Exponential Growth and Decay of M&Ms

Materials:
3 large bags of M&Ms
6 plastic plates
class set of TI-84 Graphing Calculators
handout

Group students in pairs. Each pair should receive two plastic plates, a large bag of M&Ms and two calculators.

The Classic M-&-M Spill (Decay) Experiment
1. Count out 100 M&Ms from the bag.

2. Place M&Ms between two plates, shake, and then count the number with "M" side up. Set aside all M&Ms that are not "M" side up. Record both the **shake number** and **number of M&Ms remaining on the plate** in the table below.

shake number	number of M&Ms remaining on plate
1	100
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	

3. Repeat step 2 until there are no more M&Ms left.

4. Enter the **shake number** and **number of M&Ms remaining** respectively into lists **L1** and **L2** in the calculator. [Note – do not enter the final pair of data values when number of M&Ms equals 0]

    -   To enter data in lists, type STAT >> EDIT

5. Construct a scatterplot of the data.
   - Use [2nd]-[STATPLOT] to set Plot1 up as a scatterplot of the data, with **L1** for the Xlist, and **L2** for the Ylist.
     - Type **2ND** >> **STAT PLOT** >> **ENTER**
     - Highlight **ON**
     - Under Type, choose the scatterplot (first graph)
     - Make sure Xlist is L1 and Ylist is L2
   - Set up the **[WINDOW]** with appropriate values for X_{min}, X_{max}, Y_{min} and Y_{max}.
   - Type **[GRAPH]** to create the scatterplot representing the data in your lists.

6. Describe the relationship that exists between x and y? _____
   - As the value of x increases, the value of y _____.
   - This rate of _____ [increase / decrease] becomes _____ [greater / less] as values of x increase.

7. Construct a function that models this experiment. If you start with 100 M&Ms, how many would you expect to land "M" side up _____ on shake number 1?   Using the number of M&Ms that you expected to land "M" side up in shake number 1, how many would you expect to land "M" side up on shake number 2? Continue the pattern.

   shake number   number of M&Ms remaining

       1

       2

       3

       4

   The function that models this experiment is _____.
   Interpret the values (constants and variables) of your function.

8. Graph this function along with your scatterplot from step 5. On your calculator
   - Type **Y=**
   - The expression of your function that you found in the previous step in terms of X
   - Type **GRAPH**

9. Describe this function.

Exponential Growth Experiment

1. Start with 4 M&Ms from the bag.

2. Place the M&Ms between two plates, shake, and then record the **shake number** and the **number of M&Ms with "M" side up** in the table below.

shake number	total number of M&Ms	M&Ms with an M face up
1	4	
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

3. Add the **number of M&Ms with "M" side up** to the number of M&Ms that you shook in the previous step for a new **total number of M&Ms**.

4. Repeat steps 2 and 3 until you have exhausted all M&Ms from the bag.

5. Enter the **shake number** and **the total number of M&Ms** respectively into lists **L1** and **L2** in the calculator.

   - To enter data in lists, type STAT >> EDIT

6. Construct a scatterplot of the data.
   - Use [2nd]-[STATPLOT] to set Plot1 up as a scatterplot of the data, with **L1** for the Xlist, and **L2** for the Ylist.
     - Type [2nd]>> [**STAT PLOT**] >> [**ENTER**]
     - Highlight **ON**
     - Under Type, choose the scatterplot (first graph)
     - Make sure Xlist is L1 and Ylist is L2
   - Set up the **[WINDOW]** with appropriate values for X_{min}, X_{max}, Y_{min} and Y_{max}.
   - Type **[GRAPH]** to create the scatterplot representing the data in your lists.

7. What type of relationship exists between x and y? _____
   - As the value of x increases, the value of y _____.
   - This rate of _____ [increase / decrease] becomes _____ [greater / less] as values of x increase.

8. Construct a function that models this experiment. If you start with **k** M&Ms on the first shake, how many total M&Ms would you expect to have on the second shake?   Using the total number of M&Ms that you expected to have in shake number 2, how many total M&Ms would you expect to have in shake number 3? Continue the pattern.

   <u>shake number</u>   <u>total number of M&Ms</u>

      1

      2

      3

      4

   The function that models this experiment is _____.

   Interpret the values (constants and variables) of your function.

9. Graph this function along with your scatterplot from step 5. On your calculator

   - Type **Y=**
   - The expression of your function that you found in the previous step in terms of X
   - Type **GRAPH**

10. Describe this function.