Radical Operations
Day 1

N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. (i.e., simplify and/or use the operations of addition, subtraction, and multiplication, with radicals within expressions limited to square roots).

Perfect Squares

1	36	121
4	49	144
9	64	169
16	81	196
25	100	225

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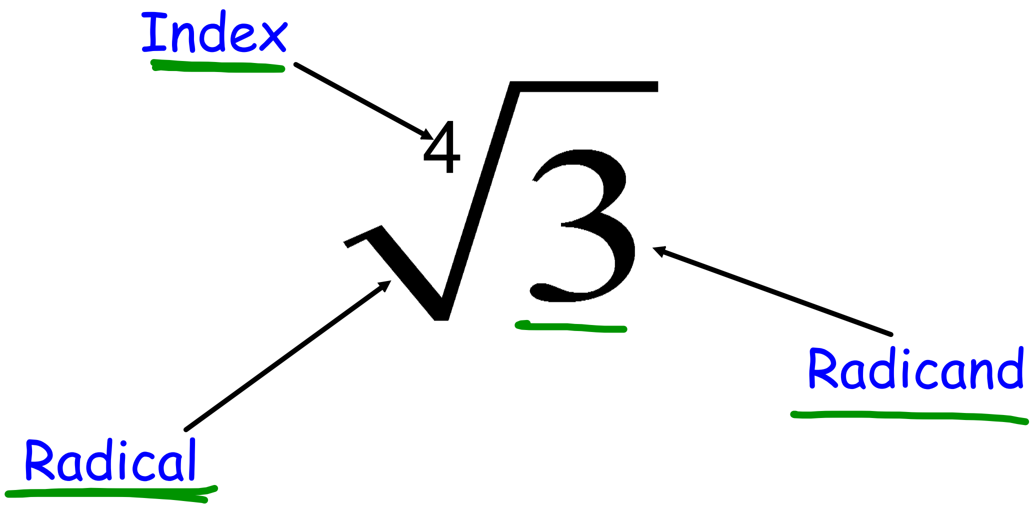
What am I learning today?

How to simplify and multiply radical expressions

How will I show that I learned it?

Multiply 2 square-root expressions, including variables

Vocabulary:



Properties of Radicals:

Product Property: $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

$$\sqrt{54} = \sqrt{9} \cdot \sqrt{6} = 3\sqrt{6}$$

$\sqrt{9 \cdot 6}$

We use this to both simplify and multiply radicals.

$$\sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{\sqrt{4}}$$

Simplifying Radicals (Square Roots):

Step 1: Factor the radicand into its prime factors by using a factor tree.

Step 2: Group same factors in groups of 2.

Step 3: For every group of 2 you have, you have a perfect square. Multiply your pairs back together into one radical and the leftovers into a second radical.

Step 4: Simplify.

Example A. $\sqrt{24}$

$\sqrt{4 \cdot 6}$

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

$2\sqrt{6}$

$\sqrt{12 \cdot 2}$

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

$2\sqrt{6}$

Example B. $\sqrt{27}$

$\sqrt{9 \cdot 3} = \sqrt{9} \cdot \sqrt{3}$

$= 3\sqrt{3}$

Example C. $\sqrt{225} = 15$

$\sqrt{15 \cdot 15}$

Example D. $\sqrt{x^5}$

odd exponents are NOT perfect squares

"odd man out"

$\sqrt{x \cdot x \cdot x \cdot x \cdot x}$

$x^2\sqrt{x}$

$\sqrt{x^5}$

$\sqrt{x^4 \cdot x}$

$x^2\sqrt{x}$

even exponents are perfect squares

$\sqrt{x^8} = x^4$

$\sqrt{x^{12}} = x^6$

$\sqrt{16}$

$= 4$

$\sqrt{12}$

$\sqrt{4 \cdot 3}$

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

$2\sqrt{3}$

$\sqrt{20}$

$\sqrt{4 \cdot 5}$

$\sqrt{4} \cdot \sqrt{5}$

$2\sqrt{5}$

Example E. $\sqrt{108x^5y^4}$

$\sqrt{36 \cdot 3 \cdot x \cdot x^4 \cdot y^4}$

$\sqrt{36} \cdot \sqrt{3}$ $x \cdot x$ $x \cdot x$

$= 6x^2y^2\sqrt{3x}$

Example F. $3x\sqrt{18x^4}$

$3x^1\sqrt{9 \cdot 2 \cdot x^4}$

$\cdot 3 \cdot x^2$

$9x^3\sqrt{2}$

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pg. 6-7 Odds

$$\sqrt{125n}$$

$$\sqrt{25 \cdot 5 \cdot n}$$

$$\sqrt{25} \cdot \sqrt{5} \cdot \sqrt{n}$$

$$5\sqrt{5n}$$

Multiplying Radicals:

Step 1: Factor radicands.
Step 2: Multiply coefficients and combine factors of radicands under one radical (assuming index is same).
Step 3: Simplify radical.

Example A. $\sqrt{18} \cdot \sqrt{24}$

Example B. $\sqrt{32x^3y} \cdot \sqrt{72xy^2}$

Example C. $2x\sqrt{15x^2} \cdot 3\sqrt{20x^3}$

Challenge: $2x\sqrt{15x^4y^2} \cdot 3\sqrt{20xy} \cdot \sqrt{12xy^5}$

What have we learned about the products of rational and irrational numbers?

How would you describe the following?
Give 2 examples of each.

The product of a rational and a rational.

How would you describe the following?
Give 2 examples of each.

The product of an irrational and an irrational.

How would you describe the following?
Give 2 examples of each.

The product of a rational and an irrational.