9.3 Find Special Products of Polynomials

Goal • Use special product patterns to multiply polynomials.

Your Notes

SQUARE OF A BINOMIAL PATTERN

Algebra

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

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

Example

$(x + 4)^2 = x^2$ _____ $+ 16$

$(3x - 2)^2 = 9x^2$ _____ $+ 4$

Example 1 ***Use the square of a binomial pattern***

Find the product.

Solution

When you use special product patterns, remember that a and b can be numbers, variables, or variable expressions.

a. $(4x + 3)^2 = (4x)^2$ _____ $+ 3^2$

$= 16x^2$ _____ $+ 9$

b. $(3x - 5y)^2 = (3x)^2$ _____ $+ (5y)^2$

$= 9x^2$ _____ $+ 25y^2$

✔ ***Checkpoint*** **Find the product.**

1. $(x + 9)^2$

2. $(2x - 7)^2$

3. $(5r + s)^2$

Your Notes

SUM AND DIFFERENCE PATTERN

Algebra

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

Example

$(x + 4)(x - 4) = \_\_\_^2 - \_\_\_$

Example 2 *Use the sum and difference pattern*

Find the product.

Solution

a. $(n + 3)(n - 3) = \_\_\_^2 - \_\_\_^2$ **Sum and difference pattern**

$= \_\_\_^2 - \_\_\_$ **Simplify.**

b. $(4x + y)(4x - y) = \_\_\_\_\_^2 - \_\_\_^2$ **Sum and difference pattern**

$= \_\_\_\_\_^2 - \_\_\_^2$ **Simplify.**

Example 3 *Use special products and mental math*

Use special products to find the product 17 • 23.

Solution

Notice that 17 is 3 less than ____ while 23 is 3 more than ____.

$17 \cdot 23 = (\_\_\_\_ - 3)(\_\_\_\_ + 3)$ **Write as product.**

$= \_\_\_\_\_$ **Sum and difference pattern**

$= \_\_\_\_\_$ **Evaluate powers.**

$= \_\_\_\_$ **Simplify.**

Your Notes

✔ ***Checkpoint*** **Complete the following exercises.**

4. Find the product $(z + 6)(z - 6)$.

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

6. Find the product $(x + 5y)(x - 5y)$.

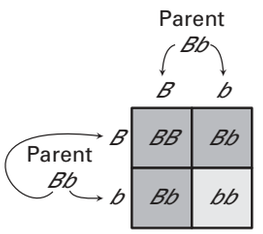
7. *Describe* how you can use special products to find 39^2.

Your Notes

Example 4 ***Solve a multi-step problem***

Eye Color An offspring's eye color is determined by a combination of two genes, one inherited from each parent. Each parent has two color genes, and the offspring has an equal chance of inheriting either one.

The gene *B* is for brown eyes, and the gene *b* is for blue eyes. Any gene combination with a *B* results in brown eyes. Suppose each parent has the same gene combination *Bb*. The Punnett square shows the possible gene combinations of the offspring and the resulting eye color.



- What percent of the possible gene combinations of the offspring result in blue eyes?
- Show how you could use a polynomial to model the possible gene combinations of the offspring.

Solution

Step 1 **Notice** that the Punnett square shows that ___ out of 4, or _____ of the possible gene combinations result in blue eyes.

Step 2 **Model** the gene from each parent with _____. The possible gene of the offspring can be modeled by _____. Notice that this product also represents the area of the Punnett square.

_____

= _____

= _____

The coefficients show that _____ of the possible gene combinations will result in blue eyes.

Homework

✔ ***Checkpoint*** **Complete the following exercise.**

8. Eye Color Look back at Example 4. What percent of the possible gene combinations of the offspring result in brown eyes?