**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 sum 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 sum total by adding each roll value to the previous total**.

|  |  |  |
| --- | --- | --- |
| Term #OrRoll # | DiceValue | Running Sum Total |
| 0 | XXXX |  |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |
| 9 |  |  |
| 10 |  |  |

4. Enter the ***Roll #* (not dice value)** into L1 and enter the **sum 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 = 11, Ymin = 0, and Ymax = 50. Press Graph to view your graph. Label your axes and plot the points on the coordinate plane.

5. Calculate the mean of List 1 (L1) (Roll #)

6. Calculate the mean of List 2 (L2) (sum totals)

7. Plot the mean point (ordered pair) on the coordinate plane.

8. Turn diagnostics on by pressing 2nd 0 (catalog), arrowing down to DiagnosticOn and press Enter twice.

8. You will now find the equation to fit the data. Press Stat, arrow over to Calc, Choose #8 which is linear regression. Press Enter several times. Round the *a*, *b,* and *r* values to three significant digits.

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

9. Substitute the values for *a* and *b* into the equation *y = a + bx* and copy the equation here.

10. Press *Y =* and enter the equation into your calculator. Return to the graph and copy the new addition to your graph in #4. **Make sure the line goes through the mean point you plotted in question #11 the *a*-value which is the *y*-intercept of the line.**

11. 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.

12. The arithmetic mean of the possible dice rolls is 3.5 because $\frac{1+2+3+4+5+6}{6}=3.5$ Use that knowledge to interpret what the *b* value represents in context.

13. Research the *r* – value (correlation coefficient) of a linear regression equation and summarize its significance.

14. Interpret the *r* – value from #8 in this activity.