Key

4-5 Math 1

Name______________________

Date________

Exponential Regression – M & M Experiment

- *I can create and use a line of best fit both by hand (using two points) and using technology (linear or exponential).*

Investigation #1

1. Put 4 M & Ms into your empty cup. This number (4) is record in the table below for trial # 0 (your initial value).
2. Pour them ***gently*** onto the plate (or they'll end up on the floor and then you can't eat them).
3. Count the number that have the "M" showing. Add that number of M & Ms to the plate. Count the ***total*** number of M & Ms now on the plate. Record this data for trial #1.
4. Put the M & Ms currently on the plate back into the ***empty*** cup and continue this process five more times. If you run out of M & Ms on the last trial, just record how many M & Ms you would have put back into the cup.

Investigation #2

1. Count all of your M & Ms and record this below as trial #0 (your initial value).
2. Put all of your M & Ms into the cup and pour them *gently* onto the plate.
3. Remove all the M & Ms with an "M" showing and put them back into the bag.
4. Count the number of ***remaining*** M & Ms back into the cup and continue the process five more times (or until you are out of M & Ms).

Data will vary

Table for Investigation 1

Trial Number	**TOTAL** # of M & Ms
0	**4**
1	6
2	9
3	14
4	21
5	31
6	47

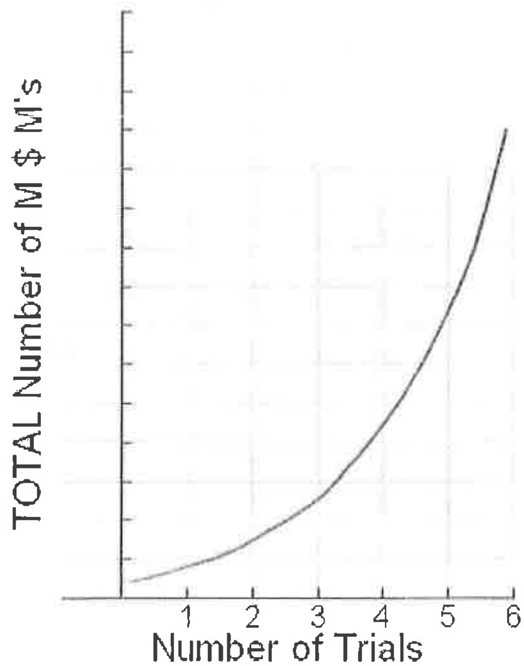
Table for Investigation 2

Trial Number	**REMAINING** # of M & Ms
0	50
1	25
2	13
3	7
4	4
5	2
6	1

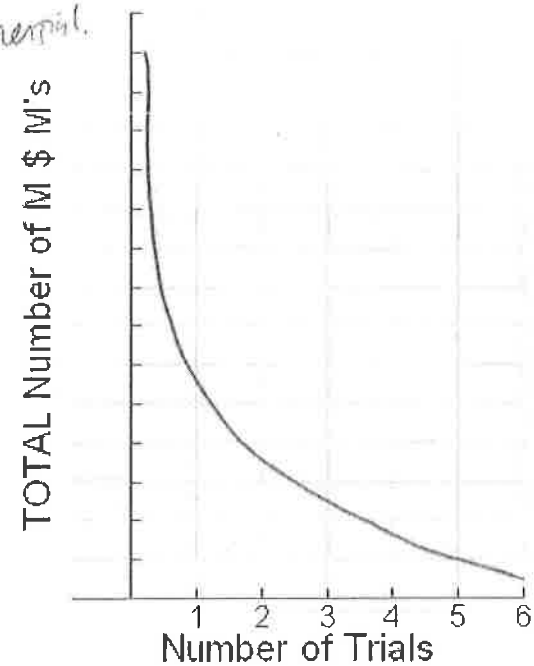
1. Plot the scatterplots for Investigations 1 and 2 below. Be sure to choose an appropriate scale.

Both are exponential.

INVESTIGATION #1



INVESTIGATION #2



2. On your calculator, make a scatterplot of the data from investigation 1. ✓

3. Explain why your data set from investigation 1 is not linear. Refer to what the x and y variables represent in your explanation.

As the trials increase, the # of M & Ms increased at an increasing rate. Not constant!

4. Would a linear regression equation help you accurately predict the number of M & Ms you will have after a certain number of trials? Explain your answer.

No! A prediction line would not be accurate since our data is not linear.

5. Find the **exponential regression** equation using your calculator for both investigations (*Menu 4-1-A*). Write the equations below. ***Round to the nearest thousandth.***

Answers vary based on data set

Investigation 1: $f(x) = 3.998(1.509)^x$

Investigation 2: $f(x) = 48.673(0.526)^x$

6. Graph the exponential regression equation from investigation 1 on your calculator with the scatterplot of the data from investigation 1 (*on data/statistics page – press Menu-4-6-8)*. Does the regression function seem to be a good fit? Why or why not?

Yes! The graph fits our curved data well since it is an exponential equation.

7. Use your regression equation for Investigation 1 to predict the number of M & Ms after Trial 3. How close is this to your actual amount of M & Ms from the experiment? Why does this make sense?

$f(3) = 3.998(1.509)^3 \approx 13.74$ which is very close to my actual data (14). This makes sense since the regression function fits the data well.

8. Use your regression equation for Investigation 1 to predict the number of M & Ms after Trial 30. Do you think this is an accurate prediction? Explain.

$f(30) = 3.998(1.509)^{30} \approx 917,318.14$ M&Ms. This should be a good prediction since the regression function fits so well

9. Use your exponential regression equation from investigation 1 to predict how many trials it would take until you reach 10,000 M & Ms.

$10,000 = 3.998(1.509)^x$ Graph & find intersection

F1 F2

$x \approx 19$ trials

10. Graph the exponential regression equation from investigation 2 on your calculator with the scatterplot of the data from investigation 1. Does this function seem to be a good fit? Why or why not?

Yes, it's a good fit since our data set is exponential as well.

11. Use your exponential regression equations to predict the number of M & Ms for trial number 3 of Investigation 2. How close is your prediction to the actual value?

$f(3) = 48.673(0.526)^3 \approx 7.1$

This is close to the actual value of 7.

12. Use your exponential regression equation to predict the number of M & Ms for trial number 30 in Investigation 2.

$f(30) = 48.673(0.526)^{30} \approx$ 2.12 M&Ms

13. Use your exponential regression equation for Investigation 2 to predict how many trials it will take until you have 0 M & Ms left. Explain your answer.

The equation says this will never happen. This is because exponential decay graphs technically never reach the x-axis (y=0).

OVER →

$f(x) = 3.998(1.509)^x$

14. Based on your regression equation for Investigation 1, what percent of M & Ms did you add each trial? How does this compare to the percent of M & Ms you would expect to add each time?

Added about 51%. We expect to add 50%. each time. Half should have Ms showing.

$0.509 \approx 0.51 = 51\%$

15. Based on your regression equation for Investigation 2, what percent of M & Ms did you remove each trial? How does this compare to the percent of M & Ms you would expect to remove each time?

$f(x) = 48.673(0.526)^x$

We removed about 52.6% each time. We expect to remove about 50% each time based on the fact that half would have Ms showing each trial.