

I. Model Problems

To simplify fractional exponents, rewrite the expression as a radical raised to a power. The denominator of the fractional exponent is the root and the numerator is the power.

In other words: $x^{m/n} = \sqrt[n]{x^m} = \left(\sqrt[n]{x}\right)^m$

Example 1 Write $27^{2/3}$ as a radical and simplify.

$$27^{2/3} = \left(\sqrt[3]{27}\right)^2$$

Rewrite as a radical.

$$= 3^2$$

Simplify.

$$= 9$$

Simplify.

The answer is **9**.

Sometimes you need to write a radical expression using a fractional exponent.

Example 2 Write $\sqrt[4]{y^6}$ using a fractional exponent.

$$\sqrt[4]{y^6} = y^{6/4}$$

Rewrite as a fractional exponent.

$$= y^{3/2}$$

Simplify.

The answer is $y^{3/2}$.

Sometimes there will be many variables in the radicand. Simplify each variable one at a time, then multiply.

Example 3 Simplify $\sqrt[3]{8x^5y^6z^{11}}$.

$$\sqrt[3]{8x^5y^6z^{11}} = \sqrt[3]{8} \cdot \sqrt[3]{x^5} \cdot \sqrt[3]{y^6} \cdot \sqrt[3]{z^{11}}$$

Rewrite the expression.

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

Simplify.

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

Simplify.

The answer is $2xy^2z^3 \cdot \sqrt[3]{x^2z^2}$.

Practice #2 Radicals and Rational Exponents

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Period_____

Write each expression in exponential form.

1) $(\sqrt{7m})^5$

2) $(\sqrt[4]{r})^7$

3) $(\sqrt[3]{6x})^4$

4) $\frac{1}{\sqrt{6n}}$

Simplify.

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

6) $(v^9)^{\frac{5}{3}}$

7) $(x^{12})^{-\frac{2}{3}}$

8) $(125n^3)^{-\frac{5}{3}}$

Write each expression in exponential form.

9) $(\sqrt{5k})^5$

10) $\sqrt[3]{4a}$

11) $\frac{1}{(\sqrt[3]{4p})^2}$

12) \sqrt{x}

Write each expression in radical form.

13) $(3n)^{\frac{1}{4}}$

14) $m^{\frac{1}{4}}$

15) $(2x)^{\frac{5}{6}}$

16) $r^{\frac{5}{2}}$

Simplify. Answers should contain only positive exponents.

$$17) \frac{\left(\frac{1}{y^4}\right)^2 \cdot x^{-\frac{1}{2}} y^2}{x^{\frac{7}{4}} y^{\frac{3}{2}}}$$

$$18) \frac{nm^{\frac{7}{4}}}{\left(mn^{\frac{5}{4}}\right)^2 \cdot mn^{-1}}$$

$$19) \left(\frac{a^{\frac{5}{3}} b^2 \cdot a^{\frac{5}{4}} b^{\frac{3}{2}}}{(a^2)^{-4}} \right)^3$$

$$20) \left(\frac{x^{-1} y^{\frac{1}{4}}}{x^{\frac{2}{3}} y^{-1} \cdot x^{\frac{5}{4}} y^{\frac{5}{3}}} \right)^{\frac{5}{4}}$$

Simplifying Rational Exponents

Simplify.

1) $(n^4)^{\frac{3}{2}}$

2) $(27p^6)^{\frac{2}{3}}$

3) $(25b^6)^{-\frac{3}{2}}$

4) $(64m^4)^{\frac{3}{2}}$

5) $(a^8)^{\frac{3}{2}}$

6) $(9r^4)^{\frac{1}{2}}$

7) $(81x^{12})^{\frac{5}{4}}$

8) $(216r^9)^{\frac{1}{3}}$

Simplify. Your answer should contain only positive exponents.

9) $2m^2 \cdot 4m^{\frac{3}{2}} \cdot 4m^{-2}$

10) $3b^{\frac{1}{2}} \cdot b^{\frac{4}{3}}$

11) $\left(p^{\frac{3}{2}}\right)^{-2}$

12) $\left(a^{\frac{1}{2}}\right)^{\frac{3}{2}}$

$$(13) \frac{2x^{-\frac{7}{4}}}{4x^{\frac{4}{3}}}$$

$$14) \frac{4x^2}{2x^{\frac{1}{2}}}$$

$$(15) \frac{3x^{-\frac{1}{2}} \cdot 3x^{\frac{1}{2}} y^{-\frac{1}{3}}}{3y^{-\frac{7}{4}}}$$

$$16) \frac{3y^{\frac{1}{4}}}{4x^{-\frac{2}{3}} y^{\frac{3}{2}} \cdot 3y^{\frac{1}{2}}}$$

$$17) \left(m \cdot m^{-2} n^{\frac{5}{3}} \right)^2$$

$$(18) \left(a^{-1} b^{\frac{1}{3}} \cdot a^{-\frac{4}{3}} b^2 \right)^2$$

$$(19) \left(\frac{x^{\frac{1}{2}} y^{-2}}{y x^{\frac{7}{4}}} \right)^4$$

$$(20) \frac{(x^3 y^2)^{\frac{3}{2}}}{(x^{-1} y^{-\frac{2}{3}})^4}$$

$$21) \frac{\left(x^{-\frac{1}{2}} y^2 \right)^{-\frac{5}{4}}}{x^2 y^{\frac{1}{2}}}$$

$$22) \frac{\left(x^{-\frac{1}{2}} y^4 \right)^{\frac{1}{4}}}{x^{\frac{2}{3}} y^{\frac{3}{2}} \cdot x^{-\frac{3}{2}} y^{\frac{1}{2}}}$$