MULTIPLYING POLYNOMIALS

7.3

Let's start off with multiplying 2 binomials.

Example 1: Find the product of $(x + 2)(x + 5)$.

Method 1: Use the Distributive Property

$$(x + 2)(x + 5) = x(x + 5) + 2(x + 5)$$
$$= x^2 + 5x + 2x + 10$$
$$= x^2 + 7x + 10$$

Example 2: Find the product of $(x + 3)(2x - 4)$.

Method 2: Use a Table of Products

$(x + 3)(2x - 4)$

	$2x$	$-$ 4
x	$2x^2$	$-4x$
$+$ 3	$6x$	-12

$$= 2x^2 + 2x - 12$$

On Your Own

Use the Distributive Property to find the product.

1. $(y + 4)(y + 1)$

$= y^2 + 5y + 4$

2. $(z - 2)(z + 6)$

$= z^2 + 4z - 12$

Use a table to find the product.

3. $(p + 3)(p - 8)$

$= p^2 - 5p - 24$

4. $(r - 5)(2r - 1)$

$= 2r^2 - 11r + 5$

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$$(x + 1)(x + 2) = x^2 + 2x + x + 2 = x^2 + 3x + 2$$

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b. Find the product of $(2x + 1)(3x - 5)$

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$(x - 3)(x - 6) = x(x) + x(-6) + (-3)(x) + (-3)(-6)$ Use the FOIL Method.

b. Find the product of $(2x + 1)(3x - 5)$

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$(x - 3)(x - 6) = x(x) + x(-6) + (-3)(x) + (-3)(-6)$ Use the FOIL Method.

$$= x^2 + (-6x) + (-3x) + 18 \qquad \text{Multiply.}$$

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a. Find the product of $(x - 3)(x - 6)$.

$$\textcolor{red}{\text{First}} \quad \textcolor{blue}{\text{Outer}} \quad \textcolor{green}{\text{Inner}} \quad \text{Last}$$

$(x - 3)(x - 6) = \textcolor{red}{x(x)} + \textcolor{blue}{x(-6)} + \textcolor{green}{(-3)(x)} + (-3)(-6)$ Use the FOIL Method.

$\qquad\qquad\qquad = x^2 + (-6x) + (-3x) + 18$ Multiply.

$\qquad\qquad\qquad = x^2 - 9x + 18$ Combine like terms.

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$(2x + 1)(3x - 5) = 2x(3x) + 2x(-5) + 1(3x) + 1(-5)$ Use the FOIL Method.

$$= 6x^2 + (-10x) + 3x + (-5) \qquad \text{Multiply.}$$

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$$= 6x^2 + (-10x) + 3x + (-5) \qquad \text{Multiply.}$$

$$= 6x^2 - 7x - 5 \qquad \text{Combine like terms.}$$

On Your Own

Use the FOIL Method to find the product.

5. $(m + 5)(m - 6)$

$m(m) + m(-6) + 5(m) + 5(-6)$

$m^2 - 6m + 5m - 30$

$m^2 - m - 30$

6. $(x - 4)(x + 2)$

$x(x) + x(2) - 4(x) - 4(2)$

$x^2 + 2x - 4x - 8$

$x^2 - 2x - 8$

7. $(k + 5)(6k + 3)$

$k(6k) + k(3) + 5(6k) + 5(3)$

$6k^2 + 3k + 30k + 15$

$6k^2 + 33k + 15$

8. $\left(2u + \dfrac{1}{2}\right)\left(u - \dfrac{3}{2}\right)$

$2u(u) + 2u\left(-\dfrac{3}{2}\right) + \dfrac{1}{2}(u) + \dfrac{1}{2}\left(-\dfrac{3}{2}\right)$

$2u^2 - 3u + \dfrac{1}{2}u - \dfrac{3}{4} = 2u^2 - 2\dfrac{1}{2}u - \dfrac{3}{4}$

Multiplying a Binomial and a Trinomial

Use the Distributive Property or a Table of Products to solve.

Example 4: Find the product of $(x + 5)(x^2 - 3x - 2)$.

Method 1: Use the Distributive Property

$$(x + 5)(x^2 - 3x - 2) = x(x^2) + x(-3x) + x(-2) + 5(x^2) + 5(-3x) + 5(-2)$$
$$= x^3 - 3x^2 - 2x + 5x^2 - 15x - 10$$
$$= x^3 + 2x^2 - 17x - 10$$

Method 2: Use a Table of Products

$(x + 5)(x^2 - 3x - 2)$

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

$$= x^3 + 2x^2 - 17x - 10$$
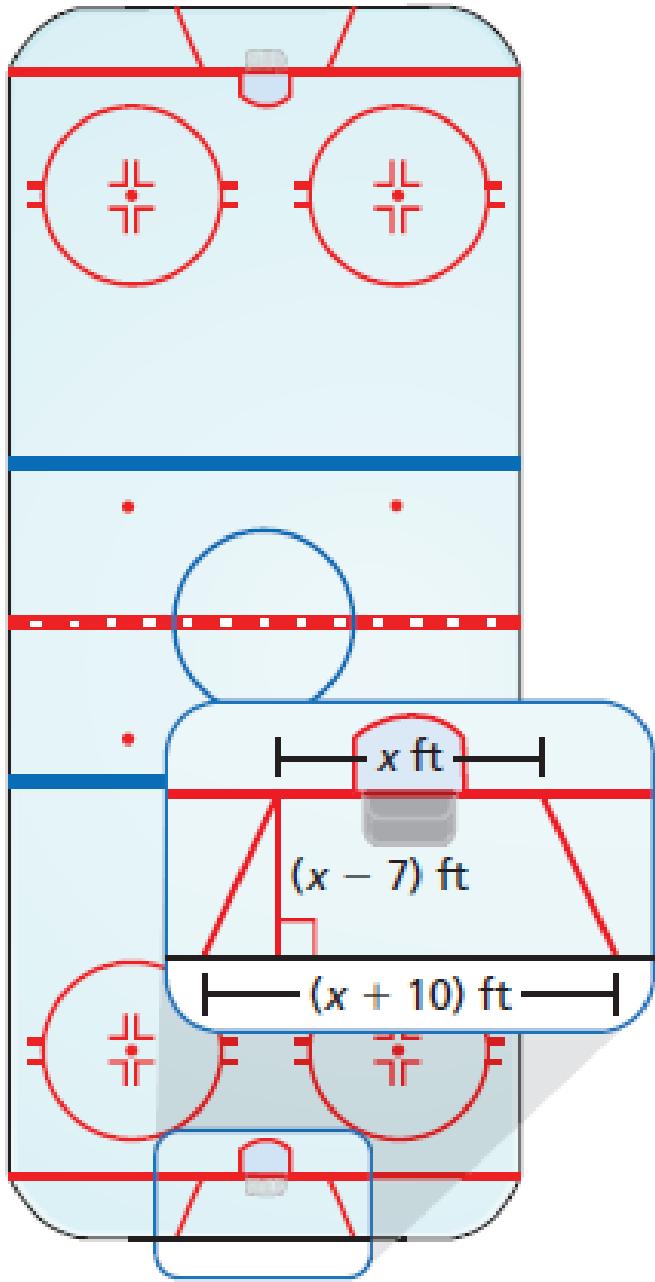
Real Life Application

Example 5: In hockey, a goalie behind the goal line can only play a puck in a trapezoid region.

a. Write a polynomial that represents the area of the trapezoidal region. $A = \frac{1}{2}h(b_1 + b_2)$

$$\frac{1}{2}(x - 7)[x + (x + 10)]$$

$$= \left(\frac{1}{2}x - 3.5\right)(2x + 10)$$

$$= x^2 + 5x - 7x - 35$$

$$= x^2 - 2x - 35$$

b. Find the area of the trapezoidal region when the shorter base is 18 feet. $253 ft^2$