

## Section 5.3 Special Products



### Built for *SPEED!*

After working through the previous section, students often wonder if there are fast methods for finding products of polynomials. Fortunately, the answer is “yes.”



In this section of the textbook, we will use the distributive property to develop patterns that will let you multiply certain binomials quite rapidly.

#### First Steps:

- Take comprehensive notes** from your instructor’s lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 5.3 of your textbook which begins on page 359.
- Complete the *Concept and Vocabulary Check* on page 365 of the textbook.

#### Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

**Objective #1:** Use FOIL in polynomial multiplication.

#### ✓ *Solved Problem #1*

**1a.** Multiply:  $(x+5)(x+6)$

$$\begin{aligned} (x+5)(x+6) &= \overbrace{x \cdot x}^{\text{F}} + \overbrace{6 \cdot x}^{\text{O}} + \overbrace{5 \cdot x}^{\text{I}} + \overbrace{5 \cdot 6}^{\text{L}} \\ &= x^2 + 6x + 5x + 30 \\ &= x^2 + 11x + 30 \end{aligned}$$

#### ✎ *Pencil Problem #1*

**1a.** Multiply:  $(y-7)(y+3)$

**1b.** Multiply:  $(7x+5)(4x-3)$

$$\begin{aligned} (7x+5)(4x-3) &= \overbrace{7x \cdot 4x}^{\text{F}} + \overbrace{7x(-3)}^{\text{O}} + \overbrace{5 \cdot 4x}^{\text{I}} + \overbrace{5(-3)}^{\text{L}} \\ &= 28x^2 - 21x + 20x - 15 \\ &= 28x^2 - x - 15 \end{aligned}$$

**1b.** Multiply:  $(2x-3)(5x+3)$

**Objective #2:** Multiply the sum and difference of two terms. **Solved Problem #2**

**2a.** Multiply:  $(7y+8)(7y-8)$

Since this product is of the form  $(A+B)(A-B)$ ,  
use the special-product formula

$$(A+B)(A-B) = A^2 - B^2.$$

$$\begin{aligned} (7y+8)(7y-8) &= \overbrace{(7y)^2}^{\text{first term squared}} - \overbrace{8^2}^{\text{second term squared}} \\ &= 49y^2 - 64 \end{aligned}$$

 **Pencil Problem #2** 

**2a.** Multiply:  $(3x+2)(3x-2)$

**2b.** Multiply:  $(2a^3+3)(2a^3-3)$

Since this product is of the form  $(A+B)(A-B)$ ,  
use the special-product formula

$$(A+B)(A-B) = A^2 - B^2.$$

$$\begin{aligned} (2a^3+3)(2a^3-3) &= \overbrace{(2a^3)^2}^{\text{first term squared}} - \overbrace{3^2}^{\text{second term squared}} \\ &= 4a^6 - 9 \end{aligned}$$

**2b.** Multiply:  $(x^{10}+5)(x^{10}-5)$

**Objective #3:** Find the square of a binomial sum. **Solved Problem #3**

**3a.** Multiply:  $(x+10)^2$

Use the special-product formula

$$(A+B)^2 = A^2 + 2AB + B^2.$$

$$\begin{aligned} (x+10)^2 &= \overbrace{x^2}^{\text{first term squared}} + \overbrace{2 \cdot 10x}^{\text{2 \cdot product of the terms}} + \overbrace{10^2}^{\text{last term squared}} \\ &= x^2 + 20x + 100 \end{aligned}$$

 **Pencil Problem #3** 

**3a.** Multiply:  $(x+2)^2$

**3b.** Multiply:  $(5x+4)^2$

Use the special-product formula

$$(A+B)^2 = A^2 + 2AB + B^2.$$

$$\begin{aligned} (5x+4)^2 &= \overbrace{(5x)^2}^{\text{first term squared}} + \overbrace{2 \cdot 20x}^{2 \cdot \text{product of the terms}} + \overbrace{4^2}^{\text{last term squared}} \\ &= 25x^2 + 40x + 16 \end{aligned}$$

**3b.** Multiply:  $(x^8+3)^2$

**Objective #4:** Find the square of a binomial difference.

 **Solved Problem #4**

**4a.** Multiply:  $(x-9)^2$

Use the special-product formula

$$(A-B)^2 = A^2 - 2AB + B^2.$$

$$\begin{aligned} (x-9)^2 &= \overbrace{x^2}^{\text{first term squared}} - \overbrace{2 \cdot 9x}^{2 \cdot \text{product of the terms}} + \overbrace{9^2}^{\text{last term squared}} \\ &= x^2 - 18x + 81 \end{aligned}$$

 **Pencil Problem #4**

**4a.** Multiply:  $(x-3)^2$

**4b.** Multiply:  $(7x-3)^2$

Use the special-product formula

$$(A-B)^2 = A^2 - 2AB + B^2.$$

$$\begin{aligned} (7x-3)^2 &= \overbrace{(7x)^2}^{\text{first term squared}} - \overbrace{2 \cdot 21x}^{2 \cdot \text{product of the terms}} + \overbrace{3^2}^{\text{last term squared}} \\ &= 49x^2 - 42x + 9 \end{aligned}$$

**4b.** Multiply:  $(7-2x)^2$

**Answers for Pencil Problems (Textbook Exercise references in parentheses):**

1a.  $y^2 - 4y - 21$  (5.3 #3)

1b.  $10x^2 - 9x - 9$  (5.3 #9)

2a.  $9x^2 - 4$  (5.3 #27)

2b.  $x^{20} - 25$  (5.3 #43)

3a.  $x^2 + 4x + 4$  (5.3 #45)

3b.  $x^{16} + 6x^8 + 9$  (5.3 #61)

4a.  $x^2 - 6x + 9$  (5.3 #49)

4b.  $49 - 28x + 4x^2$  (5.3 #55)

**Homework:**

- Review the Section 5.3 summary** which begins on page 410 of the textbook.
- Insert your homework** into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.