

How many lights are on the tree?

Warm Up



- Find the sum of ALL of the terms in this sequence:
- 1, 2, 3, 4, 5, ..., 998, 999, 1000.

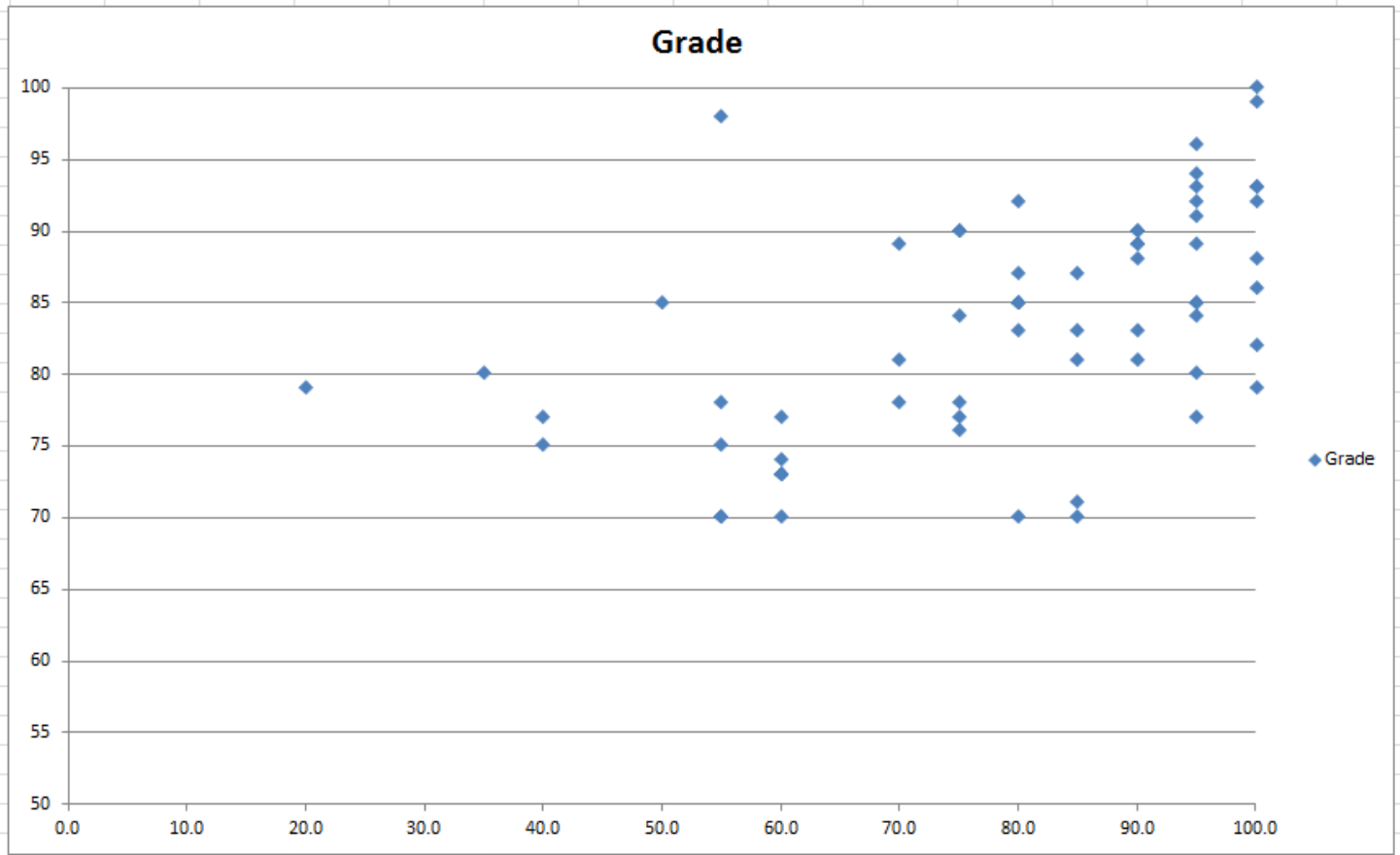


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Put this in Linear Section!

Scatter Plot – HW % vs. Grades

- **Do you think there is a relationship between the % of homework assignments and your grade in the class?**



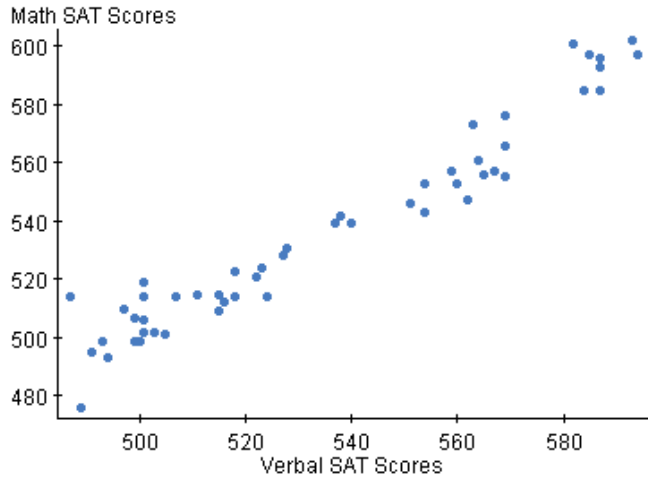
Class Grade

% of HW turned in

- **Scatter Plot** – Shows the relationship between 2 variables
 - Each “dot” is 1 piece of data
- Examples – height vs shoe size
 - Amount of time studying vs. test grade
 - # of hours of sleep and GPA
 - Days left in school and temperature outside

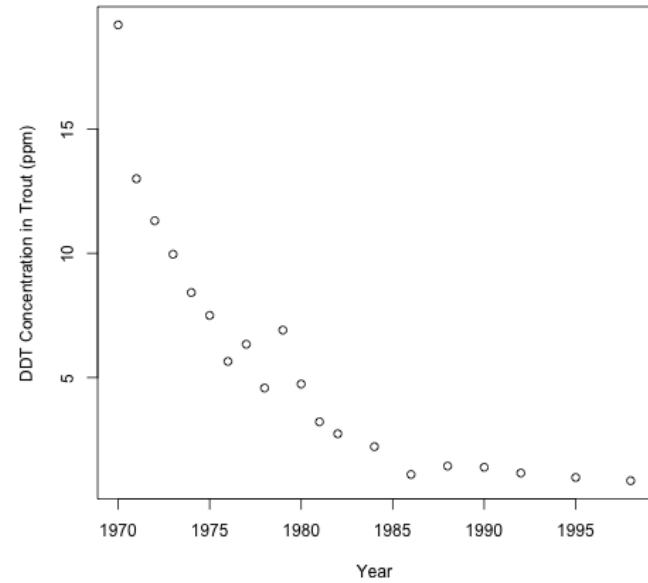
Linear

SAT Scores

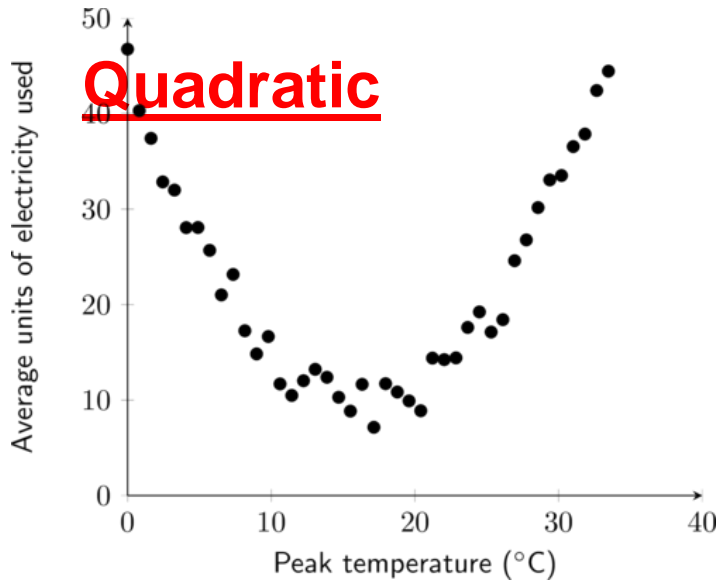


Exponential

DDT Concentration in Trout in Lake Michigan



Quadratic

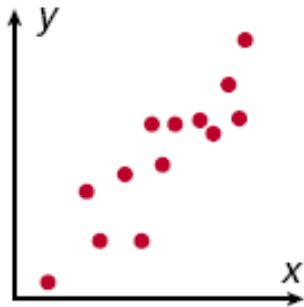


- Types of Correlations

Correlations

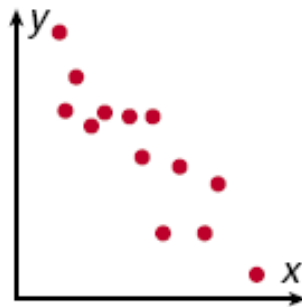
Positive Correlation

Both sets of data values increase.



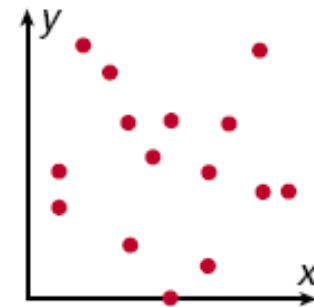
Negative Correlation

One set of data values increases as the other set decreases.



No Correlation

There is no relationship between the data sets.



Identify the correlation you would expect to see between the pair of data sets. Explain.

the average temperature in a city and the number of speeding tickets given in the city

You would expect to see no correlation. The number of speeding tickets has nothing to do with the temperature.

Identify the correlation you would expect to see between the pair of data sets. Explain.

the number of people in an audience and ticket sales

You would expect to see a positive correlation. As the number of people in the audience increases, ticket sales increase.

Identify the correlation you would expect to see between the pair of data sets. Explain.

a runner's time and the distance to the finish line

You would expect to see a negative correlation. As a runner's time increases, the distance to the finish line decreases.

Identify the type of correlation you would expect to see between the pair of data sets. Explain.

the temperature in Houston and the number of cars sold in Boston

You would expect to see no correlation. The temperature in Houston has nothing to do with the number of cars sold in Boston.

Identify the type of correlation you would expect to see between the pair of data sets. Explain.

the number of members in a family and the size of the family's grocery bill

You would expect to see positive correlation. As the number of members in a family increases, the size of the grocery bill increases.

Identify the type of correlation you would expect to see between the pair of data sets. Explain.

the number of times you sharpen your pencil and the length of your pencil

You would expect to see a negative correlation. As the number of times you sharpen your pencil increases, the length of your pencil decreases.

What kind of correlation would you expect?

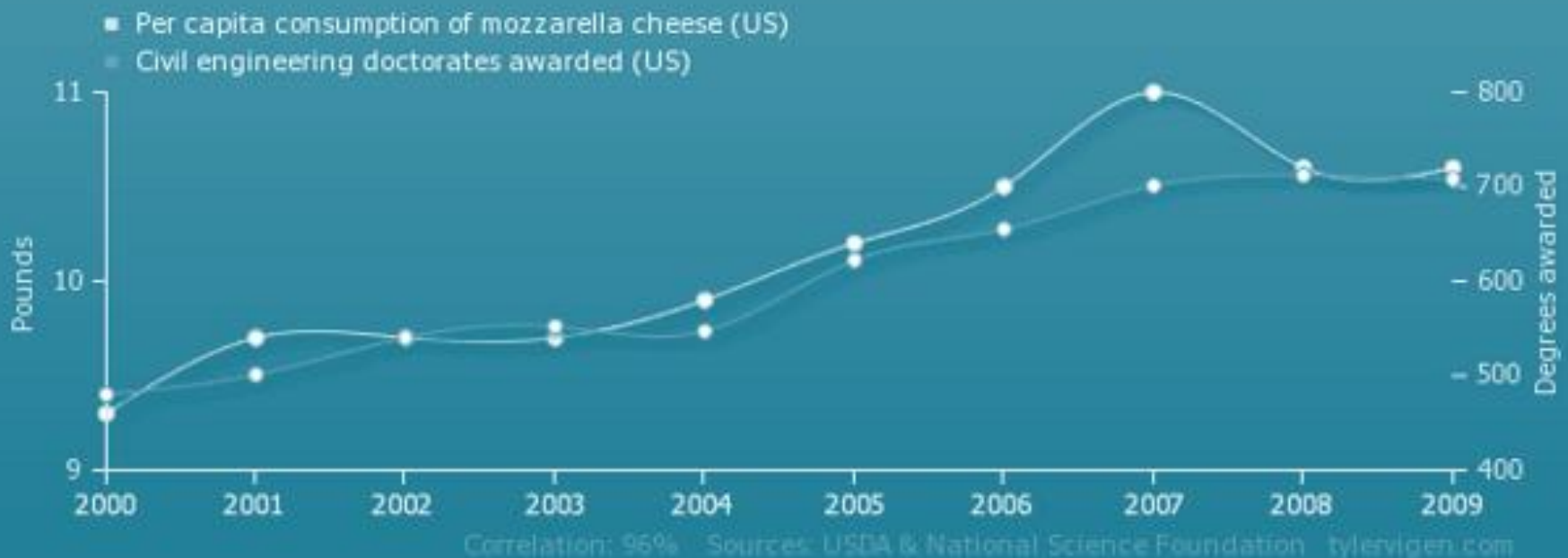
- height vs shoe size **positive**
- Amount of food you have eaten and how hungry you are **negative**
- Amount of time studying vs. test grade **positive**
- # of hours of sleep and GPA **could be positive or no correlation**
- Days left in school and temperature outside **negative**
- # of letters in your first name and # of letters in your last name **no correlation**

Correlation differs from Causation

- There is a saying in statistics:
- **“Correlation does not imply causation”**
- In other words, just because two data sets have a correlation, it does not mean one causes the other one to occur.

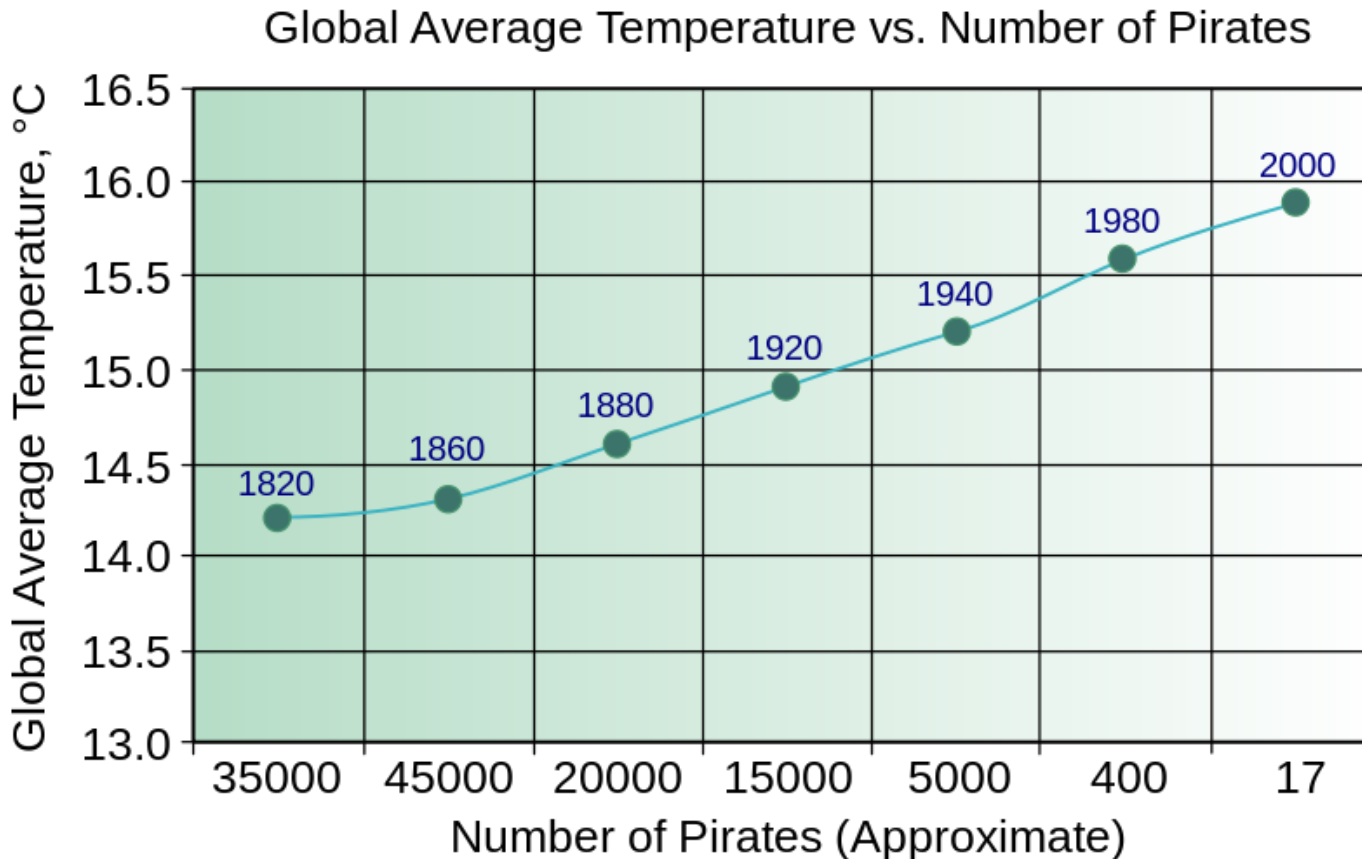
A funny example...

per capita consumption of mozzarella cheese correlates with civil engineering doctorates awarded but one does not cause the other



Pirates cause Global Warming...

- Don't believe me? Here's my proof!



An Example of Causation

- The manager of an ice cream shop studies its monthly sales figures and notices a positive correlation between the average air temperature and how much ice cream they sell on a given day.
- It is likely that warmer air temperatures cause an increase in ice cream sales.
- It is doubtful that increased ice cream sales cause an increase in air temperatures

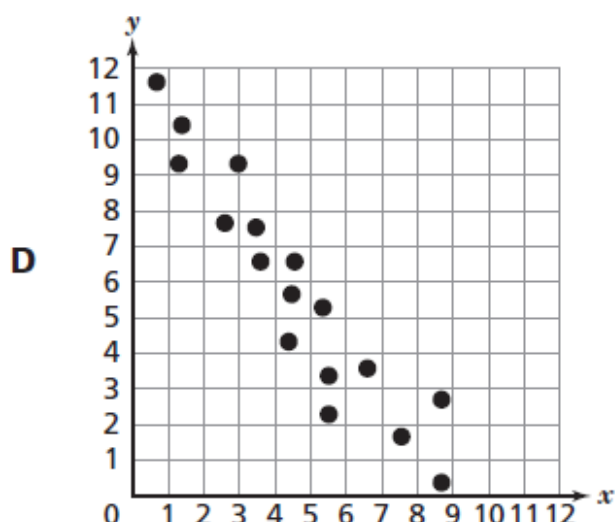
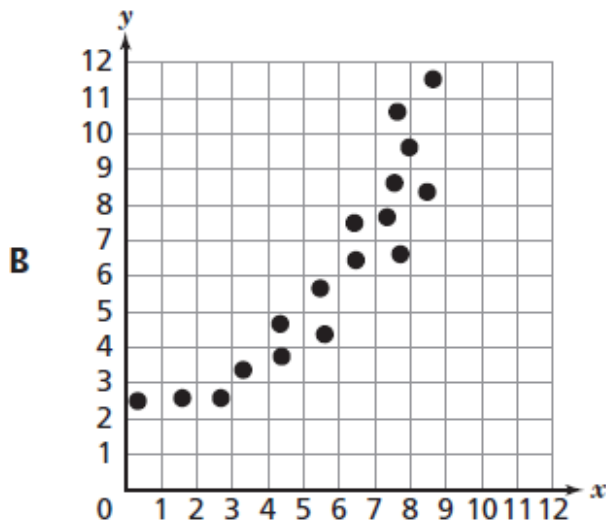
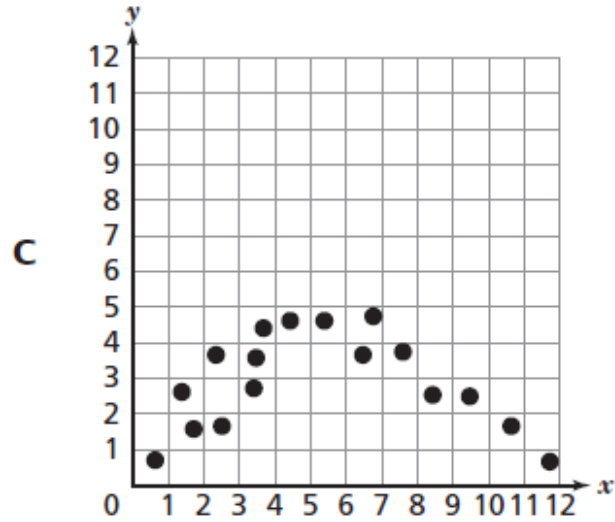
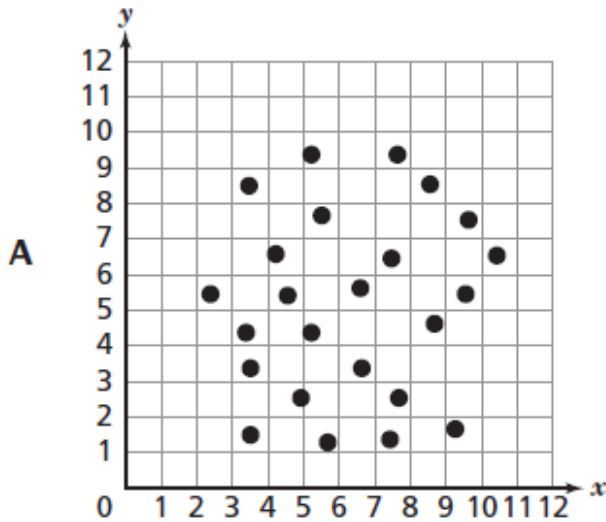


Which pair **best** represents a causation relationship?

- A.** a child's age and shoe size
- B.** the number of ice cream cones sold and the amount of sunscreen sold
- C.** the temperature at a football game and the number of hot drinks sold
- D.** the number of people attending a ballgame and the length of the ballgame

C

Which scatterplot displays a negative relationship over the entire set of data?

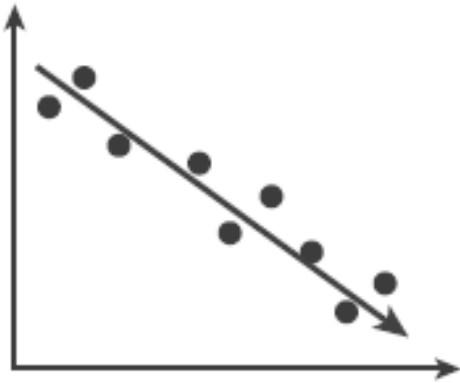


D

Correlation Coefficient

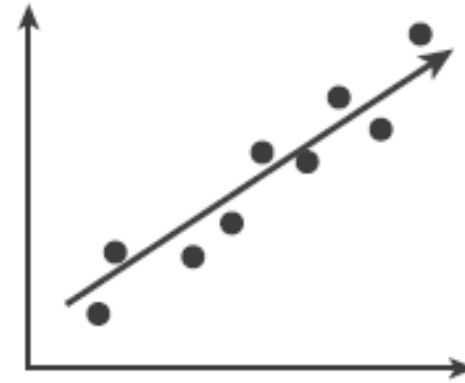
- The correlation coefficient, denoted by r varies from -1 to 1. It corresponds to the type of correlation.
- Strongly correlated data points have a value of r closer to 1 or -1.
- Weakly correlated data will have values closer to .5

Strong Negative Correlation



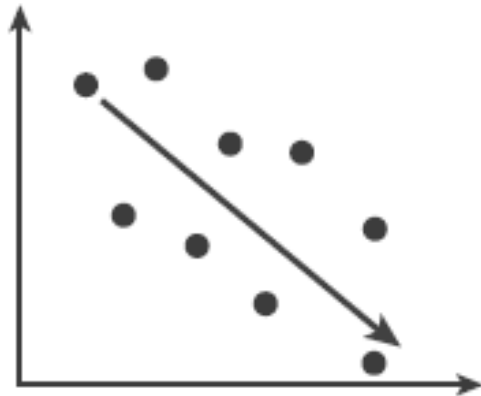
r is close to -1

Strong Positive Correlation



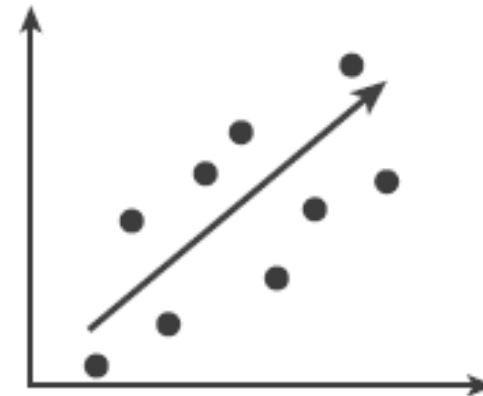
r is close to 1

Weak Negative Correlation



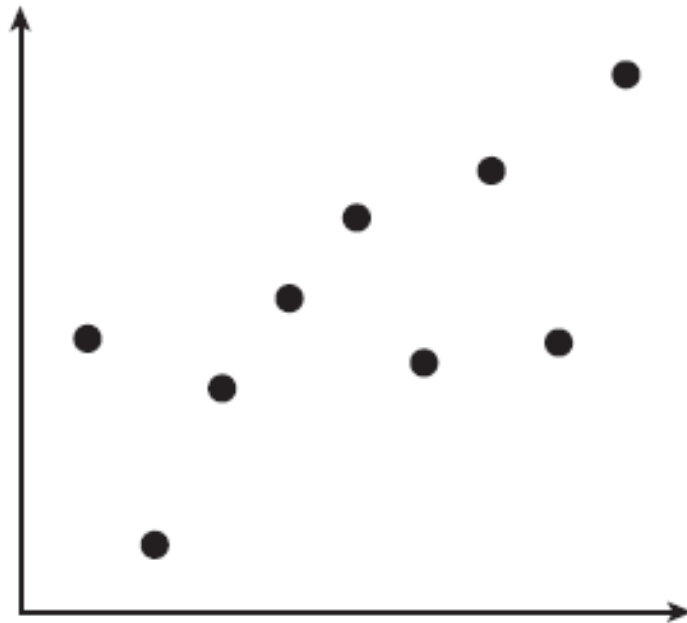
r is close to $-.5$

Weak Positive Correlation



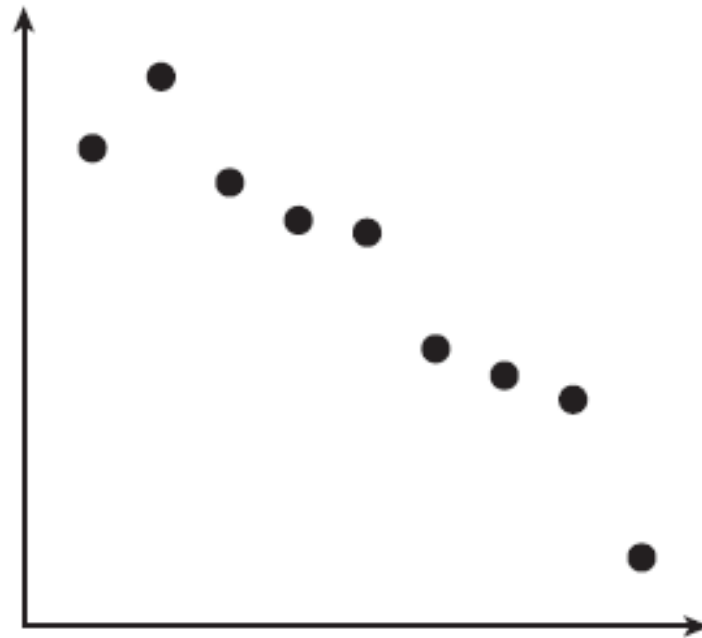
r is close to $.5$

Estimate the value of the correlation coefficient r



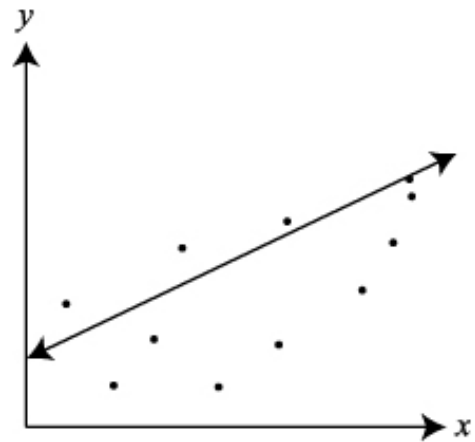
close
to .5

Estimate the value of the correlation coefficient r



close
to -1

A scatter plot is shown. A student added the line, thinking it was a line of best fit for the data.



Which correlation coefficient **most accurately** describes the data's fit to a linear model?

- A -0.9
- B -0.5
- C 0.5
- D 0.9

C

Homework

- Worksheet