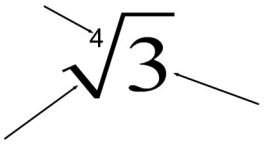
Properties of Radicals



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

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

Quotient Property: $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

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

Simplifying Radicals:

Step 1: Factor the radicand into its prime factors.

Step 2: Look at your index and group same factors in groups of that index size. (Example: index of 3, you want groups of 3). No number indicates an index of 2.

Step 3: For every group you have, you have a perfect root and can move that factor outside the radical.

Step 4: Multiply your outside factors together and your inside factors together to simplify your radical.

Adding and Subtracting Radicals:

Step 1: Simplify each radical.

Step 2: Add or subtract the coefficients of the like radicals.

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.

Dividing Radicals:

- **If denominator is a perfect root**, simplify the numerator and denominator separately. Simplify the fraction.
- **If denominator is NOT a perfect root**, look to simplify fraction under radicand. Then, multiply by needed factors for a perfect root in the denominator. Finally, simplify roots and fraction as a whole.
- **If denominator is a complex number**, multiply by its complex conjugate. Simplify.

Rational Exponents: Index becomes the denominator of the exponent.

$$\sqrt[4]{3} = 3^{\frac{1}{4}}$$

Multiplying Radicals with Unlike Indices:

Step 1: Change radicals to rational exponents.

Step 2: Find a common denominator for the rational exponents.

Step 3: Apply the exponent change of the denominator to the radicand to create an equivalent expression.

Step 4: Combine by multiplying coefficients and radicands.

Step 5: Simplify the radical.