Outcome	AEx7	Student can consistently:	Factorise quadratic equations, including ones where the coefficient of x^2 > 1.
How the topic is examined	• Examined through test paper questions. • Questions are equally likely to appear on calculator or non-calculator papers. • Questions will ask students to 'Factorise'.		

Prior knowledge	• Students should be confident with:
	  ○ Expanding brackets (AEx1)
	  ○ Simplifying expressions (AEx2)
	  ○ Factorising simple expressions (AEx4)
	  ○ Negative numbers
	  ○ Factors and multiples
	• In addition questions involving this topic can have links to:
	  ○ Solving quadratic equations by factorising.
	  ○ Simplifying algebraic fractions.		

Suggested tuition approaches	• Students need to understand that factorising is the opposite of expanding. • Students need to recognise that this is a quadratic factorisation, which requires two pairs of brackets as opposed to the examples presented in (AEx4). • There are three types of quadratic expressions that you may be asked to factorise. Each one is covered below. 1) Simple quadratic expressions (e.g. $x^2 - 5x - 14$) ▪ Look for two numbers that multiply to make the constant term (in this case -14) and the same two numbers need to add up to make -5 ▪ If students cannot see the answer straight away, encourage them to find the different factor pairs that make -14. They should list them out and check which pair adds up to make -5. ▪ Once the numbers have been identified, these can then be put into the brackets (e.g. $(x - 7)(x + 2)$) ▪ Encourage students to check their answer by expanding this out and checking that it equals the original expression.		

	2) Difference of two squares (e.g. $x^2 - 100$) ▪ These are a special case and students should aim to recognise them as a separate example. ▪ It is called the difference of two squares, because essentially you have two squared terms (e.g. x^2 and $10^2 = 100$) and it has a subtraction sign in between (difference). ▪ These questions may look like those in AEx4, however students need to see that there isn't a single expression that you factor out of both terms. They have nothing in common. ▪ Encourage students to think about it as a three term expression (e.g. $x^2 + 0x - 100$) ▪ Students can then follow the same rules as above and they realise $(x + 10)(x - 10)$ 3) Coefficient of s^2 is greater than 1 (e.g. $3x^2 + 7x + 2$) ▪ Students find these the most difficult of all the expressions. ▪ There are two ways to approach this. ▪ The first is trial and error. Encourage students to find two terms that will make the quadratic term (3x2) and these will go in the front of the two brackets. Then ask them to find two terms that make the constant term (2) and these should go in the end of brackets. Now expand the brackets you have got to check if it is what was asked for. If it is not correct, try a different set of values. ▪ The second way that you could use is more algebraic. It is a bit more complicated to explain and follow, but if used will always get the right answer. It is explained in detail here http://www.purplemath.com/modules/factquad2.htm ▪ Either method will receive full marks in an exam. • Students need to be made aware through varying the examples, that expressions may not always be presented in the form where the squared term is first, then the linear term and then the constant. There may be variations. ○ $x^2 + 10 + 11x$ ○ $9 - 6x + x^2$ • Students may find it easier to rearrange the order to the standard order.
Common errors and misconceptions	• Students fail to realise that they need to use two pairs of brackets as opposed to the examples in AEx4. They need to do many different examples to help them see when to use one pair of brackets and when to use two. • Students struggle with negatives when they appear in expressions. • A very common mistake is that students just guess which sign goes with which number in the factorised expression. To avoid this get students to check their answer by expanding. • Students can struggle to find the two numbers because they try to do it all in their head. Encourage them to write down

	all the factor pairs. • Although an easy example, students struggle when you have an example where one of the brackets is +1 (e.g. $x^2 + 7x + 6$). Many students choose the numbers 7 and 1 or 7 and -1

Suggested resources	• Questions
	  ○ http://www.cimt.org.uk/projects/mepres/allgcse/pr10-es.pdf (pp 68 - 69)
	  ○ https://corbettmaths.files.wordpress.com/2013/02/factorising-quadratics.pdf
	• Past GCSE Questions
	  ○ https://keshgcsemaths.files.wordpress.com/2013/11/85_algebra_quadratics.pdf
	• Video tutorial
	  ○ http://corbettmaths.com/2013/02/06/factorising-quadratics-1/
	  ○ http://corbettmaths.com/2013/02/07/factorising-quadratics-2/