Guidance for tutors

The table below outlines useful information for tutors as well as some suggested approaches and resources.

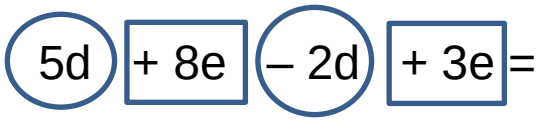
Outcome	AEx2	**Student can consistently:**	Simplify algebraic expressions including ones that require expanding brackets.
How the topic is examined	• Examined through test paper questions. • Questions are equally likely to appear on calculator or non-calculator papers. • Questions will ask students to 'Simplify'. • When students have to expand brackets first, it will say 'Expand and simplify'. Expand and simplify is a far more common question than just simplify.		

Prior knowledge	• Students should be confident with:
	  ○ Negative numbers.
	  ○ Multiplication.
	• In addition questions involving simplifying expressions can have links to:
	  ○ Expanding brackets (AEx1)		

Suggested tuition approaches	• Students should understand:
	  ○ The definition of an expression.
	  ○ That an expression is made up of terms.
	  ○ The key to simplifying expressions is that you can only add and subtract like terms.
	  ○ Like terms are where you are adding or subtracting the same letters or combinations of letters.
	  ▪ For example 5a + 2a = 7a
	  ▪ However you cannot do 7a + 2b because these are not the same letter.
	• To be successful with expressions, students should be confident simplifying expressions involving all four operations and combinations of letters. Students should understand the following:		

Type	Examples
Basic addition, subtraction	c + c + c or 5g - 3g
Basic multiplication and division	2a x 3b or $\frac{6m}{2}$
More complicating adding expressions	3m + 5n – 6m + 3n
Other expressions	a x a x a (See AEx3) $\frac{5p-25}{5}$

- When collecting like terms a common method is that students underline/circle/box up like terms



  - In this example terms involving d only have been circled and terms involving e have a box around them.
  - Students should ensure that they also circle/box the sign (+ or -) with the term too.
  - Students then work out 5d – 2d = 3d and +8e + 3e = 11e. So the answer is 3d + 11e.

- Expand and simplify:
  - When a question asks students to expand and simplify they will first have to expand the single or double bracket (See (AEx1).
  - Students then simplify the expression using the rules above.
  - Students need to be careful when simplifying an expression involving subtraction.

$$3(2x + 5) - 3(2x - 4) = 6x + 15 - 6x + \mathbf{12}$$

  - The bold value at the end is +12 because it is -3 x -4 = + 12. This is a common mistake and many students struggle to understand this. Ensure plenty of examples like this are covered.

Common errors and misconceptions

- Students want to put everything together when they add 7a + 2b = 9ab. This is a common mistake.
- When adding x and x^2 students write x^3 which is wrong. They don't realise that these are unlike terms and therefore cannot be simplified in anyway.
- When a student does 9y - 2y, some just put the answer 7 as they think the y's cancel each other out.

	• Many students forget that the sign stays with the term and they just look at what follows the term instead. To avoid this try to get students to identify like terms by circling/boxing (see above). • Students think that a and A are like terms. This is not the case. So 2a is not the same as 2A and you cannot simplify a + A. • When expanding and simplifying, they expand incorrectly or forget to simplify. • A common mistake is when two expressions that need expanding are subtracted; students just multiply by the number as if it was positive. For example $3(2x+5)-3(2x-4)=6x+15-6x-\mathbf{12}$ is a common wrong answer (see above).

Suggested resources	• Questions
	  ○ http://www.cimt.org.uk/projects/mepres/allgcse/bkb10.pdf (pp 188-189)
	  ○ https://www.tes.co.uk/teaching-resource/simplifying-expressions-6277952
	• Tutorials
	  ○ http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut11_simp.htm
	• Past GCSE Questions
	  ○ https://keshgcsemaths.files.wordpress.com/2013/11/57_algebra_collecting-like-terms.pdf