

NAME: \_\_\_\_\_

## U4:L2 Multiplying and Dividing Radicals

Read pages 282- 289 of your textbook to fill in the following notes, or use notes online at [www.burnspvw.weebly.com](http://www.burnspvw.weebly.com)

### Multiplying Radicals

When multiplying radicals, we multiply the coefficients and radicands separately.

You can only multiply radicals if they have the same index.

EXAMPLE:

$$\begin{aligned} & (2\sqrt{7})(4\sqrt{75}) \\ & 2 \cdot 4 \sqrt{7 \cdot 75} \\ & 8 \sqrt{525} \\ & 8 \sqrt{25 \cdot 21} \\ & 8 \cdot 5 \sqrt{21} \\ & \boxed{40\sqrt{21}} \end{aligned}$$

Or simplify before solving...

$$\begin{aligned} & (2\sqrt{7})(4\sqrt{75}) \\ & (2\sqrt{7})(4\sqrt{3 \cdot 25}) \\ & (2\sqrt{7})(4 \cdot 5\sqrt{3}) \\ & (2\sqrt{7})(20\sqrt{3}) \\ & 2 \cdot 20 \sqrt{7 \cdot 3} \\ & \boxed{40\sqrt{21}} \end{aligned}$$

The general formula for multiplying radicals is...

$$(m^k \sqrt[k]{a})(n^k \sqrt[k]{b}) = mn^k \sqrt[k]{ab}$$

$$\begin{aligned} k & \in \mathbb{N} \\ m, n & \in \mathbb{R} \\ a, b & \in \mathbb{R} \end{aligned}$$

Try it...

a)  $(-3\sqrt{2x})(4\sqrt{6}), x \geq 0$

$$-3 \cdot 4 \sqrt{2x} \cdot 6$$

$$-12 \sqrt{12x}$$

$$-12 \sqrt{3 \cdot 4 \cdot x}$$

$$-12 \cdot 2 \sqrt{3x}$$

$$\underline{-24 \sqrt{3x}}$$

b)  $7\sqrt{3}(5\sqrt{5} - 6\sqrt{3})$

$$(7\sqrt{3})(5\sqrt{5}) - (7\sqrt{3})(6\sqrt{3})$$

$$(7 \cdot 5 \sqrt{3 \cdot 5}) - (7 \cdot 6 \sqrt{3 \cdot 3})$$

$$(35 \sqrt{15}) - (42 \sqrt{9})$$

$$35 \sqrt{15} - (42 \cdot 3)$$

$$\underline{35 \sqrt{15} - 126}$$

★ Distributive Property.

c)  $(8\sqrt{2} - 5)(9\sqrt{5} + 6\sqrt{10})$

$$(8\sqrt{2})(9\sqrt{5}) + (8\sqrt{2})(6\sqrt{10}) - 5(9\sqrt{5}) - 5(6\sqrt{10})$$

$$(8 \cdot 9 \sqrt{2 \cdot 5}) + (8 \cdot 6 \sqrt{2 \cdot 10}) - (5 \cdot 9 \sqrt{5}) - (5 \cdot 6 \sqrt{10})$$

$$(72 \sqrt{10}) + (48 \sqrt{\frac{20}{4.5}}) - (45 \sqrt{5}) - (30 \sqrt{10})$$

★ combine LIKE radicands.

$$(72 \sqrt{10}) - (30 \sqrt{10}) - (45 \sqrt{5}) + (48 \cdot 2 \sqrt{5})$$

$$(42 \sqrt{10}) - (45 \sqrt{5}) + (96 \sqrt{5})$$

$$(42 \sqrt{10}) + (51 \sqrt{5})$$

$$\underline{42 \sqrt{10} + 51 \sqrt{5}}$$

★ Distributive Property.

# Dividing Radicals

Dividing and multiplying are similar.

To divide radicals, divide the coefficients and radicands separately.

You can only divide radicals with the same Index.

EXAMPLE:

$$\frac{4\sqrt[3]{6}}{2\sqrt[3]{3}} = 2\sqrt[3]{\frac{6}{3}}$$

$$= 2\sqrt[3]{2}$$

The general formula for dividing radicals is...

$$\frac{m\sqrt[k]{a}}{n\sqrt[k]{b}} = \frac{m}{n}\sqrt[k]{\frac{a}{b}} \quad \begin{array}{l} k \in \mathbb{N} \\ a, b, m, n \in \mathbb{R} \quad \begin{array}{l} n \neq 0 \\ b \neq 0 \end{array} \end{array}$$

Try it...

a)  $\frac{\sqrt{24x^2}}{\sqrt{3x}}, x > 0$   $\sqrt{\frac{24x^2}{3x}} = \sqrt{8x} = \sqrt{4 \cdot 2 \cdot x} = 2\sqrt{2x}$

b)  $\frac{4\sqrt{5n}}{3\sqrt{2}}, n \geq 0$   $\frac{4\sqrt{5n}}{3\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{4\sqrt{5n \cdot 2}}{3 \cdot 2} = \frac{2\sqrt{10n}}{3}$   
 RATIONALIZE IT!  $\cup$

c)  $\frac{11}{\sqrt{5+7}} \times \frac{\sqrt{5-7}}{\sqrt{5-7}} = \frac{11(\sqrt{5-7})}{\sqrt{5^2-7^2}} = \frac{11(\sqrt{5-7})}{5-49} = \frac{11(\sqrt{5-7})}{-44}$   
 RATIONALIZE IT!  
 with the CONJUGATE.  
 $= \frac{\sqrt{5-7}}{-4} = \frac{-\sqrt{5+7}}{4} \text{ or } \frac{7-\sqrt{5}}{4}$

## Reminder...

"Rationalizing the Denominator" is what you do to simplify a radical expression by getting the radical out of the denominator.

EXAMPLE:

$$\frac{5}{2\sqrt{3}}$$

we do not want  $\sqrt{3}$  in the denominator.

$$\frac{5}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \Rightarrow \text{you can always multiply by a RATIO of 1.}$$

$$\frac{5\sqrt{3}}{2\sqrt{3} \times 3}$$

$$\frac{5\sqrt{3}}{2\sqrt{9}}$$

$$\frac{5\sqrt{3}}{2 \cdot 3}$$

$$\frac{5\sqrt{3}}{6}$$

😊 Happy if NO Radicand in Denominator.

**PRACTICE:** page 289 – Q 1(a,b,c), 3 (a,b,c), 6, 8, 13