11-1

Study Guide

Rational Exponents

Example 1 **Simplify each expression.**

a. $\left(\frac{c^5d^3}{c^3d^2}\right)^{\frac{1}{2}}$

$\left(\frac{c^5d^3}{c^3d^2}\right)^{\frac{1}{2}} = (c^2d)^{\frac{1}{2}}$ $\quad \frac{a^m}{a^n} = a^{m-n}$

$= c^{\frac{2}{2}}d^{\frac{1}{2}}$ $\quad (a^m)^n = a^{mn}$

$= |c|\sqrt{d}$

b. $\left(\frac{p^2}{q^3}\right)^{-3}$

$\left(\frac{p^2}{q^3}\right)^{-3} = \frac{p^{-6}}{q^{-9}}$ $\quad \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

$= \frac{q^9}{p^6}$ $\quad b^{-n} = \frac{1}{b^n}$

Example 2 **Evaluate each expression.**

a. $64^{\frac{2}{3}}$

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

$= 4^2$ or 16 $\quad (a^m)^n = a^{mn}$

b. $\frac{27^{\frac{2}{3}}}{27^{\frac{1}{3}}}$

$\frac{27^{\frac{2}{3}}}{27^{\frac{1}{3}}} = 27^{\frac{2}{3}-\frac{1}{3}}$ $\quad \frac{a^m}{a^n} = a^{m-n}$

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

c. $\sqrt{35} \cdot \sqrt{10}$

$\sqrt{35} \cdot \sqrt{10} = 35^{\frac{1}{2}} \cdot 10^{\frac{1}{2}}$ $\quad \sqrt[n]{b} = b^{\frac{1}{n}}$

$= (7 \cdot 5)^{\frac{1}{2}} \cdot (5 \cdot 2)^{\frac{1}{2}}$

$= 7^{\frac{1}{2}} \cdot 5^{\frac{1}{2}} \cdot 5^{\frac{1}{2}} \cdot 2^{\frac{1}{2}}$ $\quad (ab)^m = a^mb^m$

$= 7^{\frac{1}{2}} \cdot 5 \cdot 2^{\frac{1}{2}}$ $\quad a^ma^n = a^{m+n}$

$= 5 \cdot \sqrt{7} \cdot \sqrt{2}$

$= 5\sqrt{14}$ $\quad \sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$

Example 3 **Express $\sqrt[3]{8x^6y^{12}}$ using rational exponents.**

$\sqrt[3]{8x^6y^{12}} = (8x^6y^{12})^{\frac{1}{3}}$ $\quad b^{\frac{1}{n}} = \sqrt[n]{b}$

$= 8^{\frac{1}{3}}x^{\frac{6}{3}}y^{\frac{12}{3}}$ $\quad (ab)^m = a^mb^m$

$= 2x^2y^4$

Example 4 **Express $16x^{\frac{3}{4}}y^{\frac{1}{2}}$ using radicals.**

$16x^{\frac{3}{4}}y^{\frac{1}{2}} = 16(x^3y^2)^{\frac{1}{4}}$ $\quad (ab)^m = a^mb^m$

$= 16\sqrt[4]{x^3y^2}$