Unit 4 – Modeling a Business

Linear Regression – NOTES

Name: _____ Date: _____

- Line of best fit: The line that gives the best general slope and location of all of the points in the scatterplot
    - Also called: "Least Squares Line", "Line of Regression", and "Regression Line"

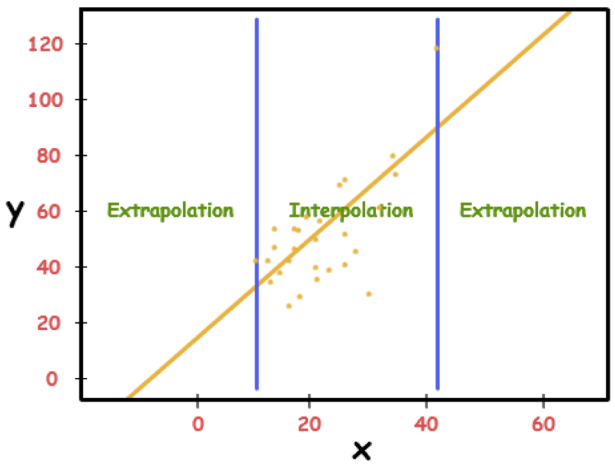
- Domain: All of the *x*-values of the data

- Range: All of the *y*-values of the data

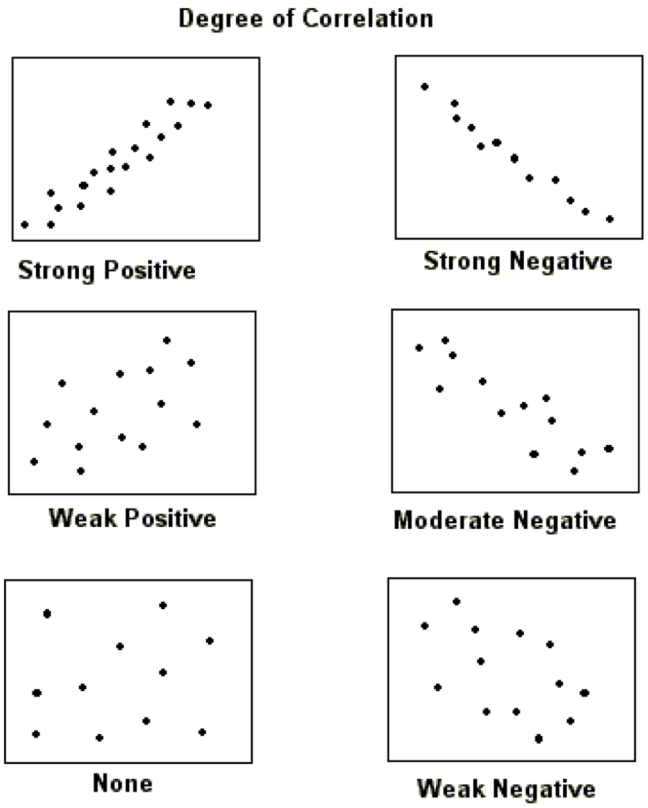
    * reminder: each coordinate is (*x*, *y*)

- Interpolation: When you use the line of best fit to estimate a point WITHIN your data set

- Extrapolation: When you use the line of best fit to estimate a point BEYOND your data set



- Correlation coefficient: *r*: The number that tells you the strength of the correlation. This will always be between -1 and +1.

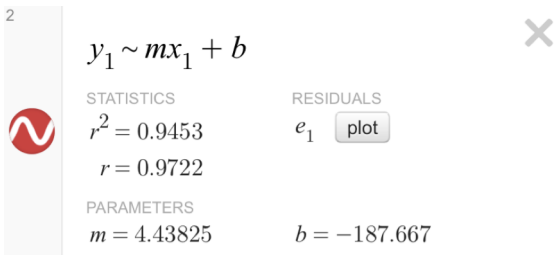


Example 1: Find the equation of the linear regression line for Rachael's water bottle sales scatterplot. The points are given below.

(65, 102), (71 133), (79, 144), (80, 161), (86, 191), (86, 207), (91, 235), (95, 237), (100, 243)

Step 1: Type your data set into a table in desmos.

Step 2: In the box below your table, type in "y_1~mx_1+b". This should show up as: "$y_1 \sim mx_1 + b$" and additional information should appear as shown below:



Using the *m*-value and *b*-value, your equation is $y = 4.43825x + -187.667$

Example 2: Interpret the slope as a rate for Rachael's linear regression line. Use the equation from example 1.

The slope of the line is the *m*-value, which is 4.43825. In Rachael's situation, this means that every time the temperature increases by 1°F, she'll sell 4.43825 more bottles of water.

Example 3: Rachael is stocking her concession stand for a day in which the temperature is expected to reach 106°F. How many water bottles should she pack?

Use the line of best fit equation to calculate this estimation. Plug in 106 for *x* and solve for *y*.

$y = 4.43825x + -187.667$

$y = 4.43825(106) + -187.667$

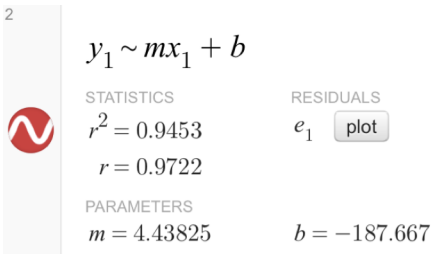
$y = 4.43825x + -187.667$

$y = 470.4545 + -187.667$

$y = 282.7875$

So, if the temperature were to be 106°F, she would sell about 283 bottles of water.

Example 4: Find the correlation coefficient to the nearest hundredth for the regression for Rachael's data. Interpret the correlation coefficient.



The correlation coefficient is the given *r*-value of 0.9722. Because this number is very close to +1, we can say that the relationship between how hot it is outside and the number of bottles of water she sells is a very strong, positive relationship.