

GCSE MATHS

Expanding and factorising

Worked Solutions

Q1

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$$3(2x) - 3(5)$$

Multiply the outside factor by every term.

$$6x - 15$$

Evaluate the products.

Q2

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$$(-4)(3x) + (-4)(2)$$

Multiply the outside factor by every term.

$$-12x - 8$$

Evaluate the products.

Q3

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$$5x(2x) - 5x(3)$$

Multiply the outside factor by every term.

$$10x^2 - 15x$$

Evaluate the products.

Q4

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$$6(2x + 3)$$

Divide each term by the greatest common factor to form the bracket.

Q5

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$$5x(3x - 2)$$

Divide each term by the greatest common factor to form the bracket.

Q6

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$$4x^2(2x + 3)$$

Divide each term by the greatest common factor to form the bracket.

Q7

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$$x^2 + 5x + 3x + 15$$

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

$$x^2 + 8x + 15$$

Collect the two x terms.

Q8

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$$x^2 + 7x - 4x - 28$$

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

$$x^2 + 3x - 28$$

Collect the two x terms.

Q9

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$$x^2 - 2x - 6x + 12$$

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

$$x^2 - 8x + 12$$

Collect the two x terms.

Q10

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$$4 + 7 = 11$$

Find the required sum and product.

$$4(7) = 28$$

$$(x + 4)(x + 7)$$

Write the two brackets.

Q11

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$$-5 + 2 = -3$$

Find the required sum and product.

$$(-5)(2) = -10$$

$$(x - 5)(x + 2)$$

Write the two brackets.

Q12

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$$-3 - 8 = -11$$

Find the required sum and product.

$$(-3)(-8) = 24$$

$$(x - 3)(x - 8)$$

Write the two brackets.

Q13

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$$2x^2 + 8x + 3x + 12$$

Multiply all four term pairs.

$$2x^2 + 11x + 12$$

Collect like terms.

Q14

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$$6x^2 + 15x - 4x - 10$$

Multiply all four term pairs.

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

Collect like terms.

Q15

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$$4x^2 - 2x - 2x + 1$$

Multiply all four term pairs.

$$4x^2 - 4x + 1$$

Collect like terms.

Q16

$$2x^2 + 6x + x + 3$$

Split the middle term using two numbers with product ac .

$$2x(x + 3) + (x + 3)$$

Factor each pair of terms.

$$(2x + 1)(x + 3)$$

Take out the common bracket.

Q17

$$6x^2 + 3x - 4x - 2$$

Split the middle term using two numbers with product ac .

$$3x(2x + 1) - 2(2x + 1)$$

Factor each pair of terms.

$$(3x - 2)(2x + 1)$$

Take out the common bracket.

Q18

$$9x^2 - 24x + 16 = (3x)^2 - 2(3x)(4) + 4^2$$

The first and last terms are squares; the middle term is minus twice their product.

$$(3x - 4)^2$$

Use the square of a difference.

Q19

$$(x^2 + 3x + 2)(x + 3)$$

Expand the first two brackets.

$$x^3 + 3x^2 + 3x^2 + 9x + 2x + 6$$

Multiply each term by each term in the last bracket.

$$x^3 + 6x^2 + 11x + 6$$

Collect equal powers of x .

Q20

$$(2x^2 + 3x - 2)(x - 3)$$

Expand the first two brackets.

$$2x^3 - 6x^2 + 3x^2 - 9x - 2x + 6$$

Multiply each term by each term in the last bracket.

$$2x^3 - 3x^2 - 11x + 6$$

Collect equal powers of x .

Q21

$$3x(x^2 - 4)$$

Remove the common factor.

$$3x(x - 2)(x + 2)$$

Factor the difference of squares.

Q22

$$[(x + 3) - 5][(x + 3) + 5]$$

Treat $x + 3$ as one expression in a difference of squares.

$$(x - 2)(x + 8)$$

Simplify the brackets.

Q23

$$ab = 24$$

Compare coefficients.

$$a + b = k$$

$$(a, b) = (1, 24), (2, 12), (3, 8), (4, 6)$$

List positive factor pairs.

$$k = 25, 14, 11, 10$$

Add each pair.

Q24

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$$2q + p = 11$$

$$pq = 12$$

$$(p, q) = (1, 12), (2, 6), (3, 4)$$

$$(p, q) = (4, 3), (6, 2), (12, 1)$$

$$2(4) + 3 = 11$$

Expand the brackets and compare coefficients.

List positive factor pairs of 12.

Include the pairs in the other order.

Only $p = 3, q = 4$ also satisfies the first equation.