

Simplifying Radicals

Product Rule for Radicals:

- The product rule for radicals states that the product of two square roots is equal to the square root of the product.

Example 1:

$$\begin{aligned}\sqrt{4} \cdot \sqrt{9} &= \sqrt{4 \cdot 9} \\ &= \sqrt{36} \\ &= 6\end{aligned}$$

We can evaluate this way:

$$\begin{aligned}\sqrt{4} \cdot \sqrt{9} &= 2 \cdot 3 \\ &= 6\end{aligned}$$

And we get the same answer.

We will use the product rule for radicals to simplify radical expressions.

Example 2:

Simplify $\sqrt{8}$.

$$\begin{aligned}\sqrt{8} &= \sqrt{4 \cdot 2} \\ &= \sqrt{4} \cdot \sqrt{2} \\ &= 2 \cdot \sqrt{2} \\ &= 2\sqrt{2}\end{aligned}$$

Example 3:

Simplify $\sqrt{12}$.

$\sqrt{12}$ can be broken down in two ways:

$$\sqrt{12} = \sqrt{6 \cdot 2} \quad \text{OR} \quad \sqrt{12} = \sqrt{4 \cdot 3}$$

Since **4** is a perfect square, we choose to break up $\sqrt{4 \cdot 3}$

$$\begin{aligned}\sqrt{12} &= \sqrt{4 \cdot 3} \\ &= \sqrt{4} \cdot \sqrt{3} \\ &= 2\sqrt{3}\end{aligned}$$

Example 4:

Simplify $\sqrt{20x^2y^3}$.

We want to write $20x^2y^3$ as a product.

$$\begin{aligned}\sqrt{20x^2y^3} &= \sqrt{4 \cdot 5 \cdot x^2 \cdot y^2 \cdot y} \\ &= \sqrt{4} \cdot \sqrt{5} \cdot \sqrt{x^2} \cdot \sqrt{y^2} \cdot \sqrt{y} \\ &= 2 \cdot \sqrt{5} \cdot x \cdot y \cdot \sqrt{y} \\ &= 2xy\sqrt{5y}\end{aligned}$$

Perfect Cubes:

8 is a perfect cube since $2^3 = 8$

Written in math:

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

said "the cube root of **8** is **2**".

Example 5:

Evaluate:

a.) $\sqrt[3]{64} =$

b.) $\sqrt[3]{x^3} =$

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

d.) $\sqrt[3]{27x^4} =$

Simplify Radicals

Practice Problems

Simplify:

1. $\sqrt{24}$

2. $\sqrt{32x^2}$

3. $\sqrt{200x^4y^5}$

Evaluate:

4. $\sqrt[3]{125}$

5. $\sqrt[3]{1000x^5y^6}$