MATHEMATICS · GRADES 7-9

Introduction to factoring

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you undo a multiplication and rewrite an expression as a product, like splitting a rectangle into its side lengths from its area. Factoring is multiplication in reverse, and it is the step that turns a hard problem into an easy one, because a product set equal to zero is simple to solve. You need it to solve quadratic equations, to simplify fractions in algebra, and to work out the side lengths of a garden or a room when all you know is its area.



Rule

Factor by taking out the greatest common factor.

Find the biggest factor shared by every term, divide each term by it, and write it outside the bracket. Check by expanding.

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Worked examples

EXAMPLE 1

Q Factor $6x + 9$

SOLUTION

Picture it

Factor $6x + 9$

Work it one step at a time, top to bottom.

Find the greatest common factor of the terms: 3 divides both $6x$ and 9.

Divide each term by 3: $6x \div 3 = 2x$ and $9 \div 3 = 3$.

So $6x + 9 = 3(2x + 3)$. Check by expanding.

EXAMPLE 2

Q Factor $x^2 + 5x$

SOLUTION

Picture it

Factor $x^2 + 5x$

Work it one step at a time, top to bottom.

Find the greatest common factor of the terms: x divides both x^2 and $5x$.

Divide each term by x: $x^2 \div x = x$ and $5x \div x = 5$.

So $x^2 + 5x = x(x + 5)$. Check by expanding.

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Practice questions

1 Write $4x + 8$ as a product of two factors.

- **A** $4(x + 2)$
- **B** $2(x + 4)$
- **C** $4(x + 8)$
- **D** $2(x + 8)$

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2 What is the greatest common factor of $8x$ and 12?

- **A** 4
- **B** 2
- **C** 8
- **D** 12

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3 Expand 5(x - 2). Which is correct?

- A 5x - 10
- B 5x - 2
- C 5x + 10
- D x - 10

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4 Write $2x^2 + 6x$ as a product of two factors.

- A 2x(x + 6)
- B 2x(x + 3)
- C x(x + 3)
- D 2x(x - 3)

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5 What is the greatest common factor of $6x^2$ and $9x$?

- **A** 3x
- **B** 3
- **C** 9x
- **D** 6x

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6 Write $6xy + 9y$ as a product.

- **A** 3y(2x + 3)
- **B** 3(2xy + 3)
- **C** 6y(x + 3)
- **D** 3y(2x - 3)

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7 Which of these is $2x(x + 4)$ written as a sum?

- **A** $2x^2 + 8x$
- **B** $2x^2 + 4$
- **C** $x^2 + 8x$
- **D** $2x + 8x$

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8 Which of these is the fully factored form of $12x + 18$?

- **A** $6(2x + 3)$
- **B** $3(4x + 6)$
- **C** $12(x + 18)$
- **D** $2(6x + 9)$

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9 What is the greatest common factor of $4x$, 8, and 12?

- **A** 4
- **B** 2
- **C** 8
- **D** $4x$

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10 A rectangle has area $4x^2 + 8x$ and one side $4x$. What is the other side?

- **A** $x + 2$
- **B** $x + 8$
- **C** $4x + 2$
- **D** x

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ANSWER KEY

1. $4(x + 2)$

2. 4

3. $5x - 10$

4. $2x(x + 3)$

5. $3x$

6. $3y(2x + 3)$

7. $2x^2 + 8x$

8. $6(2x + 3)$

9. 4

10. $x + 2$

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