Section 8.3 Simplifying Radical Expressions

# Objective 1: Using the Product Rule

Using properties of exponents, we know that $a^{\frac{1}{n}}⋅b^{\frac{1}{n}}=\left(ab\right)^{\frac{1}{n}}$. Writing this in radical notation gives us the **product rule for radicals**.

**Product Rule for Radicals:**

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers, then

$\sqrt[n]{a}⋅\sqrt[n]{b}=\sqrt[n]{ab}$.

Multiply.

|  |  |
| --- | --- |
| a. $\sqrt{3}⋅\sqrt{10}$ | b. $\sqrt[3]{2x}⋅\sqrt[3]{9x}$ |

# Objective 2: Using the Quotient Rule

Using properties of exponents, we know that $\frac{a^{\frac{1}{n}}}{b^{\frac{1}{n}}}=\left(\frac{a}{b}\right)^{\frac{1}{n}}$. Writing this in radical notation gives us the **quotient rule for radicals**.

**Quotient Rule for Radicals:**

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers and $\sqrt[n]{b}$ is not zero, then

$\sqrt[n]{\frac{a}{b}}=\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$.

Use the quotient rule to simplify.

|  |  |
| --- | --- |
| a. $\sqrt{\frac{3}{100}}$ | b. $\sqrt[3]{\frac{x}{64y^{3}}}$ |

# Objective 3: Simplifying Radicals

The product and quotient rules for radicals can be used to **simplify radicals**. In general, we say a radical of the form $\sqrt[n]{a}$ is simplified when the radicand $a$ contains no factors that are perfect $nth$ powers (other than $1$ or $-1$).

Write each radical in simplified form. Assume that all variables represent positive real numbers.

|  |  |
| --- | --- |
| a. $\sqrt{500}$ | b. $\sqrt[3]{81}$ |

|  |  |
| --- | --- |
| c. $\sqrt{24x^{5}y^{4}}$ | d. $\sqrt[3]{24x^{5}y^{4}}$ |

|  |  |
| --- | --- |
| e. $\sqrt[5]{32b^{12}}$ | f. $\sqrt[3]{75m^{17}}$ |

Use the quotient rule to divide. Then simplify if possible.

g. $\frac{\sqrt[3]{48x^{10}y^{20}}}{\sqrt[3]{6xy}}$