

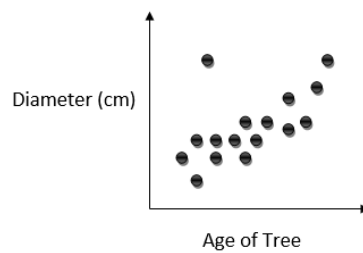
Correlation

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

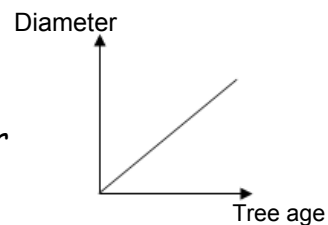


Nov 18-3:45 PM

A correlation can be positive or negative

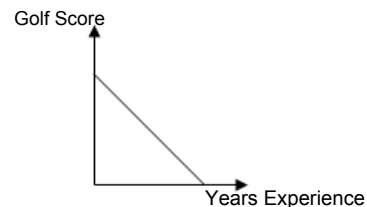
- **Positive** : when both x and y increase

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



Nov 18-3:48 PM

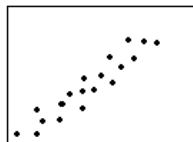
Correlations are also characterized by their **strength**

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

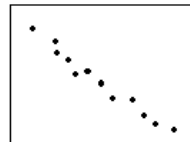
Weak correlation - If there are dots all over the place it is a weak or there is no correlation

Nov 18-4:27 PM

Degree of Correlation



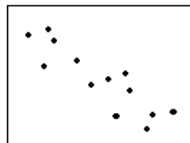
Strong Positive



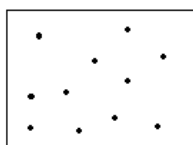
Strong Negative



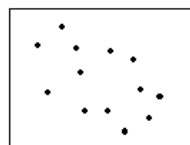
Weak Positive



Moderate Negative



None



Weak Negative

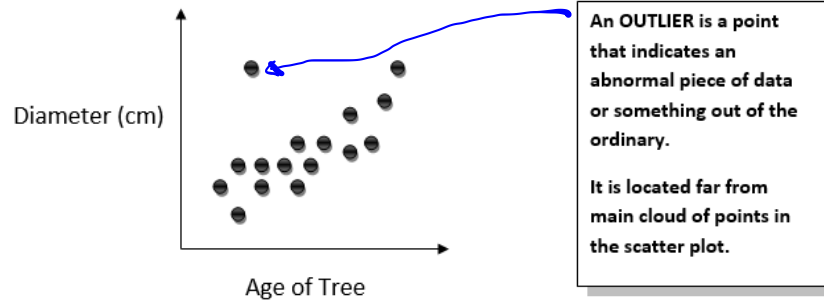
The strength is determined by how closely the scatter plot forms a line.

Nov 18-3:52 PM

Correlation Coefficient

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

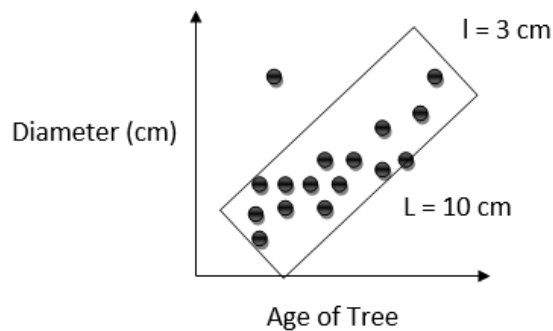
Step 1 - Draw a rectangle around the points (**ignoring the outliers**)



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

Nov 18-3:55 PM

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



Nov 18-3:59 PM

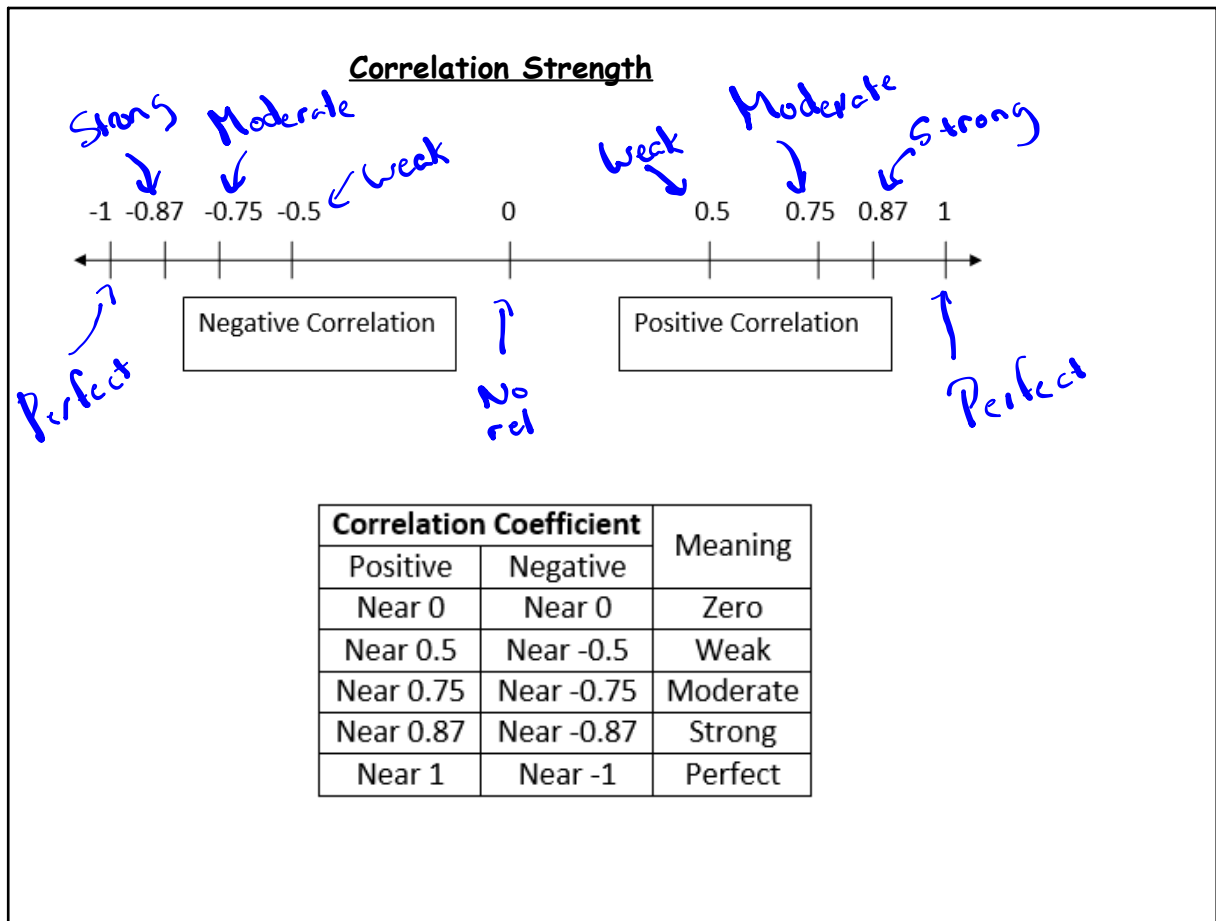
Step 3 - Apply correlation formula

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

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

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

Nov 18-4:00 PM



Nov 18-4:01 PM