

SC Algebra 1
8.4 Rational Exponents and Roots

Warm Up: Simplify each exponential expression

1) $w^2 * w^7$

w^9

2) $(2b^2f^5)^3$

$8b^6f^{15}$

3) $\frac{h^7j^5k}{h^3j^4}$

h^4jk

Powers Quick Review:

Product Rule: $a^5 \cdot a^3 = a^8$

Power of a Power: $(a^5)^3 = a^{15}$

Power of a Product: $(2a^5b^3c)^3 = 8a^{15}b^9c^3$

Quotient Rule: $\frac{a^8}{a^3} = a^5$

Power of a Quotient: $\left(\frac{a^8}{b^3}\right)^5 = \frac{a^{40}}{b^{15}}$

Zero Rule: $a^0 = 1$ $(\frac{2a^3b^7c}{-15b^8\sqrt[4]{4\pi}})^0 = 1$

Negative Rule: $a^{-3} = \frac{1}{a^3}$ $\frac{1}{b^{-5}} = b^5$

Rational Exponents:

"Like a flower in a garden, this rule is absolute. The Power grows up top, while the bottom is the Root."

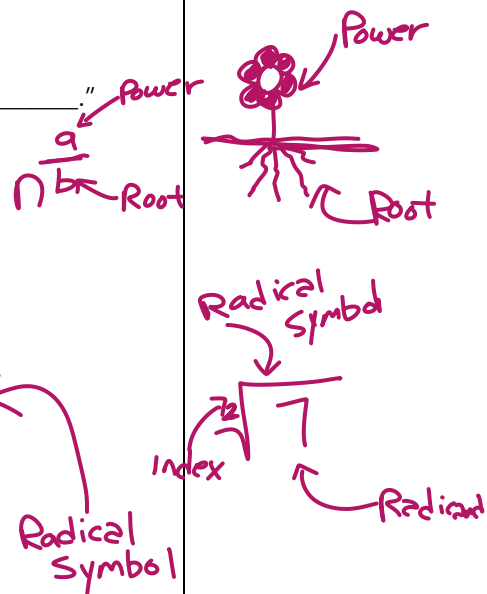
Speak Like A Mathematician:

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

Index: a
Radical Symbol: $\sqrt{\quad}$
Radicaland: x
Radical Symbol: $\sqrt{\quad}$

How can I meet today's standards?

I can apply the properties of exponents when simplifying expressions with **rational exponents**.



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Example 1:

Write each expression in radical form.

$7^{1/2}$ *Power*
 $\sqrt[2]{7} = \sqrt{7}$

$2^{5/3}$ *Root*
 $\sqrt[3]{2^5}$ or $(\sqrt[3]{2})^5$

$6^{3/2}$
 $\sqrt[2]{6^3}$
 $(\sqrt{6})^3$

Example 2:

Write each expression in exponential form.

$(\sqrt{10})^3$
 $10^{3/2}$

$(\sqrt[4]{2})^5$
 $2^{5/4}$

$\sqrt[3]{2}$
 $2^{1/3}$

Example 3:

Write each expression in radical form.

$(5x)^{-5/4}$ *Reciprocal*
 $\frac{1}{\sqrt[4]{(5x)^5}}$

$(10n)^{3/2}$
 $\sqrt[2]{(10n)^3}$ or $\sqrt{(10n)^3}$

$(6v)^{1.5}$ $\rightarrow$ $\sqrt[3]{(6v)^3}$

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Example 4:

Write each expression in exponential form.

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

$$\sqrt[4]{v^7}$$

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

$$m^{\frac{3}{4}}$$

$$v^{\frac{1}{4}}$$

$$(3a)^{\frac{4}{3}}$$

Example 5:

Simplify.

$$9^{1/2}$$

$$\sqrt{9} = 3$$

$$1,000,000^{1/6}$$

$$\sqrt[6]{1,000,000} = 10$$

$$(x^6)^{1/2}$$

$$\boxed{x^3} \quad \sqrt{x^6} = x^3$$

$$(64n^{12})^{1/6}$$

$$\frac{1}{2n^2}$$

reciprocal