

# Factoring Trinomials

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 18

## Quick Review and Helpful Hints

To factor  $x^2 + bx + c$ , find two numbers that *multiply* to  $c$  and *add* to  $b$ . Then write the factors as  $(x + \square)(x + \square)$  using those numbers. Watch the signs: a positive  $c$  means the numbers share a sign; a negative  $c$  means they have opposite signs.

▶ **Example:** Factor  $x^2 + 5x + 6$ . **Work:** Find two numbers that multiply to 6 and add to 5: that's 2 and 3. Write them as factors.

★ **Answer:**  $(x + 2)(x + 3)$

	$x$	$2$
$x$	$x^2$	$2x$
$3$	$3x$	$6$

$$(x + 2)(x + 3) = x^2 + 5x + 6.$$

### Practice Problems

Factor each trinomial.

- |                     |       |                     |       |
|---------------------|-------|---------------------|-------|
| 1. $x^2 + 5x + 6$   | _____ | 8. $x^2 - 11x + 30$ | _____ |
| 2. $x^2 + 8x + 15$  | _____ | 9. $x^2 + 4x - 12$  | _____ |
| 3. $x^2 - 6x + 8$   | _____ | 10. $x^2 + 7x + 12$ | _____ |
| 4. $x^2 - 3x - 10$  | _____ | 11. $x^2 - 9x + 20$ | _____ |
| 5. $x^2 + 2x - 24$  | _____ | 12. $x^2 + x - 12$  | _____ |
| 6. $x^2 - 10x + 21$ | _____ | 13. $x^2 - 4x - 21$ | _____ |
| 7. $x^2 + x - 30$   | _____ | 14. $x^2 + 9x + 14$ | _____ |

### Word Problems

15. A rectangle has area  $x^2 + 7x + 10$ . Write its length and width as factors. \_\_\_\_\_
16. A rectangular garden model has area  $x^2 - 5x - 14$ . Factor it to represent possible side expressions. \_\_\_\_\_
17. The area of a square plus its border is  $x^2 + 6x + 9$ . Factor it. \_\_\_\_\_
18. A photo mat area is modeled by  $x^2 + 10x + 24$ . Factor it to show the side expressions. \_\_\_\_\_



## Answer Keys

- |                     |                      |                      |
|---------------------|----------------------|----------------------|
| 1. $(x + 2)(x + 3)$ | 7. $(x + 6)(x - 5)$  | 13. $(x - 7)(x + 3)$ |
| 2. $(x + 3)(x + 5)$ | 8. $(x - 5)(x - 6)$  | 14. $(x + 2)(x + 7)$ |
| 3. $(x - 2)(x - 4)$ | 9. $(x + 6)(x - 2)$  | 15. $(x + 2)(x + 5)$ |
| 4. $(x - 5)(x + 2)$ | 10. $(x + 3)(x + 4)$ | 16. $(x - 7)(x + 2)$ |
| 5. $(x + 6)(x - 4)$ | 11. $(x - 4)(x - 5)$ | 17. $(x + 3)^2$      |
| 6. $(x - 3)(x - 7)$ | 12. $(x + 4)(x - 3)$ | 18. $(x + 4)(x + 6)$ |

### Step-by-Step Explanations

**1.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Two numbers that multiply to 6 and add to 5 are 2 and 3:  $(x + 2)(x + 3)$ . So the final answer is  $(x + 2)(x + 3)$ .

**2.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 15, add to 8: 3 and 5:  $(x + 3)(x + 5)$ . So the final answer is  $(x + 3)(x + 5)$ .

**3.** Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 8, add to  $-6$ : both negative,  $-2$  and  $-4$ :  $(x - 2)(x - 4)$ . So the final answer is  $(x - 2)(x - 4)$ .

**4.** Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to  $-10$ , add to  $-3$ :  $-5$  and  $2$ :  $(x - 5)(x + 2)$ . So the final answer is  $(x - 5)(x + 2)$ .

**5.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to  $-24$ , add to 2: 6 and  $-4$ :  $(x + 6)(x - 4)$ . So the final answer is  $(x + 6)(x - 4)$ .

**6.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 21, add to  $-10$ :  $-3$  and  $-7$ :  $(x - 3)(x - 7)$ . So the final answer is  $(x - 3)(x - 7)$ .

**7.** Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to  $-30$ , add to 1: 6 and  $-5$ :  $(x + 6)(x - 5)$ . So the final answer is  $(x + 6)(x - 5)$ .

**8.** Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 30, add to  $-11$ :  $-5$  and  $-6$ :  $(x - 5)(x - 6)$ . So the final answer is  $(x - 5)(x - 6)$ .

**9.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to  $-12$ , add to 4: 6 and  $-2$ :  $(x + 6)(x - 2)$ . So the final answer is  $(x + 6)(x - 2)$ .

**10.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 12, add to 7: 3 and 4:  $(x + 3)(x + 4)$ . So the final answer is  $(x + 3)(x + 4)$ .

**11.** Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 20, add to  $-9$ :  $-4$  and  $-5$ :  $(x - 4)(x - 5)$ . So the final answer is  $(x - 4)(x - 5)$ .

**12.** Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to  $-12$ , add to 1: 4 and  $-3$ :  $(x + 4)(x - 3)$ . So the final answer is  $(x + 4)(x - 3)$ .

**13.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to  $-21$ , add to  $-4$ :  $-7$  and 3:  $(x - 7)(x + 3)$ . So the final answer is  $(x - 7)(x + 3)$ .

**14.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 14, add to 9: 2 and 7:  $(x + 2)(x + 7)$ . So the final answer is  $(x + 2)(x + 7)$ .

**15.** Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 10, add to 7: 2 and 5:  $(x + 2)(x + 5)$ . So the final answer is  $(x + 2)(x + 5)$ .

**16.** Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to  $-14$ , add to  $-5$ :  $-7$  and 2:  $(x - 7)(x + 2)$ . So the final answer is  $(x - 7)(x + 2)$ .

**17.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 9, add to 6: 3 and 3, a perfect square:  $(x + 3)^2$ . So the final answer is  $(x + 3)^2$ .

**18.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply to 24, add to 10: 4 and 6:  $(x + 4)(x + 6)$ . So the final answer is  $(x + 4)(x + 6)$ .



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