

# 9.3

## Find Special Products of Polynomials

**Goal** • Use special product patterns to multiply polynomials.

### METHOD II

Your Notes

### BINOMIAL SQUARES

HOW TO MULTIPLY WITHOUT EXPANDING:

① SQUARE THE 1ST TERM

② Middle term: multiply the 2 terms and Double

③ SQUARE THE LAST TERM

and notice always positive

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

### SQUARE OF A BINOMIAL PATTERN

Algebra

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

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

Example

$$(x + 4)^2 = x^2 + 8x + 16$$

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

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

Find the product.

**Solution**

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

$$\begin{aligned} \text{b. } (3x - 5y)^2 &= (3x)^2 + 2(3x)(-5y) + (5y)^2 \\ &= 9x^2 - 30xy + 25y^2 \end{aligned}$$

✓ **Checkpoint** Find the product. EXPAND AND MULTIPLY

$$1. (x + 9)^2 = (x+9)(x+9) = x^2 + 9x + 9x + 81$$

$$(x+9) \text{ is the base } \quad \boxed{x^2 + 18x + 81}$$

$$2. (2x - 7)^2 = (2x-7)(2x-7) = 4x^2 - 14x - 14x + 49$$

$$\boxed{4x^2 - 28x + 49}$$

$$3. (5r + s)^2 = (5r+s)(5r+s) = 25r^2 + 5rs + 5rs + s^2$$

$$\boxed{25r^2 + 10rs + s^2}$$

① What is the pattern?

### Method I

**Your Notes**

Notice

- ① Same 1<sup>st</sup> Term
- ② THE SIGNS ARE OPPOSITES (+, -)
- ③ Same last Term

These are called "conjugate binomials" and the middle term drops out.

**SUM AND DIFFERENCE PATTERN**

Algebra

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

Example

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

*notice the sign is ALWAYS NEGATIVE*

**Example 2** Use the sum and difference pattern

Find the product.

**Solution**

a.  $(n + 3)(n - 3) = n^2 - 9$

Sum and difference pattern

Simplify.

b.  $(4x + y)(4x - y) = 16x^2 - y^2$

Sum and difference pattern

Simplify.

*mental step -3n + 3n = 0*

*Mental Step -4xy + 4xy = 0*

**Your Notes**

METHOD I

Double Distribution OR FOIL

**Checkpoint** Complete the following exercises.

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

$$z^2 - 6z + 6z - 36 = z^2 - 36$$

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

$$16x^2 - 12x + 12x - 9 = 16x^2 - 9$$

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

$$x^2 - 5xy + 5xy - 25y^2 = x^2 - 25y^2$$