

Warm-Up!

- How would you solve for x ?

$$x^2 = 4$$

$$\sqrt{x} = 4$$

Objective

Students will be able to write powers as exponential expressions and vice versa.

7.1

***n*th roots and Rational Exponents**

Nth Roots Notes

- Square roots.
- Cube Roots.
- Nth Roots.

Examples.

What does the following problem mean?

$$\sqrt[3]{125}$$

How can we rewrite this to be useful?

Rewrite in exponential form.

Rational Exponent Notation!

$$\sqrt[3]{125}$$

$$\sqrt[5]{243}$$

$$\sqrt[4]{16}$$

Examples

- Rewrite in Rational Exponent Notation!

- $\sqrt[3]{35}$

- $\sqrt[4]{24}$

- $\sqrt[7]{2564}$

Examples

- Write these in reverse order.

$$34^{\frac{1}{3}}$$

$$78^{\frac{1}{5}}$$

Summation

- How can we simplify this problem?

$$(\sqrt[3]{5})^2$$

Examples

- How would you rewrite this problem?

$$34^{\frac{4}{5}}$$

You try

- Simplify!

$$(\sqrt[3]{45})^2$$

$$(\sqrt[5]{1252})^6$$

$$(\sqrt[4]{23})^3$$

Practice

- Evaluate the expression by hand

1. $\sqrt[3]{64}$

2. $\sqrt[3]{-1000}$

3. $-\sqrt[6]{64}$

4. $4^{-\frac{1}{2}}$

Practice

- Evaluate the expression by hand

1. $1^{\frac{1}{3}}$

2. $-(256^{\frac{1}{4}})$

3. $(\sqrt[4]{16})^2$

4. $(\sqrt[3]{-27})^{-4}$

Warm Up

- Evaluate
- 1. $\sqrt[3]{5^2}$
- 2. $\sqrt[3]{64}$

Algebra 1 CC **Chapter 7: POWERS, ROOTS, and** **RADICALS**

Properties of Rational Exponents

Today

- Today we will learn how to simplify rational expressions to make them easier.

Properties

- $a^m * a^n = a^{m+n}$ add exponents
- $(a^m)^n = a^{mn}$ multiply exponents
- $(ab)^m = a^m b^m$ distribute exponent
- $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ distribute exponent
- $\frac{a^m}{a^n} = a^{m-n}$ subtract exponents

I DO (Simplifying)

- Simplify the expression

- 1. $5^{\frac{1}{2}} * 5^{\frac{1}{4}}$

- 2. $(8^{\frac{1}{2}} * 5^{\frac{1}{3}})^2$

- 3. $(2^4 * 3^4)^{\frac{1}{4}}$

- 4. $\frac{7}{7^{\frac{1}{3}}}$

Directions

- Combine Like radicals. Utilize the correct property to simplify each express.

WE DO (Simplifying)

- Simplify the expression

- 1. $\sqrt[3]{4} * \sqrt[3]{16}$

- 2. $\frac{\sqrt[4]{162}}{\sqrt[4]{2}}$

- 3. $\sqrt[3]{54}$

- 4. $\left(\frac{4^{\frac{5}{3}}}{4^{\frac{1}{3}}}\right)^2$

YOU DO (Simplifying)

- Simplify the expression

- 1. $3^{\frac{5}{3}} * 3^{\frac{1}{3}}$

- 2. $\sqrt[4]{8} * \sqrt[4]{2}$

- 3. $\frac{3^{\frac{2}{3}} * 3^{\frac{2}{3}}}{3^{\frac{4}{3}}}$

- 4. $\frac{7^{\frac{4}{5}}}{7^{\frac{3}{5}}}$

Warm Up

- Simplify

- 1. $5^{\frac{2}{3}} * 5^{\frac{4}{3}}$

- 2. $\frac{3^{\frac{3}{2}}}{3}$

Algebra 3

Chapter 7: POWERS, ROOTS, and RADICALS

Lesson 2: Properties of Rational Exponents

Today

- Yesterday we learned how to simplify rational expressions to make them easier.
- Today we are doing the same thing but with variables.

LETS TALK

- What does the following mean?
- x^3
- x^5
- x^2y^3
- $\sqrt[3]{}$
- $\sqrt[5]{}$

Properties

- $a^m * a^n = a^{m+n}$ add exponents
- $(a^m)^n = a^{mn}$ multiply exponents
- $(ab)^m = a^m b^m$ distribute exponent
- $a^{-m} = \frac{1}{a^m}$ change the spot and make power opposite
- $\frac{a^m}{a^n} = a^{m-n}$ subtract exponents
- $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ distribute exponent

Directions

- Combine Like radicals

I DO (Simplifying with Variables)

- Simplify the expression

- 1. $\sqrt[3]{125y^6}$

- 2. $(9x^2y^{10})^{\frac{1}{2}}$

- 3. $\sqrt[4]{\frac{x^4}{y^8}}$

- 4. $\frac{6xy^{\frac{1}{2}}}{2x^{\frac{1}{3}}z^{-5}}$

Warm Up

- Simplify

- $\frac{1}{x^{-\frac{5}{4}}}$

- $(y * y^{\frac{1}{4}})^{\frac{4}{3}}$

I DO (Simplifying with Variables)

- Simplify the expression

- 1. $x^{\frac{1}{3}} * x^{\frac{1}{5}}$

- 2. $\frac{x^{\frac{3}{7}}}{x^{\frac{1}{5}}}$

- 3. $(\sqrt[4]{x^3} * \sqrt[4]{x^5})^{-2}$

- 4. $(y^3)^{\frac{1}{6}}$

WE DO (Simplifying with Variables)

- Simplify the expression

- 1. $\sqrt[4]{\frac{x^{12}}{y^4}}$

- 2. $\frac{x^{\frac{3}{4}}yz^{-\frac{1}{3}}}{x^{\frac{1}{4}}z^{\frac{2}{3}}}$

- 3. $\sqrt[5]{32x^5}$

- 4. $\frac{x^{\frac{5}{3}}y}{xy^{-\frac{1}{2}}}$

YOU DO (Simplifying with Variables)

- Simplify the expression

- 1. $\sqrt{9x^2}$

- 2. $\sqrt[3]{2x^3}$

- 3. $x^{\frac{2}{3}} * x^{\frac{1}{3}}$

- 4. $\left(\frac{x}{4}\right)^{\frac{1}{2}}$

- 5. $(16x)^{\frac{1}{4}}$

Warm Up

- Simplify

- $\frac{1}{x^{\frac{7}{4}}}$

- $(y^2 * y^{\frac{1}{5}})^{\frac{2}{3}}$

Today

- The past 2 days we learned how to simplify radical expressions (with and without variables)
- Today we will learn if we will work with the same thing except we have RADICAL exponents
- We will also see some strange cases
- If we have time
 - We are going to learn how to combine like radical expressions

Question

- $\sqrt{9}$
- $\sqrt{5}$
- What is another way to write this?

I DO (Rooted Powers)

- Simplify the radical expression

- 1. $z^{\frac{3}{4}} * z^{\sqrt{3}}$

- 2. $(y^{\sqrt{3}})^{\sqrt{2}}$

- 3. $\sqrt[3]{\sqrt{64a^6}}$

- 4. $(5x^2)^{\sqrt{2}}$

WE DO (Rooted Powers)

- Simplify the radical expression

- 1. $x^2 * x^{\sqrt{3}}$

- 2. $(x^{\sqrt{5}})^3$

- 3. $\frac{x^{\sqrt{2}}}{x^{3\sqrt{2}}}$

- 4. $\sqrt{\sqrt{\frac{108}{27}}}$

YOU DO (Rooted Powers)

- Simplify the radical expression
- 1. $\sqrt[3]{\sqrt{x}}$
- 2. $(x^{\sqrt{5}})^{\sqrt{5}}$
- 3. $x^{-\sqrt{3}}$
- 4. $6x^{\sqrt{2}} - 3x^{\sqrt{2}}$

Review

- Today we learned how to simplify radical expressions that have rooted exponents.

Homework

- Worksheet
– 7.2 (19 - 24)

Directions (Add and Subtract)

- Find like radicals
- Make the radicand be the same number
- Perform the given operation to ONLY the outside number

I DO (Like Radicals)

- Simplify the like radicals

- 1. $7(6^{\frac{1}{5}}) + 2(6^{\frac{1}{5}})$

- 2. $\sqrt[3]{16} - \sqrt[3]{2}$

- 3. $5\sqrt{y} + 6\sqrt{y}$

- 4. $2xy^{\frac{1}{3}} - 7xy^{\frac{1}{3}}$

WE DO (Like Radicals)

- Simplify the like radicals

- 1. $\sqrt[5]{6} + 5\sqrt[5]{6}$

- 2. $160^{\frac{1}{2}} - 10^{\frac{1}{2}}$

- 3. $3\sqrt[3]{5x^5} - x\sqrt[3]{40x^2}$

- 4. $2\sqrt[5]{y} + 7\sqrt[5]{y}$

YOU DO (Like Radicals)

- Simplify the like radicals
- 1. $5(5^{\frac{1}{7}}) - 7(5^{\frac{1}{7}})$
- 2. $\sqrt[3]{375} + \sqrt[3]{81}$
- 3. $y\sqrt[3]{24x^5} + \sqrt[3]{-3x^2y^3}$
- 4. $9x^{\frac{1}{5}} - 2x^{\frac{1}{5}}$

Question

- What if the powers aren't the same?

REVIEW

- Today we learned how to combine like radicals

Homework

- Worksheet
 - 7.2B (25 - 30)

Rewrite the expression in simplest form.

1. $y^{\frac{1}{2}}$

2. $d^{\frac{1}{4}}$

3. $x^{\frac{8}{5}}$

4. $y^{11} \cdot y^4$

5. $(x^8)^6$

6. $(d^2ef^3)^2$

7. $\left(x^{\frac{19}{20}}\right)^{20}$

8. $x^{\frac{42}{12}}$

9. $\frac{x^{\frac{7}{2}}}{x^{\frac{3}{2}}}$

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