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NOTES: Section 9.3 – Simplifying Radicals

Goals: #1 - I can simplify radical expressions.

Homework: Section 9.3 Worksheet

Warm Up: Solve the equation or write *no real solution*. Write the solutions as integers, if possible. Otherwise, write them as radical expressions.

1. $m^2 = 1$

$\sqrt{m^2} = \pm\sqrt{1}$

$\boxed{m = \pm 1}$

2. $3x^2 - 75 = 0$

$+75 \quad +75$

$\frac{3x^2}{3} = \frac{75}{3}$

$x^2 = 25$

$\sqrt{x^2} = \pm\sqrt{25}$

$\boxed{x = \pm 5}$

3. $-12 + 5x^2 = 8$

$+12 \quad +12$

$\frac{5x^2}{5} = \frac{20}{5}$

$x^2 = 4$

$\sqrt{x^2} = \pm\sqrt{4}$

$\boxed{x = \pm 2}$

Exploration #1: Work with a partner and answer the following questions.

1. Use your calcualtor to evaluate the following expressions.

a. $\sqrt{50} =$ 7.07

b. $\sqrt{5} \cdot \sqrt{10} =$ 7.07

2.24 · 3.16

c. $\sqrt{100} =$ 10

d. $\sqrt{10} \cdot \sqrt{10} =$ 10

3.16 · 3.16

2. What do you notice?

They are the same

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Notes:

- Product Property of Radicals

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

We use this property to simplify radical expressions.

Example #1: Simplify the expression.

1. $\sqrt{12}$

$\sqrt{4} \cdot \sqrt{3}$

$\boxed{2\sqrt{3}}$

2. $\sqrt{75}$

$\sqrt{25} \cdot \sqrt{3}$

$\boxed{5\sqrt{3}}$

3. $\sqrt{48}$

$\sqrt{16} \cdot \sqrt{3}$

$\boxed{4\sqrt{3}}$

You practice: Simplify the expression.

1. $\sqrt{32}$

$\sqrt{16} \cdot \sqrt{2}$

$\boxed{4\sqrt{2}}$

2. $\sqrt{132}$

$\sqrt{4} \cdot \sqrt{33}$

$\boxed{2\sqrt{33}}$

3. $\sqrt{63}$

$\sqrt{9} \cdot \sqrt{7}$

$\boxed{3\sqrt{7}}$

Notes:

- Quotient Property of Radicals

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

We use this property to simplify radical expressions.

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Example #2: Simplify the expression.

1. $\sqrt{\frac{4}{9}}$

$\frac{\sqrt{4}}{\sqrt{9}}$

$\boxed{\frac{2}{3}}$

2. $\sqrt{\frac{32}{50}}$

$\sqrt{\frac{16}{25}}$

$\frac{\sqrt{16}}{\sqrt{25}}$

$\boxed{\frac{4}{5}}$

3. $5\sqrt{\frac{1}{25}}$

$5 \cdot \frac{\sqrt{1}}{\sqrt{25}}$

$5 \cdot \frac{1}{5}$

$\boxed{1}$

You practice: Simplify the expression.

1. $\sqrt{\frac{49}{36}}$

$\frac{\sqrt{49}}{\sqrt{36}}$

$\boxed{\frac{7}{6}}$

2. $3\sqrt{\frac{1}{9}}$

$3 \cdot \frac{\sqrt{1}}{\sqrt{9}}$

$3 \cdot \frac{1}{3}$

$\boxed{1}$

3. $-\sqrt{\frac{80}{45}}$

$-\sqrt{\frac{16}{9}}$

$-\frac{\sqrt{16}}{\sqrt{9}}$

$\boxed{-\frac{4}{3}}$

Notes:

When we get a radical symbol in our denominator, we need to rationalize the denominator.

Example #3: Simplify the expression.

1. $\sqrt{\frac{1}{18}}$

$\frac{\sqrt{1}}{\sqrt{18}}$

$\frac{1}{\sqrt{18}} \cdot \frac{\sqrt{18}}{\sqrt{18}}$

$\frac{\sqrt{18}}{18}$

$\frac{\sqrt{9} \cdot \sqrt{2}}{18}$

$\frac{3\sqrt{2}}{18}$

$\boxed{\frac{\sqrt{2}}{6}}$

2. $\sqrt{\frac{27}{15}}$

$\sqrt{\frac{9}{5}}$

$\frac{\sqrt{9}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

$\boxed{\frac{3\sqrt{5}}{5}}$

3. $\sqrt{\frac{5}{12}}$

$\frac{\sqrt{5}}{\sqrt{12}} \cdot \frac{\sqrt{12}}{\sqrt{12}}$

$\frac{\sqrt{4} \cdot \sqrt{3} \cdot \sqrt{5}}{12}$

$\frac{2\sqrt{15}}{12}$

$\boxed{\frac{\sqrt{15}}{6}}$

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You practice: Simplify the expression.

1. $\sqrt{\frac{3}{5}}$

$\frac{\sqrt{3}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

$\boxed{\frac{\sqrt{15}}{5}}$

2. $\sqrt{\frac{1}{3}}$

$\frac{\sqrt{1}}{\sqrt{3}}$

$\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$\boxed{\frac{\sqrt{3}}{3}}$

3. $\sqrt{\frac{16}{10}}$

$\frac{\sqrt{16}}{\sqrt{10}}$

$\frac{4}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}}$

$\frac{4\sqrt{10}}{10}$

$\boxed{\frac{2\sqrt{10}}{5}}$

Review/more practice: Simplify the expression.

4. $\frac{1}{3}\sqrt{63}$

$\frac{1}{3} \cdot \sqrt{9} \cdot \sqrt{7}$

$\frac{1}{3} \cdot 3 \cdot \sqrt{7}$

$\boxed{\sqrt{7}}$

2. $-\sqrt{\frac{25}{16}}$

$-\frac{\sqrt{25}}{\sqrt{16}}$

$\boxed{-\frac{5}{4}}$

3. $-4\sqrt{\frac{1}{10}}$

$-4\frac{\sqrt{1}}{\sqrt{10}}$

$-4 \cdot \frac{1}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}}$

$-4 \cdot \frac{\sqrt{10}}{10}$

$\frac{-4\sqrt{10}}{10}$

$\boxed{-\frac{2\sqrt{10}}{5}}$