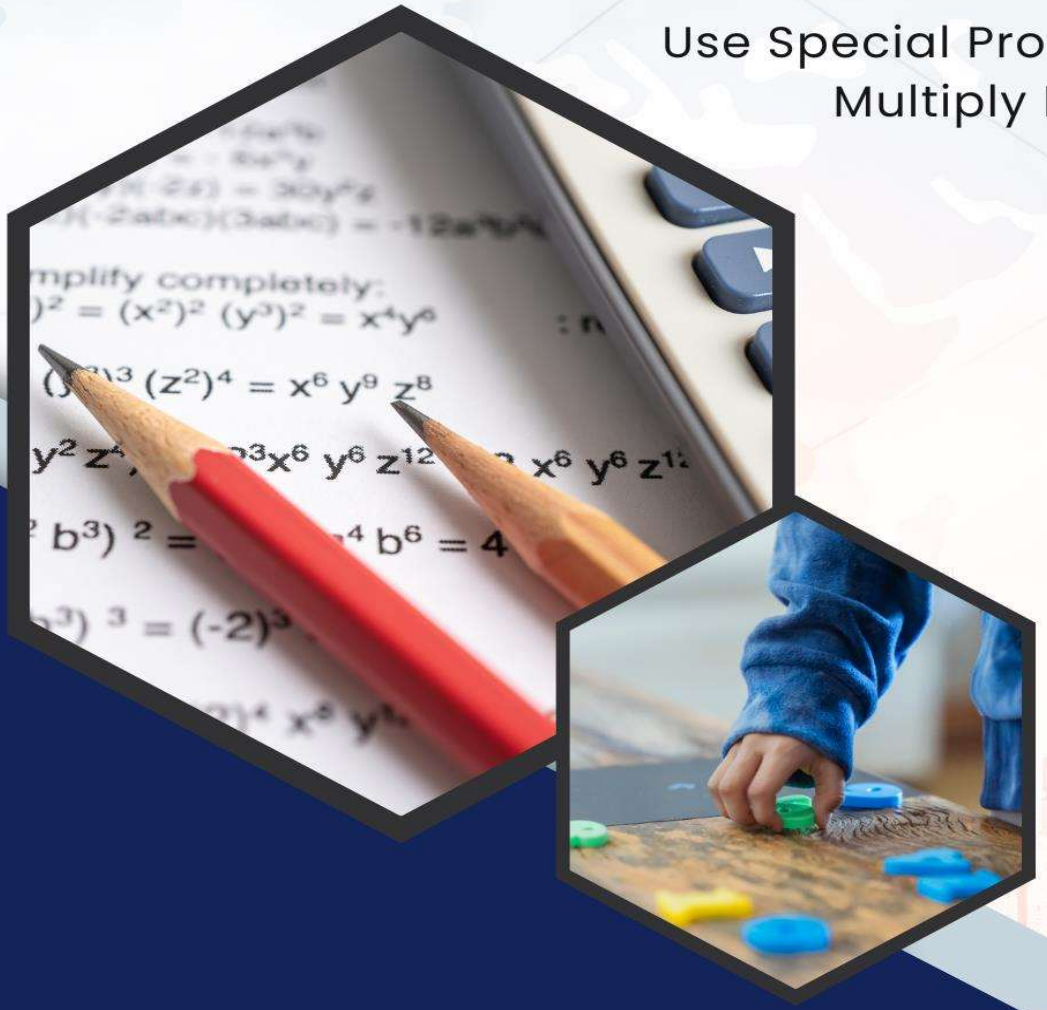
ALMS8

TAILORED LEARNING, PERSONALIZED PROGRESS

GRADE 8

LEARNING MODULE 7

Use Special Product Patterns To Multiply Binomials



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USE SPECIAL PRODUCT PATTERNS TO MULTIPLY BINOMIALS.

Welcome!

Hey there, future math whizzes! Welcome to our exciting journey through the world of special product patterns. Get ready to unleash the power of multiplying binomials as we dive into this main course together. Over the next few lessons, we'll break down the complexities and discover the magic behind these patterns. From foil methods to mastering unique formulas, you're in for a treat. So, grab your math gear, sharpen those pencils, and let's embark on a mathematical adventure that will have you multiplying binomials like a pro in no time!

Learning Objectives

At the end of this module, students will be able to:

- apply special product patterns to multiply binomials accurately in various problem-solving scenarios;
- execute the steps involved in multiplying binomials using special product patterns; and
- develop confidence and enthusiasm in utilizing special product patterns for binomial multiplication.

Let's recall the Laws of Exponents first, as it is an important concept that we will be using throughout this module. The important laws of exponents are given below:

- $a^m \times a^n = a^{m+n}$
- $\frac{a^m}{a^n} = a^{m-n}$
- $(a^m)^n = a^{mn}$
- $\frac{a^n}{b^n} = \left(\frac{a}{b}\right)^n$

- $a^0 = 1$
- $a^{-m} = \frac{1}{a^m}$
- $a^{\frac{1}{n}} = \sqrt[n]{a}$

For further information about this, please visit the attached links:

- https://byjus.com/maths/laws-of-exponents/
- https://www.mathsisfun.com/algebra/exponent-laws.html

Three Special Cases of Multiplying Binomials and Their Patterns

Let a be the first term in the expression and b be the second term.

1. **Square of a Sum (Add times Add)**

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

Example 1:

$$(x+9)^2 = ?$$

Let a = x (first term) and b = 9 (second term). Substitute into $a^2 + 2ab + b^2$.

$$= (x)^2 + 2(x)(9) + (9)^2$$

$$(x + 9)^2 = x^2 + 18x + 81$$

Example 2:

$$(4x + 6)^2 = ?$$

Let a = 4x (first term) and b = 6 (second term). Substitute into $a^2 + 2ab + b^2$.

$$= (4x)^2 + 2(4x)(6) + (6)^2$$

$$= 4^2x^2 - 2(4x)(6) + 6^2$$

$$(4x + 6)^2 = 16x^2 + 48x + 36$$

2. **Square of a Difference (Subtract Times Subtract)**

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

Example 1:

$$(p - 13)^2 = ?$$

Let a = p (first term) and b = 13 (second term). Substitute into $a^2 - 2ab + b^2$.

$$= (p)^2 - 2(p)(13) + (13)^2$$

$$(p - 13)^2 = p^2 - 26p + 169$$

Example 2:

$$(2x - 3y)^2 = ?$$

Let a = 2x (first term) and b = 3y (second term). Substitute into $a^2 - 2ab + b^2$.

$$= (2x)^2 - 2(2x)(3y) + (3y)^2$$

$$= 2^2x^2 - 2(2x)(3y) + 3^2y^2$$

$$(2x - 3y)^2 = 4x^2 - 12xy + 9y^2$$

3. **Product of the Sum and Difference (Add Times Subtract)**

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

Example 1:

$$(2x+5)(2x-5) = ?$$

Let a = 2x (first term) and b = 5 (second term). Substitute into $a^2 - b^2$.

$$= (2x)^2 - (5)^2$$

$$= 2^2x^2 - 5^2$$

$$(2x+5)(2x-5) = 4x^2 - 25$$

Example 2:

$$(5m^2 - 9n)(5m^2 + 9n) = ?$$

Let a = $5m^2$ (first term) and b = 9n (second term). Substitute into $a^2 - b^2$.

$$= (5m^2)^2 - (9n)^2$$

$$= 5^2m^{2\times2} - 9^2n^2$$

$$(5m^2 - 9n)(5m^2 + 9n) = 25m^4 - 81n^2$$