Outcome	AEx10	Student can consistently:	Complete the square for an algebraic expression
How the topic is examined	• Examined through test paper questions. • Questions are equally likely to appear on calculator or non-calculator papers. • It is unlikely to ask students to 'complete the square'. Instead it will ask students to write a given quadratic expression in the form $(x + a)^2 + b$. A supplementary question usually then asks to state the values of a and b. • In the previous GCSE, questions on this topic were quite rare, but it is likely that these questions will get more emphasis on the new GCSE.		

Prior knowledge	• Students should be confident with:
	  ○ Expanding brackets (AEx1)
	  ○ Simplifying expressions (AEx2)
	  ○ Factorising simple expressions (AEx4)
	  ○ Factorising quadratic expressions (AEx7)
	  ○ Multiplying and dividing fractions
	• In addition questions involving this topic can have links to:
	  ○ Solving algebraic fraction equations.		

Suggested tuition approaches	• Students should be made aware that completing the square is one of the most useful methods when working with quadratic expressions.
	• Completing the square for a quadratic function has multiple uses:
	  ○ It allows you to go and solve equations.
	  ○ You can use it to prove the quadratic formula (AEq7)
	  ○ You can use it to sketch a quadratic graph and determine the line of symmetry and co-ordinates of the turning point.
	  ○ You can use it to rearrange more complicated formulae.
	• Students might be interested to know why it is called completing the square. The following link gives a nice visual explanation. https://en.wikipedia.org/wiki/Completing_the_square		

- The steps involved in completing the square are outlined below.

Step 1 Halve the middle term (x term) – the coefficient of this becomes the 'a' in the bracket.	Write $x^2 - 8x + 3$ in the form $(x + a)^2 + b$ Halve the coefficient of the x term and this is the value of a $(x - 4)^2$
Step 2: Now square this value and subtract this value.	If we square -4, you get 16 (note you will always get a positive answer here) We now subtract 16 form our expression $(x - 4)^2 - 16$
Step 3 Bring down the constant term from the original expression.	The constant term in the original expression was +3 $(x - 4)^2 - 16 + 3$
Step 4 Simplify your expression.	$(x - 4)^2 - 13$ You may be asked to state the values of a and b. If you compare them to the form you want $a = -4$ and $b = -13$

- You can check your answer by expanding out your answer and check that it equals what you were given to start with.
- Students can then write down the values of a and b.
- Note that you could be asked to write the expression in the form $(x - a)^2 + b$ or $(x + a)^2 - b$ or $(x - a)^2 - b$, these are all the same. It is just the signs of the values of a and b that could change.

Common errors

and misconceptions	• Students often forget to bring down the constant term form the original expression. • Students can get the sign associated with a and b wrong when asked to state them. Be careful to check the signs of a and b in the required form. For example if our example asked to write the given expression in the form $(x-a)^2-b$ then a = 4 and b = 13.

Suggested resources	• Questions
	  ○ http://www.cimt.org.uk/projects/mepres/allgcse/pr10-es.pdf (pp 75 - 77)
	  ○ https://corbettmaths.files.wordpress.com/2013/02/completing-the-square-exercise-10-pdf.pdf
	• Past GCSE Questions
	  ○ https://corbettmaths.files.wordpress.com/2013/02/completing-the-square-pdf1.pdf
	• Video tutorial
	  ○ http://corbettmaths.com/2013/12/29/completing-the-square-video-10/