

# Factoring Trinomials: $x^2 + bx + c$

Algebra 1 • Section 8.2

Name: \_\_\_\_\_

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## Quick Review and Helpful Hints

Polynomial work is pattern work. Keep like terms together, apply exponent rules only when the bases match, and check factoring by multiplying the factors back together.

▷ **Example:** Factor  $x^2 + 9x + 20$ .

**Work:** Look for two numbers that multiply to 20 and add to 9. The numbers are 4 and 5.

★ **Answer:**  $(x + 4)(x + 5)$

## ◆ Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Factor  $x^2 + 7x + 10$ .

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6. Factor  $x^2 - 16x + 63$ .

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2. Factor  $x^2 - 9x + 20$ .

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

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

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8. Factor  $x^2 - 49$ .

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4. Factor  $x^2 - 2x - 35$ .

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

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5. Factor  $x^2 + 11x + 24$ .

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10. Factor  $x^2 + 4x + 9$  over the integers.

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## ◆ Word Problems

11. A rectangular area is  $x^2 + 13x + 40$ . Factor to find possible side lengths.

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12. A quadratic model has zeros from  $x^2 - 6x + 8 = 0$ . Factor it.

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## Answer Keys

1.  $(x + 5)(x + 2)$

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

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

4.  $(x - 7)(x + 5)$

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

6.  $(x - 7)(x - 9)$

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

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

9.  $(x + 1)^2$

10. Prime

11.  $(x + 5)(x + 8)$

12.  $(x - 2)(x - 4) = 0$

### Step-by-Step Explanations

- Hunt for two numbers hitting 10 when multiplied and 7 when added — that's 5 and 2.
- You need a product of 20 and a sum of  $-9$ , so both numbers go negative:  $-5$  and  $-4$ .
- Looking for a pair that multiplies to  $-12$  and adds to 1 lands you on 4 and  $-3$ .
- The negative product means opposite signs;  $-7$  and 5 multiply to  $-35$  and add to  $-2$ .
- Which two positives give 24 and 11? Three and eight do the job perfectly.
- A positive product with a negative sum means two negatives:  $-7$  and  $-9$  work.

- Opposite signs are needed for  $-24$ ; pick 8 and  $-3$  so they add to 5.
- There's no middle term — that's the signature of a difference of squares.
- Both ends are squares and the middle fits twice the product, so it's a perfect square.
- No whole-number pair multiplies to 9 and adds to 4, so it won't factor — it's prime.
- Two numbers that reach 40 and 13 at once are 5 and 8.
- You want a product of 8 and a sum of 6; both negative gives  $-2$  and  $-4$ .



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