

## GUIDED NOTES (MODEL NOTES)

### Adding and Subtracting Radicals

Radicals can be added and subtracted only if they are exactly the same under the radical.

#### Examples

Simplify.

$$\begin{aligned} 1) \quad & 3\sqrt{7} + 2\sqrt{7} \\ & = (3+2)\sqrt{7} = 5\sqrt{7} \end{aligned}$$

$$\begin{aligned} 2) \quad & \sqrt{3} - \sqrt{48} \\ & = \sqrt{3} - \sqrt{16}\sqrt{3} = \sqrt{3} - 4\sqrt{3} \\ & = -3\sqrt{3} \end{aligned}$$

$$\begin{aligned} 3) \quad & 4\sqrt{2} + \sqrt{3} - \sqrt{2} \\ & = (4\sqrt{2} - \sqrt{2}) + \sqrt{3} \\ & = 3\sqrt{2} + \sqrt{3} \end{aligned}$$

$$\begin{aligned} 4) \quad & \sqrt{90} - \sqrt{40} \\ & = \sqrt{9}\sqrt{10} - \sqrt{4}\sqrt{10} \\ & = 3\sqrt{10} - 2\sqrt{10} = \sqrt{10} \end{aligned}$$

### Multiplying and Dividing Radicals

Product property of radicals:  $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

#### Examples

Simplify.

$$\begin{aligned} 5) \quad & 2\sqrt{2} \cdot -4\sqrt{6} \\ & = (2 \cdot -4)(\sqrt{2} \cdot \sqrt{6}) = -8\sqrt{2}\sqrt{2}\sqrt{3} \\ & = -8(2)\sqrt{3} = -16\sqrt{3} \end{aligned}$$

$$\begin{aligned} 6) \quad & 4\sqrt{7}(3\sqrt{2} - 2) \\ & = 4\sqrt{7} \cdot 3\sqrt{2} - 2(4\sqrt{7}) \\ & = (4 \cdot 3)(\sqrt{7} \cdot \sqrt{2}) - 8\sqrt{7} = 12\sqrt{14} - 8\sqrt{7} \end{aligned}$$

Quotient property of radicals:  $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

### Examples

Simplify.

$$\begin{aligned} 7) \quad \sqrt{\frac{16}{49}} &= \frac{\sqrt{16}}{\sqrt{49}} \\ &= \frac{4}{7} \end{aligned}$$

$$\begin{aligned} 8) \quad \sqrt{\frac{121}{25}} &= \frac{\sqrt{121}}{\sqrt{25}} \\ &= \frac{11}{5} \end{aligned}$$

### Rationalizing the Denominator

We never want to leave a radical in the denominator of a fraction. To rationalize, multiply by the bottom square root over itself.

### Examples

Simplify.

$$\begin{aligned} 9) \quad \frac{3}{\sqrt{11}} &= \frac{3 \cdot \sqrt{11}}{\sqrt{11} \cdot \sqrt{11}} \\ &= \frac{3\sqrt{11}}{\sqrt{121}} = \frac{3\sqrt{11}}{11} \end{aligned}$$

$$10) \quad \frac{1}{\sqrt{4}} = \frac{1}{2}$$

$$\begin{aligned} 11) \quad \sqrt{\frac{8}{5}} &= \frac{\sqrt{8}}{\sqrt{5}} \\ &= \frac{\sqrt{4}\sqrt{2} \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}} = \frac{2\sqrt{10}}{\sqrt{25}} = \frac{2\sqrt{10}}{5} \end{aligned}$$

$$12) \quad \sqrt{\frac{12}{6}} = \sqrt{2}$$