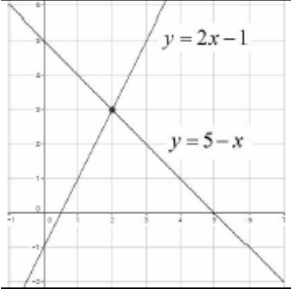


Topic: Simultaneous Equations

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

<p>6. Solving Simultaneous Equations (Graphically)</p>	<p>Draw the graphs of the two equations.</p> <p>The solutions will be where the lines meet.</p> <p>The solution can be written as a coordinate.</p>	 <p>$y = 5 - x$ and $y = 2x - 1$.</p> <p>They meet at the point with coordinates (2,3) so the answer is $x = 2$ and $y = 3$</p>
<p>7. Solving Linear and Quadratic Simultaneous Equations</p>	<p>Method 1: If both equations are in the same form (eg. Both $y = \dots$):</p> <ol style="list-style-type: none"> 1. Set the equations equal to each other. 2. Rearrange to make the equation equal to zero. 3. Solve the quadratic equation. 4. Substitute the values back in to one of the equations. <p>Method 2: If the equations are not in the same form:</p> <ol style="list-style-type: none"> 1. Rearrange the linear equation into the form $y = \dots$ or $x = \dots$ 2. Substitute in to the quadratic equation. 3. Rearrange to make the equation equal to zero. 4. Solve the quadratic equation. 5. Substitute the values back in to one of the equations. <p>You should get two pairs of solutions (two values for x, two values for y.)</p> <p>Graphically, you should have two points of intersection.</p>	<p><u>Example 1</u> Solve $y = x^2 - 2x - 5$ and $y = x - 1$</p> $x^2 - 2x - 5 = x - 1$ $x^2 - 3x - 4 = 0$ $(x - 4)(x + 1) = 0$ <p>$x = 4$ and $x = -1$</p> <p>$y = 4 - 1 = 3$ and $y = -1 - 1 = -2$</p> <p>Answers: (4,3) and (-1,-2)</p> <p><u>Example 2</u> Solve $x^2 + y^2 = 5$ and $x + y = 3$</p> $x = 3 - y$ $(3 - y)^2 + y^2 = 5$ $9 - 6y + y^2 + y^2 = 5$ $2y^2 - 6y + 4 = 0$ $y^2 - 3y + 2 = 0$ $(y - 1)(y - 2) = 0$ <p>$y = 1$ and $y = 2$</p> <p>$x = 3 - 1 = 2$ and $x = 3 - 2 = 1$</p> <p>Answers: (2,1) and (1,2)</p>