Rational Exponents

Math 3

Unit 3

Radical Expressions can be rewritten in Exponential Form

- <u>Radical Form</u>
- <u>Exponential Form</u>

Radical Form	Exponential Form
$\sqrt{x}$	$x^{1/2}$
$\sqrt[3]{x}$	$x^{1/3}$
$\sqrt[4]{x}$	$x^{1/4}$

You can reverse the process also…

- <u>Radical Form</u>

$$\sqrt[6]{x}$$

$$\sqrt[5]{x}$$

$$\sqrt[10]{x}$$

- <u>Exponential Form</u>

$$x^{1/6}$$

$$x^{1/5}$$

$$x^{1/10}$$

Let's simplify these exponential expressions:

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

$$64^{1/3} = \sqrt[3]{64} = 4$$

$$81^{1/4} = \sqrt[4]{81} = 3$$

$$32^{1/5} = \sqrt[5]{32} = 2$$

How do the properties of exponents apply to rational exponents?

- Property:

$$a^{m/n} = \left(a^{1/n}\right)^m$$

- Examples:

$$81^{3/4} = \left(81^{1/4}\right)^3 = (3)^3 = 27$$

$$-32^{4/5} = \left(-32^{1/5}\right)^4 = (-2)^4 = 16$$

How do the properties of exponents apply to rational exponents?

- Property:

$$a^{-1/n} = \frac{1}{a^{1/n}}$$

- Examples:

$$81^{-1/2} = \frac{1}{81^{1/2}} = \frac{1}{9}$$

$$64^{-1/3} = \frac{1}{64^{1/3}} = \frac{1}{4}$$

How do the properties of exponents apply to rational exponents?

- Property:

$$a^{-m/n} = \frac{1}{a^{m/n}}$$

- Examples:

$$8^{-2/3} = \frac{1}{8^{2/3}} = \frac{1}{\left(8^{1/3}\right)^2} = \frac{1}{(2)^2} = \frac{1}{4}$$

$$256^{-3/4} = \frac{1}{\left(256^{1/4}\right)^3} = \frac{1}{(4)^3} = \frac{1}{64}$$

Notation:

- You can still translate between exponential and radical forms:

$$a^{m/n} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$$

- Example:

$$x^{2/3} = \sqrt[3]{x^2} = \left(\sqrt[3]{x}\right)^2$$