

Simultaneous equations 1

Simultaneous equations have two unknowns. You need to find the values for the two unknowns which make BOTH equations true.

Algebraic solution

1. Number each equation.
2. If necessary, multiply the equations so that the coefficients of one unknown are the same.
3. Add or subtract the equations to ELIMINATE that unknown.
4. Once one unknown is found use substitution to find the other.
5. Check the answer by substituting both values into the original equations.

$$\begin{array}{r} 3x + y = 20 \quad (1) \\ x + 4y = 14 \quad (2) \\ 12x + 4y = 80 \quad (1) \times 4 \\ - (x + 4y = 14) \quad - (2) \\ \hline 11x = 66 \\ x = 6 \\ \text{Substitute } x = 6 \text{ into (1):} \\ 3(6) + y = 20 \\ 18 + y = 20 \\ y = 2 \\ \text{Solution is } x = 6, y = 2 \\ \text{Check: } x + 4y = 6 + 4(2) = 14 \checkmark \end{array}$$

Worked example

Solve the simultaneous equations

$$6x + 2y = -3 \quad (1)$$

$$4x - 3y = 11 \quad (2)$$

$$\begin{array}{r} 18x + 6y = -9 \quad (1) \times 3 \\ + 8x - 6y = 22 \quad (2) \times 2 \\ \hline 26x = 13 \end{array}$$

$$26x = 13$$

$$x = \frac{1}{2}$$

Substitute $x = \frac{1}{2}$ into (1):

$$6\left(\frac{1}{2}\right) + 2y = -3$$

$$3 + 2y = -3$$

$$2y = -6$$

$$y = -3$$

grade
A

EXAM ALERT!

Only 1 in 6 students got full marks in this question.

When deciding which unknown to eliminate, if possible choose the unknown where the signs are different. You can then eliminate the unknown by adding the equations.

Multiply both equations by a whole number to make the coefficients the same.

Check it!

Always use the equation you didn't substitute into to check.

$$4x - 3y = 4\left(\frac{1}{2}\right) - 3(-3) = 2 + 9 = 11 \checkmark$$

This was a real exam question that caught students out – be prepared!

ResultsPlus

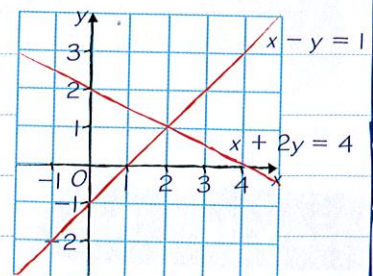
Graphical solution

You can solve these simultaneous equations by drawing a graph.

$$x - y = 1 \quad x + 2y = 4$$

The coordinates of the point of intersection give the solution to the simultaneous equations.

The solution is $x = 2, y = 1$.



Now try this

grade
B

1. Solve the simultaneous equations

$$2y - 3x = 6$$

$$2x + 2y = 1$$

(4 marks)

2. Solve the simultaneous equations

$$2x + 3y = -3$$

$$3x - 2y = 28$$

(4 marks)

grade
A

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