MRS22/MPS21-Lesson-2 Mr. Pineda

Aim: How do we use the properties of exponents to rewrite expressions with integral exponents?

Do Now: **Simplify. To start, factor each radicand.**

1. $\sqrt{18}+\sqrt{32}$ **2.** $\sqrt[4]{324}-\sqrt[4]{2500}$ **3.** $\sqrt[3]{192}+\sqrt[3]{24}$

$=\sqrt{9\cdot 2}+\sqrt{16\cdot 2}$

Multiply.

4. $\left(3-\sqrt{6}\right)\left(2-\sqrt{6}\right)$ **5.** $\left(5+\sqrt{5}\right)\left(1-\sqrt{5}\right)$ **6.** $\left(4+7\right)^2$

I – Rational Exponent

1) Solve for x: $a^x = \sqrt[4]{a^3}$

2) In General, $\sqrt[n]{x} = x^{\frac{1}{n}}$

3) **Simplify each expression.**

1. $16^{\frac{1}{4}}$ **2.** $(-3)^{\frac{1}{3}}\cdot(-3)^{\frac{1}{3}}\cdot(-3)^{\frac{1}{3}}$ **3.** $5^{\frac{1}{2}}\cdot 45^{\frac{1}{2}}$

$\sqrt[4]{16}$

II- Converting between exponential and radical form

1)

All the properties of integer exponents apply to rational exponents.

take note

Properties **Properties of Rational Exponents**

Let m and n represent rational numbers. Assume that no denominator equals 0.

Property	Example	Property	Example
$a^m \cdot a^n = a^{m+n}$	$8^{\frac{1}{3}} \cdot 8^{\frac{2}{3}} = 8^{\frac{1}{3}+\frac{2}{3}} = 8^1 = 8$	$a^{-m} = \frac{1}{a^m}$	$9^{-\frac{1}{2}} = \frac{1}{9^{\frac{1}{2}}} = \frac{1}{3}$
$(a^m)^n = a^{mn}$	$(5^{\frac{1}{2}})^4 = 5^{\frac{1}{2} \cdot 4} = 5^2 = 25$	$\frac{a^m}{a^n} = a^{m-n}$	$\frac{7^{\frac{3}{2}}}{7^{\frac{1}{2}}} = 7^{\frac{3}{2}-\frac{1}{2}} = 7^1 = 7$
$(ab)^m = a^m b^m$	$(4 \cdot 5)^{\frac{1}{2}} = 4^{\frac{1}{2}} \cdot 5^{\frac{1}{2}} = 2 \cdot 5^{\frac{1}{2}}$	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	$\left(\frac{5}{27}\right)^{\frac{1}{3}} = \frac{5^{\frac{1}{3}}}{27^{\frac{1}{3}}} = \frac{5^{\frac{1}{3}}}{3}$

2)

a. What are the expressions $w^{-\frac{5}{8}}$ and $w^{0.2}$ in radical form?

b. What are the expressions $\sqrt[4]{x^3}$ and $(\sqrt[5]{y})^4$ in exponential form?

c. Reasoning Refer to the definition of rational exponent. Explain the need for the restriction that $a \neq 0$ if m is negative.

III- Combining radical expressions and simplifying

1) **Simplify each number.**

a. $(-216)^{\frac{1}{3}}$ **b.** $243^{1.2}$ **c.** $32^{-0.4}$

$\sqrt[3]{-216}$

2) **Find each product or quotient. To start, rewrite the expression using exponents.**

a. $\left(\sqrt[4]{6}\right)\left(\sqrt[3]{6}\right)$

$=\left(6^{\frac{1}{4}}\right)\left(6^{\frac{1}{3}}\right)$

b. $\dfrac{\sqrt[5]{x^2}}{\sqrt[10]{x^2}}$

c. $\sqrt{20}\cdot\sqrt[3]{135}$

3) **Simplify each number.**

a. $(125)^{\frac{2}{3}}$

b. $(216)^{\frac{2}{3}}(216)^{\frac{2}{3}}$

c. $(-243)^{\frac{2}{5}}$

4) **Write each expression in simplest form. Assume that all variables are positive.**

a. $\left(16x^{-8}\right)^{\frac{3}{4}}$

b. $\left(8x^{15}\right)^{-\frac{1}{3}}$

c. $\left(\dfrac{x^2}{x^{-10}}\right)^{\frac{1}{3}}$