3.2 Scatter Plots

Learning Goals: I am learning to…
- ☐ Create, use and interpret scatter plots involving two-variable data
- ☐ Analyze scatter plots to determine correlation and make connections
- ☐ Analyze two-variable relationships to determine if there is a reasonable cause between two variables

In lesson 3.1, we learned that a scatter plot is used for two-variable data to show how two pieces of information can be collected and compared to see if there is a relationship between the two variables.

Part A: Creating a Scatter Plot

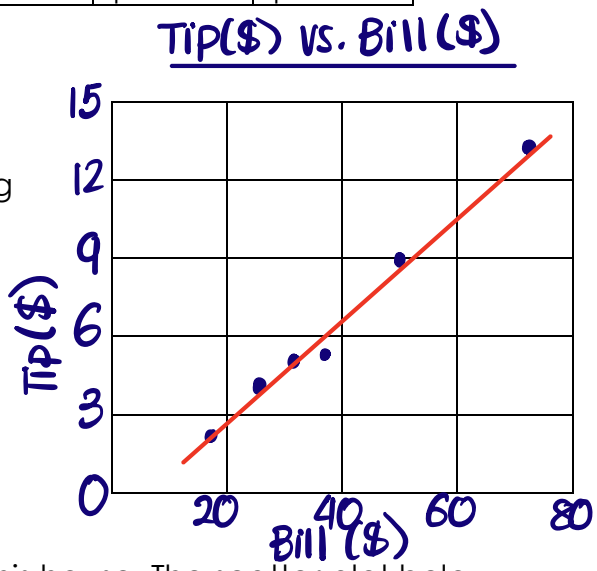
Example 1: Shayna recorded the cost of customers restaurant bills and the tip amount left. The data she collected is displayed in the table below. Create a scatter plot to display the data collected.

(25.15, 4.0)

$ Bill (x)	$25.15	$38.49	$19.27	$49.66	$32.45	$72.14
$ Tip (y)	$4.00	$5.50	$2.50	$9.00	$5.00	$14.00

Your scatter plot should include the following:
- ✓ Title
- ✓ Axes labels
  - (x) ○ Independent variable (bill) relies on nothing
  - (y) ○ Dependent variable (tip) relies on the independent variable
- ✓ Appropriate scale
- ✓ Plot the (x, y) coordinates
- ✓ Draw a line of best fit (LOBF)
- ✓ State correlation:

strong positive correlation



Part B: Interpreting a Scatter Plot

Example 2: Jay researched estimates for a job painting his house. The scatter plot below shows the results he collected.

1. Which two companies will take the longest to complete the job? Which of these is the cheaper option?

   D & E take the longest
   E is the cheapest

2. Which two companies charge the same amount?

   B and D charge the same amount

3. Why might you pick company E?

If we wanted a cheaper option and did not have a time limit.

4. Why might you pick company B?

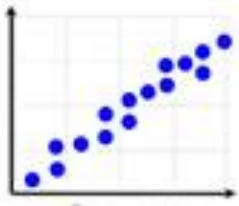
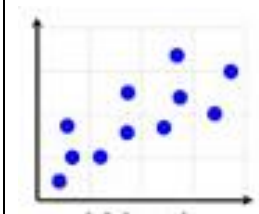
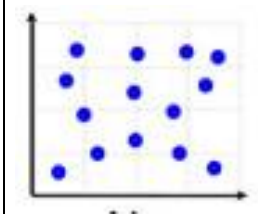
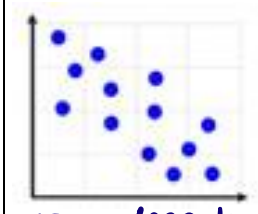
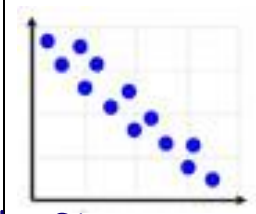
If you want the job completed fairly quickly but still at a reasonable price.

Part C: Analyzing a Scatter Plot

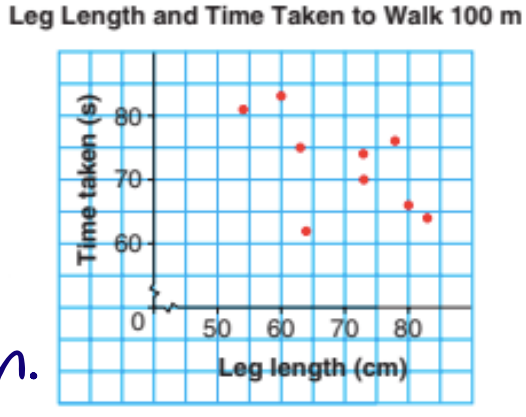
Correlation measures the strength of a relationship and the direction in which the relationship occurs.

- **Positive** correlation: Points on a scatter plot go up and to the right
- **Negative** correlation: Points on a scatter plot go down and to the right
- **Strong** correlation: Points on a scatter plot closely follows a linear pattern
- **Moderate** correlation: Points on a scatter plot somewhat follows a linear pattern
- **Weak** correlation: Points on a scatter plot loosely follows a linear pattern

Example 3: Classify each of the following scatter plots based on their correlation.
Note: Your classification should include both direction and strength

 Strong positive correlation	 Weak/moderate positive correlation	 No correlation	 Weak/moderate negative correlation	 Strong negative correlation

Example 4: Davis conducted an experiment comparing a person's leg length and how long it takes to walk 100m. The data he collected is shown in the scatter plot below.

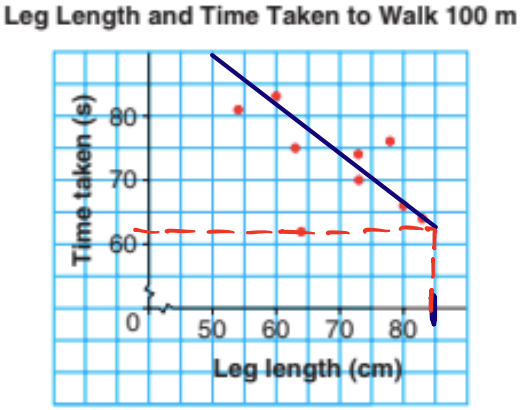


a) What sort of relationship does the graph suggest between leg length and time take to walk 100m?

Correlation: weak, negative

The longer a persons leg is, the faster they can walk 100m.

b) Use the scatter plot to estimate the time it would take a person with a leg length of 85 cm to walk 100m?



Approx. 62/63 seconds.

*Answers depend on your LOBF

c) How might Davis make the results of his experiment more reliable?

- Survey more people
- Be more specific about people survey (eg. age, gender, fitness level)

Part D: Cause and Effect Relationships

Observing the relationship between two variables does not always mean that one variable causes a change in the other variable. Other factors could be involved to cause the relationship, or the correlation could be a coincidence. Some relationships are obvious, but others may have a common cause to both variables.

Example 5: State whether the claim made in each situation is reasonable. If not, determine if there is a common cause, or if the relationship is coincidental.

a) A scientific study showed a negative correlation between aerobic exercise and blood pressure. It claimed that the increase in aerobic activity was the cause of the decrease in blood pressure.

Reasonable → Exercise makes your heart stronger, so you don't have to work as hard.

b) Mila discovered a positive correlation between ice cream sales and the number of drowning incidents. She then warned all her friends not to eat ice cream if they intended on going swimming.

Not reasonable → she doesn't know if all people who bought ice creams went swimming.

common cause of hotter weather → more people

c) Since the 1950's the concentration of carbon dioxide (CO_2) in the atmosphere has be increasing. Crime rates in most countries has also increased during this time period. A newspaper reports that the increase in CO_2 levels in the atmosphere causes people to commit more crimes.

Not reasonable, more likely a coincidence or caused by other factors.