2.2 Multiplying Polynomials

Objective: Today we will multiply binomials, use the FOIL method, and multiply trinomials.

Warm-up: Find the sum or the difference.

$$(6n^2 + 2n + 3) + (-5n^2 - 4n - 7)$$

$$(5x^2 - 4x + 7) - (4x - 7)$$

2.2 MULTIPLYING POLYNOMIALS

METHODS FOR MULTIPLYING

① DISTRIBUTIVE PROPERTY

ex. $(x+2)(x+5) = x(x+5) + 2(x+5)$
$= x^2+5x+2x+10$
$= \boxed{x^2+7x+10}$

② TABLE METHOD

ex. $(2x-3)(x+5)$

	$2x$	-3
x	$2x^2$	$-3x$
5	$10x$	-15

$2x^2+10x-3x-15$
$= \boxed{2x^2+7x-15}$

③ FOIL METHOD

To multiply **TWO** Binomials using the FOIL Method, Find the Products of

FIRST terms, $(x+1)(x+2) \rightarrow x(x) = x^2$
OUTER terms, $(x+1)(x+2) \rightarrow x(2) = 2x$
INNER terms, $(x+1)(x+2) \rightarrow 1(x) = x$
LAST terms, $(x+1)(x+2) \rightarrow 1(2) = 2$

then combine like terms $\rightarrow \boxed{x^2+3x+2}$

In Exercises 3–10, use the Distributive Property to find the product. *(See Example 1.)*

4. $(y + 6)(y + 4)$ **5.** $(z - 5)(z + 3)$ **10.** $(5s + 6)(s - 2)$

In Exercises 11–18, use a table to find the product.

11. $(x + 3)(x + 2)$ **17.** $(-3 + 2j)(4j - 7)$

16. $(5g + 3)(g + 8)$

In Exercises 21–30, use the FOIL Method to find the product. *(See Example 3.)*

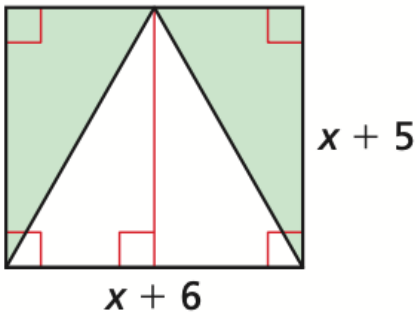
22. $(w + 9)(w + 6)$

29. $(w + 5)(w^2 + 3w)$

26. $\left(z - \frac{5}{3}\right)\left(z - \frac{2}{3}\right)$

MATHEMATICAL CONNECTIONS **In Exercises 31–34, write a polynomial that represents the area of the shaded region.**

33.

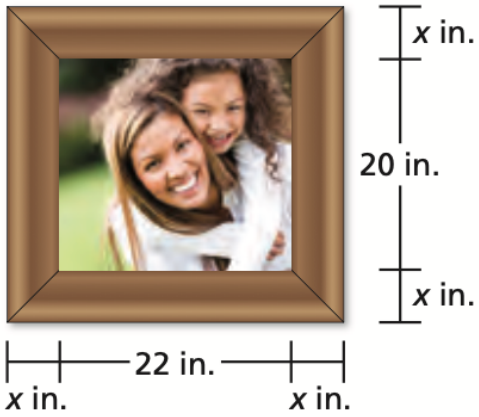


In Exercises 35–42, find the product.

37. $(y + 3)(y^2 + 8y - 2)$

42. $(6v^2 + 2v - 9)(4 - 5v)$

44. **MODELING WITH MATHEMATICS** You design a frame to surround a rectangular photo. The width of the frame is the same on every side, as shown.



a. Write a polynomial that represents the combined area of the photo and the frame.

b. Find the combined area of the photo and the frame when the width of the frame is 4 inches.

2.3 Special Products of Polynomials

Objective: Today we will use the square of a binomial pattern and the sum & difference patterns to multiply binomials and solve real-life problems.

Checkpoint: Use the TABLE Method to multiply the binomials.

1. $(x + 2)(x - 2)$ **2.** $(2x - 3)(2x + 3)$

Both sets of binomials have the form of (a + b)(a – b), what do you notice about their products? Does this ALWAYS work for the products of (a +b)(a –b)?

2.3 SPECIAL PRODUCTS OF POLYNOMIALS

SQUARE OF A BINOMIAL PATTERN

$(a+b)^2 = a^2+2ab+b^2$ ← SUM²

$(a-b)^2 = a^2-2ab+b^2$ ← DIFFERENCE²

SUM & DIFFERENCE PATTERN

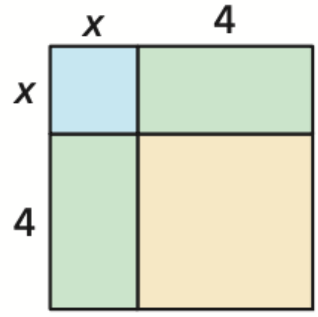
$(a+b)(a-b) = a^2-b^2$

In Exercises 3–10, find the product.

4. $(a - 6)^2$ **7.** $(-7t + 4)^2$ **9.** $(2a + b)^2$

MATHEMATICAL CONNECTIONS **In Exercises 11–14, write a polynomial that represents the area of the square.**

11.



In Exercises 15–24, find the product.

16. $(m + 6)(m - 6)$

20. $\left(\frac{1}{2} - c\right)\left(\frac{1}{2} + c\right)$

19. $(8 + 3a)(8 - 3a)$

22. $(7m + 8n)(7m - 8n)$

In Exercises 25–30, use special product patterns to find the product. *(See Example 3.)*

26. $33 \cdot 27$

28. 29^2

29. 30.5^2

34. MODELING WITH MATHEMATICS A square-shaped parking lot with 100-foot sides is reduced by x feet on one side and extended by x feet on an adjacent side.

a. The area of the new parking lot is represented by $(100 - x)(100 + x)$. Find this product.

b. Does the area of the parking lot increase, decrease, or stay the same? Explain.

c. Use the polynomial in part (a) to find the area of the new parking lot when $x = 21$.

46. REPEATED REASONING Find $(x + 1)^3$ and $(x + 2)^3$. Find a pattern in the terms and use it to write a pattern for the cube of a binomial $(a + b)^3$.