

Course Learning Objective:

Demonstrate appropriate manipulation of expressions with rational exponents and radicals.

Weekly Learning Objectives:

- 1) Understand the meaning of $a^{1/n}$.**
- 2) Understand the meaning of $a^{m/n}$.**
- 3) Understand the meaning of $a^{-m/n}$.**
- 4) Write radical expressions in terms of rational exponents.**
- 5) Write expressions involving rational exponents as radical expressions.**
- 6) Use rules for exponents to simplify expressions that contain rational exponents.**
- 7) Use rational exponents to simplify radical expressions.**
- 8) Multiply and factor expressions containing rational exponents.**
- 9) Approximate radicals and rational expressions with a calculator.**

Rational Exponents

$$a^{\frac{1}{n}} \text{ means } \sqrt[n]{a}$$

$$a^{-\frac{1}{n}} \text{ means } \frac{1}{\sqrt[n]{a}}$$

Examples:

$$121^{\frac{1}{2}} =$$

$$27^{\frac{1}{3}} =$$

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

$$(-4)^{\frac{1}{2}} =$$

$$(-32)^{\frac{1}{5}} =$$

$$(81 \times 8)^{\frac{1}{4}} =$$

$$a^{\frac{n}{m}} \text{ means } \sqrt[m]{a^n}$$

↑
Use this if a
has variables

or

$$a^{\frac{n}{m}} \text{ means } \left(\sqrt[m]{a}\right)^n$$

↑
Use this if a
is a constant

Examples:

$$64^{\frac{3}{2}} =$$

$$-32^{\frac{2}{5}} =$$

$$(-36)^{\frac{3}{2}} =$$

$$81^{-\frac{3}{2}} =$$

$$\left(\frac{-64}{125}\right)^{-\frac{2}{3}} =$$

Write each of the following using radicals:

$$(3p)^{\frac{3}{4}} =$$

$$(5y)^{-\frac{3}{5}} =$$

$$z^{\frac{3}{2}} =$$

$$3x^{\frac{1}{2}} =$$

Write each of the following using rational exponents:

$$\sqrt{5^{10}} =$$

$$\sqrt[4]{6^8} =$$

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

Use properties of exponents to help simplify the following expressions:

$$6^{\frac{4}{3}} \cdot 6^{\frac{2}{3}} =$$

$$\frac{64^{\frac{5}{3}}}{64^{\frac{1}{3}}} =$$

$$r^{-\frac{8}{9}} \cdot r^{\frac{17}{9}} =$$

$$\frac{z^{\frac{3}{4}}}{z^{\frac{5}{4}} z^{-2}} =$$

$$\frac{(a^2 b^5)^{-\frac{1}{4}}}{(a^{-3} b^2)^{\frac{1}{6}}} =$$

Multiply:

$$r^{\frac{2}{5}} (r^{\frac{1}{2}} + r^{\frac{3}{4}}) =$$

$$4m^{\frac{5}{3}} (m^{-\frac{2}{3}} - 4m^{-\frac{5}{3}}) =$$

Factor:

$$3x^{-\frac{1}{2}} + 15x^{\frac{1}{2}} =$$

$$9k^{-\frac{3}{4}} + 6k^{-\frac{1}{4}} =$$

Simplify the radicals below:

$$\sqrt[9]{x^3} =$$

$$\sqrt[4]{36} =$$

$$\sqrt[8]{4y^2} =$$

$$\sqrt[9]{y^6z^3} =$$

Multiplication and Division of radicals with LIKE indices:

$${}^n\sqrt{x} \cdot {}^n\sqrt{y} = {}^n\sqrt{xy}$$

$$\frac{{}^n\sqrt{x}}{{}^n\sqrt{y}} = {}^n\sqrt{\frac{x}{y}}$$

$${}^3\sqrt{10} \cdot {}^3\sqrt{50} =$$

$$\frac{{}^4\sqrt{xy^2}}{{}^4\sqrt{xy}} =$$

UNLIKE indices:

$${}^3\sqrt{y^2} \cdot {}^6\sqrt{y} =$$

$$\frac{{}^4\sqrt{a}}{{}^5\sqrt{a}} =$$

$$\frac{{}^5\sqrt{b^2}}{{}^{10}\sqrt{b^3}} =$$

$${}^3\sqrt{5} \cdot \sqrt{2} =$$

Use your calculator to evaluate the following:

$$\sqrt{6825} =$$

$$80^{\frac{7}{8}} =$$

$$-\sqrt[3]{13} =$$

$$104^{\frac{-4}{5}} =$$