Equations for straight lines: review how to get the equation from some data.

Learning objectives:

3.B.1. To be able to calculate the equation for a straight line given two points on the line.

Revise some basic maths on equations for straight lines.

The equation of a straight line is **y = mx + c**

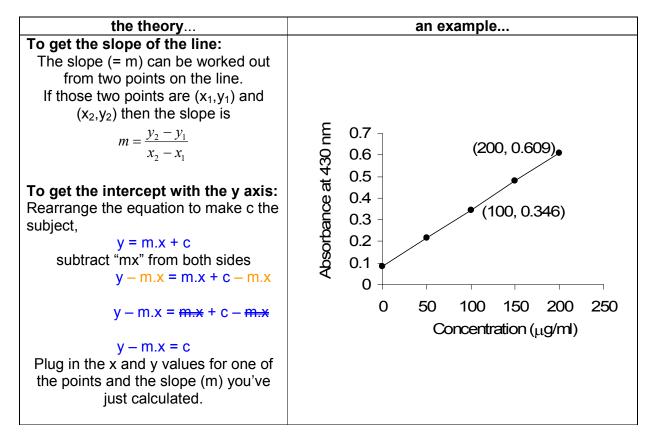**x** is the **independent variable** – that is the data that we have control over.

y is the **dependent variable** – that is the data we don't control – it is what we measure.

m is the **slope**,

c is the **intercept** through the y axis

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the theory...	an example...
To get the slope of the line: The slope (= m) can be worked out from two points on the line. If those two points are (x_1, y_1) and (x_2, y_2) then the slope is $$m = \frac{y_2 - y_1}{x_2 - x_1}$$ **To get the intercept with the y axis:** Rearrange the equation to make c the subject, $$y = m.x + c$$ subtract "mx" from both sides $$y - m.x = m.x + c - m.x$$ $$y - m.x = \cancel{m.x} + c - \cancel{m.x}$$ $$y - m.x = c$$ Plug in the x and y values for one of the points and the slope (m) you've just calculated.	Graph of Absorbance at 430 nm vs Concentration (μg/ml), showing points (200, 0.609) and (100, 0.346)

Test your recall of this topic by answering the following questions. If you have difficulty, the answers with working are at the end.

Q1. Calculate the slope of the line in the graph above. Express your answer in ml/µg and in ml/mg.

Q2. Calculate the intercept for the line in the graph above.

Q3. Write the equation for the line.

3B1: Getting the equation for a straight line

A1. slope = 0.00263 ml.µg^{-1}

Working:

$$m = \frac{0.609 - 0.346}{200 - 100\,\mu g.ml^{-1}} = 0.00263\,ml.\mu g^{-1}$$

Convert this to ml/mg...
0.00263 ml.µg^{-1} x 1000 µg.mg^{-1} = 2.63 ml/mg

A2. b = 0.083

Working:
Rearrange the equation for a straight line to get b on its own
y = mx + b
b = y – mx

Now substitute in the values for (x, y) and m,
b = 0.346 – 100 x 0.00263 = 0.083

A3.
The equation for the line is…   y = (0.00263 ml.µg^{-1}).x + 0.083