



Factorising

About 70 minutes No calculator 62 marks

Date _____

A Do Now

The first questions are what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks]

Factorise $x^2 - 5x - 24$.

A2 Needed today [2 marks]

Factorise fully $6x^2y - 15xy^2$.

Answer

Answer

- A3** Last lesson [2 marks]

A code is four different digits chosen from 1 to 9. How many different codes are possible?

A4 From chapter 1 [2 marks]

Expand and simplify $(3 + \sqrt{5})(2 - \sqrt{5})$.

Answer

Answer

B Example, then your turn

Level 2

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

EXAMPLE 1

Factorise $3ab - 6a + 5b - 10$.

Hint Take a common factor out of the first two terms, then out of the last two. The brackets should match.

- B1** Factorise $2xy + 6x - 5y - 15$. [2 marks]

Answer

EXAMPLE 2

Factorise $6x^2 - 7x - 20$.

Hint Find two numbers with a product of $6 \times (-20) = -120$ and a sum of -7 . Use them to split $-7x$.

- B2** Factorise $10x^2 + 11x - 6$. [2 marks]

Answer

EXAMPLE 3Factorise $6x^2 + xy - 12y^2$.

Hint The same method: a product of $6 \times (-12) = -72$ and a sum of 1. Every term of the split carries y as well.

B3 Factorise $5a^2 - 13ab - 6b^2$. [2 marks]

Answer

EXAMPLE 4Factorise $(2x + 5)^2 - (x - 1)^2$.

Hint This is $A^2 - B^2 = (A + B)(A - B)$ with $A = 2x + 5$ and $B = x - 1$. Take care with the signs in $A - B$.

B4 Factorise fully [3 marks] $(3x - 2)^2 - (x + 4)^2$.

Answer

EXAMPLE 5Factorise fully $12x^5 - 75x^3y^2$.

Hint "Fully" means more than one step. Take out the highest common factor first, then look at what is left in the bracket.

B5 Factorise fully $2a^7 - 32a^3$. [3 marks]

Answer

c Practice

Level 2

C1 Factorise $9x^2 - 42x + 49$. [2 marks]

Answer

C2 Use factorising to work out $1006^2 - 994^2$ without a calculator. [2 marks]

Answer

- C3** Factorise $2(y+1)^2 + 7(y+1) + 3$. Give your answer in terms of y , with no brackets inside brackets. [3 marks]
- C4** Factorise $x^2 - 6x + 9 - y^2$. [2 marks]

Answer

Answer

- C5** Factorise $12 + 5x - 2x^2$. [2 marks]
- C6** Factorise fully $x^3 - 3x^2 - 4x + 12$. [3 marks]

Answer

Answer

D Exam-style questions

AQA exam style

- D1** Jo says, " $12x^2 - 27 = (6x + 9)(2x - 3)$, so I have factorised it fully." [2 marks]
- Explain why Jo is wrong, and factorise $12x^2 - 27$ fully.

Answer

- D2** Each part of this question uses the answer to the part before it.

- (a) Factorise $x^2 + 5x - 36$. [2 marks]

Answer

- (b) Hence factorise fully $(2y - 1)^2 + 5(2y - 1) - 36$. [2 marks]

Answer

- (c) Hence factorise fully $t^4 + 5t^2 - 36$. [2 marks]

Answer

Total for D2: 6 marks

D3 Factorise fully $3(x - 2)^7 - 12(x - 2)^5$.

[3 marks]

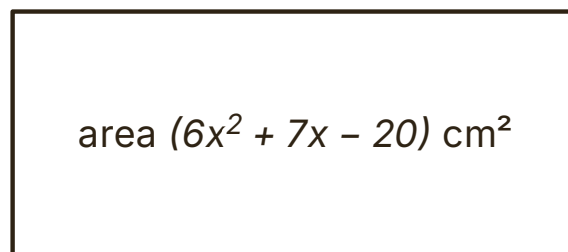
Answer

D4 The rectangle has area $(6x^2 + 7x - 20)$ cm². One side is $(2x + 5)$ cm long.

- (a) Work out an expression for the length of the other side. [2 marks]

Answer cm

- (b) The perimeter of the rectangle is 52 cm. Work out the area of the rectangle. [3 marks]



Not drawn accurately

Answer cm²

Total for D4: 5 marks

D5 Use factorising to show that $2^{16} - 1$ is a multiple of 17.

[3 marks]

D6 $E = 3x^2 - 10xy + 3y^2$

- (a) Factorise E .

[2 marks]

Answer

- (b) Hence work out the value of E when $x = 3.4$ and $y = 1.1$. You must show your working. [2 marks]

Answer

Total for D6: 4 marks

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

- E1** Factorise $x^4 + 4y^4$ into two quadratic factors. Hence show that $n^4 + 4$ is not a prime number for any whole number $n > 1$. [5 marks]

Extension hints

Cover these with paper. Uncover one at a time.

- E1 Hint 1** $x^4 + 4y^4$ is not a difference of two squares as it stands. Add and take away a term so that it becomes one.
- Hint 2** $x^4 + 4y^4 = (x^2 + 2y^2)^2 - 4x^2y^2 = (x^2 + 2y^2)^2 - (2xy)^2$.
- Hint 3** So $x^4 + 4y^4 = (x^2 + 2xy + 2y^2)(x^2 - 2xy + 2y^2)$. Put $x = n$ and $y = 1$: $n^4 + 4 = (n^2 + 2n + 2)(n^2 - 2n + 2)$. The smaller factor is $(n - 1)^2 + 1$, which is at least 2 when $n > 1$, so $n^4 + 4$ is a product of two whole numbers each bigger than 1.

How did it go?

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

- I can factorise four terms by grouping them in pairs. ☐ ☐ ☐
- I can factorise $ax^2 + bx + c$, including quadratics in two letters. ☐ ☐ ☐
- I can spot and use a difference of two squares, including with brackets. ☐ ☐ ☐
- I can factorise an expression fully, in more than one step. ☐ ☐ ☐