Maths Learning Service: Revision

Straight Lines and Simultaneous Equations

Intro. to Fin. Maths I

The general equation of a straight line is

$$y = mx + k$$

where y is the vertical axis variable,
x is the horizontal axis variable,
m is the *slope/gradient/"rise over run"* of the line and
k is the y

out what the other has to be. For example, picking $x = 0$ is an easy choice:

$$
\begin{array}{rrcl}
 & 2 \times 0 + y & = & 1 \\
\Rightarrow & y & = & 1.
\end{array}
$$

Hence, the point $x = 0, y = 1$ is on this line (it is in fact the $y-$intercept). For a second point, try $y = 0$:

$$
\begin{array}{rrcl}
 & 2x + 0 & = & 1 \\
\Rightarrow & x & = & \frac{1}{2}
\end{array}
$$

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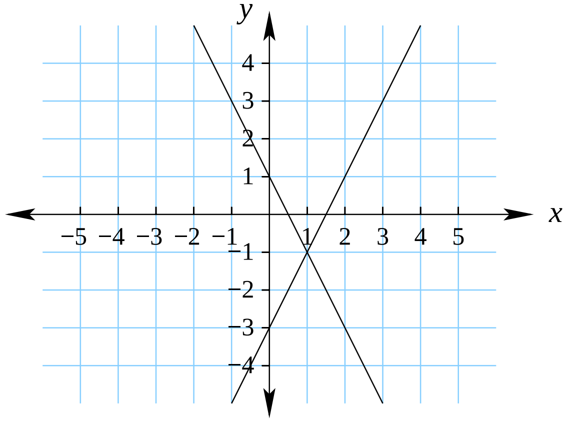
because they represent input values (x and y) that satisfy two sets of conditions (equations) at once.

Using the two lines from the previous section:



we can see that the intersection is at $x = 1$, $y = -1$ but this is a tedious and inexact method (especially if the lines don't intersect at whole number co-ordinates, eg. see Exercise (1)(a) and (c)). We need an algebraic method.

The best way is to "line up" the two equations *term by term* as shown:

$$\begin{array}{rcrcl} & & y & = & 2x - 3 \\ 2x & + & y & = & 1 \end{array}$$

$$\Rightarrow \quad -2x \quad + \quad y \quad =$$

Subtracting the two equations gives:

$$\begin{array}{rrcrcr} & 6x & + & 3y & = & 6 \\ - & 3x & + & 3y & = & -3 \\ \hline & 3x & + & 0 & = & 9 \\ \Rightarrow & & & x & = & 3 \end{array}$$

Substituting this into, say, $2x + y = 2$ gives $2 \times 3 + y = 2$, so $y = -4$. (The reader may verify that $x = 3$, $y = -$