



Algebra1Coach.com

Rational Exponents and Radicals

Unit 7 Lesson 5

RATIONAL EXPONENTS AND RADICALS

Students will be able to:

Simplify and evaluate radicals using rational exponent.

Key Vocabulary:

- Rational Exponent
- Properties of Power
- Base
- Radicals

RATIONAL EXPONENTS AND RADICALS

Rational Exponent

$$x^{\frac{m}{n}} = \sqrt[n]{x^m}$$



RATIONAL EXPONENTS AND RADICALS

Laws of Radicals

$$\left({}^n\sqrt{a}\right)^n = a, a > 0$$

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}, \quad a, b > 0$$

$$\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b}, \quad a, b > 0$$

$$\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a} = \sqrt[n]{\sqrt[m]{a}}$$

RATIONAL EXPONENTS AND RADICALS

Sample Problem 1: Change the following expression in rational exponent to radicals.

$$1.a^{\frac{3}{4}}$$

$$2.3^{\frac{1}{2}}$$

RATIONAL EXPONENTS AND RADICALS

Sample Problem 1: Change the following expression in rational exponent to radicals.

$$1. a^{\frac{3}{4}} = \sqrt[4]{a^3}$$

$$2. 3^{\frac{1}{2}} = \sqrt{3}$$

RATIONAL EXPONENTS AND RADICALS

Sample Problem 2: Change the following radicals to rational exponent.

$$3.\sqrt{5}$$

$$4.\sqrt[4]{a^3}$$

RATIONAL EXPONENTS AND RADICALS

Sample Problem 2: Change the following radicals to rational exponent.

$$3.\sqrt{5} = 5^{\frac{1}{2}}$$

$$4.\sqrt[4]{a^3} = a^{\frac{3}{4}}$$

RATIONAL EXPONENTS AND RADICALS

Sample Problem 3: Simplify the following expression in rational exponent.

$$5.(x^3)^{\frac{2}{3}}$$

$$6.(a^2b^4)^{\frac{3}{2}}$$

$$7.25^{\frac{3}{2}}$$

$$8.4^{-\frac{5}{2}}$$

RATIONAL EXPONENTS AND RADICALS

Sample Problem 3: Simplify the following expression in rational exponent.

$$\begin{aligned} 5. (x^3)^{\frac{2}{3}} &= \sqrt[3]{(x^3)^2} \\ &= \sqrt[3]{x^6} \\ &= x^2 \end{aligned}$$

$$\begin{aligned} 6. (a^2b^4)^{\frac{3}{2}} &= \sqrt{(a^2b^4)^3} \\ &= \sqrt{a^6b^{12}} \\ &= a^3b^6 \end{aligned}$$

RATIONAL EXPONENTS AND RADICALS

Sample Problem 3: Simplify the following expression in rational exponent.

$$\begin{aligned} 7.25^{\frac{3}{2}} &= \sqrt{25^3} \\ &= \sqrt{(5^2)^3} \\ &= \sqrt{5^6} \\ &= 5^3 \\ &= 125 \end{aligned}$$

$$\begin{aligned} 8.4^{-\frac{5}{2}} &= \frac{1}{4^{\frac{5}{2}}} = \frac{1}{\sqrt{4^5}} = \frac{1}{\sqrt{(2^2)^5}} \\ &= \frac{1}{\sqrt{2^{10}}} = \frac{1}{2^5} = \frac{1}{32} \end{aligned}$$

RATIONAL EXPONENTS AND RADICALS

Sample Problem 4: Evaluate the following radicals.

$$9. \left(\sqrt{x^3} \right)^2$$

$$10. \sqrt[6]{4}$$

$$11. \sqrt[6]{4y^4}$$

$$12. \sqrt[3]{\frac{-2}{8x^6}}$$

RATIONAL EXPONENTS AND RADICALS

Sample Problem 4: Evaluate the following radicals.

$$9. \left(\sqrt{x^3} \right)^2 = \left(x^{\frac{3}{2}} \right)^2$$

$$= x^{\frac{6}{2}}$$

$$= x^3$$

$$10. \sqrt[6]{4} = \sqrt[3]{\sqrt{4}}$$

$$= \sqrt[3]{2}$$

Sample Problem 2: Evaluate the following radicals.

$$\begin{aligned} 11. \sqrt[6]{4y^4} &= (2^2 y^4)^{\frac{1}{6}} \\ &= (2y^2)^{\frac{1}{3}} \\ &= \sqrt[3]{2y^2} \end{aligned}$$

$$12. \sqrt[3]{\frac{-2}{8x^6}} = \frac{(2)^{\frac{1}{3}}}{(-2^3 x^6)^{\frac{1}{3}}}$$

$$= \frac{\sqrt[3]{2}}{-2x^2}$$