

Simultaneous Equations - Solving by Substitution



This method is used when you have 2 equations using the same variables which you can solve at the same time (simultaneously).

Example

$$\begin{aligned} 1) \quad y &= 2x + 4 & \textcircled{1} \\ \text{and } y &= 3x + 2 & \textcircled{2} \end{aligned}$$

let $\textcircled{1} = \textcircled{2}$

$$2x + 4 = 3x + 2$$

$$-x + 4 = 2$$

$$-x = -2$$

$$\underline{x = 2}$$

substitute $x = 2$ in $\textcircled{1}$

$$y = 2(2) + 4$$

$$\underline{y = 8}$$

check in $\textcircled{2}$ $8 = 3(2) + 2$
 $8 = 8$ ✓

$$\begin{aligned} 2) \quad x + 2y &= -1 & \textcircled{1} \\ \text{and } x - y &= 5 & \textcircled{2} \end{aligned}$$

Rearrange equations

$$x = -2y - 1 & \textcircled{1}$$

$$x = y + 5 & \textcircled{2}$$

let $\textcircled{1} = \textcircled{2}$

$$-2y - 1 = y + 5$$

$$-3y = 6$$

$$\underline{y = -2}$$

substitute $y = -2$ in $\textcircled{1}$ check in $\textcircled{2}$

$$x = -2(-2) - 1$$

$$\underline{x = 3}$$

$$3 = -2 + 5$$

$$3 = 3$$
 ✓