

Correlation

A correlation between two variables indicates that there exists a relationship between them.

- Ex:**
- A persons weight and height
 - Number of years of school and future income

We can illustrate a two variable distribution on the Cartesian plane by plotting data points (x and y coordinates). This is called a **Scatter Plot**.

Ex: Age and Diameter of Trees

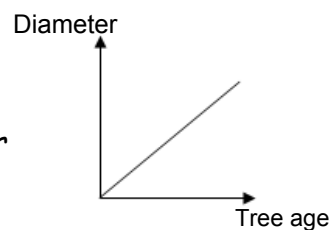


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A correlation can be positive or negative

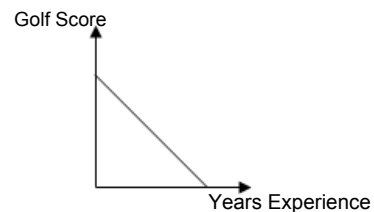
- **Positive** : when both x and y increase

Ex: tree age increases, so does its diameter



- **Negative** : when x increases and y decreases

Ex: your golf score decreases as years
of experience increases



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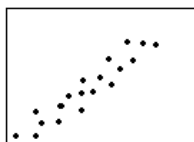
Correlations are also characterized by their **strength**

Strong Correlation - If there is a strong correlation then the scatterplot graph will resemble a **line**

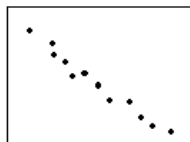
Weak correlation - If there are dots all over the place it is a weak or there is no correlation

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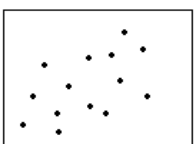
Degree of Correlation



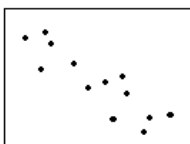
Strong Positive



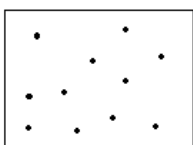
Strong Negative



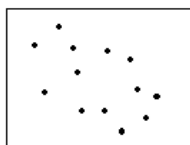
Weak Positive



Moderate Negative



None



Weak Negative

The strength is determined by how closely the scatter plot forms a line.

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Correlation Coefficient

To measure the strength of a correlation we need to determine a correlation coefficient (r)

Step 1 - Draw a rectangle around the points (**ignoring the outliers**)



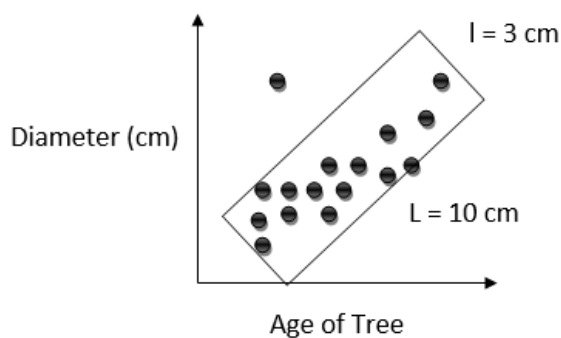
An **OUTLIER** is a point that indicates an abnormal piece of data or something out of the ordinary.

It is located far from main cloud of points in the scatter plot.

NB: Make the rectangle as tight a fit as possible.
The sides should be **parallel** to each other.

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Step 2 - Measure the long side (L) and the short side (I)



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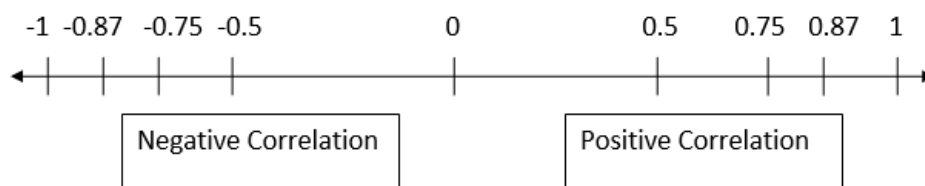
Step 3 - Apply correlation formula

$$r \approx \pm \left(1 - \frac{\text{Length of short side}}{\text{Length of long side}} \right)$$

$$r \approx \left(1 - \frac{3}{10} \right)$$

$r \approx 0.7 \rightarrow$ this indicates a moderate positive correlation

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Correlation Strength

Correlation Coefficient		Meaning
Positive	Negative	
Near 0	Near 0	Zero
Near 0.5	Near -0.5	Weak
Near 0.75	Near -0.75	Moderate
Near 0.87	Near -0.87	Strong
Near 1	Near -1	Perfect

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