Name:_____Date:_____Period:_____

6-0 Properties of Exponents

Standards

A2.N.RN.A.1 (formerly N-RN.A.1) Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
A2.N.RN.A.2 (formerly N-RN.A.2) Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Key Concepts

Properties of Exponents- Assume that no denominator is equal to zero and *m* and *n* are integers.

1. $a^0 = 1$
2. $a^{-n} = \frac{1}{a^n}, a \neq 0$
3. $a^m \cdot a^n = a^{m+n}$
4. $\frac{a^m}{a^n} = a^{m-n}, a \neq 0$
5. $(ab)^n = a^n b^n$
6. $(\frac{a}{b})^n = \frac{a^n}{b^n}, b \neq 0$
7. $(a^m)^n = a^{mn}$

Examples

1. Simplify each expression using only positive exponents.

a. $(3a^4)(-2a^{-5})$ b. $(-3x^{-3}y^4)^2$ c. $\frac{(x^2y)^0}{2x^{-3}}$

d. $\frac{6a^3b^{-2}c^5}{ab^{-3}c^3}$ e. $(\frac{2x^2y^{-2}}{3})^3$ f. $(\frac{3r^{-2}s^3t^0}{3rs})^{-3}$

You do Practice 6-0: Complete your assignment on a separate sheet of paper. Show all work.

1. Simplify. Your exponents should only include positive exponents.

a. $(x^{-2}y^{-3})^4$ b. $(x^4)^{-3}(2x^4)$ c. $\frac{2y^3 \cdot 3xy^3}{3x^2y^4}$

d. $\frac{x^3y^3z^2}{3x^2y^4}$ e. $\frac{3x^2y^2}{2x^{-1}(4xy^2)}$ f. $\frac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$

6-1 Roots and Radical Expressions

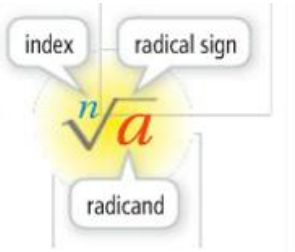
Standards

A2.N.RN.A.1 (formerly N-RN.A.1) Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
A2.N.RN.A.2 (formerly N-RN.A.2) Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Key Concepts

_____ - For any real numbers *a* and *b*, and any positive integer *n*, if $a^n = b$, then *a* is an *n*th root of *b*.

- If *n* is _____, there is _____ real *n*th root.
- If *n* is _____, there are _____ real *n*th roots.



_____ - the number under the radical.

_____ - the degree of the root.

_____ - the positive root when the number has two real roots.

_____- $\sqrt[n]{a^n} = \begin{cases} a & \text{if } n \text{ is odd} \\ |a| & \text{if } n \text{ is even} \end{cases}$

Examples

1. (I do) Find all real cube roots.
   a. 0.027 b. -125 c. $\frac{1}{64}$

2. (We do) Find all real fourth roots.
   a. 625 b. -0.0016 c. $\frac{81}{625}$

3. (We do) What is each principal real number root?
   a. $\sqrt[3]{-27}$ b. $\sqrt{0.09}$ c. $\sqrt[4]{-16}$ d. $\sqrt{(-3)^2}$

4. (We do) Simplify each radical expression. Use absolute value symbols as needed.
   a. $\sqrt{16x^8}$ b. $\sqrt[3]{27a^3b^3}$ c. $\sqrt[4]{x^{16}y^4}$ d. $\sqrt[4]{81(x+y)^8}$

5. (They do) Find all real solutions.
   a. $x^2 = 81$ b. $x^3 = 27$ c. $x^4 = \frac{256}{625}$ d. $x^4 = -16$

6. (They do) The voltage V of an audio system's speaker can be represented by $V = 4\sqrt{P}$, P is the power of the speaker.
   a. An engineer wants to design a speaker with 400 watts of power. What would the voltage be?

   b. Casey wants to buy an audio system's speaker with a voltage of 100. What would be the power of the speaker in watts?

(You do) Practice 6-1: Complete your assignment on a separate sheet of paper. Show work.

1. Find all the real square roots.
   a. 625 b. $\frac{16}{81}$

2. Find all the real cube roots.
   a. -216 b. 0.027

3. Find all the real fourth roots.
   a. -1296 b. 0.2401

4. Find each principal real number root.
   a. $\sqrt{400}$ **b.** $-\sqrt[4]{256}$ **c.** $\sqrt[3]{-729}$

5. Simplify each radical expression. Use absolute value symbols when needed.
   a. $\sqrt{25x^6}$ **b.** $\sqrt[3]{343x^9y^{12}}$ **c.** $\sqrt[4]{16x^{16}y^{20}}$

6. **Reasoning.** Explain how you know whether or not to include the absolute value symbol on your root.