TP: Students will understand the distinction between correlation and causation in bivariate data

HW: Worksheet

Do Now: Which of these two things are **most** closely related? Why?

a) Outdoor temperature and heating bills

b) Outdoor temperature and precipitation

c) Outdoor temperature and movie tickets sold

Bivariate Data: Data that measures two variables

The purpose of bivariate data is to determine the relationship between two variables

Which table does *not* show bivariate data? Explain your choice.

1)

Height (inches)	Weight (pounds)
39	50
48	70
60	90

2)

Gallons	Miles Driven
15	300
20	400
25	500

3)

Quiz Average	Frequency
70	12
80	15
90	6

4)

| Speed (mph)	Distance (miles)
40	80
50	120
55	150

Correlation: A concept from statistics that measures the relationship between two things.

A **positive correlation** means that when one thing goes up, the other goes up too.
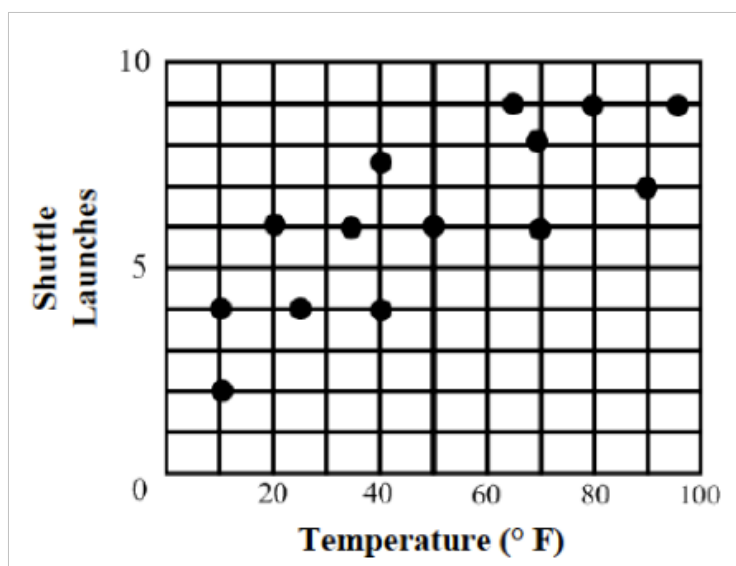
A **negative correlation** is the opposite, when one goes up, the other goes down.

Causation: means that one thing will cause the other.

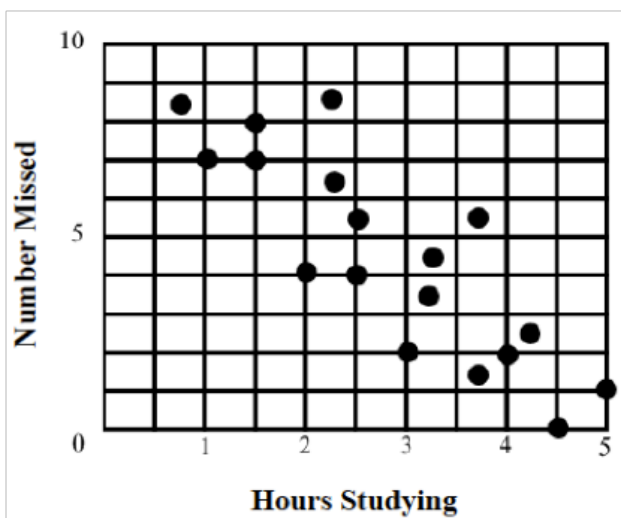   * **Correlation does not imply causation.**
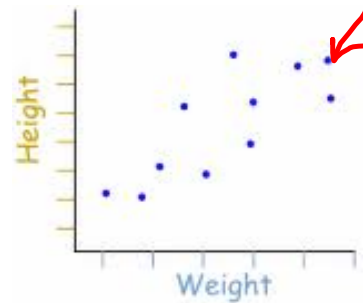
Ex 1: The scatter plot below shows the amount of shuttle launches in one year during days of certain average temperatures.
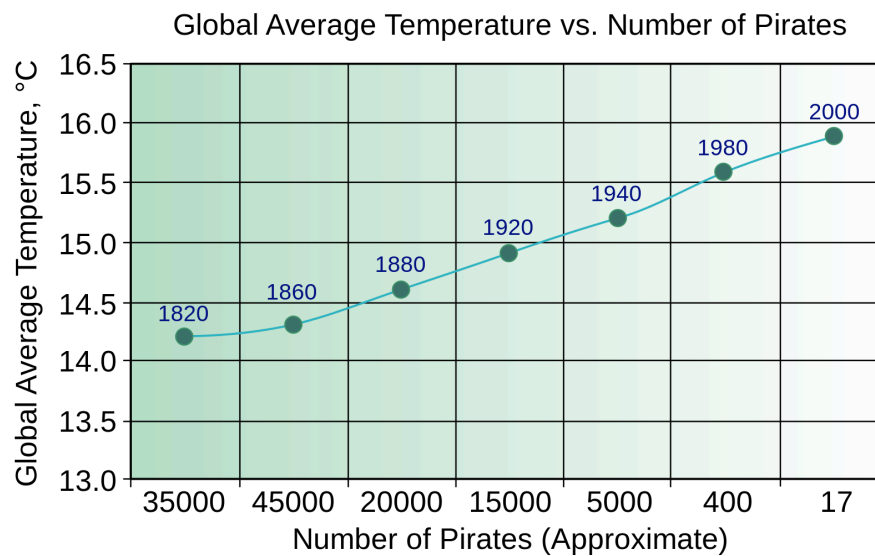

Is there a causal relationship between Temperature and Shuttle Launches?

Ex 2: The graph below shows a comparison of the hours students study compared to the number of questions missed on the test.

Is this a causal relationship? Why or why not?

Ex 3: Did the decrease in number of pirates lead to global warming?

Global Average Temperature vs. Number of Pirates

Ex 4:

Explain the meaning of the following expression: "Correlation does not imply causation."
Provide a real-world example to support your explanation.

1 Which example of bivariate data is the best example of "correlation does not imply causation?"

   A As the availability of a smallpox vaccine increases, the number of smallpox deaths decreases (negative correlation)

   B The more homework a student turns in, the higher their homework grade will be. (positive correlation)

   C As the popultion of foxes increases in an area, the population of bunnies decreases (negative correlation)

   D As the amount of ice cream sold per month increases, the amount of time spent in a pool increases (positive correlation)

Classwork (do not copy): Each situation shows a correlation. Does it also represent causation? Why or why not?

Group A: #1-3   Group B: #3-5   Group C: #6-8

1. The number of cold, snowy days and the amount of hot chocolate sold at a ski resort.

2. The number of miles driven and the amount of gas used.

3. The number of additional calories consumed and the amount of weight gained.

4. The age of a child and his/her shoe size.

5. The amount of cars a salesperson sells and how much commission he makes.

6. The number of cars traveling over a busy holiday weekend and the number of accidents reported.

7. The number of homework assignments turned in and how well an individual does in class.

8. The annual salary and blood pressure for men ages 20-60

Summary: Explain this comic.