

Interpreting Straight Line Graphs

Once you have calculated a regression line in the format of $y = mx + c$, there are many additional calculations and conclusion that can be formed from the equation. For example, you could be asked to:

1. Predict a dependent value from a given independent value, or vice versa
2. Interpret the significance of the Y-Intercept
3. Interpret the significance of the X-Intercept
4. Interpret the significance of the slope or gradient

When analysing the **gradient (m)**, it is important to consider what the **rise** and **run** represents in terms of the variables being investigated. Consider the following examples:

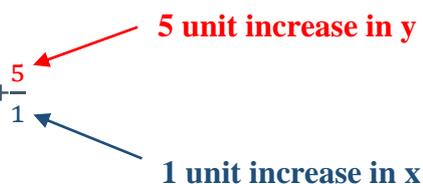
$m = +3$ Statement: On average, for every unit increase in the x variable there is an increase of 3 units in the y variable

$m = -2$ Statement: On average, for every unit increase in the x variable there is a decrease of 2 units in the y variable

$m = \frac{5}{3}$ Statement: On average, for every 3 units increase in the x variable there is an increase of 5 units in the y variable

$m = -\frac{3}{7}$ Statement: On average, for every 7 units increase in the x variable there is a decrease of 3 units in the y variable

Recall: that a gradient of +5 is actually a gradient of $+\frac{5}{1}$



Example 1

A study was done to investigate the relationship between the **age in years** of a young person (x) and the **time in minutes** (y) at which the child can run one mile. Data from children between the ages of 8 and 15 was collected. The equation of the regression line was found to be;

$$y = 17 - 0.5x \text{ or}$$

$$\text{Time (minutes)} = 17 - 0.5 \times \text{Age (years)}$$

Task

Interpret the slope and y-intercept.

Solution

Part A

The slope is -0.5 . What this mean is that for every **increase of 1 in x** there is a **decrease of 0.5 in y** . In the context of the question, we can say that

"On average, as a child ages one year their time to run a mile goes down by 30 seconds (half a minute)."

Part B

The y-intercept is 17, which means that when x is 0, y is 17. For this question, the y-intercept is not relevant, since 0 year old children cannot run one mile.

Example 2

A biologist wants to study the relationship between the **number of trees per acre** (x) and the **number of birds per acre** (y). She came up with the equation of the regression line;

$$y = 5 + 4.2x \text{ or}$$

$$\text{Number of birds (per acre)} = 5 + 4.2 \times \text{Number of trees (per acres)}$$

Interpret the slope and y-intercept.

Part A

The slope is 4.2. This means that;

"For every additional tree, you can expect an average of 4.2 additional birds per acre."

Part B

The y-intercept 5 has meaning in this case. We can say that;

"The average number of birds per acre in an area with no trees is 5."