

# Study Guide and Intervention

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

**Factor  $ax^2 + bx + c$**  To factor a trinomial of the form  $ax^2 + bx + c$ , find two integers,  $m$  and  $n$  whose product is equal to  $ac$  and whose sum is equal to  $b$ . If there are no integers that satisfy these requirements, the polynomial is called a **prime polynomial**.

### Example 1 Factor $2x^2 + 15x + 18$ .

In this example,  $a = 2$ ,  $b = 15$ , and  $c = 18$ . You need to find two numbers whose sum is 15 and whose product is  $2 \cdot 18$  or 36. Make a list of the factors of 36 and look for the pair of factors whose sum is 15.

Factors of 36	Sum of Factors
1, 36	37
2, 18	20
3, 12	15

Use the pattern  $ax^2 + mx + nx + c$ , with  $a = 2$ ,  $m = 3$ ,  $n = 12$ , and  $c = 18$ .

$$\begin{aligned} 2x^2 + 15x + 18 &= 2x^2 + 3x + 12x + 18 \\ &= (2x^2 + 3x) + (12x + 18) \\ &= x(2x + 3) + 6(2x + 3) \\ &= (x + 6)(2x + 3) \end{aligned}$$

Therefore,  $2x^2 + 15x + 18 = (x + 6)(2x + 3)$ .

### Example 2 Factor $3x^2 - 3x - 18$ .

Note that the GCF of the terms  $3x^2$ ,  $3x$ , and 18 is 3. First factor out this GCF.

$$3x^2 - 3x - 18 = 3(x^2 - x - 6).$$

Now factor  $x^2 - x - 6$ . Since  $a = 1$ , find the two factors of  $-6$  whose sum is  $-1$ .

Factors of -6	Sum of Factors
1, -6	-5
-1, 6	5
-2, 3	1
2, -3	-1

Now use the pattern  $(x + m)(x + n)$  with  $m = 2$  and  $n = -3$ .

$$x^2 - x - 6 = (x + 2)(x - 3)$$

The complete factorization is  $3x^2 - 3x - 18 = 3(x + 2)(x - 3)$ .

### Exercises

Factor each trinomial, if possible. If the trinomial cannot be factored using integers, write *prime*.

1.  $2x^2 - 3x - 2$

2.  $3m^2 - 8m - 3$

3.  $16r^2 - 8r + 1$

4.  $6x^2 + 5x - 6$

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

6.  $18x^2 - 27x - 5$

7.  $2a^2 + 5a + 3$

8.  $18y^2 + 9y - 5$

9.  $-4c^2 + 19c - 21$

10.  $8x^2 - 4x - 24$

11.  $28p^2 + 60p - 25$

12.  $48x^2 + 22x - 15$

13.  $3y^2 - 6y - 24$

14.  $4x^2 + 26x - 48$

15.  $8m^2 - 44m + 48$

16.  $6x^2 - 7x + 18$

17.  $2a^2 - 14a + 18$

18.  $18 + 11y + 2y^2$

# Study Guide and Intervention *(continued)*

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

**Solve Equations by Factoring** Factoring and the Zero Product Property can be used to solve some equations of the form  $ax^2 + bx + c = 0$ .

### Example

Solve  $12x^2 + 3x = 2 - 2x$ . Check your solutions.

$12x^2 + 3x = 2 - 2x$	Original equation
$12x^2 + 5x - 2 = 0$	Rewrite equation so that one side equals 0.
$(3x + 2)(4x - 1) = 0$	Factor the left side.
$3x + 2 = 0$ or $4x - 1 = 0$	Zero Product Property
$x = -\frac{2}{3}$ or $x = \frac{1}{4}$	Solve each equation.

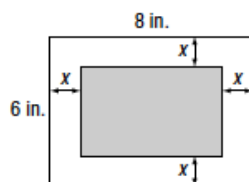
The solution set is  $\left\{-\frac{2}{3}, \frac{1}{4}\right\}$ .

Since  $12\left(-\frac{2}{3}\right)^2 + 3\left(-\frac{2}{3}\right) = 2 - 2\left(-\frac{2}{3}\right)$  and  $12\left(\frac{1}{4}\right)^2 + 3\left(\frac{1}{4}\right) = 2 - 2\left(\frac{1}{4}\right)$ , the solutions check.

### Exercises

Solve each equation. Check your solutions.

- $8x^2 + 2x - 3 = 0$
  - $3n^2 - 2n - 5 = 0$
  - $2d^2 - 13d - 7 = 0$
  - $4x^2 = x + 3$
  - $3x^2 - 13x = 10$
  - $6x^2 - 11x - 10 = 0$
  - $2k^2 - 40 = -11k$
  - $2p^2 = -21p - 40$
  - $-7 - 18x + 9x^2 = 0$
  - $12x^2 - 15 = -8x$
  - $7a^2 = -65a - 18$
  - $16y^2 - 2y - 3 = 0$
  - $8x^2 + 5x = 3 + 7x$
  - $4a^2 - 18a + 5 = 15$
  - $3b^2 - 18b = 10b - 49$
16. The difference of the squares of two consecutive odd integers is 24. Find the integers.
17. **GEOMETRY** The length of a Charlotte, North Carolina, conservatory garden is 20 yards greater than its width. The area is 300 square yards. What are the dimensions?
18. **GEOMETRY** A rectangle with an area of 24 square inches is formed by cutting strips of equal width from a rectangular piece of paper. Find the dimensions of the new rectangle if the original rectangle measures 8 inches by 6 inches.



Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

Assignment \_\_\_\_\_

**SHOW YOUR WORK IN THE SPACES PROVIDED** (*one problem per space and number the problems*)

A blank sheet of graph paper featuring a uniform grid of squares. The grid is composed of thin blue horizontal and vertical lines intersecting at right angles. There are 10 columns and 8 rows of squares visible on the page. The background is white, and the lines are a light blue color.

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