustered?

12. What is the amount of grams of fat do most of the snack foods contain?

GLOSSARY

Average:	a number that can be regarded as typical of a group of numbers, calculated by adding the numbers together, then dividing the total by the amount of numbers.
Balance:	a simple mechanical device for finding the mass of objects or samples, often consisting of a pivoted horizontal beam with a pan suspended from each end. Material to be massed is put in one pan and masses of a fixed value are gradually added to the other until the beam returns to the horizontal.
Calories:	a unit of energy-producing potential in food, equal to one large calorie.
Carbohydrates:	an organic compound derived from carbon, hydrogen, and oxygen that is an important source of food and energy for humans and animals. Sugar, starch, and cellulose are carbohydrates.
Compare:	to examine two or more people or things in order to discover similarities and differences between them.
Control:	a subject taking part in an experiment or survey who is not involved in the procedures affecting the rest of the experiment, thus acting as the standard against which the results are compared.
Experiment:	to carry out a scientific test of a theory or process with the use of tests and trials in order to make discoveries.
Fat :	greasy water-insoluble solid or semisolid chemical compound that is among the chief nutritional components of food. Fats are esters of glycerol and fatty acids.
Graph:	a diagram used to indicate relationships between two or more variable quantities. The quantities are measured along two axes, usually at right angles. A graph may consist, for example, of a line joining points plotted between coordinates.

Length:	the distance along something from end to end, or a measurement taken of this distance.
Mass:	the property of an object that is a measure of the amount of matter it contains.
Percent:	Percent literally means “per hundred”. If 20 out of 100 gumballs are red, 20 percent (%) are red.
Positive correlation:	in scatter plot, as you move right, the graph slopes up.
Proportion:	a relationship or ratio between two variables that remains fixed.
Protein:	a complex natural substance that has a high molecular weight and a globular or fibrous structure composed of amino acids linked by peptide bonds. Proteins are essential to the structure and function of all living cells and viruses.
Ratio:	a quotient of two numbers or expressions arrived at by dividing one by the other.
Negative correlation:	in scatter plot, as you move right, the graph slopes down.
No correlation:	no general trend found.
Nutrition:	foods, or the minerals, vitamins, and other nourishing substances that they contain.
Scatter plot:	a visual means in which to see a correlation of data that involves points plotted on a x and y axis.
Stem-and-leaf plot:	a visual means in which to see relationship between various types of data.
Trials:	done as a test or experiment.
Volume:	the size of a three-dimensional space enclosed within or occupied by an object. Volume is measured in cubic units.