Chapter 12-2 Multiplying Radicals

- treat like multiplying integers initially
- may need to remove perfect squares under the radical sign
- may need to FOIL
- can have a two term answer like $12 + 3\sqrt{2}$

Chapter 12-2 Dividing Radicals

- cannot have a radical in the denominator

To clear a radical from the denominator

1) single radical, multiply top and bottom by the radical
2) two terms with a radical, multiply top and bottom by the conjugate

Conjugates - concept similar to a reciprocal; when multiplied the middle terms drop off. Examples are:

$3+\sqrt{2}$ and $3-\sqrt{2}$

$5-\sqrt{7}$ and $5+\sqrt{7}$

How a conjugate works when multiplied together

$$(6+\sqrt{2}) \cdot (6-\sqrt{2})$$

FOIL $\quad 36 - 6\sqrt{2} + 6\sqrt{2} - \sqrt{4}$

$$36 - \sqrt{4}$$

middle terms containing the radical cancel one another

$$36 - 2$$

$$34$$

Simplify the expression.

1) $\sqrt{3} \cdot \sqrt{8}$

$\sqrt{3} \cdot \sqrt{2} \cdot \sqrt{4}$

$2\sqrt{6}$

or

$\sqrt{3} \cdot \sqrt{8}$

$\sqrt{24}$

$\sqrt{6}\ \sqrt{4}$

$2\sqrt{6}$

Simplify the expression.

2) $\sqrt{3} \cdot \sqrt{7}$

$\sqrt{21}$ cannot simplify anymore

Simplify the expression.

3) $\sqrt{6} \cdot \sqrt{2}$

Simplify the expression.

3) $\sqrt{6} \cdot \sqrt{2}$

$\sqrt{12}$

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

$2\sqrt{3}$

Simplify the expression.

4) $\sqrt{2}\left(7\sqrt{3}+\sqrt{2}\right)$

must distribute

$7\sqrt{6}+\sqrt{4}$

$7\sqrt{6}+2$ cannot combine

Simplify the expression.

5) $\sqrt{3}\left(5\sqrt{3} - 2\sqrt{6}\right)$

Simplify the expression.

5) $\sqrt{3}\left(5\sqrt{3} - 2\sqrt{6}\right)$

$5\sqrt{9} - 2\sqrt{18}$

$\sqrt{9}\ \sqrt{2}$

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

$15 - 6\sqrt{2}$

Simplify the expression.

6) $\frac{4}{\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}}$

must multiply to remove radical from the denominator

$$\frac{4\sqrt{13}}{\sqrt{169}} = \frac{4\sqrt{13}}{13}$$

Simplify the expression.

7) $\frac{6}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}}$

must multiply to remove radical from the denominator

$$\frac{6\sqrt{10}}{\sqrt{100}} = \frac{{}^{3}\cancel{6}\sqrt{10}}{\cancel{10}_{5}} = \frac{3\sqrt{10}}{5}$$

Simplify the expression.

8) $\dfrac{8}{\sqrt{60}}$

Simplify the expression.

8) $\dfrac{8}{\sqrt{60}} \cdot \dfrac{\sqrt{60}}{\sqrt{60}}$

$$\frac{8\sqrt{60}}{60} = \frac{8 \cdot \sqrt{4} \cdot \sqrt{15}}{60} = \frac{8 \cdot 2 \cdot \sqrt{15}}{60}$$

$$\frac{{}^{4}\cancel{16}\sqrt{15}}{\cancel{60}_{15}} = \frac{4\sqrt{15}}{15}$$

Simplify the expression.

9) $\dfrac{4}{3+\sqrt{2}} \cdot \dfrac{3-\sqrt{2}}{3-\sqrt{2}}$

multiply by the conjugate

$$\frac{12-4\sqrt{2}}{9-\sqrt{4}} = \frac{12-4\sqrt{2}}{9-2} = \frac{12-4\sqrt{2}}{7}$$

Simplify the expression.

10) $\dfrac{3}{8-\sqrt{10}}$

multiply by the conjugate

Simplify the expression.

10) $\dfrac{3}{8-\sqrt{10}} \cdot \dfrac{8+\sqrt{10}}{8+\sqrt{10}}$

multiply by the conjugate

$$\frac{24+3\sqrt{10}}{64-\sqrt{100}} = \frac{\overset{8}{\cancel{24}}+\overset{1}{\cancel{3}}\sqrt{10}}{\underset{18}{\cancel{54}}} = \frac{8+\sqrt{10}}{18}$$

reduce by 3