Section 11.2 **Operations with Radical Expressions**

Definitions

Like Radicals- _____

_____

Unlike Radicals- _____

_____

Conjugates- _____

_____

Examples

Example 1-Combining like Radicals

Simplify $1\sqrt{2} + 3\sqrt{2}$.

Solution

$1 + 3 = 4$ Add the coefficients of the radicals.

$4\sqrt{2}$ Place the sum back in front of the radical to solve.

Example 2- Simplifying to Combine Like Radicals

Simplify $7\sqrt{3} - \sqrt{12}$

Solution 3 4

$\sqrt{4}\sqrt{3}$ Split the second radical into a product of two square roots.

$2\sqrt{3}$ Simplify if possible.

$7\sqrt{3} - 2\sqrt{3}$ Rewrite the original expression.

$7 - 2 = 5$ Add the coefficients of the radicals.

$5\sqrt{3}$ Place the sum back in front of the radical to solve.

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Example 3-Using the Distributive Property

Simplify $\sqrt{3}(\sqrt{6}+7)$

Solution

$\sqrt{3}\sqrt{6}+\sqrt{3}\times 7$	distribute.
$\sqrt{18}+7\sqrt{3}$	Multiply the product of the radicands.
$\sqrt{9}\sqrt{2}+7\sqrt{3}$	Split the radical into two radicals, one of which is a perfect square.
$3\sqrt{2}+7\sqrt{3}$	Simplify.

Example 4- Simplifying Using FOIL

Simplify. $(\sqrt{5}-2\sqrt{15})(\sqrt{5}+\sqrt{15})$

Solution

$\sqrt{5}\times\sqrt{5}+\sqrt{5}\times\sqrt{15}-\sqrt{5}\times 2\sqrt{15}-\sqrt{15}\times 2\sqrt{15}$	_____ the expression.
$5+\sqrt{\_\_}-2\sqrt{\_\_}-2(15)$	Multiply the products.
$5+\sqrt{\_\_}\sqrt{3}-2\sqrt{\_\_}\sqrt{3}-30$	Split the $\sqrt{75}$ into a product of two radicals.
$5+\_\_\sqrt{3}-2\times\_\_\sqrt{3}-30$	Simplify the $\sqrt{25}$.
$-25+\_\_\sqrt{3}-\_\_\sqrt{3}$	Simplify the expression.
$-25-\_\_\sqrt{3}$	Combine the radicals.

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Example 5- Rationalizing a Denominator Using Conjugates

Simplify. $\frac{6}{\sqrt{5}-\sqrt{2}}$

Solution

$\frac{6}{\sqrt{5}-\sqrt{2}} \times \frac{(\sqrt{5}+\sqrt{2})}{(\sqrt{5}+\sqrt{2})}$	Multiply the and bottom by the conjugate expression.
$\frac{6(\sqrt{5}+\sqrt{2})}{(\sqrt{5}-\sqrt{2})(\sqrt{5}+\sqrt{2})}$	_____ the numerator and denominator.
$\frac{6\sqrt{5}+6\sqrt{2}}{\_\_-\_\_}$	The radicals disappear out of the denominator.
$\frac{6\sqrt{5}+6\sqrt{2}}{\_\_}$	Simplify.

Example 6-Finding an Exact Solution

$$\frac{3}{1+\sqrt{5}} = \frac{1-\sqrt{5}}{x}$$

Solution

$\frac{3}{1+\sqrt{5}} = \frac{1-\sqrt{5}}{x}$	Since the two expressions are equivalent, we can _____-_____ to solve!
$3(\_\_) = (1+\sqrt{5})(1-\sqrt{5})$	Cross-multiply.
$\_\_x = 1-5$	FOIL both sides.
$3x = \_\_\_\_$	Simplify.
$x =$ _____	Solve for x.

Section 11.2 **Operations with Radical Expressions**

Quick Check

1. Simplify $3\sqrt{2} + 3\sqrt{2}$.

$6\sqrt{2}$

2. Simplify $\sqrt{3}(\sqrt{5} + 7)$

$\sqrt{15} + 7\sqrt{3}$

3. Simplify. $\frac{3}{\sqrt{3}-\sqrt{2}}$