

Key Concepts

Lesson
25

Multiplying a Polynomial by a Monomial

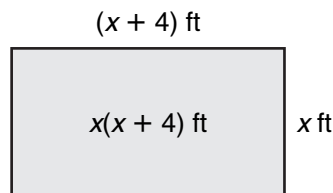
Objective Teach students the technique of multiplying a polynomial by a monomial by using the Distributive Property and the properties of exponents.

Note to the Teacher *In this lesson, students will learn to multiply a polynomial by a monomial by using the Distributive Property. Do Example 1 on the chalkboard to illustrate using the Distributive Property with the variable x .*

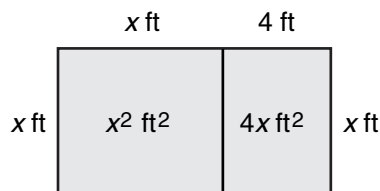
Simplifying Expressions

Example 1 Find the area of a rectangular region of height x feet and width $(x + 4)$ feet.

Solution Draw a picture of the region.



Now draw a picture of the same region, divided as follows.



So, the area of the region is $x(x + 4)$ or $x^2 + 4x$ ft².

This example illustrates the Distributive Property, that is, $a(b + c) = ab + ac$. Point out to your students that this principle holds even when a , b , and c are monomials, so that $b + c$ represents a polynomial.

Now do several examples on the chalkboard.

Example 2 Find $2x^3(x^2 + 3x + 4)$.

Solution Use the Distributive Property to find the product.

$$\begin{aligned}2x^3(x^2 + 3x + 4) &= 2x^3(x^2) + 2x^3(3x) + 2x^3(4) \\ &= 2x^5 + 6x^4 + 8x^3\end{aligned}$$

Now do an example in which the polynomial has more than one variable. In this case, students may have to simplify by combining like terms.

Example 3 Find $a^2b(3a^3b^2 - 2ab^4 + 3a^2b^2)$.

Solution Use the Distributive Property to find the product.

$$\begin{aligned}a^2b(3a^3b^2 - 2ab^4 + 3a^2b^2) &= a^2b(3a^3b^2) - a^2b(2ab^4) + a^2b(3a^2b^2) \\ &= 3a^5b^3 - 2a^3b^5 + 3a^4b^3\end{aligned}$$

Solving Equations

Sometimes adding, subtracting, and multiplying monomials can be used to help solve a polynomial equation. Do the following example on the chalkboard.

Example 4 Solve $x(x - 2) + 5x - 9 = x(x + 1) - 4$.


Solution First multiply each side of the equation by using the Distributive Property.

$$\begin{aligned}x(x - 2) + 5x - 9 &= x(x + 1) - 4 \\ x(x) - x(2) + 5x - 9 &= x(x) + x(1) - 4 \\ x^2 - 2x + 5x - 9 &= x^2 + x - 4\end{aligned}$$

Now simplify this equation by combining like terms.

$$\begin{aligned}x^2 - 2x + 5x - 9 &= x^2 + x - 4 \\ x^2 + (-2x + 5x) - 9 &= x^2 + x - 4 \\ x^2 + 3x - 9 &= x^2 + x - 4 \\ 3x - 9 &= x - 4 && \text{Subtract } x^2 \text{ from each side.} \\ 2x - 9 &= -4 && \text{Subtract } x \text{ from each side.} \\ 2x &= 5 && \text{Add 9 to each side.} \\ x &= \frac{5}{2} && \text{Divide each side by 2.}\end{aligned}$$

Note to the Teacher *Multiplication of a polynomial by a monomial is an important technique. It will immediately lead to the more general technique of multiplication of polynomials in the next lesson. Therefore, it is very important students learn this skill well.*



End of
Lesson