MATHEMATICS · GRADES 10-12

Factoring out a common numerical factor

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you pull out a number that every part shares. Splitting a bill fairly when every item costs the same amount means pulling out that shared price first, and factoring does the same thing with numbers. Once the common factor is out, what is left is simpler to work with. It is the first move in almost every factoring problem.



Rule

Common factor: to factor an expression, pull out the greatest number that divides every term, and write what is left inside brackets.

The factor outside times the brackets gives back the original expression.

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Worked examples

EXAMPLE 1

Q Factor 6x + 12

SOLUTION

6: 1, 2, 3, 6

12: 1, 2, 3, 4, 6, 12

The greatest common factor (GCF) is 6 — the biggest number that divides both 6 and 12.

6x ÷ 6 = x

12 ÷ 6 = 2

Write the result as 6(x + 2)

EXAMPLE 2

Q Factor 20 - 12x

SOLUTION

20: 1, 2, 4, 5, 10, 20

12: 1, 2, 3, 4, 6, 12

The greatest common factor (GCF) is 4 — the biggest number that divides both 20 and 12.

20 ÷ 4 = 5

12x ÷ 4 = 3x

Write the result as 4(5 - 3x)

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Practice questions

1 Factor out the common number from $9x + 18$.

- **A** 9(x + 3)
- **B** 9(x + 2)
- **C** 3(x + 2)
- **D** 18(x + 1)

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2 Factor out the common number from $14x - 21$.

- **A** 7(2x + 3)
- **B** 14(x - 3)
- **C** 7(x - 3)
- **D** 7(2x - 3)

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3 Factor out the common number from $10 + 25x$.

- **A** $5(2 + 5x)$
- **B** $5(2 - 5x)$
- **C** $5(5x - 2)$
- **D** $10(2 + 5x)$

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4 What is the greatest common factor of 16 and 24?

- **A** 4
- **B** 6
- **C** 8
- **D** 12

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5 Factor out the common number from $24x - 36 + 48$.

- **A** $12(2x - 3 + 4)$
- **B** $12(2x + 3 - 4)$
- **C** $12(2x - 3 - 4)$
- **D** $6(4x + 6 + 8)$

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6 Factor out the common number from $8x^2 + 12x$.

- **A** $4(2x^2 - 3x)$
- **B** $8(x^2 + 3x)$
- **C** $4(2x^2 + 3)$
- **D** $4(2x^2 + 3x)$

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7 Factor out the common number from $27 - 36x$.

- **A** $9(3 - 4x)$
- **B** $9(3 + 4x)$
- **C** $9(4x - 3)$
- **D** $27(1 - 4x)$

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8 Mia factors $15x + 20$ as $5(3x + 5)$. What is her mistake?

- **A** She should have taken out 15
- **B** The second number inside the brackets should be 4, not 5
- **C** She should have divided by x as well
- **D** $15x + 20$ cannot be factored

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9 The factored form is $14(3x + 4)$. What was the original expression?

- A $42x + 56$
- B $42x + 4$
- C $14x + 56$
- D $42x + 18$

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10 Factor out the common number from $12x + 18y$.

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

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ANSWER KEY

1. $9(x + 2)$

2. $7(2x - 3)$

3. $5(2 + 5x)$

4. 8

5. $12(2x - 3 + 4)$

6. $4(2x^2 + 3x)$

7. $9(3 - 4x)$

8. The second number inside the brackets should be 4, not 5

9. $42x + 56$

10. $6(2x + 3y)$

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