

Section 5.2

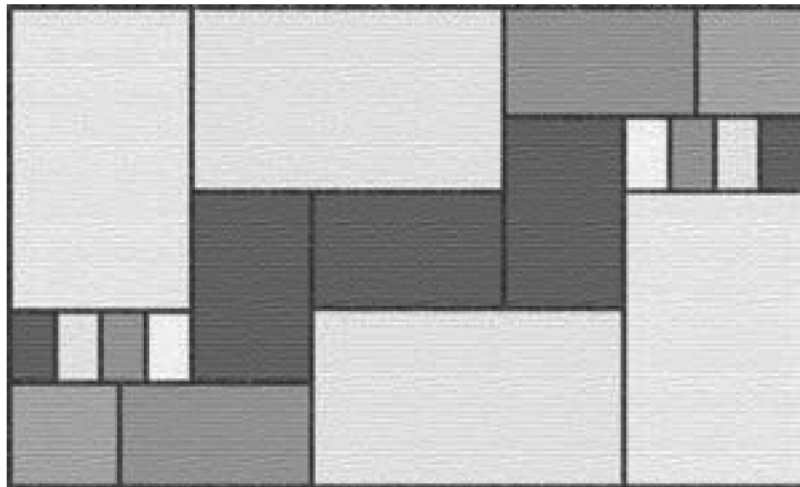
Multiplying Polynomials

It's all Greek to me!

As discussed earlier in the textbook, the ancient Greeks believed that the most visually pleasing rectangles have a ratio of length to width of approximately 1.618 to 1.

With the exception of the squares on the lower left and the upper right, the interior of this geometric figure is filled entirely with these golden rectangles.

Furthermore, the large rectangle is also a golden rectangle.



The total area of the large rectangle can be found in many ways. This is because the area of any large rectangular region is related to the areas of the smaller rectangles that make up that region.

In this section, we apply areas of rectangles as a way to picture the multiplication of polynomials.

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 5.2 of your textbook which begins on page 349.
- Complete the *Concept and Vocabulary Check* on page 356 of the textbook.

Guided Practice:

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

Objective #1: Use the product rule for exponents.	
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<p style="text-align: center;"> Solved Problem #1</p> <p>1a. Multiply the expression using the product rule.</p> $2^2 \cdot 2^4$ $2^2 \cdot 2^4 = 2^{2+4}$ $= 2^6 \text{ or } 64$	<p style="text-align: center;"> Pencil Problem #1 </p> <p>1a. Multiply the expression using the product rule.</p> $x^{15} \cdot x^3$
<p>1b. Multiply the expression using the product rule.</p> $y^4 \cdot y^3 \cdot y^2$ $y^4 \cdot y^3 \cdot y^2 = y^{4+3+2}$ $= y^9$	<p>1b. Multiply the expression using the product rule.</p> $x^2 \cdot x^6 \cdot x^3$

Objective #2: Use the power rule for exponents.	
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<p style="text-align: center;"> Solved Problem #2</p> <p>2a. Simplify the expression using the power rule.</p> $(x^9)^{10}$ $(x^9)^{10} = x^{9 \cdot 10}$ $= x^{90}$	<p style="text-align: center;"> Pencil Problem #2 </p> <p>2a. Simplify the expression using the power rule.</p> $(x^{15})^3$
<p>2b. Simplify the expression using the power rule.</p> $\left[(-5)^7\right]^3$ $\left[(-5)^7\right]^3 = (-5)^{7 \cdot 3}$ $= (-5)^{21}$	<p>2b. Simplify the expression using the power rule.</p> $\left[(-20)^3\right]^3$

Objective #3: Use the products-to-powers rule.

<p style="text-align: center;"> Solved Problem #3</p> <p>3a. Simplify the expression using the powers-to-products rule.</p> $(2x)^4$ $(2x)^4 = 2^4 x^4$ $= 16x^4$	<p style="text-align: center;"> Pencil Problem #3</p> <p>3a. Simplify the expression using the powers-to-products rule.</p> $(-5x)^2$
<p>3b. Simplify the expression using the powers-to-products rule.</p> $(-4y^2)^3$ $(-4y^2)^3 = (-4)^3 (y^2)^3$ $= (-4)^3 y^{2 \cdot 3}$ $= -64y^6$	<p>3b. Simplify the expression using the powers-to-products rule.</p> $(-2y^6)^4$

Objective #4: Multiply monomials.
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<p style="text-align: center;"> Solved Problem #4</p> <p>4. Multiply: $(-5x^4)(4x^5)$</p> $(-5x^4)(4x^5) = (-5 \cdot 4)(x^4 \cdot x^5)$ $= -20x^9$	<p style="text-align: center;"> Pencil Problem #4</p> <p>4. Multiply: $(2x^2)(-3x)(8x^4)$</p>
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Objective #5: Multiply a monomial and a polynomial. **Solved Problem #5**

5. Multiply: $6x^2(5x^3 - 2x + 3)$

$$\begin{aligned} 6x^2(5x^3 - 2x + 3) &= 6x^2 \cdot 5x^3 - 6x^2 \cdot 2x + 6x^2 \cdot 3 \\ &= 30x^5 - 12x^3 + 18x^2 \end{aligned}$$

 **Pencil Problem #5** 

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

Objective #6: Multiply polynomials when neither is a monomial. **Solved Problem #6**

6. Multiply: $(5x + 3)(2x - 7)$

$$\begin{aligned} (5x + 3)(2x - 7) &= 10x^2 - 35x + 6x - 21 \\ &= 10x^2 - 29x - 21 \end{aligned}$$

 **Pencil Problem #6** 

6. Multiply: $(2x - 5)(x + 4)$

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

1a. x^{18} (5.2 #1) 1b. x^{11} (5.2 #5) 2a. x^{45} (5.2 #11) 2b. $(-20)^9$ (5.2 #13)

3a. $25x^2$ (5.2 #17) 3b. $16y^{24}$ (5.2 #21)

4. $-48x^7$ (5.2 #33) 5. $12x^4 - 3x^3 + 15x^2$ (5.2 #53) 6. $2x^2 + 3x - 20$ (5.2 #63)

Homework:

- Review the Section 5.2 summary 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.