

Lesson 2.02 Rational Exponents

Students will be able to:

- Content Objective: Evaluate an expression in an equivalent form using rational exponents.
- Language Objective: Explain the steps for rewriting rational exponents as roots.



Warm Up

Simplify each of the following using laws of exponents.

a. $(-2a^2b^3)^{-2} \cdot 8a^3$

b. $\left(\frac{10x^{-4}y^5}{5y^2}\right)^2$



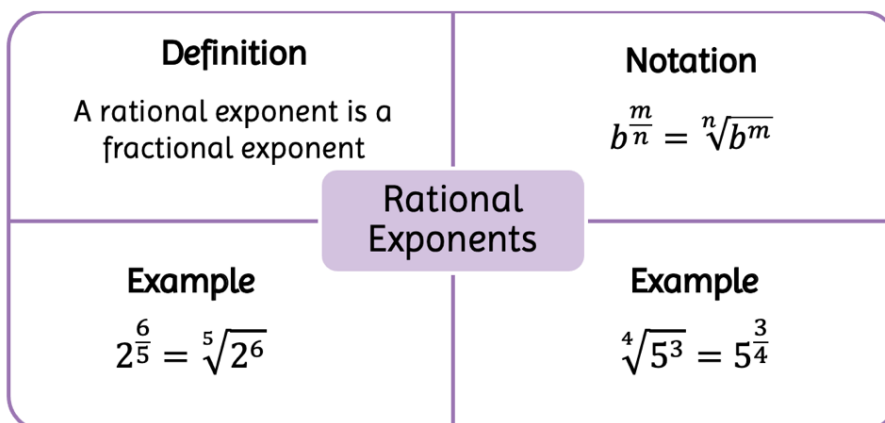
Vocabulary Review

Matching- Match each of the following rules of exponents its corresponding example.

- | | |
|---|---------------------------------|
| 1. _____ Power to a Power | a. $\left(\frac{x}{y}\right)^b$ |
| 2. _____ Quotient Rule | b. $(xy)^b$ |
| 3. _____ Extended Power Rule (Division) | c. $z^x \cdot z^y$ |
| 4. _____ Product Rule | d. $(x^a)^b$ |
| 5. _____ Extended Power Rule (Multiplication) | e. $\frac{z^x}{z^y}$ |



Graphic Organizer





Investigate

1. Evaluate each of the following using a calculator.

a. $25^{\frac{1}{2}} =$

b. $64^{\frac{1}{2}} =$

c. $343^{\frac{1}{3}} =$

2. What do you notice? What can we say about the denominator of fractional exponents?



Skill 1: Writing Roots

Rewrite each of the following as roots instead of fractional exponents. Then evaluate the expression.

a. $125^{\frac{1}{3}}$

b. $4^{\frac{3}{2}}$

c. $9^{-\frac{1}{2}}$

d. $x^{-\frac{1}{3}}$



Exercise 1: Writing Roots

Rewrite each of the following as roots instead of fractional exponents. Then evaluate the expression.

a. $25^{\frac{3}{2}}$

b. $16^{\frac{1}{4}}$

c. $32^{-\frac{1}{5}}$

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



Skill 2: Exponential Form

Rewrite in exponential form, then simplify completely.

a. $\sqrt{81}$

b. $(\sqrt[3]{4})^6$

c. $\sqrt[4]{x^8}$

d. Solve the equation $9 + 5\sqrt[3]{2x} = 29$ for x using your knowledge of rational exponents and roots.



Exercise 2: Exponential Form

Rewrite in exponential form, then simplify completely.

a. $\sqrt{49}$

b. $\sqrt[3]{125^2}$

c. $\sqrt{x^5}$

d. Solve the equation $7 = y^{\frac{1}{2}}$ for y using your knowledge of rational exponents and roots.



Write It Out

Explain how $(2^{\frac{1}{5}})^3$ can be written as the equivalent radical expression $\sqrt[5]{8}$.



Skill 3: Variables

When $a > 0$ and b is a positive integer, the expression $(2a)^{\frac{3}{b}}$ is equivalent to

(1) $\frac{1}{(b\sqrt{2a})^3}$

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

(3) $\frac{1}{\sqrt[3]{2a^b}}$

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



Exercise 3: Variables

Given $y > 0$, the expression $\sqrt{3x^2y} \cdot \sqrt[3]{27x^3y}$ is equivalent to

(1) $3^{1.5}x^2y^{0.2}$

(2) $3^{\frac{3}{2}}x^2y^{\frac{5}{6}}$

(3) $81x^{\frac{5}{6}}y^5$

(4) $3^{\frac{4}{3}}xy$



Check Point

Multiple Choice

For all positive values of x , which expression is equivalent to $x^{\frac{3}{5}}$?

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

(2) $(x^3)^5$

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

(4) $3(x^5)$



2.02- Problem Set

Name: _____

1. Multiple Choice

Which of the following represents $10^{\frac{8}{5}}$ in radical form?

a. $(\sqrt[5]{10})^8$

b. $(\sqrt[10]{8})^5$

c. $(\sqrt[10]{5})^8$

d. $(\sqrt[8]{10})^5$

2. Multiple Choice

Which of the following represents $(5x)^{\frac{5}{2}}$ in radical form?

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

b. $(\sqrt[5]{5x})^2$

c. $(\sqrt{5x})^5$

d. $\sqrt{5x}$

3. Rewrite each of the following as roots instead of fractional exponents. Then evaluate the expression.

a. $5^{\frac{5}{4}}$

b. $2^{\frac{4}{5}}$

c. $(10x)^{\frac{3}{5}}$

4. Rewrite in exponential form, then simplify completely.

a. $\sqrt{5}$

b. $\sqrt[3]{7^5}$

c. $(\sqrt[3]{6k})^2$