


Section 8.2

Multiplying and Dividing Radicals




Radicals in Space???

What does travel in space have to do with radicals?

Imagine that in the future we will be able to travel at velocities approaching the speed of light (approximately 186,000 miles per second).

According to Einstein's theory of special relativity, time would pass more quickly on Earth than it would in the moving spaceship.






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 8.2 of your textbook which begins on page 575.
- Complete the *Concept and Vocabulary Check* on page 581 of the textbook.

Guided Practice:

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

Objective #1: Multiply square roots.	
<p style="text-align: center;"> Solved Problem #1</p> <p>1a. Use the product rule for square roots to find the product: $\sqrt{3} \cdot \sqrt{10}$</p> $\begin{aligned} \sqrt{3} \cdot \sqrt{10} &= \sqrt{3 \cdot 10} \\ &= \sqrt{30} \end{aligned}$	<p style="text-align: center;"> Pencil Problem #1 </p> <p>1a. Use the product rule for square roots to find the product: $\sqrt{2} \cdot \sqrt{7}$</p>
<p>1b. Use the product rule for square roots to find the product: $\sqrt{2x} \cdot \sqrt{13y}$</p> $\begin{aligned} \sqrt{2x} \cdot \sqrt{13y} &= \sqrt{2x \cdot 13y} \\ &= \sqrt{26xy} \end{aligned}$	<p>1b. Use the product rule for square roots to find the product: $\sqrt{3x} \cdot \sqrt{5y}$</p>

1c. Use the product rule for square roots to find the product: $\sqrt{3} \cdot \sqrt{3}$

$$\begin{aligned}\sqrt{3} \cdot \sqrt{3} &= \sqrt{9} \\ &= 3\end{aligned}$$

1c. Use the product rule for square roots to find the product: $\sqrt{5} \cdot \sqrt{5}$

Objective #2: Simplify square roots.

 **Solved Problem #2**

2a. Simplify: $\sqrt{60}$

4 is the greatest perfect square that is a factor of 60.

$$\begin{aligned}\sqrt{60} &= \sqrt{4 \cdot 15} \\ &= \sqrt{4} \sqrt{15} \\ &= 2\sqrt{15}\end{aligned}$$

 **Pencil Problem #2** 

2a. Simplify: $\sqrt{50}$

2b. Simplify: $\sqrt{55}$

$\sqrt{55}$ cannot be simplified because it has no perfect square factors other than 1.

2b. Simplify: $\sqrt{35}$

2c. Simplify: $\sqrt{40x^{16}}$

$4x^{16}$ is the greatest perfect square that is a factor of $40x^{16}$.

$$\begin{aligned}\sqrt{40x^{16}} &= \sqrt{4x^{16} \cdot 10} \\ &= 2x^8 \sqrt{10}\end{aligned}$$

2c. Simplify: $\sqrt{20x^6}$

2d. Multiply and then simplify: $\sqrt{15x^6} \cdot \sqrt{3x^7}$

$$\begin{aligned}\sqrt{15x^6} \cdot \sqrt{3x^7} &= \sqrt{15x^6 \cdot 3x^7} \\ &= \sqrt{45x^{13}} \\ &= \sqrt{9x^{12} \cdot 5x} \\ &= 3x^6\sqrt{5x}\end{aligned}$$

2d. Multiply and then simplify: $\sqrt{15x^4} \cdot \sqrt{5x^9}$

Objective #3: Use the quotient rule for square roots.

 **Solved Problem #3**

3a. Simplify: $\sqrt{\frac{49}{25}}$

$$\begin{aligned}\sqrt{\frac{49}{25}} &= \frac{\sqrt{49}}{\sqrt{25}} \\ &= \frac{7}{5}\end{aligned}$$

 **Pencil Problem #3** 

3a. Simplify: $\sqrt{\frac{3}{4}}$

3b. Simplify: $\frac{\sqrt{48x^5}}{\sqrt{3x}}$

$$\begin{aligned}\frac{\sqrt{48x^5}}{\sqrt{3x}} &= \sqrt{\frac{48x^5}{3x}} \\ &= \sqrt{16x^4} \\ &= 4x^2\end{aligned}$$

3b. Simplify: $\frac{\sqrt{32x^3}}{\sqrt{8x}}$

Objective #4: Use the product and quotient rules for other roots.

 **Solved Problem #4**

4a. Simplify: $\sqrt[3]{40}$

8 is the greatest perfect cube that is a factor of 40.

$$\begin{aligned}\sqrt[3]{40} &= \sqrt[3]{8 \cdot 5} \\ &= 2\sqrt[3]{5}\end{aligned}$$

 **Pencil Problem #4** 

4a. Simplify: $\sqrt[3]{54}$

4b. Simplify: $\sqrt[5]{8} \cdot \sqrt[5]{8}$

$$\begin{aligned}\sqrt[5]{8} \cdot \sqrt[5]{8} &= \sqrt[5]{64} \\ &= \sqrt[5]{32 \cdot 2} \\ &= \sqrt[5]{32} \cdot \sqrt[5]{2} \\ &= 2\sqrt[5]{2}\end{aligned}$$

4b. Simplify: $\sqrt[4]{4} \cdot \sqrt[4]{8}$ 4c. Simplify: $\sqrt[3]{\frac{125}{27}}$

$$\begin{aligned}\sqrt[3]{\frac{125}{27}} &= \frac{\sqrt[3]{125}}{\sqrt[3]{27}} \\ &= \frac{5}{3}\end{aligned}$$

4c. Simplify: $\sqrt[3]{\frac{3}{8}}$ **Answers for Pencil Problems (Textbook Exercise references in parentheses):**

- 1a. $\sqrt{14}$ (8.2 #1) 1b. $\sqrt{15xy}$ (8.2 #3) 1c. 5 (8.2 #5)
 2a. $5\sqrt{2}$ (8.2 #15) 2b. $\sqrt{35}$ cannot be simplified (8.2 #25)
 2c. $2x^3\sqrt{5}$ (8.2 #39) 2d. $5x^6\sqrt{3x}$ (8.2 #63)
 3a. $\frac{\sqrt{3}}{2}$ (8.2 #71) 3b. $2x$ (8.2 #87)
 4a. $3\sqrt[3]{2}$ (8.2 #95) 4b. $2\sqrt[4]{2}$ (8.2 #103) 4c. $\frac{\sqrt[3]{3}}{2}$ (8.2 #107)

Homework:

- Review the Section 8.2 summary** which begins on page 613 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.