LESSON #2 - How Strong is Spaghetti?

Objective: To find a linear function that fits a set of real world data.

Procedure:

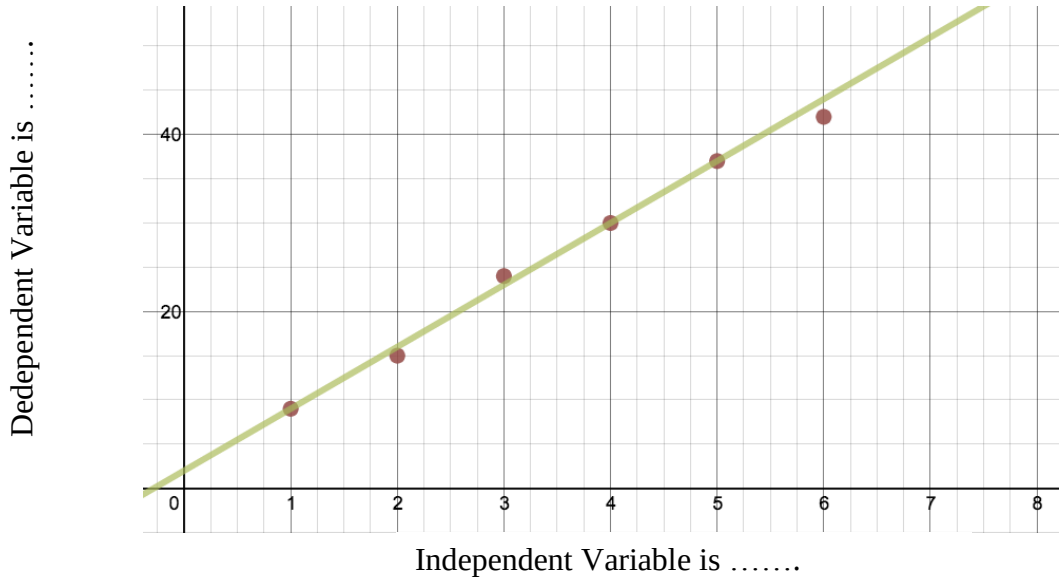
- Puncture two holes in the top of the cup and thread a string through the holes. Tie the ends of the string together so that the string acts like a handle.
- Place one piece of spaghetti under the string so that the cup hangs from the middle of the piece of spaghetti. One person should hold both ends of the spaghetti.
- Another person should begin to add weights to the cup. When the spaghetti breaks, record the number of weights needed to break the spaghetti.
- After you have broken one piece of spaghetti, use two new pieces and again place weights in the cup until the spaghetti breaks. Repeat the experiment until the table below is completed.

Data Table and Exploration:

1. Complete the table below based upon your experiments.

Pieces of Spaghetti	Number of Weights Needed
1	8
2	15
3	24
4	30
5	37
6	42

2. Create a graphical display for your data, with appropriate labels and indicate the independent and dependent variables. **A2,C2**



3. Is your data linear? Justify your response in at least two ways. **K2**

   Here are 2 reasons why I think the data is non-linear (or linear). Reason number one is … Reason number two is …

4. Suppose the data does have a linear relationship (*regardless of your answer in question 2)*.

   a. Determine the equation of the line for this data. **K1**

      I think that the equation of my line of best fit is y = 7x + 2

   b. What is the slope of this line? Comment on what this value means realistically. **K1, A1**

      Two points on my line of best fit were (7,51) and (2,16), so the slope is $m = \frac{51-16}{7-2} = \frac{35}{5} = 7$. What I think the slope means is …….

   c. What is the y-intercept of this line? Comment on what this value means realistically. **A2**

      The y-intercept of my line is (0,2). What I think the y-intercept means is ……

   d. Using your linear model, how many weights could you add for 10 pieces of spaghetti? Confirm your response using the equation and the graph. **K2, A1**

      If I used 10 pieces of spaghetti, I would need y = 7(10) + 2 = 72 pieces of spaghetti

   e. Using your linear model, how many pieces of spaghetti would hold 50 weights? Confirm your response using the equation and the graph. **K2, A1**

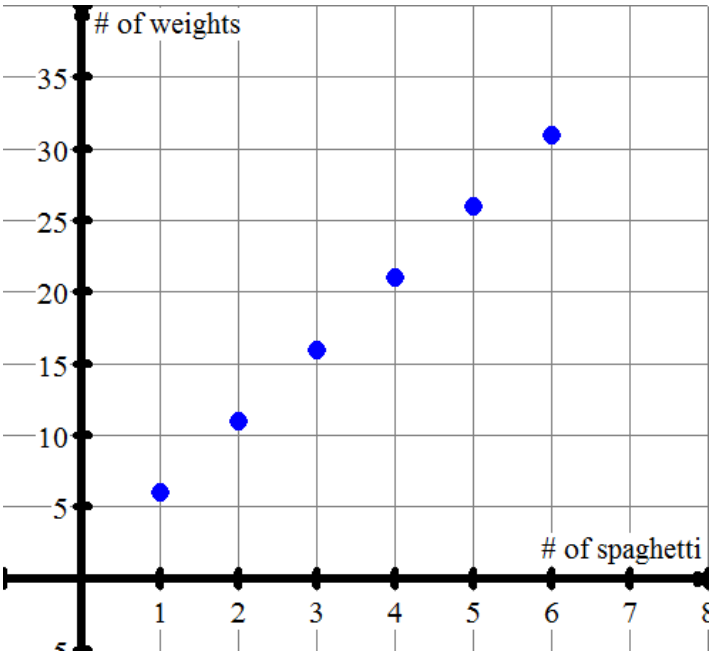
      If my bridge had supported 50 weights, I would have used about 7 pieces of spaghetti as I see that the line goes through the point (7,51). I used my equation to confirm this as follows:
      50 = 7x + 2
      48=7x
      48/7 = 6 6/7 = 7 pieces

5. If your group had decided to use spaghettini instead of spaghetti, describe how you think the linear model would change. **T2, C1**

   The model (meaning the equation) would have changed because the y-intercept/slope would now be ….. and one reason why I think that would be …..

6. Alexa's group also conducted this experiment of the strength of spaghetti, using a tin tray and dice for weights. Alexa's group drew this graph from their investigation.

a. How would this graph differ if your group had used a heavy plastic tray instead of a tin tray? Sketch the graph that would result from your experiment. Alexa's original graph using a tin tray is drawn as a dotted line in the reference graph. Explain your reasoning. **T2, C2**



If we would have used a heavy plastic container for this experiment, then the new graph would appear like …….. The reason for this change would be because ……

b. How would the graph differ if her group had still used a tin tray, but M&Ms instead of dice? Sketch the graph that would result. Again, Alexa's original graph using a tin tray is draw in as a dotted line as a reference graph. Explain your reasoning. **T2, C2**

If we would have used MM's instead of dice for this experiment, then the new graph would appear like …….. The reason for this change would be because ……