MATHEMATICS · GRADES 10-12

Factoring trinomials of the form x^2+bx+c

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you break apart the most common kind of curving equation. A room with a known area can give you its length and width once you factor the equation that describes it. The two brackets tell you the two numbers that multiply to the area and add to the middle term. It is the factoring pattern you will use more than any other.



Rule

Factoring trinomials: to factor $x^2 + bx + c$, find two numbers that multiply to c and add to b, then write the brackets with those numbers.

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Worked examples

EXAMPLE 1

Q Factor $x^2 + 7x + 12$

SOLUTION

__ × __ = 12

__ + __ = 7

3 × 4 = 12 and 3 + 4 = 7, so the numbers are 3 and 4

Write the brackets with those numbers: $(x + 3)(x + 4)$

Check by expanding: $x^2 + 4x + 3x + 12 = x^2 + 7x + 12$

EXAMPLE 2

Q Factor $x^2 - 5x + 6$

SOLUTION

__ × __ = 6

__ + __ = -5

(-2) × (-3) = 6 and (-2) + (-3) = -5, so the numbers are -2 and -3

Write the brackets: $(x - 2)(x - 3)$

Check: $x^2 - 3x - 2x + 6 = x^2 - 5x + 6$

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Practice questions

1 Factor $x^2 + 5x + 6$.

- **A** $(x + 1)(x + 6)$
- **B** $(x + 2)(x + 3)$
- **C** $(x - 2)(x - 3)$
- **D** $(x + 5)(x + 1)$

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2 Factor $x^2 + 6x + 9$.

- **A** $(x + 3)(x + 3)$
- **B** $(x + 9)(x + 1)$
- **C** $(x + 3)(x + 6)$
- **D** $(x + 1)(x + 9)$

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3 Factor $x^2 - 7x + 12$.

A (x - 3)(x - 4)

B (x + 3)(x + 4)

C (x - 2)(x - 6)

D (x - 1)(x - 12)

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4 Factor $x^2 + 3x - 10$.

A (x - 5)(x + 2)

B (x + 10)(x - 1)

C (x + 5)(x - 2)

D (x + 1)(x - 10)

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5 Factor $x^2 - 2x - 15$.

- **A** $(x - 3)(x + 5)$
- **B** $(x + 3)(x - 5)$
- **C** $(x + 15)(x - 1)$
- **D** $(x + 1)(x - 15)$

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6 To factor $x^2 + 7x + 12$, which two numbers multiply to 12 and add to 7?

- **A** 2 and 6
- **B** 3 and 4
- **C** 1 and 12
- **D** 6 and 6

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7 A rectangle's sides are $(x + 6)$ and $(x + 2)$. What was its area as a trinomial?

- **A** $x^2 + 6x + 12$
- **B** $x^2 + 8x + 6$
- **C** $x^2 + 8x + 12$
- **D** $x^2 + 12x + 8$

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8 Ana factors $x^2 + 7x + 12$ as $(x + 2)(x + 6)$. What middle term does her factorization give?

- **A** 2x
- **B** 6x
- **C** 7x
- **D** 8x

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9 Factor $x^2 - 16$.

- **A** $(x - 4)(x + 4)$
- **B** $(x + 4)(x + 4)$
- **C** $(x - 8)(x + 2)$
- **D** $(x - 16)(x + 1)$

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10 Three of these trinomials factor with whole numbers and one does not. Which one?

- **A** $x^2 + 5x + 6$
- **B** $x^2 + 6x + 8$
- **C** $x^2 + 7x + 11$
- **D** $x^2 + 8x + 15$

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ANSWER KEY

1. $(x + 2)(x + 3)$

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

3. $(x - 3)(x - 4)$

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

5. $(x + 3)(x - 5)$

6. 3 and 4

7. $x^2 + 8x + 12$

8. $8x$

9. $(x - 4)(x + 4)$

10. $x^2 + 7x + 11$

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