

Outcome	AEq7	Student can consistently:	Solve quadratic equations using the formulae.
How the topic is examined	<ul style="list-style-type: none"> <li>Examinated through test paper questions.</li> <li>In the past questions would usually only appear on calculator papers due to the level of calculations required.</li> <li>There is an increasing likelihood that questions might now appear on non-calculator papers, with students asked to give their answers in surd form.</li> <li>The question will say "Solve the equation ..... Give your answers to 2 decimal places."</li> <li>The question will also state the level of accuracy that is required. It will usually be to 2 decimal places, but other degrees of accuracy have been asked for in the past.</li> </ul>		
Prior knowledge	<ul style="list-style-type: none"> <li>Students should be confident with: <ul style="list-style-type: none"> <li>Simplifying expressions (AEx2)</li> <li>Surds (NS3)</li> <li>Substituting into expressions (AEx5)</li> <li>Solving basic equations (AEq1)</li> </ul> </li> <li>In addition questions involving this topic can have links to: <ul style="list-style-type: none"> <li>Solving quadratic equations by factorising (AEq6) and by completing the square (AEq9)</li> </ul> </li> </ul>		
Suggested tuition approaches	<ul style="list-style-type: none"> <li>The quadratic formula is used to solve quadratic equations that cannot be solved by factorising (or factorising easily). Students can use the formula to solve any quadratic, however it is inefficient if the equation can be factorised.</li> <li>Students need to now be able to remember the quadratic formula as it is no longer given on the front of the exam paper.</li> </ul> $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ <ul style="list-style-type: none"> <li>Although the question will say "solve", it also says this when a student is required to factorise also. Some students struggle to know which method to use. However when you need to use the formula the question wants the answer to 2 d.p. suggesting the answers are not going to be exact and therefore you will need to use the quadratic formula.</li> <li>For the highest attaining students you may want to go through where the quadratic formula comes from. It is derived from completing the square (AEx9). <a href="http://www.purplemath.com/modules/sqrquad2.htm">http://www.purplemath.com/modules/sqrquad2.htm</a></li> <li>The steps involved in solving these equations using the formula are: <ul style="list-style-type: none"> <li>Identify the values of a, b and c. (these are the coefficient of x<sup>2</sup>, coefficient of x and constant term respectively)</li> <li>Substitute these values into the quadratic formula.</li> </ul> </li> </ul>		

	<ul style="list-style-type: none"> <li>o Either simplify the expression or evaluate it straight away on a calculator.</li> <li>o There are two answers, one where you add (<math>- + \dots</math>) and one where you subtract (<math>- - \dots</math>)</li> <li>• The following link provides a detailed explanation and example of the quadratic formula. <a href="http://corbettmaths.com/2013/04/24/quadratic-formula/">http://corbettmaths.com/2013/04/24/quadratic-formula/</a></li> <li>• Make sure the equation equals 0. If it doesn't you will need to rearrange the equation so that it does.</li> <li>• Remember that the sign (direction) is with the number also. So in <math>3x^2 - 5x - 8 = 0</math>, <math>a = 3</math>, <math>b = -5</math> and <math>c = -8</math></li> </ul>
<b>Common errors and misconceptions</b>	<ul style="list-style-type: none"> <li>• A common error is students don't make the equation equal 0. To solve a quadratic equation they must always equal 0 before students try to factorise.</li> <li>• Students sometimes get the values of a, b and c wrong if the equation is presented in a different form to <math>ax^2 + bx + c = 0</math>. They just take the numbers in the order that they are written.</li> <li>• Students substitute values incorrectly and make errors when typing it into to their calculator. The most common errors: <ul style="list-style-type: none"> <li>o Students forget to divide by <math>2a</math></li> <li>o They don't square root the entire of <math>b^2 - 4ac</math></li> <li>o Students get a negative answer when they square a negative number.</li> <li>o Linked to this, when typing into a calculator they don't use brackets around negative numbers (e.g. <math>(-3)^2</math>). A calculator would give the answer -9 if a student just typed in <math>-3^2</math></li> </ul> </li> </ul>
<b>Suggested resources</b>	<ul style="list-style-type: none"> <li>• Questions <ul style="list-style-type: none"> <li>o <a href="http://www.cimt.org.uk/projects/mepres/allgcse/pr10-es.pdf">http://www.cimt.org.uk/projects/mepres/allgcse/pr10-es.pdf</a> (pp 71 - 73)</li> <li>o <a href="https://corbettmaths.files.wordpress.com/2013/02/quadratic-formula-pdf.pdf">https://corbettmaths.files.wordpress.com/2013/02/quadratic-formula-pdf.pdf</a></li> </ul> </li> <li>• Past GCSE Questions <ul style="list-style-type: none"> <li>o <a href="https://keshgcsemaths.files.wordpress.com/2013/11/98_quadratic-formula.pdf">https://keshgcsemaths.files.wordpress.com/2013/11/98_quadratic-formula.pdf</a></li> </ul> </li> <li>• Video tutorial <ul style="list-style-type: none"> <li>o <a href="http://corbettmaths.com/2013/04/24/quadratic-formula/">http://corbettmaths.com/2013/04/24/quadratic-formula/</a></li> </ul> </li> </ul>