

Factorising quadratics with negative coefficients

Year 8 About 75 minutes No calculator 47 marks



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

Date _____

A Do Now

Quick questions to start.

- A1** Last lesson [1 mark] **A2** Needed today [1 mark]
 Factorise $x^2 + 23x + 120$. Find two numbers that multiply to -24 and add to 5 .

Answer

Answer

- A3** Lesson 1 [1 mark] **A4** Year 7 [1 mark]
 Expand and simplify $(x - 3)(x + 13)$. Work out the value of $x^2 - 3x$ when $x = -6$.

Answer

Answer

B Example, then your turn

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

EXAMPLE 1

Factorise $x^2 + 4x - 96$.

Hint The product -96 is negative, so one number is positive and one is negative. The sum $+4$ is positive, so the positive number is the bigger one.

- B1** Factorise $x^2 + x - 90$. [2 marks]

Answer

EXAMPLE 2

Factorise $x^2 - 19x + 84$.

Hint The product $+84$ is positive, so the two numbers have the same sign. The sum -19 is negative, so both are negative.

- B2** Factorise $x^2 - 15x + 26$. [2 marks]

Answer

EXAMPLE 3

Factorise $x^2 - 10x - 56$.

Hint The product is negative, so one number of each sign. The sum is negative, so the negative number is the bigger one.

- B3** Factorise $x^2 - 6x - 55$. [2 marks]

Answer

EXAMPLE 4Factorise $x^2 - 26x + 169$.

Hint Look for two numbers with product 169 and sum -26 . They may be the same number.

B4 Factorise $x^2 - 36x + 324$. [2 marks]

Answer

EXAMPLE 5Factorise fully $135 - 42x + 3x^2$.

Hint Write the terms in the usual order, $3x^2 - 42x + 135$. Every term is a multiple of 3, so take out the 3 first.

B5 Factorise fully [3 marks] $4x^2 - 20x - 200$.

Answer

c Practice

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C1 Factorise $x^2 + 6x - 72$. [2 marks]

Answer

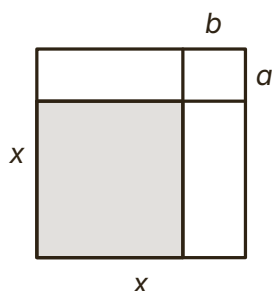
C2 Fill in the missing numbers: [2 marks]

$$x^2 - \square x - 60 = (x + 4)(x - \square).$$

Answer and

C3 The diagram shows a square of [2 marks]

side x . A strip of width a is cut from the top and a strip of width b from the side. The shaded rectangle that is left has area $x^2 - 17x + 72$. Work out a and b , where $a < b$.



Not drawn accurately

C4 Factorise $x^2 - 11x - 12$. [2 marks]

Answer

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

C5 Factorise $-52 + 9x + x^2$. [2 marks]

Answer

D Exam-style questions

GCSE Foundation

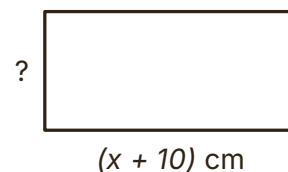
D1 Mia says: " $x^2 - x - 132 = (x - 11)(x + 12)$, because $-11 \times 12 = -132$." [3 marks]

Mia is wrong. Explain why, and factorise $x^2 - x - 132$ correctly.

Answer $x^2 - x - 132 = \dots\dots$

D2 The area of this rectangle is $(x^2 - 2x - 120)$ cm². Its length is $(x + 10)$ cm.

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



Not drawn accurately

Answer cm

(b) The width of the rectangle is 3 cm. Work out the area of the rectangle. [3 marks]

Answer cm²

Total for D2: 5 marks

D3 Show that $x^2 - 32x + 256$ can never be negative. [3 marks]

Answer

D4 n is a whole number. Show that $n^2 - 25n + 156$ is always even. [4 marks]

Answer

D5 Here is an expression: $5x^2 - 65x + 110$.

(a) Factorise $5x^2 - 65x + 110$ fully.

[3 marks]

Answer

(b) Use your answer to work out the value of $5x^2 - 65x + 110$ when $x = 12$.

[1 mark]

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 $(x + 3)^2 - 2(x + 3) - 80$. Write each bracket as simply as you can.

[3 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

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

How did it go?

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

I can use the signs of the product and the sum to choose the two numbers.



I can factorise $x^2 + bx + c$ when b or c is negative.



I can rearrange the terms and take out a common factor before I factorise.



I can use factorising to show an expression is never negative or always even.

