Rational Exponents

Summary

1. $\sqrt[root]{x^{power}} = x^{power/root}$

Radicand

For $\sqrt[n]{a}$, the **radicand** is **a**.

We are going to build the intuition of rational exponents.

- $(12^5)^9 =$

- $(12^6)^7 =$

- $(12^{\frac{1}{7}})^7 =$

- Let $x = 12^{\frac{1}{7}}$. Substitute x into the equation below

$$(12^{\frac{1}{7}})^7 = 12$$

- Solve for x using radicals.

$$x^7 = 12$$

- We have $x = 12^{\frac{1}{7}}$ and $x = \sqrt[7]{12}$:

$$\boxed{12^{\frac{1}{7}} = \sqrt[7]{12}}$$

In general,

$$\boxed{\sqrt[root]{x^{power}} = x^{power/root}}$$

Example 1. Write each of the following in radical form.

(a) $5^{1/2}$

(b) $(-9)^{5/3}$

(c) $x^{1/3}$

Example 2. Write each of the following using rational exponents.

(a) $\sqrt{6}$

(b) $\sqrt[3]{8}$

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

Example 3. Simplify each of the following. Exact answers only.

(a) $\sqrt{72x^2}$

(b) $\sqrt{175x^3}$

(c) $\sqrt{18x^4}$

(d) $\sqrt{65x^5y^3}$

(e) $\sqrt[3]{27x^7y^8}$

(f) $\sqrt[3]{128x^6}$