9.2 Multiply Polynomials

Before	You added and subtracted polynomials.
Now	You will multiply polynomials.
Why?	So you can determine areas, as in Example 7.

Key Vocabulary
- polynomial, *p. 554*
- binomial, *p. 555*

The diagram shows that a rectangle with width x and length $2x + 3$ has an area of $2x^2 + 3x$. You can also find this product by using the distributive property.

$$x(2x + 3) = x(2x) + x(3) = 2x^2 + 3x$$
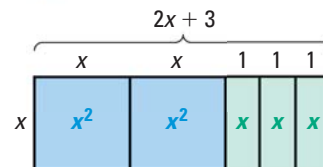
In this lesson, you will learn several methods for multiplying polynomials. Each method is based on the distributive property.

EXAMPLE 1 Multiply a monomial and a polynomial

REVIEW PROPERTIES OF EXPONENTS
For help with using the properties of exponents, see p. 489.

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

$2x^3(x^3 + 3x^2 - 2x + 5)$ **Write product.**

$= 2x^3(x^3) + 2x^3(3x^2) - 2x^3(2x) + 2x^3(5)$ **Distributive property**

$= 2x^6 + 6x^5 - 4x^4 + 10x^3$ **Product of powers property**

EXAMPLE 2 Multiply polynomials using a table

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

Solution

STEP 1 **Write** subtraction as addition in each polynomial.

$$(x - 4)(3x + 2) = [x + (-4)](3x + 2)$$

STEP 2 **Make** a table of products.

	$3x$	2
x	$3x^2$	
-4		

→

	$3x$	2
x	$3x^2$	$2x$
-4	$-12x$	-8

▶ The product is $3x^2 + 2x - 12x - 8$, or $3x^2 - 10x - 8$.

✓ **GUIDED PRACTICE** for Examples 1 and 2

Find the product.

1. $x(7x^2 + 4)$ **2.** $(a + 3)(2a + 1)$ **3.** $(4n - 1)(n + 5)$