

**Simultaneous Equations**

Simultaneous Equations	<p>A set of <b>two or more equations</b>, each involving <b>two or more variables</b> (letters).</p> <p>The <b>solutions</b> to simultaneous equations <b>satisfy both/all</b> of the <b>equations</b>.</p>	$\begin{aligned} 2x + y &= 7 \\ 3x - y &= 8 \end{aligned}$ $\begin{aligned} x &= 3 \\ y &= 1 \end{aligned}$
Variable	A <b>symbol</b> , usually a <b>letter</b> , which <b>represents a number</b> which is usually unknown.	In the equation $x + 2 = 5$ , $x$ is the variable.
Coefficient	<p>A <b>number</b> used to <b>multiply a variable</b>.</p> <p>It is the number that comes before/in front of a letter.</p>	$6z$ 6 is the coefficient $z$ is the variable
Solving Simultaneous Equations (by Elimination)	<ol style="list-style-type: none"> <li><b>Balance</b> the <b>coefficients</b> of one of the variables.</li> <li><b>Eliminate</b> this variable by adding or subtracting the equations (<b>Same Sign Subtract, Different Sign Add</b>)</li> <li><b>Solve</b> the linear equation you get using the other variable.</li> <li><b>Substitute</b> the value you found back into one of the previous equations.</li> <li><b>Solve</b> the equation you get.</li> <li><b>Check</b> that the two values you get satisfy both of the original equations.</li> </ol>	$\begin{aligned} 5x + 2y &= 9 \\ 10x + 3y &= 16 \end{aligned}$ <p>Multiply the first equation by 2.</p> $\begin{aligned} 10x + 4y &= 18 \\ 10x + 3y &= 16 \end{aligned}$ <p>Same Sign Subtract (+10x on both)</p> $y = 2$ <p>Substitute <math>y = 2</math> in to equation.</p> $\begin{aligned} 5x + 2 \times 2 &= 9 \\ 5x + 4 &= 9 \\ 5x &= 5 \\ x &= 1 \end{aligned}$ <p>Solution: <math>x = 1, y = 2</math></p>
Solving Simultaneous Equations (by Substitution)	<ol style="list-style-type: none"> <li><b>Rearrange</b> one of the equations into the form <math>y = \dots</math> or <math>x = \dots</math></li> <li><b>Substitute</b> the right-hand side of the rearranged equation into the other equation.</li> <li>Expand and <b>solve</b> this equation.</li> <li><b>Substitute</b> the value into the <math>y = \dots</math> or <math>x = \dots</math> equation.</li> <li><b>Check</b> that the two values you get satisfy both of the original equations.</li> </ol>	$\begin{aligned} y - 2x &= 3 \\ 3x + 4y &= 1 \end{aligned}$ <p>Rearrange: <math>y - 2x = 3 \rightarrow y = 2x + 3</math></p> <p>Substitute: <math>3x + 4(2x + 3) = 1</math></p> <p>Solve: <math>3x + 8x + 12 = 1</math></p> $\begin{aligned} 11x &= -11 \\ x &= -1 \end{aligned}$ <p>Substitute: <math>y = 2 \times -1 + 3</math></p> $y = 1$ <p>Solution: <math>x = -1, y = 1</math></p>

