

Solving Simultaneous Equations Graphically (including the cover-up method)

Notes

Simultaneous equations at GCSE consist of two equations and two unknowns. For example,

$$\begin{aligned}4x - y &= 7 \\ x + y &= 3\end{aligned}$$

We are usually interested in finding the unique x - and y -values which satisfy both equations.

In future lessons, we will look at solving them algebraically but they can also be solved graphically.

To do that we have to draw them both and find their point of intersection.

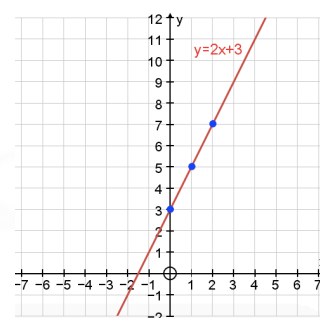
Drawing straight line graphs – a quick reminder

Remember we need two points to define a straight line (a 3rd point can be used as a check).

So we choose two x -values and find the corresponding y -values.

E.g. 1 Draw the line $y = 2x + 3$.

Working: Let $x = 0$ then $y = 3$ so plot $(0, 3)$
 Let $x = 1$ then $y = 2 + 3 = 5$ so plot $(1, 5)$
 Check: let $x = 2$ then $y = 2 \times 2 + 3 = 7$
 so plot $(2, 7)$
 Plot the points and draw a straight line through them.



There is another way to draw straight line graphs called the cover-up method.

Cover-up method for drawing straight line graphs

The cover-up method is a quick way to find 2 points on a straight line when the coefficients of x and y are multiples of the constant. When we say “cover-up”, we mean we set that part of the equation to zero.

E.g. 2 Draw the line $y = 3x + 6$.

Working:
 Cover up $3x$ (i.e. $x = 0$) $\Rightarrow y = 6 \Rightarrow$ plot $(0, 6)$
 Cover up y (i.e. $y = 0$) $\Rightarrow x = -2 \Rightarrow$ plot $(-2, 0)$

E.g. 3 Draw $2x + 3y = 6$.

N.B. The symbol ‘ \Rightarrow ’ means implies.

The point where the lines intersect is the solution to the simultaneous equations.

In this case it is $(-1.1, 2.7)$ to 1 d.p. i.e. $x = -1.1$ and $y = 2.7$.

We can substitute the numbers in to check:

$$\text{For } y = 3x + 6: \quad 3 \times (-1.1) + 6 = 2.7$$

$$\text{For } 2x + 3y = 6: \quad 2 \times (-1.1) + 3 \times 2.7 = 5.9 \approx 6 \quad (\text{rounding error})$$

E.g. 4 Solve the simultaneous equations $3x + y = 6$ and $x + y = 4$ using a graphical method

Working:

$$3x + y = 6$$

Cover up $3x$ (i.e. $x = 0$) $\Rightarrow y = 6 \Rightarrow$ plot $(0, 6)$

Cover up y (i.e. $y = 0$) $\Rightarrow x = 2 \Rightarrow$ plot $(2, 0)$

$$x + y = 4$$

Cover up x (i.e. $x = 0$) $\Rightarrow y = 4 \Rightarrow$ plot $(0, 4)$

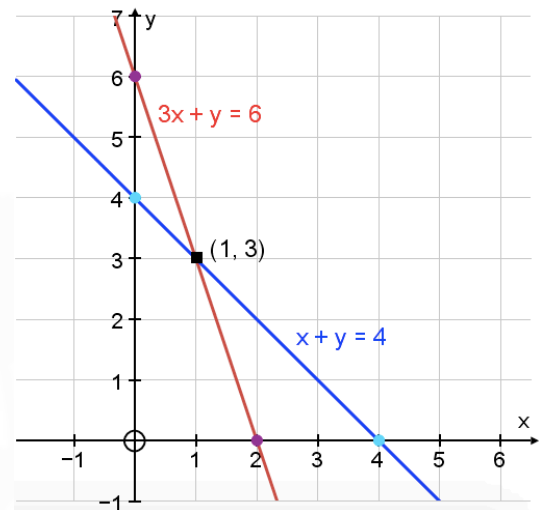
Cover up y (i.e. $y = 0$) $\Rightarrow x = 4 \Rightarrow$ plot $(4, 0)$

Lines intersect at $(1, 3)$ so the solution is
 $x = 1, y = 3$

Check:

$$3x + y = 6: \quad 3 \times 1 + 3 = 6 \quad \checkmark$$

$$x + y = 4: \quad 1 + 3 = 4 \quad \checkmark$$



Video:

[Solving simultaneous equations graphically](#)

[Solutions to Starter and E.g.s](#)

Exercise

N.B. Qu 1, 2 gives the axes pupils have to draw on.

9-1 class textbook: p378 M12.1 Qu 1-3 **and** p379 M12.2 Qu 2-5

A*-G class textbook: p342 M12.1 Qu 2, 3 **and** p343 M12.2 Qu 1-6

9-1 homework book: p126 M12.1 Qu 1, 2 **and** p127 M12.2 Qu 1-3

A*-G homework book: p95 M12.1 Qu 1, 2 **and** p95 M12.2 Qu 1-3

Summary

Drawing straight line graphs: we need two points to define a straight line (a 3rd point can be used as a check). So choose two x -values and find the corresponding y -values.

Cover-up method for drawing straight line graphs:

Use the cover-up method when the coefficients of x and y are multiples of the constant. When we say "cover-up", we mean we set that part of the equation to zero.

[Homework book answers \(only available during a lockdown\)](#)