

FOIL works when you multiply two binomials, but it is not helpful when multiplying a trinomial and a binomial. You can use the vertical method or the horizontal method to distribute each term in such factors.

4 EXAMPLE Multiplying a Trinomial and a Binomial

Simplify the product $(4x^2 + x - 6)(2x - 3)$.

Method 1 Multiply using the vertical method.

$$\begin{array}{r}
 4x^2 + x - 6 \\
 \underline{ 2x - 3} \\
 -12x^2 - 3x + 18 \quad \text{Multiply by } -3. \\
 8x^3 + 2x^2 - 12x \quad \text{Multiply by } 2x. \\
 \hline
 8x^3 - 10x^2 - 15x + 18 \quad \text{Add like terms.}
 \end{array}$$

Method 2 Multiply using the horizontal method.

$$\begin{array}{c}
 \text{Diagram showing the horizontal multiplication of } (2x - 3)(4x^2 + x - 6). \\
 \text{Arrows indicate the distribution of } 2x \text{ and } -3 \text{ across the terms of the trinomial.} \\
 (2x - 3)(4x^2 + x - 6)
 \end{array}$$

$$\begin{aligned}
 &= 2x(4x^2) + 2x(x) + 2x(-6) - 3(4x^2) - 3(x) - 3(-6) \\
 &= 8x^3 + 2x^2 - 12x - 12x^2 - 3x + 18 \\
 &= 8x^3 - 10x^2 - 15x + 18 \quad \text{Add like terms.}
 \end{aligned}$$

The product is $8x^3 - 10x^2 - 15x + 18$.



Quick Check

4 Simplify $(6n - 8)(2n^2 + n + 7)$ using both methods shown in Example 4.

EXERCISES

For more exercises, see *Extra Skill and Word Problem Practice*.

Practice and Problem Solving

A Practice by Example

Example 1
(page 505)



Copy and fill in each blank.

- $(5a + 2)(6a - 1) = \blacksquare a^2 + 7a - 2$
- $(3c - 7)(2c - 5) = 6c^2 - 29c + \blacksquare$
- $(z - 4)(2z + 1) = 2z^2 - \blacksquare z - 4$
- $(2x + 9)(x + 2) = 2x^2 + \blacksquare x + 18$

Simplify each product using the Distributive Property.

- $(x + 2)(x + 5)$
- $(h + 3)(h + 4)$
- $(k + 7)(k - 6)$
- $(a - 8)(a - 9)$
- $(2x - 1)(x + 2)$
- $(2y + 5)(y - 3)$

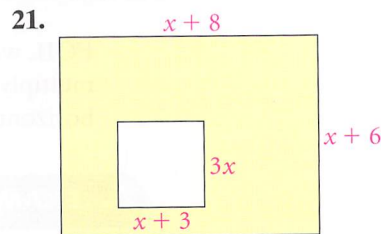
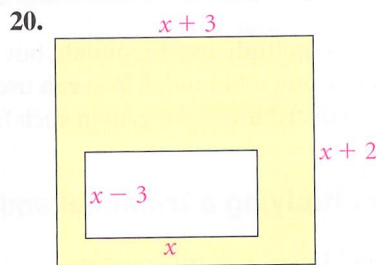
Example 2
(page 506)

Simplify each product using FOIL.

- $(r + 6)(r - 4)$
- $(y + 4)(5y - 8)$
- $(x + 6)(x - 7)$
- $(m - 6)(m - 9)$
- $(4b - 2)(b + 3)$
- $(8w + 2)(w + 5)$
- $(x - 7)(x + 9)$
- $(a + 11)(a + 5)$
- $(p - 1)(p + 10)$

Example 3
(page 506)

Geometry Find an expression for the area of each shaded region. Simplify.



Example 4
(page 507)

Simplify. Use the vertical method.

22. $(x + 9)(x^2 - 4x + 1)$

23. $(a - 4)(a^2 - 2a + 1)$

24. $(g - 3)(2g^2 + 3g + 3)$

25. $(k + 8)(3k^2 - 5k + 7)$

Simplify. Use the horizontal method.

26. $(x^2 + 2x + 1)(9x - 3)$

27. $(t^2 - 6t + 3)(2t - 5)$

28. $(7p^2 + 5p - 1)(8p + 9)$

29. $(12w^2 - w - 1)(4w - 2)$

B Apply Your Skills

Simplify each product. Write in standard form.

30. $(p - 7)(p + 8)$

31. $(-7 + p)(8 + p)$

32. $(p^2 - 7)(p + 8)$

33. $(5c - 9)(5c + 1)$

34. $(n^2 + 3)(n + 11)$

35. $(3k^2 + 2)(k + 5k^2)$

36. $(6h - 1)(4h^2 + h + 3)$

37. $(9y^2 + 2)(y^2 - y - 1)$

38. $(8q - 4)(6q^2 + q + 1)$

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39. **Construction** You are planning a rectangular garden. Its length is twice its width x . You want a walkway 2 ft wide around the garden.
- Write an expression for the area of the garden and walk.
 - Write an expression for the area of the walk only.
 - You have enough gravel to cover 76 ft^2 and want to use it all on the walk. How big should you make the garden?

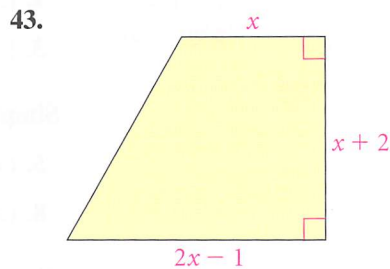
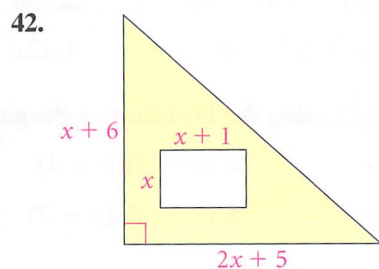
40. **Open-Ended** Write a binomial and a trinomial. Find their product.



41. **Writing** Which method do you prefer for multiplying a binomial and a trinomial? Explain.



Geometry Write an expression for the area of each shaded region. Write your answer in simplest form.



44. a. Simplify each pair of products.

i. $(x + 1)(x + 1)$

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

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

$11 \cdot 11$

$11 \cdot 12$

$11 \cdot 13$

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

GO for Help

For a guide to solving Exercise 42, see p. 511.