

LESSON 3: The Product of a Sum and Difference of the Same Two Terms

Learning Objectives

At the end of the lesson, you will be able to:

1. Discuss the process of finding the product of a sum and the difference between the same two terms.
2. Find the product of polynomials using the product of a sum and the difference of the same two terms.
3. Apply the shortcut method to multiply binomials when encountering the sum and difference of the same two terms.

When distributing binomials over other terms, knowing how to find the sum and difference of the same two terms is a handy shortcut. The sum of any two terms multiplied by the difference of the same two terms is easy to find and even easier to work out — the result is simply the **square of the two terms**. The middle term disappears because a term and its opposite are always in the middle.

If you encounter the same two terms and just the sign between them changes, rest assured that the result is the square of those two terms. The second term will always be **negative**, as in the example,

$$(a + b)(a - b) = a^2 - b^2$$

Following that pattern, we can multiply the sum and difference of the same two terms without using the long method.

$$\begin{aligned}\text{Example 1: } (x + 4)(x - 4) \\ &= (x)^2 - (4)^2 \\ &= x^2 - 16\end{aligned}$$

$$\begin{aligned}\text{Example 2: } (m + 3)(m - 3) \\ &= (m)^2 - (3)^2 \\ &= m^2 - 9\end{aligned}$$

$$\begin{aligned}\text{Example 3: } (w - 5)(w + 5) \\ &= (w)^2 - (5)^2 \\ &= w^2 - 25\end{aligned}$$

$$\begin{aligned}\text{Example 4: } (2x - 5)(2x + 5) \\ &= (2x)^2 - (5)^2 \\ &= 4x^2 - 25\end{aligned}$$

SUMMARY

- The product of the sum and difference of the same two terms is denoted by

$$(a + b)(a - b) = a^2 - b^2$$

where a and b are the first and second terms, respectively.

- The product of the sum and difference of the same two terms is the difference between the squares of the two terms.