

Outcome	AEq8	Student can consistently:	Solve a pair of linear simultaneous equations.
How the topic is examined	<ul style="list-style-type: none"> • Examined through test paper questions. • Questions are equally likely to appear on calculator or non-calculator papers. • Students are asked to “Solve” or “Solve the pair of equations” and students are specifically asked to show an algebraic method for the solution. They are not allowed to use a trial and error approach to the question. • Simultaneous equations can sometimes be given in the form of a word problem and students have to write down two equations to solve firstly. 		
Prior knowledge	<ul style="list-style-type: none"> • Students should be confident with: <ul style="list-style-type: none"> ◦ Simplifying expressions (AEx2) ◦ Substituting into expressions (AEx5) ◦ Solving basic equations (AEq1) • In addition questions involving this topic can have links to: <ul style="list-style-type: none"> ◦ Solving quadratic equations by factorising (AEq6) and by completing the square (AEq9) 		
Suggested tuition approaches	<ul style="list-style-type: none"> • When solving a pair of simultaneous equations students need to understand that they are trying to find both unknowns (usually x and y). The values of these unknowns should satisfy both equations and not just one of them. • Students must use an algebraic method to solve simultaneous equations. Sometimes students try to use trial and error methods or even use matrices – no marks will be awarded for these methods even if they get both values correct. • There are two methods that are generally used to solve a pair of simultaneous equations: <ul style="list-style-type: none"> ◦ Elimination (most common method) ◦ Substitution • Both are acceptable algebraic methods and will lead to the correct answers. <p>1) Method of elimination</p> <ul style="list-style-type: none"> ◦ If not already done so, set the equations out above each other with the same letters lined up with each other. ◦ Ensure that you have the same number of x or same number of y in the equations. Do this by multiplying one or both of the equations by a number. ◦ Add or subtract the two equations in order to eliminate the letter that has the numbers the same. ◦ Find the value of the first unknown ◦ Substitute this value into one of the equations and then solve this to find the other letter. 		

	<p>A detailed example can be seen here http://corbettmaths.com/2013/03/05/simultaneous-equations-elimination-method/</p> <p>2) Method of substitution</p> <ul style="list-style-type: none"> o Ensure that you have the same number of or same number of in the equations. Do this by multiplying one or both of the equations by a number. o Rearrange each equation so that the letter that has the same amount becomes the subject. o Put these two new equations equal to one another. o Solve the new equation for the first letter. o Substitute this value into one of the equations and then solve this to find the other letter. <p>A detailed example can be seen here http://corbettmaths.com/2013/05/07/solving-simultaneous-equations-by-substitution/</p> <p>An alternative to this is to rearrange each equation to make x or y the subject (you need to arrange them so they have the same subject). You will likely end up with fractional equations. Now put these equal to each other and solve. (See AEq5)</p> <ul style="list-style-type: none"> • For both methods encourage students to check their answers by substituting their two values into the other equation and they should equal. If not they should go back and check their working. • Students must show all their working out at all stages. • Sometimes questions are given in the form of word problems and students have to extract the relevant information and form a pair of simultaneous equations from this. <p><i>E.g. John sells 60 bags of oranges. Each small bag costs £2 and each large bag costs £3. He makes £165 in total. How many of each type of bag did he sell? Show all your working.</i></p> <p>For this student would need to set up their own pair of equations. Let x be the number of small bags Let y be the number of large bags</p> $x + y = 60$ $2x + 3y = 165$
<p>Common errors and misconceptions</p>	<ul style="list-style-type: none"> • Students incorrectly add or subtract and are left with another equation involving two unknowns. Ask them to check whether they should have added or subtracted. Indeed students don't know whether to add or subtract. • Even when students choose the correct calculation for adding or subtracting they still get the answer wrong, particularly when there are negative terms. Students need to take care when working with negative numbers.

	<ul style="list-style-type: none"> • When substituting numbers back into the equation students need to remember that the letter is replaced by the number. For example if $x = 4$ and $2 + 3 = 11$ then $8 + 2 = 11$, a lot of students want to put $8 + 3 = 11$
<p>Suggested resources</p>	<ul style="list-style-type: none"> • Questions <ul style="list-style-type: none"> o http://www.cimt.org.uk/projects/mepres/allgcse/pr10-es.pdf (pp 65 – 67) o https://corbettmaths.files.wordpress.com/2013/02/simultaneous-equations-pdf.pdf o https://corbettmaths.files.wordpress.com/2013/02/simultaneous-equations-pdf.pdf • Past GCSE Questions <ul style="list-style-type: none"> o https://keshgcsemaths.files.wordpress.com/2013/11/87_simultaneous-equations.pdf • Video tutorial <ul style="list-style-type: none"> o http://corbettmaths.com/2013/03/05/simultaneous-equations-elimination-method/ o http://corbettmaths.com/2013/05/07/solving-simultaneous-equations-by-substitution/