Name _____ Period _____ Date _____

Exponential Decay Bead Activity

1. Gathering data: **Cup # _____**

    a. Start with a cup full of 100 beads. Shake the cup and pour the beads onto a piece of paper.

    b. Remove all the beads that have the hole face up. Count the number of beads remaining and record that number in the table for trial #1. Return the remaining beads to the cup. Shake the cup and pour the beads onto the paper.

    c. Repeat step b until the table is filled in or until you run out of beads. Add this same data to the Class Data Table shared with you in Drive.

Trial Number	Number of beads remaining	Decay Factor
0	100	
		>
1		
		>
2		
		>
3		
		>
4		
		>
5		
		>
6		
		>
7		
		>
8		
		>
9		
		>
10		
		>
11		
		>
12		
		>
13		
		>
14		
		>
15		

Calculate decay factors for each of your trials and add them into the table above.

2. Using your data, what is the calculated decay factor? Show below how you calculated this.
   Note: As the experimenter, you can decide which data points you want to include in your calculations as long as you have valid reasoning.

3. What is the decay rate?

4. Write an equation you can use to calculate the number of beads remaining after "x" number of trials.

5. Graph your data: Create a graph of Trials (x) and Total Beads Remaining (y).

6. Thinking about what we know about probability we could have predicted this decay factor. Explain what the probability would be for one of the beads to fall hole side up?

   Based on this probability, what should the **decay factor** be?

7. Compare the number of remaining beads we would expect based on probability to the number of beads the class actually had in the experiment.

   a. In the left-hand column fill in the total number of beads the class had after each trial. (Class totals are in the spreadsheet shared in Drive)

   b. In the right-hand column fill in the number of beads you would expect to remain after each trial based on your **predicted decay factor from #6**.

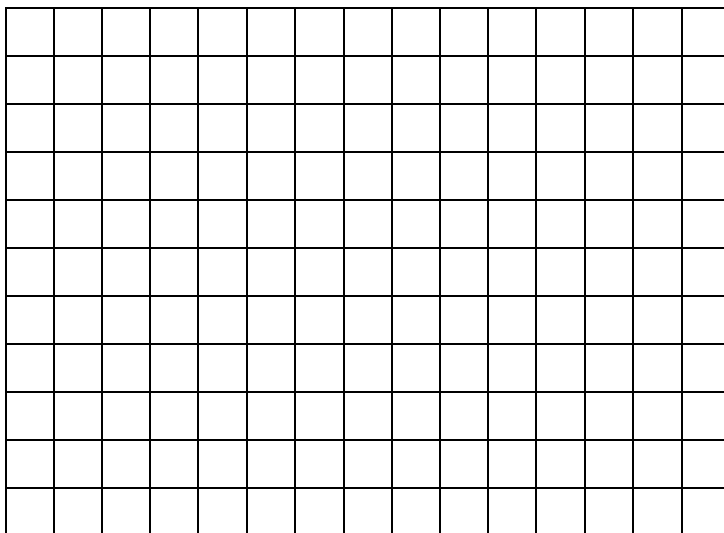| Trial Number	ACTUAL Number of Remaining Beads (class totals)	EXPECTED Number of Beads Remaining based on **decay factor** from #6
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

8. How does the **actual** number of beads remaining calculated above compare to your **expected** amount? Why might there be a difference?

9. Assuming the same decay factor that you calculated for the class data, if there are 43 beads remaining after 10 trials, how many beads were there initially?

10. If we had used Skittles instead of beads and had removed the Skittles with the "S" side up at each trial, what would the **decay rate** have been? (Skittles only have an "S" on one side.)

11. What would the equation be if we started with 100 Skittles?

12. Using two different colors draw below (on the same plot) the expected graphs for the exponential decay relationship if we started with 100 beads, compared to that with 100 Skittles. Explain how the graphs are the same, and how they are different.

Same:

Different: