MATHEMATICS · GRADES 10-12

Checking a factorization by expansion

Difficulty level: Advanced

Mathematics: Grades 10-12

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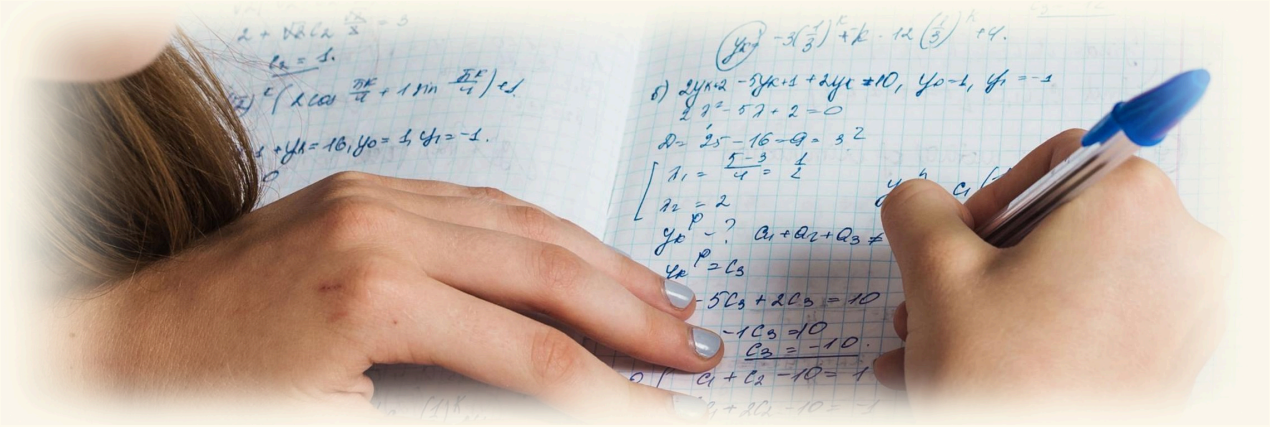
Overview of the concept

This is how you prove your factoring is right before handing in your work. You multiply it back out and check it matches the expression you started with. It takes a few seconds and catches almost every factoring slip, which is why it is worth doing on every question, not just the hard ones.



Rule

A factorization is correct only if expanding it gives back the original expression.

To check your factoring, multiply the factors back out. If the expansion matches the expression you started with, the factorization is right.

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Worked examples

EXAMPLE 1

Q Check that $(x + 4)(x + 5) = x^2 + 9x + 20$

SOLUTION

Expand the first terms: $x \times x = x^2$

Expand the outer, inner, and last terms: $5x + 4x + 20$

Add them: $x^2 + 9x + 20$, which matches the original, so the factorization is correct.

EXAMPLE 2

Q Check that $(2x - 3)(x + 4) = 2x^2 + 5x - 12$

SOLUTION

Expand: $2x \times x = 2x^2$, $2x \times 4 = 8x$, $-3 \times x = -3x$, $-3 \times 4 = -12$

Add the middle terms: $8x - 3x = 5x$

The expansion is $2x^2 + 5x - 12$, which matches, so the factorization is correct.

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Practice questions

1 Expand $(x + 2)(x + 7)$.

- **A** $x^2 + 9x + 14$
- **B** $x^2 + 9x - 14$
- **C** $x^2 + 7x + 14$
- **D** $x^2 + 9x + 12$

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2 Expand $(x - 3)(x + 8)$.

- **A** $x^2 + 5x + 24$
- **B** $x^2 - 5x - 24$
- **C** $x^2 + 5x - 24$
- **D** $x^2 + 11x - 24$

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3 Expand $(2x + 5)(x - 1)$.

A $2x^2 - 3x - 5$

B $2x^2 + 3x - 5$

C $2x^2 + 3x + 5$

D $2x^2 + 7x - 5$

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4 Expand $(x + 6)(x + 6)$.

A $x^2 + 6x + 36$

B $x^2 + 12x + 12$

C $x^2 + 36$

D $x^2 + 12x + 36$

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

- **A** $3x^2 + 10x - 8$
- **B** $3x^2 - 10x - 8$
- **C** $3x^2 + 10x + 8$
- **D** $3x^2 + 14x - 8$

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6 A rectangle has length $x + 4$ and width $x + 3$. Expand to find its area.

- **A** $x^2 + 7x - 12$
- **B** $x^2 + 12x + 12$
- **C** $x^2 + 7x + 12$
- **D** $x^2 + x + 12$

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7 The expansion is $x^2 + 11x + 24$. Which product expands to it?

- **A** $(x + 3)(x + 8)$
- **B** $(x + 4)(x + 6)$
- **C** $(x + 2)(x + 12)$
- **D** $(x + 1)(x + 24)$

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8 Tess claims $(x + 2)(x + 5) = x^2 + 10$. What is the correct expansion?

- **A** $x^2 + 7x + 10$
- **B** $x^2 + 10$
- **C** $x^2 + 5x + 10$
- **D** $x^2 + 2x + 10$

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9 **Expand $(x + 4)(x + 4)$.**

A $x^2 + 8x + 16$

B $x^2 + 4x + 16$

C $x^2 + 16x + 16$

D $x^2 + 8x + 8$

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10 **Which product does NOT expand to a trinomial with constant term 6?**

A $(x + 2)(x + 3)$

B $(x + 1)(x + 6)$

C $(x + 5)(x + 1)$

D $(x - 2)(x - 3)$

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ANSWER KEY

1. $x^2 + 9x + 14$

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

3. $2x^2 + 3x - 5$

4. $x^2 + 12x + 36$

5. $3x^2 + 10x - 8$

6. $x^2 + 7x + 12$

7. $(x + 3)(x + 8)$

8. $x^2 + 7x + 10$

9. $x^2 + 8x + 16$

10. $(x + 5)(x + 1)$

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