



Factorising algebraic expressions

Year 8 About 70 minutes No calculator 49 marks

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark] **A2** Needed today [1 mark]
Work out the highest common factor of 18 and 24. Simplify $x^3 \div x$.

Answer

Answer

- A3** Last lesson [1 mark] **A4** Year 7 [1 mark]
Expand $4y(3y - 2)$. Factorise $14x + 21$.

Answer

Answer

B Example, then your turn

Year 8

Factorising is expanding backwards. Find the highest common factor (HCF) of all the terms: the biggest number, and as many of the letter as every term has. Put it outside the bracket. Check by expanding. Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

Factorise $15a^2 + 20a - 35$ as much as possible.

Hint The HCF of 15, 20 and 35 is 5. The last term has no a , so a is not common.

- B1** Factorise as much as possible [2 marks]
(i) $24t - 16$ (ii) $18y^2 + 27y - 36$.

Answer (i) (ii)

EXAMPLE 2

Factorise $14y^2 - 21y$ as much as possible.

Hint 7 is the HCF of 14 and 21, and both terms have at least one y .

- B2** Factorise as much as possible [2 marks]
(i) $12x^2 + 18x$ (ii) $20p - 15p^2$.

Answer (i) (ii)

EXAMPLE 3

Factorise $8m^3 + 12m^2$ as much as possible.

Hint Both terms have at least m^2 : $m^3 = m^2 \times m$.

- B3** Factorise as much as possible [2 marks]
(i) $15k^3 - 10k^2$ (ii) $6d^2 + 18d^3$.

Answer (i) (ii)

EXAMPLE 4

Factorise $10y^3 - 15y^2 + 25y$ as much as possible.

Hint The HCF of the numbers is 5, and every term has at least one y .

B4 Factorise $12x^3 + 8x^2 - 20x$ as much as possible. [2 marks]

Answer

EXAMPLE 5

Expand $2x^2(x + 3) + 2x(x^2 - 5)$, collect like terms and factorise as much as possible.

Hint Expand both brackets first. Then collect the x^3 terms.

B5 Expand $3y(y^2 + 2) + y^2(3y - 9)$, collect like terms and factorise as much as possible. [3 marks]

Answer

c Practice

Year 8

C1 Factorise as much as possible [2 marks]
(i) $6ab + 9a$ (ii) $8xy - 12x^2$.

Answer (i) (ii)

C3 Use factorising to work out [2 marks]
 $37 \times 14 + 37 \times 6$. Show your working.

Answer

C2 Fill in the boxes: [2 marks]
 $18x^2 - 30x = 6x(\square - \square)$.

Answer $6x(\dots - \dots)$

C4 A rectangle has area $(6x^2 + 15x)$ cm². One side is $3x$ cm. Find an expression for the other side. [2 marks]

? Area = $6x^2 + 15x$

$3x$

Not drawn accurately

Answer

- C5** Factorise $2x^4 - 10x^2$ as much as possible. [2 marks]
- C6** Factorise $24m^2n - 16mn^2$ as much as possible. [2 marks]

Answer

Answer

D Exam-style questions

GCSE Foundation

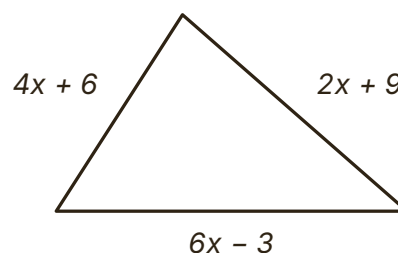
- D1** Leo factorises $18x^2 - 12x$ and gets $3x(6x - 4)$. He says, "That is factorised as much as possible." [3 marks]

Leo is wrong. Explain why, and factorise the expression as much as possible.

Answer Correct answer

- D2** The sides of a triangle are $(4x + 6)$ cm, $(2x + 9)$ cm and $(6x - 3)$ cm.

- (a) Write an expression for the perimeter of the triangle. Factorise it as much as possible. [3 marks]



Not drawn accurately

Answer

- (b) The perimeter is 60 cm. Work out the value of x . [2 marks]

Answer

Total for D2: 5 marks

- D3** $2n$, $2n + 2$ and $2n + 4$ are three consecutive even numbers. Show that their sum is always a multiple of 6. [3 marks]

D4 A rectangle has area $(8x^2 + 12x)$ cm². One side is $4x$ cm.

(a) Find an expression for the other side. [2 marks]

?

$$\text{Area} = 8x^2 + 12x$$

$4x$

Answer

Not drawn accurately

(b) Write an expression for the perimeter of the rectangle. Factorise it as much as possible. [2 marks]

Answer

Total for D4: 4 marks

D5 Expand and simplify $4x(x^2 - 3) - 2x^2(x - 5)$. Factorise your answer as much as possible. [3 marks]

Answer

E Extension

Stretch

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

E1 Ravi says, "If you add any five consecutive whole numbers, you always get a multiple of 10." Show that Ravi is wrong. Then prove that the sum is always a multiple of 5, and say which of the five numbers the sum is 5 times. [4 marks]

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Try $1 + 2 + 3 + 4 + 5$.
Hint 2 Call the numbers $n, n + 1, n + 2, n + 3$ and $n + 4$. Add them and collect like terms.
Hint 3 $5n + 10 = 5(n + 2)$. Which of the five numbers is $n + 2$?

How did it go?

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

I can find the highest common factor of the terms in an expression. ☐ ☐ ☐

I can factorise with a number, a letter or a power outside the bracket. ☐ ☐ ☐

I can expand, collect and then factorise as much as possible. ☐ ☐ ☐

I can use factorising to find a missing side and to show a number fact. ☐ ☐ ☐