

Expanding Double Brackets

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

Multiply out and simplify $(x + 3)(x + 5)$

Multiply each term in the first bracket by each term in the second bracket:

$$x \times x = x^2$$

$$x \times 5 = 5x$$

$$3 \times x = 3x$$

$$3 \times 5 = 15$$

$$\text{So } (x + 3)(x + 5) = x^2 + 5x + 3x + 15$$

$$\text{Collect the } x \text{ terms: } 5x + 3x = 8x$$

Answer: $x^2 + 8x + 15$

Tip: There should be four terms before you simplify. A grid or FOIL (First, Outside, Inside, Last) helps you not miss one.

Marks: 1 mark for three of the four terms correct. 1 mark for $x^2 + 8x + 15$.

2 (2 marks)

Multiply out and simplify $(x + 4)(x - 2)$

$$x \times x = x^2$$

$$x \times (-2) = -2x$$

$$4 \times x = 4x$$

$$4 \times (-2) = -8$$

$$\text{So } (x + 4)(x - 2) = x^2 - 2x + 4x - 8$$

$$\text{Collect the } x \text{ terms: } -2x + 4x = 2x$$

$$\text{Answer: } x^2 + 2x - 8$$

Tip: Keep the sign with each number. The last term is $4 \times (-2) = -8$, not $+8$.

Marks: 1 mark for three of the four terms correct. 1 mark for $x^2 + 2x - 8$.

3 (2 marks)

Multiply out and simplify $(x - 6)(x - 1)$

$$x \times x = x^2$$

$$x \times (-1) = -x$$

$$-6 \times x = -6x$$

$$-6 \times (-1) = +6 \text{ (negative } \times \text{ negative = positive)}$$

$$\text{So } (x - 6)(x - 1) = x^2 - x - 6x + 6$$

$$\text{Collect the } x \text{ terms: } -x - 6x = -7x$$

$$\text{Answer: } x^2 - 7x + 6$$

Marks: 1 mark for three of the four terms correct. 1 mark for $x^2 - 7x + 6$.

4 (1 mark)

Circle the expression that is equivalent to $(x - 3)^2$

Options: $x^2 - 9$, $x^2 + 9$, $x^2 - 6x + 9$, $x^2 - 6x - 9$

$$(x - 3)^2 \text{ means } (x - 3)(x - 3).$$

$$= x^2 - 3x - 3x + 9$$

$$= x^2 - 6x + 9$$

Answer: $x^2 - 6x + 9$

Tip: $(x - 3)^2$ is not $x^2 - 9$ or $x^2 + 9$. Always write it as two brackets, $(x - 3)(x - 3)$, and multiply out all four terms.

5 (2 marks)

Multiply out and simplify $(x + 5)^2$

$(x + 5)^2$ means $(x + 5)(x + 5)$.

$$= x^2 + 5x + 5x + 25$$

$$= x^2 + 10x + 25$$

Answer: $x^2 + 10x + 25$

Marks: 1 mark for $(x + 5)(x + 5)$ with at least three terms correct. 1 mark for $x^2 + 10x + 25$.

6 (2 marks)

Amy says,

$$'(x + 4)^2 = x^2 + 16'$$

Is she correct? Tick a box.

Give a reason for your answer.

$$(x + 4)^2 = (x + 4)(x + 4)$$

$$= x^2 + 4x + 4x + 16$$

$$= x^2 + 8x + 16$$

Amy has missed out the two 'middle' terms, $4x + 4x = 8x$.

Answer: No, because $(x + 4)^2 = x^2 + 8x + 16$

Marks: 1 mark for No. 1 mark for showing $(x + 4)^2 = x^2 + 8x + 16$ or explaining the missing $8x$.

7 (2 marks)

Here is a grid for multiplying out $(x + 7)(x + 2)$

×	x	$+7$
x		
$+2$		

Complete the grid.

Use it to multiply out and simplify $(x + 7)(x + 2)$

Multiply the row label by the column label for each box:

×	x	$+7$
x	x^2	$+7x$
$+2$	$+2x$	$+14$

Add the four boxes: $x^2 + 7x + 2x + 14$

Collect the x terms: $7x + 2x = 9x$

Answer: $x^2 + 9x + 14$

Marks: 1 mark for all four boxes correct. 1 mark for $x^2 + 9x + 14$.

8 (2 marks)

Multiply out and simplify $(2x + 3)(x + 4)$

$$2x \times x = 2x^2$$

$$2x \times 4 = 8x$$

$$3 \times x = 3x$$

$$3 \times 4 = 12$$

$$\text{So } (2x + 3)(x + 4) = 2x^2 + 8x + 3x + 12$$

Collect the x terms: $8x + 3x = 11x$

Answer: $2x^2 + 11x + 12$

Tip: $2x \times x = 2x^2$, not $2x$ or $3x$. Multiply the numbers and the letters.

Marks: 1 mark for three of the four terms correct. 1 mark for $2x^2 + 11x + 12$.

9 (3 marks)

Multiply out and simplify $(3x - 2)(2x + 5)$

$$3x \times 2x = 6x^2$$

$$3x \times 5 = 15x$$

$$-2 \times 2x = -4x$$

$$-2 \times 5 = -10$$

$$\text{So } (3x - 2)(2x + 5) = 6x^2 + 15x - 4x - 10$$

Collect the x terms: $15x - 4x = 11x$

Answer: $6x^2 + 11x - 10$

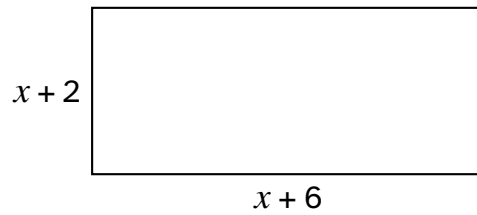
Tip: Take care when collecting: $15x - 4x = +11x$. A sign mistake here is very common.

Marks: 1 mark for four terms with at least three correct. 1 mark for all four terms correct. 1 mark for $6x^2 + 11x - 10$.

10 (2 marks)

Here is a rectangle.

All lengths are in centimetres.



Not drawn accurately

Show that the area of the rectangle, in cm^2 , is $x^2 + 8x + 12$

Area = length $\times$ width

$$\text{Area} = (x + 6)(x + 2)$$

$$= x^2 + 2x + 6x + 12$$

$$= x^2 + 8x + 12$$

Marks: 1 mark for $(x + 6)(x + 2)$. 1 mark for correctly expanding to $x^2 + 8x + 12$.

11 (2 marks)

a and b are numbers.

$$(x + a)(x + 3) \equiv x^2 + 7x + b$$

Work out the values of a and b .

Expand the left-hand side:

$$(x + a)(x + 3) = x^2 + 3x + ax + 3a$$

The x terms must match: $3x + ax = 7x$

So $3 + a = 7$, which gives $a = 4$

The numbers must match: $b = 3a$

So $b = 3 \times 4 = 12$

Answer: $a = 4, b = 12$

Tip: Expand first, then match the x terms and the number terms on both sides.

Marks: 1 mark for $a = 4$. 1 mark for $b = 12$ (or $3 \times$ your value of a).

12 (2 marks)

Multiply out and simplify $(x + 5)(x - 5)$

$$x \times x = x^2$$

$$x \times (-5) = -5x$$

$$5 \times x = 5x$$

$$5 \times (-5) = -25$$

$$\text{So } (x + 5)(x - 5) = x^2 - 5x + 5x - 25$$

The x terms cancel out: $-5x + 5x = 0$

Answer: $x^2 - 25$

Marks: 1 mark for $x^2 - 5x + 5x - 25$. 1 mark for $x^2 - 25$.

13 (2 marks)

Tick **one** box for each statement.

	True	False
$(x + 2)(x + 3) = x^2 + 5x + 6$	✓	
$(x - 2)(x + 3) = x^2 + x - 6$	✓	
$(x - 4)^2 = x^2 - 16$		✓
$(2x + 1)(x + 1) = 2x^2 + 2x + 1$		✓

$(x + 2)(x + 3) = x^2 + 3x + 2x + 6 = x^2 + 5x + 6$ ✓

$(x - 2)(x + 3) = x^2 + 3x - 2x - 6 = x^2 + x - 6$ ✓

$(x - 4)^2 = x^2 - 4x - 4x + 16 = x^2 - 8x + 16$, not $x^2 - 16$

$(2x + 1)(x + 1) = 2x^2 + 2x + x + 1 = 2x^2 + 3x + 1$, not $2x^2 + 2x + 1$

Marks: 2 marks for all four correct. 1 mark for two or three correct.

14 (3 marks)

Expand and simplify $(x + 2)(x + 5) - (x + 1)(x + 3)$

Expand the first pair: $(x + 2)(x + 5) = x^2 + 7x + 10$

Expand the second pair: $(x + 1)(x + 3) = x^2 + 4x + 3$

Subtract, keeping the second answer in a bracket:

$$x^2 + 7x + 10 - (x^2 + 4x + 3)$$

$$= x^2 + 7x + 10 - x^2 - 4x - 3$$

$$= 3x + 7$$

Answer: $3x + 7$

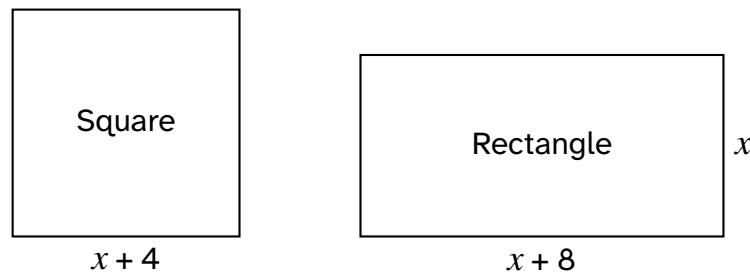
Tip: The minus sign applies to every term of the second expansion:

$$-(x^2 + 4x + 3) = -x^2 - 4x - 3.$$

Marks: 1 mark for $x^2 + 7x + 10$. 1 mark for $x^2 + 4x + 3$. 1 mark for $3x + 7$.

15 (3 marks)

Here are a square and a rectangle.
All lengths are in centimetres.



Not drawn accurately

Show that the area of the square is 16 cm^2 more than the area of the rectangle.

$$\text{Square: area} = (x + 4)^2 = (x + 4)(x + 4)$$

$$= x^2 + 8x + 16$$

$$\text{Rectangle: area} = x(x + 8) = x^2 + 8x$$

$$\text{Difference: } (x^2 + 8x + 16) - (x^2 + 8x) = 16$$

So the square's area is always 16 cm^2 more.

Marks: 1 mark for $(x + 4)^2 = x^2 + 8x + 16$. 1 mark for $x^2 + 8x$. 1 mark for showing the difference is 16.
