IDENTIFYING VARIABLES
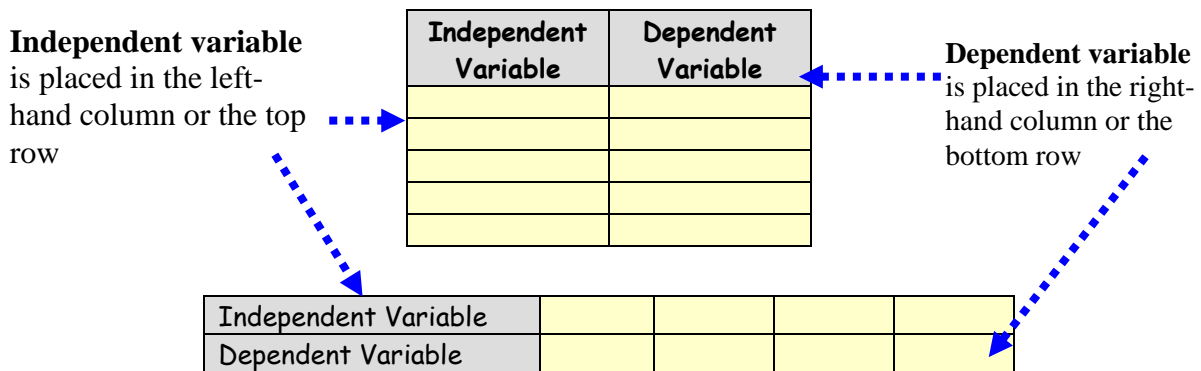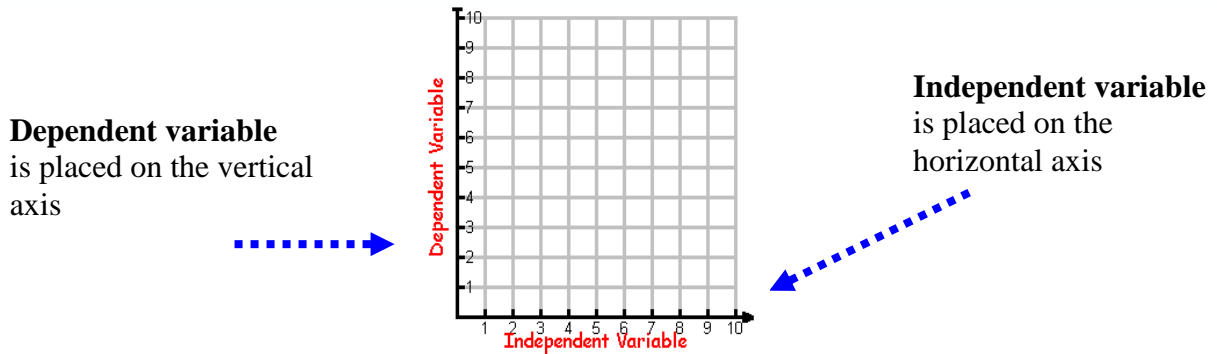
When looking at the relationship between the **variables**, one must decide which variable most likely depends on the other.
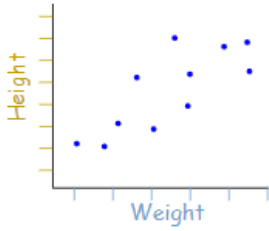
INDEPENDENT VARIABLE	DEPENDENT VARIABLE
In a relation, the variable whose values you choose. The variable that does **NOT** depend on the other variable.	In a relation, the variable whose values you calculate. The variable that **depends** on the other variable.

Identify the independent variable and dependent variable for the questions below:

Question	Independent Variable	Dependent Variable
1. What effect does the **outdoor temperature** have on the **amount of fuel** needed to heat a house?	Outdoor temperature	amount of fuel
2. Is there a relationship between people's **ages** and their **heights**?	age	height
3. Is there a relationship between the **outside temperature** and the **number of hot chocolates** sold?	outside temperature	# of h.c. sold
4. Is there a relationship between **cost** to fix a car and **hours** worked by the mechanic?	hours worked	cost

Dependent variable is placed on the vertical axis

Independent variable is placed on the horizontal axis

Independent variable is placed in the left-hand column or the top row

Independent Variable	Dependent Variable

Dependent variable is placed in the right-hand column or the bottom row

Independent Variable				
Dependent Variable				

SCATTER PLOT

(Height vs Weight scatter plot illustration)

A scatter plot has points that show the relationship between two sets of data.
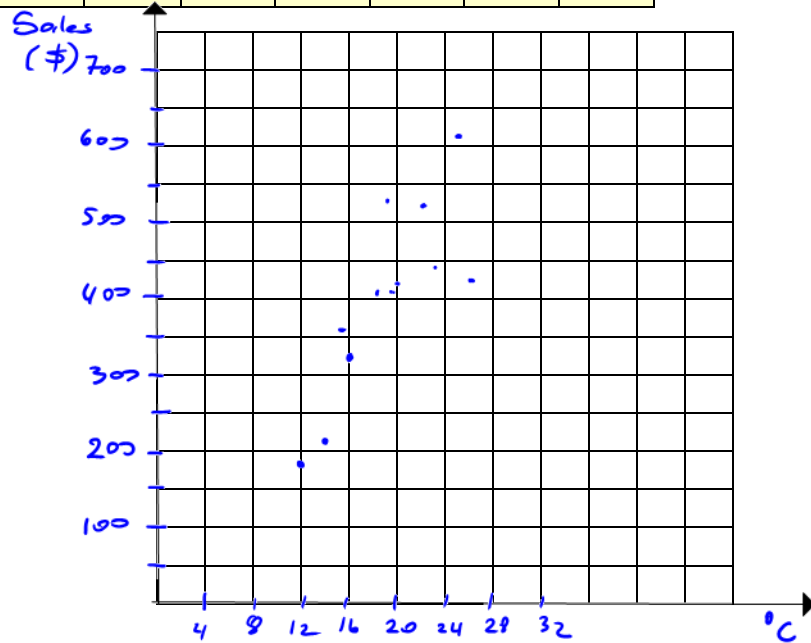
In this example, each dot shows one person's weight versus their height

Example: The local ice cream shop keeps track of how much ice cream they sell versus the noon temperature on that day. Here are their figures for the last 12 days.

← independent

ICE CREAM SALES vs TEMPERATURE												
Temperature °C	14	16	12	15	19	22	20	25	19	26	23	18
Ice Cream Sales ($)	215	325	185	332	406	522	412	614	544	421	445	408

a) Make a scatter plot of the data.

b) Label the title

c) Identify the independent variable and label the "x" axis.

    temperature

d) Identify the dependent variable and label the "y" axis.

    sales

e)   Describe the relationship between the variables.

The __*hotter*__ the weather, the __*more*__ sales.

(Scatter plot on grid: Sales ($) on y-axis from 100 to 700, temperature °C on x-axis marked 4, 8, 12, 16, 20, 24, 28, 32)
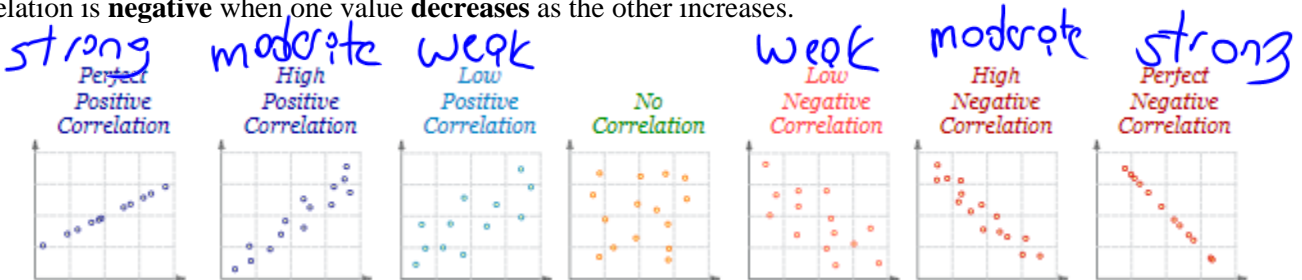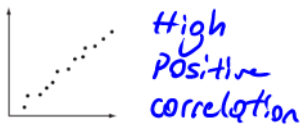
ANALYZING A SCATTER PLOT

When the two sets of data are strongly linked together, we say they have a **high correlation.**

The word Correlation is made of **Co-** (meaning "together"), and **Relation**

- Correlation is **positive** when the values **increase** together
- Correlation is **negative** when one value **decreases** as the other increases.
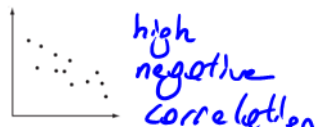
strong   *moderate*   *weak*   *weak*   *moderate*   *strong*

Perfect Positive Correlation	High Positive Correlation	Low Positive Correlation	No Correlation	Low Negative Correlation	High Negative Correlation	Perfect Negative Correlation

EXAMPLE   Classify each of the following scatter plots

wpof

High
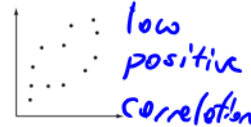Positive
correlation

Strong

high
negative
correlation

moderate

no
correlation

low
positive
correlation

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?
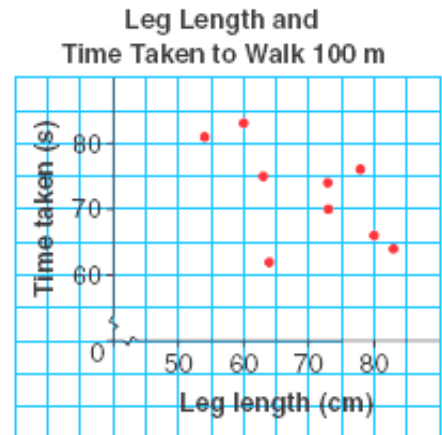
weak, negative   correlation

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

apr

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

– more data
– keep other variables constant
*   · age   · fitness level*
*   · gender*

Leg Length and Time Taken to Walk 100 m

Time taken (s)

80
70
60
0

50   60   70   80

Leg length (cm)

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 because exercising makes your heart stronger and make your veins more flexible

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.

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