Outcome	AEq6	Student can consistently:	Solve quadratic equations by factorising.
How the topic is examined	• Examined through test paper questions. • Questions are equally likely to appear on calculator or non-calculator papers. • This follows on from factorising quadratic expressions (AEx7) and occasionally students are helped into the question by asking students to 'factorise' first. It is more likely that students will be presented with a quadratic equation that they are asked to solve.		
Prior knowledge	• Students should be confident with: o Expanding brackets (AEx1) o Simplifying expressions (AEx2) o Solving basic equations (AEq1) o Simplifying algebraic fractions (AEx6) o Factorising quadratic expressions (AEx7) • In addition questions involving this topic can have links to: o Solving quadratic equations using the quadratic formula (AEq7)		
Suggested tuition approaches	• Students may ask "How do they know if they should factorise?" Explain to them that they can use any method to solve the equation, however when a question says solve, it usually means the expression can factorise. If students struggle to factorise they can use the quadratic formula (AEx7) and also by completing the square (AEx9) • The steps involved in solving a quadratic equation using factorising are; o Make sure the equation equals 0. If it doesn't you will need to rearrange the equation so that it does. o Factorise the quadratic expression. o Find the value that will make the expression in each bracket equal zero, these are the two solutions to the equations. • All quadratic equations that students meet in the GCSE exam will have two solutions. It is possible that one solution is repeated (i.e. the same number both times) – but it is unlikely. • Students should understand why they are trying to make the brackets equal 0. The key point is that the brackets represent numbers and you have two which are multiplied together. Because you know the answer is 0 (this is why the equation should always equal zero) this means that at least one of the brackets must be 0. If you have two numbers that multiply to make 0 one of them must be 0.		

Basic equation	Equation with coefficient of x^2 greater than 1
Solve $x^2 - 5x - 14 = 0$ The equation equals 0, so we now just factorise $(x - 7)(x + 2) = 0$ The numbers that will make each bracket 0 are $x = 7$ and $x = -2$	Solve $3x^2 + 16x + 15 = 10$ First make the equation equal 0 by subtracting 10 from each side. $3x^2 + 16x + 5 = 0$ Now factorise $(3x + 1)(x + 5) = 0$ The numbers that will make each bracket 0 are $x = -\frac{1}{3}$ and $x = -5$
Special case 1	**Special case 2**
Solve $x^2 + 3x = 0$ The equation equals 0, so we now just factorise $x(x + 3) = 0$ The numbers that will make this equation 0 are; $x = 0$ and $x = -3$ The $x = 0$ comes from the x in front of the first bracket. You might write this as $(x + 0)$ to help students see.	Solve $x^2 - 9 = 0$ The equation equals 0, so we now just factorise. Remember this is an example of a difference of two squares. $(x + 3)(x - 3) = 0$ The numbers that will make each bracket 0 are $x = 3$ and $x = -3$

Common errors and misconceptions	• Some teachers will simply tell students to change the sign of the number in the brackets and these will be the solutions. Students need to take care with this as a method when they have examples like $(3x + 1)(x + 5) = 0$. Students may struggle to work out what the first solution is using this method. If instead they try to find the value that should make the expression in the bracket equal 0, they are likely to have more success. • Another 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. • Students struggle to recognise the special case examples. It is important that they meet plenty of examples like this. Note special case 2 could have been presented originally as $x^2 = 9$. In this example students may have just square rooted and found the answer 3 instead of both solutions 3 and -3. • Students make errors when factorising quadratics (see AEx7)
Suggested resources	• Questions o http://www.cimt.org.uk/projects/mepres/allgcse/pr10-es.pdf (pp 69 - 71) o https://corbettmaths.files.wordpress.com/2013/02/solving-quadratics-factorising-pdf.pdf • Past GCSE Questions o https://keshgcsemaths.files.wordpress.com/2013/11/86_solving-quadratics-by-factorising.pdf • Video tutorial o http://corbettmaths.com/2013/05/03/solving-quadratics-by-factorising/