



68 - Solving Linear Simultaneous Equations

Content

This is when you have two equations with two unknowns which you can solve either algebraically or graphically.

Example 1

Solve the simultaneous equations:

$$3x + y = 7 \quad (1)$$

$$5x + y = 5 \quad (2)$$

Label the equations 1 and 2.

The coefficient of the y values is the same so we want to eliminate the y values. We must subtract one equation from the other as both y values have the same sign.

(2) - (1)

$$\begin{array}{r} 5x + y = 5 \quad _ \\ 3x + y = 7 \\ \hline 2x \quad = -2 \end{array}$$

Therefore, $x = -1$.

Substitute this into equation (1)

$$3 \times -1 + y = 7$$

$$-3 + y = 7$$

$$y = 10$$

Check your answers by substituting both values into the other equation.

$$5 \times -1 + 10 = 5$$

Example 2

Solve the simultaneous equations:

$$5x - 2y = 25 \quad (1)$$

$$4x + 3y = 43 \quad (2)$$

In this example, the coefficients of x and of y are different.

We must start by finding the LCM of either the x or the y coefficients and multiplying both equations to get the same coefficient.

The LCM of 2 and 3 (the y coefficients) is 6.

$$(1) \times 3 \quad 15x - 6y = 75 \quad (3)$$

$$(2) \times 2 \quad 8x + 6y = 86 \quad (4)$$

Now that the coefficients of the y values are the same we can eliminate the y values. We must add the equations as the signs of the y values are different.

(3) + (4)

$$\begin{array}{r} 15x - 6y = 75 \\ 8x + 6y = 86 \quad + \\ \hline 23x \quad = 161 \end{array}$$

Therefore, $x = 7$.

Substitute this into equation (1)

$$5 \times 7 - 2y = 25$$

$$35 - 2y = 25$$

$$2y = 10$$

$$y = 5$$

Check in equation (2) as before.

Example 3 – Graphically

Solve the simultaneous equations:

$$3x + 2y = 23$$

$$5x - 6y = 1$$



The solution to these simultaneous equations is given by the point where the lines meet.

The x-coordinate gives the solution of x and the y-coordinate gives the solution of y.

In this example, the solution is $x = 5$ and $y = 4$.

Linked Prior Topics

Substitution, equations, simplifying expressions, lowest common multiple

Vocabulary

Simultaneous, elimination, coefficient, substitute

Linked Future Topics

Solving quadratic simultaneous equations