Rational Exponents

Agenda

Warm-Up
HW Check
Notes p. 73/Foldable
HW #1-8

Reminders

Quiz Friday!

HW 4.3 due Friday!

Essential Question

How do I convert fraction exponents to radicals?

Warm-Up Wednesday

$(1)^{\frac{1}{2}} = 1,\ (4)^{\frac{1}{2}} = 2,\ (9)^{\frac{1}{2}} = 3,\ (16)^{\frac{1}{2}} = 4,\ (25)^{\frac{1}{2}} = 5$

1. What pattern do you see is happening with the problems above?

   taking square root of # in parenthesis

2. What is the symbol that means the same as raising numbers to the $\frac{1}{2}$ power?

   $\sqrt{}$ (square root)

3. Why are they the same?

   $25^{\frac{1}{2}} = 5$ $\sqrt{25} = 5$

4. What do you think it means when a number is raised to the $\frac{1}{3}$ power?

   cube root

Questions, comments, concerns?

Algebra I – Unit 6: Division Properties of Exponents

Practice –Division Properties of Exponents

Name _____ Date _____ Period _____

Simplify the expressions below:

1. $\frac{-3x^7}{6x^3}$

2. $\frac{15x^{-3}}{x}$

3. $\frac{8x^{10}y^7}{2x^6y^6}$ $\boxed{4x^4y}$

$\frac{8}{2}x^{10-6}y^{7-6}$

4. $\left(\frac{x^{-5}}{x^{-2}}\right)^5$ $\boxed{\frac{x^5}{y^{15}}}$

5. $\frac{x^9y}{(x^2y^9)^2}$

$(x^2y^9)(x^2y^9)$

x^4y^{18}

$\frac{x^9y}{x^4y^{18}}$

6. $\left(\frac{3b^2c}{6ab^3}\right)^{-2}$

$\left(\frac{1c}{2ab}\right)^{-2} = \frac{c^{-2}}{2^{-2}a^{-2}b^{-2}}$

$\boxed{\frac{2^2a^2b^2}{c^2}}$

7. A rectangular parking lot has an area of $10a^3b^6$ square yards. If the length of the park is $2a^3$, what is the width of the park?

$\frac{10a^3b^6}{2a^3}$

$\frac{10aaab^6}{2aaa}$

$\boxed{5ab^6}$

$A = L \cdot W$

8. Marlena was asked to find an expression that is not equivalent to 2^{12}. Which of the following is not equivalent to the given expression?

F $(2^2)^6$

G $(2^8)^4$

H $(2^6)(2^6)$

J $(2^3)(2^9)$

CALC

4096 4096

9. Which expression is equivalent to $(-5abc^4)(-3a^2c^2)(-4a^2b^6c^3)$?

A $-12a^6b^5c^9$

B $-12a^6b^4c^{24}$

C $-60a^6b^5c^9$

D $-60a^9b^9c^9$

10. The volume of a rectangular prism is $125x^3$ cubic units, and the area of its base is $25x^2y^2$ square units. What is the height of the prism in units if $x > 0$ and $y > 0$?

$V = B \cdot h$

area of base

$\frac{V}{B} = \frac{125x^3}{25x^2y}$

Rational Exponents p.73

Essential Question: How do I convert fraction exponents to radicals?

index, root

radical

$$x^{\frac{a}{b}} = \sqrt[b]{x^a}$$

power

if there is no b (root), invisible 2 (square root)

Rational Exponents p.73

Essential question: How do I convert fraction exponents to radicals?

$$x^{\frac{a}{b}} = \sqrt[b]{x^a}$$

Rewrite as a base with an exponent:

1. $\sqrt[2]{9} = 9^{\frac{1}{2}}$
2. $\sqrt{16} = 16^{\frac{1}{2}}$

Rewrite as a radical expression

3. $5^{\frac{2}{3}} = \sqrt[3]{5^2}$
4. $9^{\frac{1}{7}} = \sqrt[7]{9}$
5. $2^{\frac{5}{3}} = \sqrt[3]{2^5}$

Exponents Foldable

$$a^{\frac{m}{n}}$$

Rational Exponent

Exponents Foldable

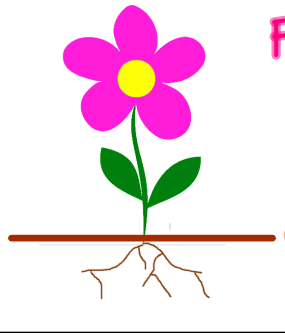
ex.

$$x^{\frac{5}{8}} = \sqrt[8]{x^5}$$

$$\sqrt[3]{x^2} = x^{\frac{2}{3}}$$

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

"Flower Power"



Flower → power (on top)

dirt line → fraction bar

Roots → outside radical

Rational Exponents p.73

Essential question: How do I convert fraction exponents to radicals?

Simplify each expression.

6. $\left(27x^3y^6\right)^{\frac{1}{3}}$

$(27)^{\frac{1}{3}}(x^3)^{\frac{1}{3}}(y^6)^{\frac{1}{3}}$

$3x^{3\cdot\frac{1}{3}}y^{6\cdot\frac{1}{3}}$

$\boxed{3x^1y^2}$

8. $\left(\dfrac{16x^8}{x^6}\right)^{\frac{1}{4}}$

$(16x^{8-6})^{\frac{1}{4}}$

$(16x^2)^{\frac{1}{4}} = (16)^{\frac{1}{4}}(x^2)^{\frac{1}{4}}$

$\boxed{2x^{\frac{1}{2}} \text{ or } 2\sqrt{x}}$

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

10. $\left(48x^4y^3z^5\right)^{\frac{1}{2}}$

mskmath

Algebra 1 – Unit 6: Rational Exponents and Radical Expressions

Practice Rational Exponents and Radical Expressions

1. What are two ways to write the square root of x?

2. Which expression is the equivalent to $(xyz)^{\frac{1}{2}}$?

A $\sqrt{xyz}$

B $x^2y^2z^2$

C $xyz^{\frac{1}{2}}$

D $\frac{1}{x^2y^2z^2}$

3. What is $\sqrt{36xy}$ written as a fractional exponent?

Simplify each expression.

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

5. $\sqrt{49x^5y^6z^{11}}$

6. $(a^4bc)(a^9b^3c^{21})^{\frac{1}{3}}$

7. Which expression is greater $(-4)^{\frac{2}{3}}$ or $(-4)^3$? Explain your reasoning.

8. There is an error in the student work shown below. What is the error? Explain how to solve the problem.

$(12a^3b^4c^7)^{\frac{1}{2}} =$

$12^{\frac{1}{2}}a^{\frac{3}{2}}b^{\frac{4}{2}}c^{\frac{7}{2}} =$

$2ac^3\sqrt{3abc}$

HW Help Rational Exponents

No work = no credit = no kidding

Help...

1. Square roots have a denominator of 2!
2. Again, square roots have a denominator of 2. We don't write the 2 in the radical!
3. If there is no root, then we assume it is 2.
4. There are lots of ways to solve this problem. First, you can distribute the square to each part of the parenthesis. Then, using the power to a power rule, multiply any exponents. Negative exponents make the part cross the line!
5. Remember, a square root is the same as to the 1/2 power. Each piece is raised to the 1/2, simplify what you can!
6. Distribute the 1/3 to the 2nd parenthesis, then use the product property to simplify.
7. This problem has all numbers - use your calculator!
8. The error is in the 3rd line. What did the student do wrong?

Solutions...

1: $\sqrt{x}$ and $(x)^{\frac{1}{2}}$

2: A

3: $(36xy)^{\frac{1}{2}}$

4: $\dfrac{25}{ab^3}$

5: $7x^2y^3z^5\sqrt{xz}$

6: $a^7b^2c^8$

7: $(-4)^{\frac{2}{3}}$. *Answers may vary.*

8: The b variable is not simplified correctly.