**Learning Objective:** We have been learning about recursively defined sequences. Here, we will generate data that will resemble those patterns and find explicit equations to model the data.

1. Pick your favorite number from 1 to 6 to use as a starting value. Record your number as the 0-term under running product total.

2. Using the Probability Simulator on your calculator, roll a dice 10 times (1 at a time) and record the data on the table provided. The directions are as follows

a. Press APPS

b. Arrow Down to 9 or 0: Prob Sim and Press Enter

c. Press Enter again

d. Arrow Down to 2: Roll Dice and Press Enter

e. Press Roll (window key) and record the first roll.

f. Press +1 (window key) to roll the dice again and record the second roll.

g. Continue to press +1 (window key) to roll 8 more times and record each roll

**3. Keep a running product total by multiplying each roll value to the previous product total**.

|  |  |  |
| --- | --- | --- |
| Term #OrRoll # | DiceValue | Running Product Total |
| 0 | XXXX |  |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |

4. Enter the ***Roll #* (not dice value)** into L1 and enter the **product total** into L2. Create a scatter plot of the data. Press 2nd *Y=*, enter, enter, to turn on the scatter plot. Press window and set Xmin = 0, Xmax = 7, Ymin = 0, and Ymax = **Higher than the ending product total.** Press Graph to view your graph. Label your axes and plot the points on the coordinate plane.

5. What observations can you make about the graph? Give a minimum of 2.

6. You will now find the exponential equation to fit the data. Press Stat, arrow over to Calc, Choose #0 which is exponential regression. Press Enter several times. Round the *a*, *b,* and *r* values to three significant digits.

a = \_\_\_\_\_\_\_\_\_\_\_\_ b = \_\_\_\_\_\_\_\_\_\_\_\_ r = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. Substitute the values for *a* and *b* into the equation $y=a\left(b\right)^{x}$ and copy the equation here.

8. Press *Y =* and enter the equation into your calculator. Return to the graph and copy the new addition to your graph in #4. The graph will have the ordered pair $(0, a)$, so be sure to draw the graph through that point.

9. Does the *y* - intercept, *a*, correspond (closely) to any numbers in the table? Use this question to explain what you think the *a* value represents in context.

10. The geometric mean of the possible dice rolls is approximately 2.993 because $\sqrt[6]{1∙2∙3∙4∙5∙6}≈2.993$ Use that knowledge to interpret what the *b* value represents in context.

11. Research the *r* – value of an exponential regression equation and summarize its significance.

12. Interpret the *r* – value from #6 in this activity.