

## **Problem 5** Multiplying a Trinomial and a Binomial

What is a simpler form of  $(3x^2 + x - 5)(2x - 7)$ ?

Multiply by arranging the polynomials vertically as shown.



$$\begin{array}{r}
 3x^2 + x - 5 \\
 \underline{\phantom{3x^2 + x - 5} 2x - 7} \\
 -21x^2 - 7x + 35 \quad \text{Multiply by } -7. \\
 \underline{6x^3 + 2x^2 - 10x} \quad \text{Multiply by } 2x. \\
 6x^3 - 19x^2 - 17x + 35 \quad \text{Add like terms.}
 \end{array}$$

The product is  $6x^3 - 19x^2 - 17x + 35$ .

### Plan

**How should you align the polynomials?**

Write the polynomials so that like terms are vertically aligned.

-   **Got It?** 5. a. What is a simpler form of  $(2x^2 - 3x + 1)(x - 3)$ ?  
 b. **Reasoning** How can you use the Distributive Property to find the product of a trinomial and a binomial?




## **Lesson Check**

### Do you know HOW?

Simplify each product.


- $(x + 3)(x + 6)$
- $(2x - 5)(x + 3)$
- $(x + 2)(x^2 + 3x - 4)$
- A rectangle has length  $x + 5$  and width  $x - 3$ . What is the area of the rectangle? Write your answer as a polynomial in standard form.

### Do you UNDERSTAND? MATHEMATICAL PRACTICES

-  **Reasoning** Explain how to use the FOIL method to find the product of two binomials.
-  **Compare and Contrast** Simplify  $(3x + 8)(x + 1)$  using a table, the Distributive Property, and the FOIL method. Which method is most efficient? Explain.
-  **Writing** How is the degree of the product of two polynomials  $p(x)$  and  $q(x)$  related to the degrees of  $p(x)$  and  $q(x)$ ?



## Practice and Problem-Solving Exercises MATHEMATICAL PRACTICES

 **Practice** Simplify each product using the Distributive Property.

- |                       |                       |                        |
|-----------------------|-----------------------|------------------------|
| 8. $(x + 7)(x + 4)$   | 9. $(y - 3)(y + 8)$   | 10. $(m + 6)(m - 7)$   |
| 11. $(c - 10)(c - 5)$ | 12. $(2r - 3)(r + 1)$ | 13. $(2x + 7)(3x - 4)$ |

 See Problem 1.

Simplify each product using a table.

- |                       |                       |                        |
|-----------------------|-----------------------|------------------------|
| 14. $(x + 5)(x - 4)$  | 15. $(a - 1)(a - 11)$ | 16. $(w - 2)(w + 6)$   |
| 17. $(2h - 7)(h + 9)$ | 18. $(x - 8)(3x + 1)$ | 19. $(3p + 4)(2p + 5)$ |

 See Problem 2.

Simplify each product using the FOIL method.

See Problem 3.

20.  $(a + 8)(a - 2)$

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

22.  $(k - 6)(k + 8)$

23.  $(b - 3)(b - 9)$

24.  $(5m - 2)(m + 3)$

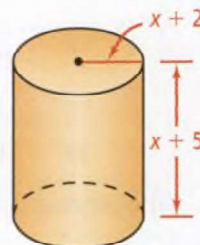
25.  $(9z + 4)(5z - 3)$

26.  $(3h + 2)(6h - 5)$

27.  $(4w + 13)(w + 2)$

28.  $(8c - 1)(6c - 7)$

29. **Geometry** What is the total surface area of the cylinder? Write your answer as a polynomial in standard form.



See Problem 4.

30. **Design** The radius of a cylindrical gift box is  $(2x + 3)$  in. The height of the gift box is twice the radius. What is the surface area of the cylinder? Write your answer as a polynomial in standard form.

Simplify each product.

See Problem 5.

31.  $(x + 5)(x^2 - 3x + 1)$

32.  $(k^2 - 4k + 3)(k - 2)$

33.  $(2a^2 + 4a + 5)(5a - 4)$

34.  $(2g + 7)(3g^2 - 5g + 2)$

35. **Sports** A school's rectangular athletic fields currently have a length of 125 yd and a width of 75 yd. The school plans to expand both the length and the width of the fields by  $x$  yards. What polynomial in standard form represents the area of the expanded athletic field?

**B Apply**

Simplify each product. Write in standard form.

36.  $(x^2 + 1)(x - 3)$

37.  $(-n^2 - 1)(n + 3)$

38.  $(b^2 - 1)(b^2 + 3)$

39.  $(2m^2 + 1)(m + 5)$

40.  $(c^2 - 4)(2c + 3)$

41.  $(4z^2 + 1)(z + 3z^2)$

42. **Error Analysis** Describe and correct the error made in finding the product.

$$\begin{aligned} (x - 2)(3x + 4) &= x(3x) + x(4) - 2(4) \\ &= 3x^2 + 4x - 8 \end{aligned}$$

43. **Reasoning** Is the product of two polynomials always a polynomial? Explain.

44. **Think About a Plan** You are planning a rectangular dining pavilion. Its length is three times its width  $x$ . You want a stone walkway that is 3 ft wide around the pavilion. You have enough stones to cover 396 ft<sup>2</sup> and want to use them all in the walkway. What should the dimensions of the pavilion be?

- Can you draw a diagram that represents this situation?
- How can you write a variable expression for the area of the walkway?

45. a. Simplify each pair of products.

i.  $(x + 1)(x + 1)$   
 $11 \cdot 11$

ii.  $(x + 1)(x + 2)$   
 $11 \cdot 12$

iii.  $(x + 1)(x + 3)$   
 $11 \cdot 13$

b. **Reasoning** What are the similarities between your two answers in each pair of products?

46. **Geometry** The dimensions of a rectangular prism are  $n$ ,  $n + 7$ , and  $n + 8$ . Use the formula  $V = \ell wh$  to write a polynomial in standard form for the volume of the prism.