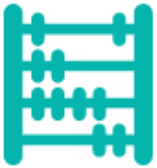

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Roots and Radical Expressions

Unit 7 Lesson 1

ROOTS AND RADICAL EXPRESSIONS

Students will be able to:

find the roots of numbers and simplify radical expressions using roots and properties of radical expressions.

Key Vocabulary

- **Roots**
- **Real Roots**
- **Radical and Radicand**
- **Radical Expression**

ROOTS AND RADICAL EXPRESSIONS

What is a root?

The root of a number **k** is a number, which when multiplied by itself a given number of times, equals **k**. The roots of a number can be Real or complex depending on the sign associated with the number and the power.

nth root of k = $\sqrt[n]{k}$

ROOTS AND RADICAL EXPRESSIONS

$$\text{nth root of k} = \sqrt[n]{k}$$

Real Even Roots:

If k is positive and n is **even,** the roots will be both positive and negative.

$$\sqrt[n]{k} = \pm \text{ answer}$$

Real Odd Roots:

If k is positive and n is **odd,** the roots will only be positive.

$$\sqrt[n]{k} = + \text{ answer}$$

If k is negative and n is **odd,** the roots will only be negative.

$$\sqrt[n]{k} = - \text{ answer}$$

ROOTS AND RADICAL EXPRESSIONS

Problem: 1

Find all the real roots of the following:

a) $\sqrt[4]{81}$

b) $\sqrt[3]{-8}$

a) Real Roots:

$\sqrt[4]{81} = \pm 3$ **Since 81 is positive and n = 4 is also positive**

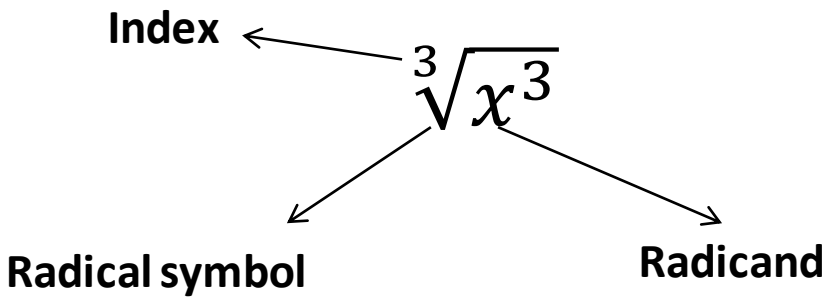
b) Real Roots:

$\sqrt[3]{-8} = -2$ **Since -8 is negative and n = 3 is also negative**

ROOTS AND RADICAL EXPRESSIONS

What is a radical?

A radical is an expression having a root. It is denoted by the symbol $\sqrt{}$



ROOTS AND RADICAL EXPRESSIONS

Properties of Radicals

1. n^{th} root property:

$$\sqrt[n]{a^n} = a$$

2. Product property:

$$\sqrt[n]{ab} = \sqrt[n]{a} \times \sqrt[n]{b}$$

3. Quotient property:

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

ROOTS AND RADICAL EXPRESSIONS

Radical Expression

An expression containing a radical sign ($\sqrt{\ }$). The expression can be variables and constants related by mathematical operations.

Examples:

1. $\sqrt[2]{4xy^2}$
2. $\sqrt[3]{6y^{12}}$
3. $\sqrt[3]{12z^3+4}$

ROOTS AND RADICAL EXPRESSIONS

Problem: 2

Simplify the following radical expressions:

a) $\sqrt[2]{25x^2}$

b) $\sqrt[3]{z^3}$

c) $\sqrt[2]{\frac{x^4}{y^4}}$

a) $\sqrt[2]{25x^2} = \sqrt[2]{25} \times \sqrt[2]{x^2} = 5x$ (Using Product property)

b) $\sqrt[3]{z^3} = z$ (Using nth root property)

c) $\sqrt[2]{\frac{x^4}{y^4}} = \frac{\sqrt[2]{x^4}}{\sqrt[2]{y^4}} = \frac{x^2}{y^2}$ (Using Quotient Property)