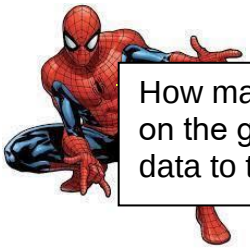
Name:_____ Mod: _____ Date:_____

# How many rubber bands does Spider-Man need?



How many rubber bands should we attach to Spider-Man to ensure that he lands safely on the ground after swinging from the top of the old café (515 cm)? Let's collect some data to try and figure this out.

Complete the table:

| # Rubber bands | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| Distance traveled | | | | | | | | |

Use your group's data to complete the following:

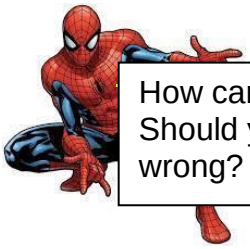
1. Identify the explanatory and response variables.

2. How many variables do we have? Are they categorical or quantitative?

3. Make a scatterplot of the data and copy it below.

4. Describe the relationship displayed in the scatterplot (Direction, Strength, Outliers).

# Will Spider-Man Save the Day? (Day 2)



How can we be sure that the web we make Spider-man will keep him safe?
Should you be worried if you used the wrong units, chose the wrong axes, or measured wrong?

Copy your group's data table below:

| # Rubber bands | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| Distance traveled | | | | | | | | |

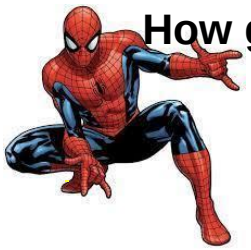
Use your group's data to complete the following:

1. Calculate and interpret the correlation coefficient for your group's data.

2. Do you think we can use these data to predict the number of rubber bands it will take to land Spider-Man safely on the ground? Why or why not?

3. Add the point (15 rubber bands, 1500 cm) to your scatterplot. How do you think this outlier will affect the correlation? What is the new *r*?

4. If you were to convert your distances to inches, how do you think it would affect the correlation? Divide your distances by 2.54 and re-calculate the correlation coefficient. Did it change?



# How good are the predictions for Spider-Man? (Day 3)

Here is the data from one of the groups. The group forgot to record their measurement for 5 rubber bands.

| Number of rubber bands | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| Distance traveled (cm) | 25 | 32 | 41 | 49 | 55 | ? | 69 | 78 |

1. Calculate the Least Squares Regression Line. This is the line that best models the data. Write the equation below.

2. Use the regression line to predict the distance Spider-Man travels for 5 rubber bands. Show work.

3. One of the group members later found the measurement for 5 rubber bands was 64 cm. Was the prediction from #2 too high or too low? How far off?

4. Predict the distance that Spider-Man would travel if the group used 20 rubber bands. Would you trust this prediction more or less than the prediction you made in #2?

5. What is the y-intercept of the equation of the regression line? What does it mean?

6. What is the slope of the equation of the regression line? What does it mean?

# Spider-Man Homecoming (Day 4)

It's finally time for Spidey to make his daring jump from the top of the Old Café (515 cm). Before he makes his feat, we will use everything we've learned this chapter to calculate the best possible web length.

Copy your group's data again:

| # Rubber bands | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| Distance traveled | | | | | | | | |

Use your group's data to complete the following:

1. Identify which variable is the explanatory variable and which is the response variable?

2. Copy and paste the scatterplot.

3. Describe the relationship you see in the graph by strength and direction.

4. Calculate and interpret the correlation coefficient, *r* value, of your distribution and interpret it.

5. What would happen to the value of the correlation (r) if you switched the x and y axes?

6. Write your least squares regression line for your data below:

7. What is the slope of your LSRL? Interpret the slope.

8. What is the *y*-intercept of your line? Interpret the value. Is it meaningful?

9. Find the $r^2$ value and interpret it.

10. Use the LSRL to calculate and interpret the residual for 4 rubber bands.

11. Copy and paste the residual plot for your LSRL.

12. Is the linear regression an appropriate model? Explain.

13. Transform the data to *y* vs. $x^2$ to create a quadratic model. Write the equation of the Linear Model of the transformed variables below.

14. Record the $r^2$ value for the new regression.

15. Calculate and interpret the residual using the quadratic regression for 4 rubber bands.

16. Copy and paste residual plot for the quadratic regression.

17. Transform the data to log *y* vs. *x* to create a logarithmic model. Write the equation of the linear model of the transformed variables below.

18. Record the $r^2$ value for the new regression.

19. Copy and paste the residual plot for the exponential regression.

20. Which model (linear, quadratic, or logarithmic) is best? Why do you think so?

21. Use the model you feel is best to predict the number of rubber bands Spider-Man will need in order to land safely from his jump (515 cm).