DATA COLLECTION AND COMPARISON

Start with the candy coated chocolate candies in the bag you are given. Count the total number of candies in your bag. This is your initial value.

(a) Pour the candies onto the paper plate.
(b) Remove any of the candies that are blank side up.
(c) Record the number of candies with the letter “M” facing up and put them back in the zip-lock bag.
(d) Repeat steps a-c until there are no candies left over.

1) Create a chart in the space provided below and record the number of pours and candies left.
   Remember to decide what your independent variable and dependent variable represent in this project.

\[
\begin{array}{c|cccccc}
\hline
x & 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\
\hline
y & 115 & 52 & 28 & 14 & 6 & 2 & 1 & 0 \\
\hline
\end{array}
\]

Since each experiment can possibly yield different results, the following answers will vary from group to group. Here is the data from an experiment I conducted.

2) Now plot the data from your table. Consider if the data should be represented as a continuous or discontinuous graph.

3) Theoretically, would the results of your experiment have been significantly different if you removed the candies with the “M” side up each time? Explain your reasoning.

The points would have different y-values possibly, but the overall shape of the graph would be the same. The number of candies would still be decreasing (decrem) exponentially.
4) Referring to your table in #1, now find the ratio of the number of candies leftover from the first pour over the initial count of candies. Then find the ratio of the number of candies leftover from the second pour over the number of candies leftover from the first pour. Continue finding ratios in this manner until you have exhausted your data. What do you notice about these ratios?

\[
\frac{52}{115} \approx 0.452 \\
\frac{28}{52} \approx 0.538 \\
\frac{14}{28} = 0.5 \\
\frac{6}{14} \approx 0.429 \\
\frac{2}{6} \approx 0.333 \\
\frac{1}{2} = 0.5
\]

These values are all relatively close.

5) Now find the average of these ratios.

\[
\frac{0.452 + 0.538 + 0.5 + 0.429 + 0.333 + 0.5}{6} \approx 0.459
\]

6) Consider the case where you start with 1,000 candies. Assuming that the number of candies would decrease in the same manner as your experiment, how many candies would be left after one pour? After two pours? After \( n \) pours? Hint: Use the value from #5.

\[
1^{st} \text{ Pour: } 1000 \cdot (0.459) = 457 \\
2^{nd} \text{ Pour: } 1000 \cdot (0.459) \cdot (0.459) = 1000 \cdot (0.459)^2 = 457 \cdot (0.459) = 210.681 \\
1^{st} \text{ Pour: } 1000 \cdot (0.459) (0.459) \ldots (0.459) = 1000 (0.459)^n
\]

7) Develop a function that relates the number of leftover candies to the number of pours, starting with 1,000 candies. If you start with 57,874,210 candies, will your function be different? Explain your reasoning.

\[
f(x) = 1000 (0.459)^x \\
g(x) = 57,874,210 (0.459)^x
\]

The only difference is the initial value of candies.

Suggested Homework Problems
Sec: 1.5: 2, 5, 13, 16, 22, 25