Example 2

Factor $9x^2 + 24x + 16$.

The first term of the trinomial is the perfect square $(3x)^2$, and the third term of the trinomial is the perfect square 4^2. These two observations are enough to further investigate the possibility that this is a perfect-square trinomial. The middle term of the trinomial is twice the product of the square root of the first and third terms. This trinomial is a perfect-square trinomial of the form $x^2 + 2xy + y^2$.

$$\begin{aligned} 9x^2 + 24x + 16 &= (3x)^2 + 2(3x)(4) + 4^2 \\ &= (3x + 4)^2 \end{aligned}$$

Recognizing that a trinomial is a perfect-square trinomial can lead to a quick factorization. However, it is still possible to use algebra tiles or decomposition to factor these perfect-square trinomials.

Check Up

1. Factor the following expressions.

   a. $p^2 + 8p + 16$

   b. $4a^2 - 4a + 1$

Compare your answers.

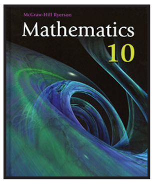
1. Factor the following expressions.

   a. $p^2 + 8p + 16$

   $$\begin{aligned} p^2 + 8p + 16 &= p^2 + 2(p)(4) + 4^2 \\ &= (p + 4)^2 \end{aligned}$$

   b. $4a^2 - 4a + 1$

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



For further information about other factoring strategies, see pp. 238 – 245 of *Mathematics 10*.

Multimedia

Additional videos related to other factoring strategies have been provided.

Differences of squares and perfect-square trinomials are two special types of polynomials that can be factored relatively easily. The key to understanding these methods, as well as any factoring strategy, is to look for patterns that appear when multiplying the factors.

Polynomials Summary

Multiplying and factoring polynomials are reverse processes. Because of this relationship, an analysis of the multiplication of polynomials can be used to develop methods for factoring polynomials.

Polynomials are at the core of many advanced math concepts. To use polynomials to solve more complex problems, it is essential that you have a clear understanding of how polynomials can be multiplied and factored.