

Skill Check:

a. $(3x^2 + 4x + 3) + (2x + 5x^2 + 1)$

7-2 Multiplying Polynomials:

3 Methods:

1.) Multiply binomials

2.) Use the FOIL method

3.) Multiply binomials and trinomials

Example 1

Multiplying Binomials Using the Distributive Property:

Find (a) $(x + 2)(x + 5)$ and (b) $(x + 3)(x - 4)$.

SOLUTION

a. Use the horizontal method.

$$\begin{aligned}(x + 2)(x + 5) &= x(x + 5) + 2(x + 5) \\ &= x(x) + x(5) + 2(x) + 2(5) \\ &= x^2 + 5x + 2x + 10 \\ &= x^2 + 7x + 10\end{aligned}$$

► The product is $x^2 + 7x + 10$.

b. Use the vertical method.

$$\begin{array}{r}x + 3 \\ \times \quad x - 4 \\ \hline -4x - 12 \\ x^2 + 3x \\ \hline x^2 - x - 12\end{array}$$

► The product is $x^2 - x - 12$.

Distribute $(x + 5)$ to each term of $(x + 2)$.

Distributive Property

Multiply.

Combine like terms.

Align like terms vertically.

Distributive Property

Distributive Property

Combine like terms.

Example 2:
Using a table

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

SOLUTION

Step 1 Write each binomial as a sum of terms.

$$(2x - 3)(x + 5) = [2x + (-3)](x + 5)$$

Step 2 Make a table of products.

► The product is $2x^2 - 3x + 10x - 15$, or $2x^2 + 7x - 15$.

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

Use the Distributive Property to find the product.

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

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

Use a table to find the product.

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

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

1. $y^2 + 5y + 4$

2. $z^2 + 4z - 12$

3. $p^2 - 5p - 24$

4. $2r^2 - 11r + 5$

FOIL Method

To multiply two binomials using the FOIL Method, find the sum of the products of the

First terms, $(x + 1)(x + 2)$ \rightarrow $x(x) = x^2$

Outer terms, $(x + 1)(x + 2)$ \rightarrow $x(2) = 2x$

Inner terms, and $(x + 1)(x + 2)$ \rightarrow $1(x) = x$

Last terms. $(x + 1)(x + 2)$ \rightarrow $1(2) = 2$

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

Example 3: Using the FOIL method

Find each product.

a. $(x - 3)(x - 6)$

b. $(2x + 1)(3x - 5)$

a. Use the FOIL Method.

$$\begin{aligned}(x - 3)(x - 6) &= \overset{\text{First}}{x(x)} + \overset{\text{Outer}}{x(-6)} + \overset{\text{Inner}}{(-3)(x)} + \overset{\text{Last}}{(-3)(-6)} && \text{FOIL Method} \\ &= x^2 + (-6x) + (-3x) + 18 && \text{Multiply.} \\ &= x^2 - 9x + 18 && \text{Combine like terms.}\end{aligned}$$

▶ The product is $x^2 - 9x + 18$.

b. Use the FOIL Method.

$$\begin{aligned}(2x + 1)(3x - 5) &= \overset{\text{First}}{2x(3x)} + \overset{\text{Outer}}{2x(-5)} + \overset{\text{Inner}}{1(3x)} + \overset{\text{Last}}{1(-5)} && \text{FOIL Method} \\ &= 6x^2 + (-10x) + 3x + (-5) && \text{Multiply.} \\ &= 6x^2 - 7x - 5 && \text{Combine like terms.}\end{aligned}$$

▶ The product is $6x^2 - 7x - 5$.

Use the FOIL Method to find the product.

5. $(m - 3)(m - 7)$

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

7. $\left(2u + \frac{1}{2}\right)\left(u - \frac{3}{2}\right)$

8. $(n + 2)(n^2 + 3)$

5. $m^2 - 10m + 21$

6. $x^2 - 2x - 8$

7. $2u^2 - \frac{5}{2}u - \frac{3}{4}$

8. $n^3 + 2n^2 + 3n + 6$

Example 4: multiplying a binomial and trinomial

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

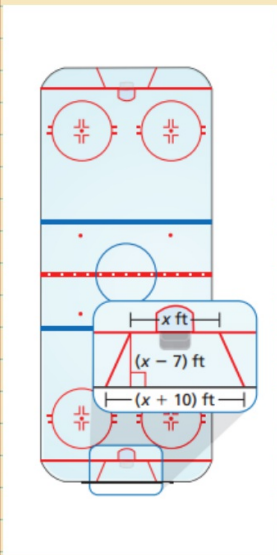
$$\begin{array}{r}
 x^2 - 3x - 2 \\
 \times \quad x + 5 \\
 \hline
 5x^2 - 15x - 10 \\
 x^3 - 3x^2 - 2x \\
 \hline
 x^3 + 2x^2 - 17x - 10
 \end{array}$$

Multiply $5(x^2 - 3x - 2)$.

Multiply $x(x^2 - 3x - 2)$.

Align like terms vertically.
 Distributive Property
 Distributive Property
 Combine like terms.

► The product is $x^3 + 2x^2 - 17x - 10$.



EXAMPLE 5 Solving a Real-Life Problem

In hockey, a goalie behind the goal line can only play a puck in the trapezoidal region.

- Write a polynomial that represents the area of the trapezoidal region.
- Find the area of the trapezoidal region when the shorter base is 18 feet.

$$\begin{aligned} \text{a. } \frac{1}{2}h(b_1 + b_2) &= \frac{1}{2}(x - 7)[x + (x + 10)] \\ &= \frac{1}{2}(x - 7)(2x + 10) \end{aligned}$$

Substitute.

Combine like terms.

$$\begin{aligned} & \quad \quad \quad \text{F} \quad \quad \text{O} \quad \quad \text{I} \quad \quad \text{L} \\ &= \frac{1}{2}[2x^2 + 10x + (-14x) + (-70)] \\ &= \frac{1}{2}(2x^2 - 4x - 70) \\ &= x^2 - 2x - 35 \end{aligned}$$

FOIL Method

Combine like terms.

Distributive Property

► A polynomial that represents the area of the trapezoidal region is $x^2 - 2x - 35$.

b. Find the value of $x^2 - 2x - 35$ when $x = 18$.

$$\begin{aligned} x^2 - 2x - 35 &= 18^2 - 2(18) - 35 \\ &= 324 - 36 - 35 \\ &= 253 \end{aligned}$$

Substitute 18 for x .

Simplify.

Subtract.

► The area of the trapezoidal region is 253 square feet.

Find the product.

9. $(x + 1)(x^2 + 5x + 8)$

10. $(n - 3)(n^2 - 2n + 4)$

