**Math 2201** **Date:**____________________

## 4.3B Dividing Radicals

**Dividing Radicals**

When dividing radicals, divide the coefficients and then divide the radicands. You can only divide radicals that have the same index.

In general, $\frac{c\sqrt{a}}{d\sqrt{b}} = \frac{c}{d} \cdot \sqrt{\frac{a}{b}}$, $a$, $b$, $c$, and $d$ are real numbers. $n \neq 0$ and $b \neq 0$. If the index is even, then $a \geq 0$ and $b > 0$.

**Example 1:**

(A) $\sqrt{\frac{25}{4}}$

$= \frac{\sqrt{25}}{\sqrt{4}}$

$= \frac{5}{2}$

(B) $\frac{\sqrt{12}}{\sqrt{6}}$

$= \sqrt{2}$

(C) $\frac{4\sqrt{6}}{2\sqrt{3}}$

$= 2\sqrt{2}$

(D) $\frac{6\sqrt{48}}{3\sqrt{6}}$

$= 2\sqrt{8}$

$= 2\sqrt{4}\sqrt{2}$

$= 2 \cdot 2\sqrt{2}$

$= 4\sqrt{2}$

**Rationalizing the Denominator**

It's considered bad form to leave a radical in the denominator of a fraction. There are two methods we use to remedy this, depending on the type of expression that is in the denominator.

A monomial denominator can simply be multiplied by 1 in the form of that denominator over itself:

Recall:

$$\frac{5}{5} = 1, \frac{\sqrt{3}}{\sqrt{3}} = 1$$

$$5 \cdot 1 = 5, 3 \cdot 1 = 3$$

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

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

**Example 3:**

(A) $\frac{2\sqrt{3}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

$$= \frac{2\sqrt{15}}{5}$$

(B) $\sqrt{\frac{12}{5}}$

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

$$= \frac{\sqrt{60}}{5}$$

$$= \frac{\sqrt{4}\sqrt{15}}{5}$$

$$= \frac{2\sqrt{15}}{5}$$

(C) $\frac{2\sqrt{3}}{7\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

$$= \frac{2\sqrt{15}}{7 \cdot 5}$$

$$= \frac{2\sqrt{15}}{35}$$

(D) $\frac{6\sqrt{48}}{3\sqrt{6}}$

$$= 2\sqrt{8}$$

$$= 2\sqrt{4}\sqrt{2}$$

$$= 4\sqrt{2}$$

**Expressions With Multiple Operations**
Some expressions may have addition or subtraction in the numerator or denominator. When possible work these operations before you divide.

**Example 3:**
Simplify:

(A) $\frac{3\sqrt{6}+5\sqrt{6}}{4\sqrt{2}}$

$= \frac{8\sqrt{6}}{4\sqrt{2}}$

$= 2\sqrt{3}$

(B) $\frac{4\sqrt{12}-10\sqrt{6}}{2\sqrt{3}}$

$= \frac{4\sqrt{12}}{2\sqrt{3}} - \frac{10\sqrt{6}}{2\sqrt{3}}$

$= 2\sqrt{4} - 5\sqrt{2}$

$= 2 \cdot 2 - 5\sqrt{2}$

$= 4 - 5\sqrt{2}$

**Textbook Questions:** page 198 - 200 #2, 3, 12, 13, 16, 20, 21