## Day 36: How to draw a Line of Best Fit

Yesterday we made the following scatterplot and line of best fit showing how many hours students watched television the night before their physics test. Today we will be learning how to write an equation of that line.

# of Hours of TV Watched	2	3	3.5	5	6	8
Test Score	85	79	80	68	62	57

Write an equation using two points **on** the line. The points do not have to represent actual data pairs, but they must lie on the line of best fit.

Step 1: Choose 2 points (_____ , _____) and (_____ , _____)
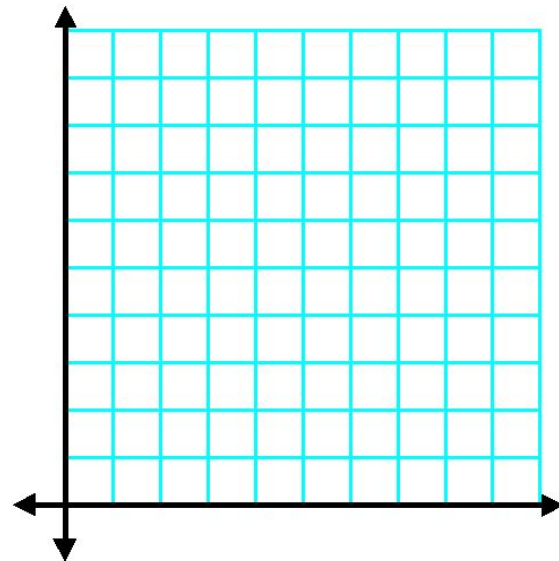
Step 2: Find the slope with the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$.

Step 3: Choose a new point (doesn't matter) and write an equation using point-slope form. $y - y_1 = m(x - x_1)$

Step 4: Convert to slope-intercept form (y=mx+b) by solving for y.

Step 5: Check that the equation makes sense by comparing it to the graph.

Analysis:

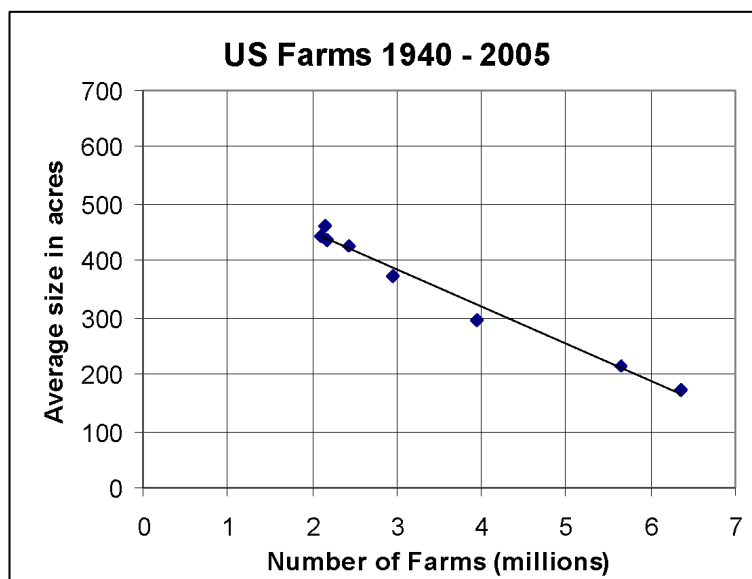| 1. Use your equation to predict a score of a student who watched 2.5 hours of TV.	2. Use your equation to predict the number of hours of TV watched for a student who scored 70

1) Carmela made a scatterplot (at right) comparing the number of farms in the United States to the average size of the farms.

Identify the variables, and then answer the question:

A. independent, *x*: _____

B. dependent, *y*: _____

C. Describe the correlation of the data in the scatterplot.

US Farms 1940 - 2005

Average size in acres (y-axis: 0, 100, 200, 300, 400, 500, 600, 700)

Number of Farms (millions) (x-axis: 0, 1, 2, 3, 4, 5, 6, 7)

D. Write an equation of the line of best fit on the scatterplot.

Step 1: Choose 2 points (_____ , _____) and (_____ , _____)

Step 2: Find the slope with the slope formula $m = \dfrac{y_2 - y_1}{x_2 - x_1}$.

Step 3: Choose a new point (doesn't matter) and write an equation using point-slope form. $y - y_1 = m(x - x_1)$

Step 4: Convert to slope-intercept form (y=mx+b) by solving for y.

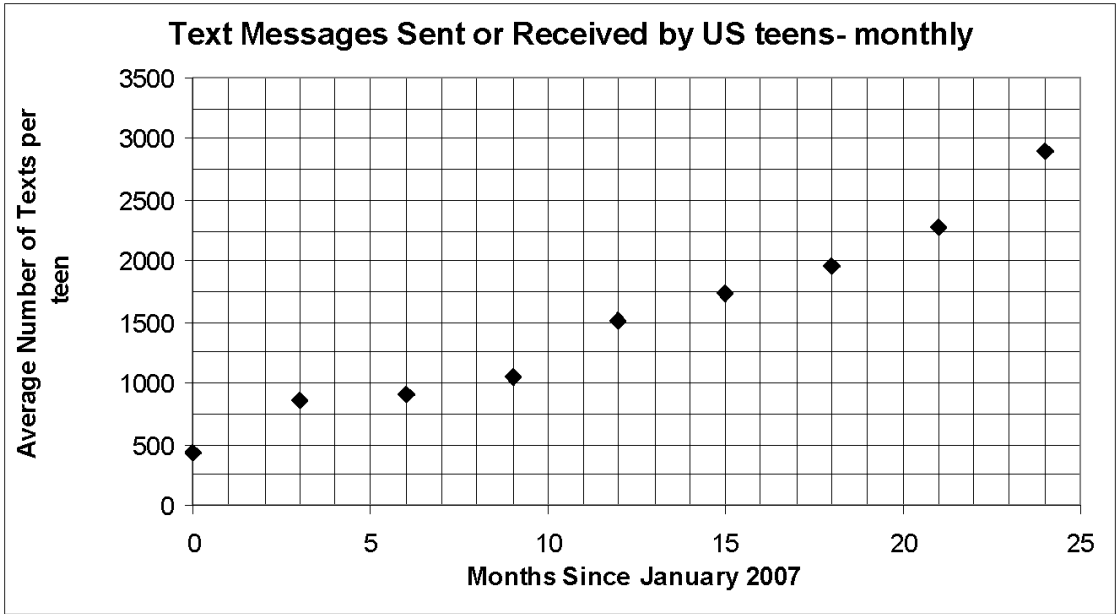**Step 5:** Check that the equation makes sense by comparing it to the graph.

Analysis:

1. Use your equation to predict the average size of a farm if there were 4.5 million farms.	2. Use your equation to predict number of farms with an average size of 300 acres.

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2. The following is a scatterplot from Pew Research Center in 2009.

Text Messages Sent or Received by US teens- monthly

(y-axis: Average Number of Texts per teen; x-axis: Months Since January 2007)

A. Describe the correlation of the data: _____

B. Draw a line of best fit (Remember, about half the points should be above, and about half below, the line.)

C. Write an equation of the line of best fit using the five steps we learned on the previous pages.

D. Using your equation, predict the average number of texts 19 months after January 2007.

E. Using your equation, predict when the average number of texts will exceed 5000.

Correlation vs. Causation: CORRELATION IS NOT CAUSATION.

Correlation: Two variables tend to be related to each other. The correlation may just be a coincidence.	Causation: One variable CAUSES the other to change. Causation is NOT a coincidence. Causation has a DIRECTION (A causes B, not the other way around)
Positive Correlation: When one variable increases, so does the other. When one decreases, so does the other. (Think of a line with positive slope).	Negative Correlation: When one variable increases, the other decreases. When one decreases, the other increases. (Think negative slope).

**Example:** # of Shark Bites and gallons of ice cream sold per month in the USA.

The # of shark bites tends to increase as the number of gallons of ice cream sold increases. When more ice cream is sold, more people are bitten by sharks. Similarly, when very little ice cream is sold, very few people are bitten by sharks.

This is a perfect example of POSITIVE CORRELATION. When one variable goes up, so does the other. When one decreases, so does the other. The two variables are related to each other.

However, this is NOT causation. There is no way that shark bites are causing people to buy more ice cream. There is also no way that buying more ice cream makes you more likely to be bitten (unless it gives you a tummy ache and you can't swim away… nvm)

So…. what's the explanation? Is there something ELSE going on that explains both shark bites and ice cream sales?

Answer: BOTH shark bites and ice cream sales increase in summer, and decrease in winter. It is all about the weather. The two variables don't cause each other to change. They are merely correlated.
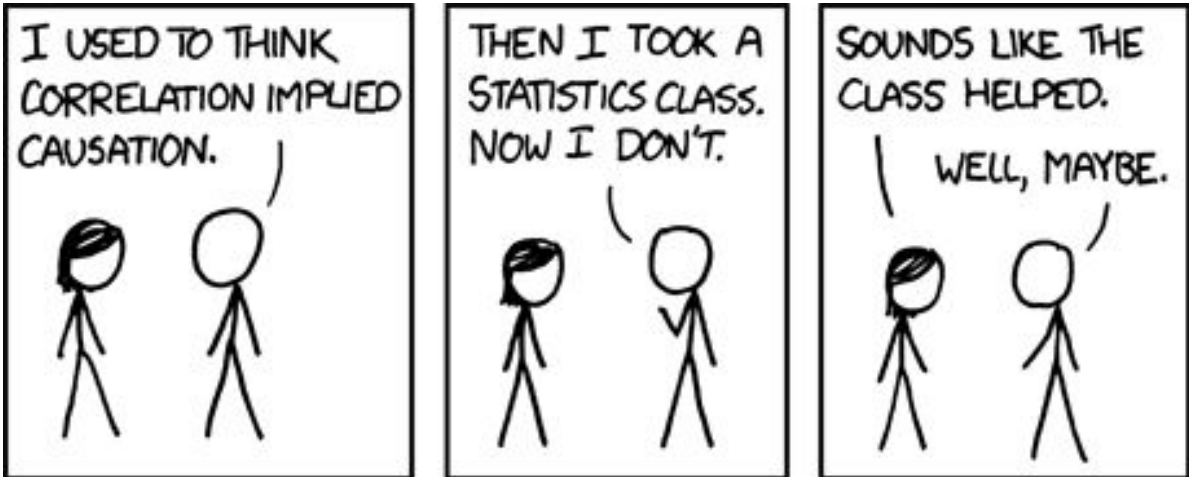
Write a sentence that explains the punch line of the comic strip:

You try: Describe the correlation as POSITIVE or NEGATIVE. Then, decide if it is truly CAUSATION or merely CORRELATION. Indicate the direction of the Causation (e.g. warm weather causes shark bites)

1. # of hours spent studying for a test and the grade on that test.

2. # of Pumpkin Spice Lattes drank and # of calories consumed

3. # of snowboarding injuries and # of hot chocolates sold (on Mt. Hood)

4. # of vitamin supplements you eat and lifespan

5. Average # of Hours of social media use and self-esteem

6. Average height of an NBA team and # of wins for the season