

Factorising quadratics with positive coefficients

Year 8 About 70 minutes No calculator 49 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/ks3-year-8-factorising-quadratics-with-positive-coefficients/

Date _____

A Do Now

Quick questions to start.

- A1** Last lesson [1 mark] **A2** Needed today [1 mark]
Expand and simplify $x(x + 1)(x + 2)$.
Write down every pair of whole numbers that multiply to make 48.
Answer _____
- A3** Needed today [1 mark] **A4** Year 7 [1 mark]
Find two numbers that add to 15 and multiply to 56.
Factorise $6x + 15$.
Answer _____
- Answer _____

B Example, then your turn

Year 8

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

Factorise $x^2 + 19x + 90$.

Hint $(x + a)(x + b) = x^2 + (a + b)x + ab$. Find two numbers with product 90 and sum 19.

B1 Factorise $x^2 + 18x + 77$. [2 marks]

Answer _____

EXAMPLE 2

Factorise $x^2 + 19x + 48$.

Hint List the pairs that multiply to 48 in order: 1 and 48, 2 and 24, 3 and 16, 4 and 12, 6 and 8. Add each pair.

B2 Factorise $x^2 + 15x + 36$. [2 marks]

Answer _____

EXAMPLE 3

Factorise $x^2 + 30x + 225$.

Hint Look for two numbers with product 225 and sum 30. They may be the same number.

B3 Factorise $x^2 + 40x + 400$. [2 marks]

Answer _____

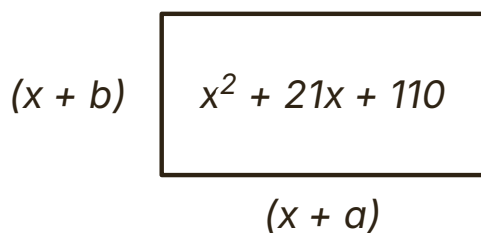
EXAMPLE 4

Factorise fully $4x^2 + 48x + 44$.

Hint Every term is a multiple of 4. Take out the 4 first, then factorise what is left in the bracket.

EXAMPLE 5

The area of this rectangle is $x^2 + 21x + 110$. Its sides are $(x + a)$ and $(x + b)$, where $a < b$. Work out a and b .



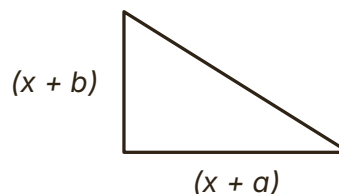
Not drawn accurately

Hint Factorise the area. The two brackets are the two sides.

B4 Factorise fully $2x^2 + 46x + 84$. [3 marks]

Answer

B5 The area of this right-angled triangle is $\frac{1}{2}(x^2 + 20x + 96)$. Its two shorter sides are $(x + a)$ and $(x + b)$, where $a < b$. Work out a and b . [3 marks]



Not drawn accurately

Answer $a = \dots\dots$ $b = \dots\dots$

c Practice

Year 8

C1 Factorise $x^2 + 16x + 55$. [2 marks]

Answer

C2 Fill in the missing numbers: [2 marks]
 $x^2 + \square x + 72 = (x + 6)(x + \square)$.

Answer and

C3 Only one of these cannot be factorised using whole numbers. Which one? Give a reason. [2 marks]

A: $x^2 + 19x + 78$

B: $x^2 + 29x + 78$

C: $x^2 + 21x + 78$

Answer because

C4 Factorise $x^2 + 19x + 88$. [2 marks]

Answer

C5 Factorise fully $3x^2 + 57x + 180$. [3 marks]

Answer

D Exam-style questions

GCSE Foundation

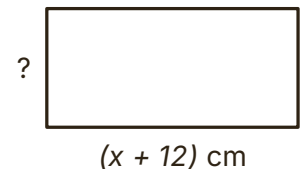
D1 Leo says: " $x^2 + 17x + 60 = (x + 3)(x + 20)$, because $3 \times 20 = 60$." [3 marks]

Leo is wrong. Explain why, and factorise $x^2 + 17x + 60$ correctly.

Answer $x^2 + 17x + 60 = \dots\dots$

D2 The area of this rectangle is $(x^2 + 23x + 132)$ cm². Its length is $(x + 12)$ cm.

- (a) Write down an expression for the width of the rectangle. [2 marks]



Not drawn accurately

Answer cm

- (b) The perimeter of the rectangle is 86 cm. Work out the value of x . [3 marks]

Answer

Total for D2: 5 marks

D3 $x^2 + kx + 40$ can be factorised as $(x + a)(x + b)$, where a , b and k are positive whole numbers. Write down every possible value of k . [4 marks]

Answer

D4 Simplify $\frac{x^2 + 20x + 99}{x + 9}$. [3 marks]

Answer

D5 Here is an expression: $x^2 + 21x + 108$.

(a) Factorise $x^2 + 21x + 108$. [2 marks]

Answer

(b) Use your answer with $x = 100$ to work out 109×112 . Show your working. [2 marks]

Answer

Total for D5: 4 marks

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 Factorise $x^4 + 18x^2 + 80$. [3 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** $x^4 = (x^2)^2$. Write y in place of x^2 .
Hint 2 Now factorise $y^2 + 18y + 80$: find two numbers with product 80 and sum 18.
Hint 3 Put x^2 back in place of y in each bracket.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can factorise $x^2 + bx + c$ by finding two numbers with product c and sum b . ☐ ☐ ☐

I can spot a perfect square and write it as $(x + a)^2$. ☐ ☐ ☐

I can take out a common factor first and then factorise. ☐ ☐ ☐

I can use factorising to find sides, simplify fractions and do arithmetic. ☐ ☐ ☐