

Simultaneous Equations

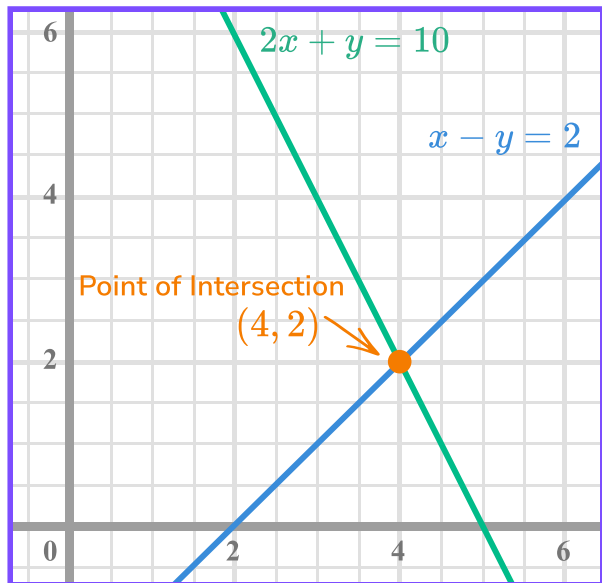
Simultaneous equations are two or more algebraic equations that share variables.

 **Example**

Solve the simultaneous equations $2x + y = 10$

$$x - y = 2$$

We can solve the equations using **elimination**, **substitution** or **graphically**



Elimination:

$$\begin{array}{r} 2x + y = 10 \\ + \quad x - y = 2 \\ \hline 3x \quad = 12 \\ \div 3 \quad \quad \div 3 \\ \hline x = 4 \end{array}$$

Substitute $x = 4$
into $x - y = 2$

$$4 - y = 2$$

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

Quadratic Simultaneous Equations

Quadratic simultaneous equations are two or more equations that share variables that are raised to powers up to 2.

 Example

$$y = x + 3$$

$$y = x^2 + 5x - 2$$

This is a pair of simultaneous equations - there is **one linear** equation and **one quadratic** equation.

$$x + 3 = x^2 + 5x - 2$$

$$\begin{array}{r} -x \\ -3 \end{array}$$

$$\begin{array}{r} -x \\ -3 \end{array}$$

$$0 = x^2 + 4x - 5$$

$$0 = (x + 5)(x - 1)$$

$$x + 5 = 0$$

$$\underline{x = -5}$$

$$y = -5 + 3$$

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

$$x - 1 = 0$$

$$\underline{x = 1}$$

$$y = 1 + 3$$

$$\underline{y = 4}$$

