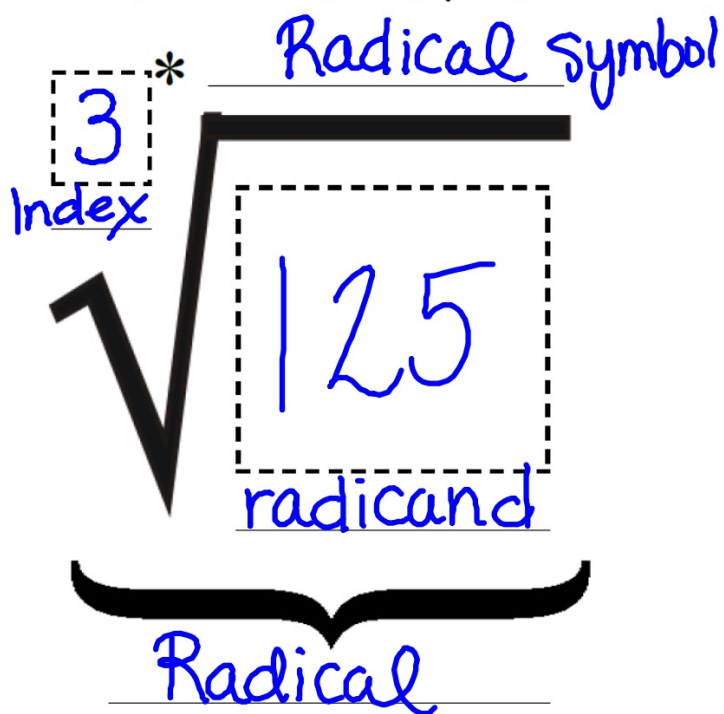


5.1.15

1. What happens when I have a number raised to a negative exponent? For example: 3^{-2}

$$\frac{1}{3^2} = \boxed{\frac{1}{9}}$$

Parts of a Radical



* If the index is not written, it is automatically a 2

For each radical, determine the index and radicand.

$$\sqrt{24} \quad \text{index: } 2 \quad \text{Radicand: } 24$$

$$\sqrt[4]{128n^8} \quad \text{index: } 4 \quad \text{Radicand: } 128n^8$$

$$\sqrt[3]{16xy} \quad I=3 \quad R=16xy$$

$$\sqrt[6]{448x^7y^7} \quad I=6 \quad R=448x^7y^7$$

$$\sqrt{512x^2} \quad I=2 \quad R=512x^2$$

$$\sqrt[3]{1000} \quad I=3 \quad R=1000$$

$$\sqrt{512} \quad I=2, \quad R=512$$

$$\sqrt{98k} \quad I=2 \quad R=98k$$

$$\sqrt[3]{-162} \quad I=3 \quad R=-162$$

Converting between Radical Form and Rational Exponent Form

The diagram illustrates the conversion between radical and exponential forms of a variable x . On the left, the radical form is shown as $\sqrt[3]{x^2}$, where the index 3 is in a box and the exponent 2 is in another box. Below this is the label "Radical Form". On the right, the exponential form is shown as $x^{\frac{2}{3}}$, where the base x is labeled "Base" and the fraction $\frac{2}{3}$ has the numerator 2 in a box and the denominator 3 in another box. Below this is the label "Exponential Form". A blue curved arrow at the top points from the radical form to the exponential form. A blue arrow points from the box containing 2 in the radical form to the box containing 2 in the exponential form. Another blue arrow points from the box containing 3 in the radical form to the box containing 3 in the exponential form. An equals sign is placed between the two expressions.

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

Radical Form

Base Exponential Form

Rewrite the expression using Radical Notation.
Then simplify if possible.

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

1) $9^{\frac{1}{2}}$

$$\sqrt[2]{9^1}$$

$$\sqrt{9}$$

$$3$$

2) $8^{\frac{2}{3}}$

$$\sqrt[3]{8^2}$$

$$\sqrt[3]{64}$$

$$4$$

3) $x^{\frac{3}{5}}$

$$\sqrt[5]{x^3}$$

Rewrite the expression using Rational Exponent Notation

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

4) $\sqrt[5]{13}$

$$13^{\frac{1}{5}}$$

$$1.7$$

5) $\sqrt[3]{25}$

$$25^{\frac{1}{3}}$$

$$2.9$$

6) $(\sqrt[2]{7})^5$

$$7^{\frac{5}{2}}$$

$$129.6$$

Product Rule with Rational Exponents

$$a^m \cdot a^n = a^{m+n}$$

7) $x^{\frac{1}{5}} \cdot x^{\frac{3}{5}}$

~~$x^{\frac{1}{5} + \frac{3}{5}}$~~

~~$x^{\frac{4}{5}}$~~

8) $\sqrt[4]{x} \cdot \sqrt[3]{x^2}$

~~$x^{\frac{1}{4}} \cdot x^{\frac{2}{3}}$~~

~~$x^{\frac{1}{4} + \frac{2}{3}}$~~

~~$x^{\frac{11}{12}}$~~

$\frac{3}{3} \cdot \frac{1}{4} + \frac{2}{3} \cdot \frac{1}{1}$

$\frac{3}{12} + \frac{8}{12}$

Quotient Rule with Rational Exponents

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

9) $\frac{x^{\frac{7}{10}}}{x^{\frac{6}{10}}}$

$$\frac{7}{10} - \frac{6}{10}$$

~~X~~

~~X~~ $x^{\frac{1}{10}}$

10) $\frac{\sqrt[6]{x^5}}{\sqrt[6]{x^2}} = \frac{x^{\frac{5}{6}}}{x^{\frac{2}{6}}}$

$$\frac{5}{6} - \frac{2}{6}$$

~~X~~

~~X~~ $x^{\frac{3}{6}} = x^{\frac{1}{2}}$

Power Rule with Rational Exponents

$$(a^m)^n = a^{m \cdot n}$$

$$11) \left(x^{\frac{3}{5}} \right)^{\frac{1}{2}}$$

$$\times \frac{3}{5} \cdot \frac{1}{2}$$

$$\times \frac{3}{10}$$

$$12) \left(x^{\frac{3}{4}} \right)^{\frac{2}{3}}$$

$$\times \frac{3}{4} \cdot \frac{2}{3}$$

$$\times \frac{6}{12} = \times \frac{1}{2}$$

Negative and Zero Rules with Rational Exponents

$$a^{-n} = \left(\frac{1}{a}\right)^n \qquad a^0 = 1$$

$$13) \left(\frac{4}{9}\right)^{-\frac{3}{2}}$$

$$\left(\frac{9}{4}\right)^{\frac{3}{2}}$$

$$\frac{27}{8}$$

$$14) \left(x^{\frac{3}{4}}\right)^0 = 1$$