By the end of the lesson, we will be able to:

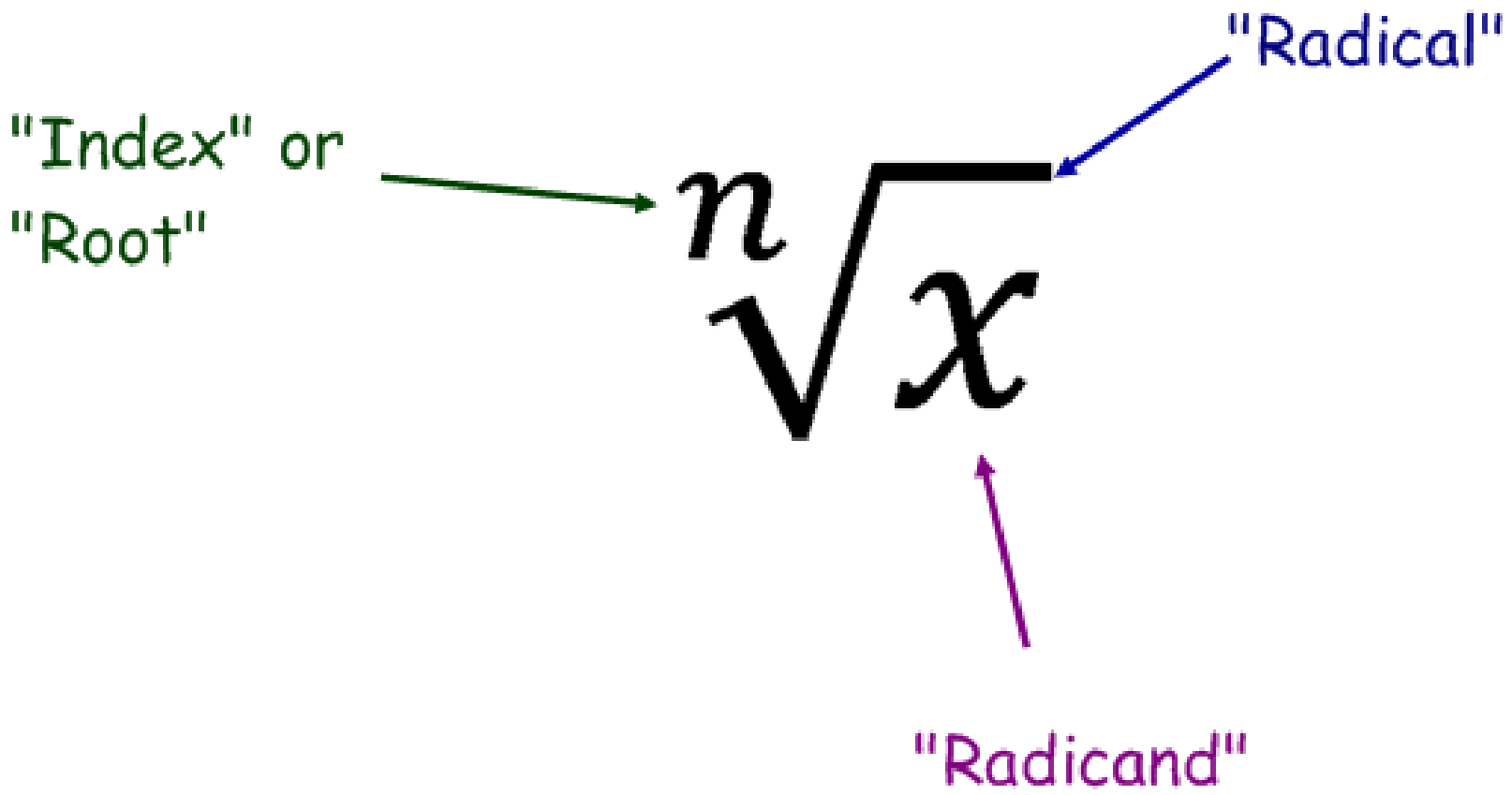
~Simplify Radical Expressions

~Add, Subtract, and Multiply Radical Expressions

Simplifying Radical Expressions

Simplifying radical expressions is similar to simplifying polynomials. You can add, subtract, and multiply using similar rules and procedures.

Parts of a Radical:



Adding and Subtracting Radicals

In order to add or subtract radicals, they must be like radicals.

This means that they must have the same radicand and index. The coefficient may be different.

To add like radicals, just add the coefficients (as if you were adding like terms.)

Sometimes radicals must be simplified first before you can tell if they are like radicals.

Like radicals:

$2\sqrt{5}$ and $7\sqrt{5}$ and $\sqrt{5}$

$3\sqrt{2x}$ and $8\sqrt{2x}$ and $-\sqrt{2x}$

Unlike radicals:

$2\sqrt{5}$ and $5\sqrt{2}$

$5\sqrt{x}$ and $\sqrt{5x}$

$2\sqrt{3}$ and $2\sqrt{13}$

$4\sqrt{5}$ and $4\sqrt[3]{5}$

Example 1 ~ Simplify:

a.) $2\sqrt{5} + 7\sqrt{5} + \sqrt{5}$

$= 10\sqrt{5}$

b.) $9 + 9\sqrt{10} - 2\sqrt{10}$

$= 9 + 7\sqrt{10}$

Example 1 ~ Simplify:

c.) $9\sqrt{2} - 8\sqrt{3} - 2\sqrt{2} + \sqrt{3}$

$= 7\sqrt{2} - 7\sqrt{3}$

or

$-7\sqrt{3} + 7\sqrt{2}$

d.) $19 - \sqrt{19} + 2 - \sqrt{2}$

$= 21 - \sqrt{19} - \sqrt{2}$

Example 1 ~ Simplify:

e.) $\sqrt{200} + \sqrt{98}$

$2 \cdot 100$ → $10 \cdot 10$

$2 \cdot 49$ → $7 \cdot 7$

$= \sqrt{2 \cdot 10 \cdot 10} + \sqrt{2 \cdot 7 \cdot 7}$

$= 10\sqrt{2} + 7\sqrt{2}$

$= \boxed{17\sqrt{2}}$

f.) $\sqrt[3]{40} + \sqrt[3]{135} + \sqrt[3]{36}$

No groups of 3

$2 \cdot 20$ → $2 \cdot 10$ → $2 \cdot 5$

$5 \cdot 27$ → $3 \cdot 9$ → $3 \cdot 3$

$3 \cdot 12$ → $3 \cdot 4$ → $2 \cdot 2$

$= \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 5} + \sqrt[3]{5 \cdot 3 \cdot 3 \cdot 3} + \sqrt[3]{36}$

$= 2\sqrt[3]{5} + 3\sqrt[3]{5} + \sqrt[3]{36}$

$= \boxed{5\sqrt[3]{5} + \sqrt[3]{36}}$

Example 1 ~ Simplify:

g.) $3\sqrt{27} - 7\sqrt{3} - \sqrt{12}$

$9 \cdot 3$, $3 \cdot 3$; $4 \cdot 3$, $2 \cdot 2$

$= 3\sqrt{3 \cdot 3 \cdot 3} - 7\sqrt{3} - \sqrt{2 \cdot 2 \cdot 3}$

$= 3 \cdot 3\sqrt{3} - 7\sqrt{3} - 2\sqrt{3}$

$= 9\sqrt{3} - 7\sqrt{3} - 2\sqrt{3}$

$= 2\sqrt{3} - 2\sqrt{3}$

$= \boxed{0}$

h.) $5\sqrt{6} - 3\sqrt{24} + \sqrt{150}$

$3 \cdot 2$; $2 \cdot 12$, $2 \cdot 6$, $2 \cdot 3$; $3 \cdot 50$, $2 \cdot 25$

$= 5\sqrt{6} - 6\sqrt{6} + 5\sqrt{6}$

$= \boxed{4\sqrt{6}}$

Multiplying Radicals

Multiplying radicals is similar to multiplying monomials and polynomials. You do not need like radicals to multiply, but the index MUST be the same.

How to:

* *The coefficients are multiplied, and the radicands are multiplied.* *

Be sure to simplify at the end.

Example 2 ~ Simplify:

a.) $3\sqrt{5} \cdot 10\sqrt{15}$

$= 30\sqrt{5 \cdot 15} = 30\sqrt{75}$

$3 \cdot 5$

$= 30\sqrt{5 \cdot 5 \cdot 3}$

$= 5 \cdot 30\sqrt{3}$

$= \boxed{150\sqrt{3}}$

b.) $12\sqrt{3} \cdot \sqrt{7}$

$= \boxed{12\sqrt{21}}$

Example 2 ~ Simplify:

c.) $4\sqrt{10} \cdot 5\sqrt{10}$

$= 20\sqrt{10 \cdot 10}$

$= 20 \cdot 10$

$= 200$

d.) $\sqrt[4]{4t^3} \cdot \sqrt[4]{8t^2v^5}$

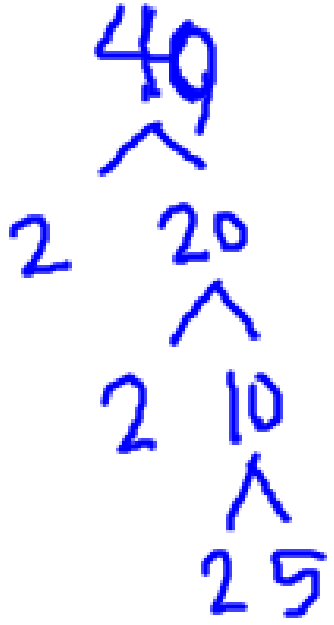
$= \sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2 t^5 v^5}$

$t^4 \cdot t \quad v^4 \cdot v$

$= 2tv\sqrt[4]{2tv}$

Example 2 ~ Simplify:

e.) $\sqrt{10x^2y} \cdot \sqrt{40xy^3}$



$= \sqrt{2 \cdot 5 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \, x^3 y^4}$

$= \sqrt{2 \cdot 2 \; 2 \cdot 2 \; 5 \; 5 \; x^2 \; x \; y^2 \; y^2}$

$= 2 \cdot 2 \cdot 5 \cdot x \, y^2 \sqrt{x}$

$= \boxed{20 x y^2 \sqrt{x}}$

By the end of the lesson, we will be able to:

~Simplify Radical Expressions

~Add, Subtract, and Multiply Radical Expressions

Can you do these things?

Homework:

Due next time — Assignment 21

&

Review Test 5 worksheet!!