Lesson 3.2 – Using Scatter Plots to Identify Relationships

Goal: Create, interpret, and analyse two-variable data using scatter plots

What is a Scatter Plot?

A graphical representation of _the relationship between two variables._
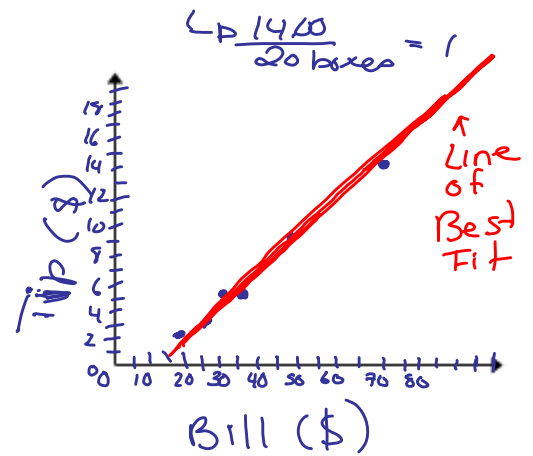
Creating a Scatter Plot

EXAMPLE Shayna recorded the cost of customers restaurant bill and the amounts they left her as a tip

$ Bill	$25.15	$38.49	$19.27	$49.66	$32.45	$72.14
$ Tip	$4.00	$5.50	$2.50	$9.00	$5.00	$14.00

→ $\frac{72.14}{20 \text{ boxes}}$

Steps:

- Title
- Axes labels
  - Independent variable (_Bill_) relies on nothing
  - Dependent variable (_Tip_) relies on independent variable
- Appropriate scale
- Plot the (x, y) coordinate pairs
- Draw a Line of Best Fit (LOBF)

$\frac{1400}{20 \text{ boxes}} = 1$

Line of Best Fit

Tip ($)

Bill ($)

Interpreting a Scatter Plot

EXAMPLE Jay researched estimates for a job painting his house. The scatter plot below shows Jay's results.
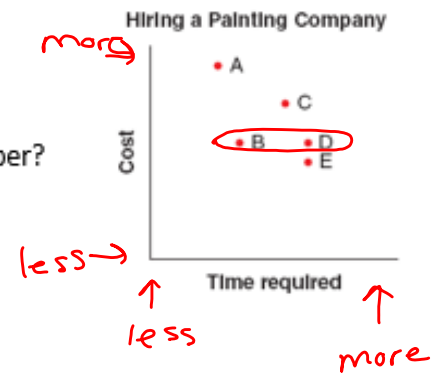
a) Which is the dependent variable?

Cost (on the vertical axis)

b) Which two companies will take the longest? Which of these two is cheaper?

D and E take longest.
D costs more than E.

Hiring a Painting Company

c) Which two companies charge the same amount?

B and D
(same height).

Analyzing a Scatter Plot

A **correlation** indicates the strength and direction of a _relationship_ between two variables

- **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 follow a linear pattern_
- **Moderate** Correlation: Points on a scatter plot _somewhat follow a linear pattern_
- **Weak** Correlation: Points on a scatter plot _loosely follow a linear pattern_

EXAMPLE   Classify each of the following scatter plots

Strong, positive   moderate, negative   No correlation   weak positive .

EXAMPLE   Davis conducted an experiment comparing a person's leg length and how long it takes to walk 100 m. His data is shown in the scatter plot.

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

weak negative correlation.

Leg Length and Time Taken to Walk 100 m

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

Approximately   63 s.

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

· more data
· keep other variables constant (age, gender, fitness level)
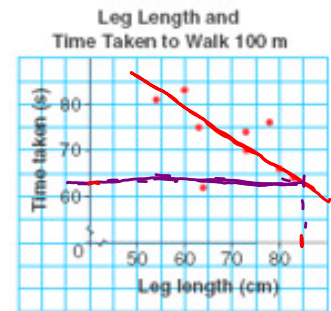
Considering Cause & Effect

Observing a relationship between two variables does __not__ mean that one variable __causes__ a change in the other. **Other factors could be involved**, or the correlation could be a **coincidence**. Some relationships are natural and/or obvious, while others may have a **common cause** to both variables.

EXAMPLE   State whether the claim 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 it doesn't have to work as hard.

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

Not reasonable.
Possible common cause : When the weather is nice, more people eat ice cream and more people go swimming.

c)   Since the 1950s the concentration of carbon dioxide (CO_2) in the atmosphere has been increasing. Crime rates in most countries have also increased over this time period. A newspaper reports that the increase in CO_2 level in the atmosphere cause people to commit crimes.

Likely a coincidence.

Practice: Page 142 #1 – 6, 8, 10, 12