

Radical Rules – Review

Radical Expressions can be written using exponents, so the rules listed below are a subset of the exponent rules:

1. Addition of Radicals (Sum Rule) and Subtraction of Radicals (Difference Rule):

If a , b , c , and n are any integers and $n \geq 2$, then

$$a\sqrt[n]{c} + b\sqrt[n]{c} = (a + b)\sqrt[n]{c} \quad \text{Example: } 3\sqrt[3]{5} + 8\sqrt[3]{5} = (3 + 8)\sqrt[3]{5} = 11\sqrt[3]{5}$$

$$a\sqrt[n]{c} - b\sqrt[n]{c} = (a - b)\sqrt[n]{c} \quad \text{Example: } 3\sqrt[3]{5} - 8\sqrt[3]{5} = (3 - 8)\sqrt[3]{5} = -5\sqrt[3]{5}$$

2. Multiplication of Radicals (Product Rules):

If a , b , c , d , and n are any integers and $n \geq 2$, then

$$\sqrt[n]{a \cdot b} = \sqrt[n]{a} \cdot \sqrt[n]{b} \quad \text{Example: } \sqrt[2]{5 \cdot 16} = \sqrt[2]{5} \cdot \sqrt[2]{16} = \sqrt[2]{5} \cdot 4 = 4\sqrt[2]{5}$$

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{a \cdot b} \quad \text{Example: } \sqrt[2]{5} \cdot \sqrt[2]{6} = \sqrt[2]{5 \cdot 6} = \sqrt[2]{30}$$

$$a\sqrt[n]{c} \cdot b\sqrt[n]{d} = a \cdot b\sqrt[n]{c \cdot d} \quad \text{Example: } 6\sqrt[2]{2} \cdot 5\sqrt[2]{8} = (6 \cdot 5)\sqrt[2]{2 \cdot 8} = 30 \cdot 4 = 120$$

3. Division of Radicals (Quotient Rules):

If a , b , m , and n are any integers and $n \geq 2$, then

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}} \quad \text{Example: } \sqrt[3]{\frac{8}{27}} = \frac{\sqrt[3]{8}}{\sqrt[3]{27}} = \frac{2}{3}$$

$$\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}} \quad \text{Example: } \frac{\sqrt[2]{125}}{\sqrt[2]{5}} = \sqrt[2]{\frac{125}{5}} = \sqrt[2]{25} = 5$$

$$\frac{a}{\sqrt[n]{b}} = \frac{a}{\sqrt[n]{b}} \cdot \frac{\sqrt[n]{b^{(n-1)}}}{\sqrt[n]{b^{(n-1)}}} = \frac{a\sqrt[n]{b^{(n-1)}}}{b} \quad \text{Example: } \frac{7}{\sqrt[2]{5}} = \frac{7}{\sqrt[2]{5}} \cdot \frac{\sqrt[2]{5}}{\sqrt[2]{5}} = \frac{7\sqrt[2]{5}}{\sqrt[2]{25}} = \frac{7\sqrt[2]{5}}{5}$$

$$\frac{a}{\sqrt[n]{b^m}} = \frac{a}{\sqrt[n]{b^m}} \cdot \frac{\sqrt[n]{b^{(n-m)}}}{\sqrt[n]{b^{(n-m)}}} = \frac{a\sqrt[n]{b^{(n-m)}}}{b} \quad \text{Example: } \frac{4}{\sqrt[5]{7^2}} \cdot \frac{\sqrt[5]{7^3}}{\sqrt[5]{7^3}} = \frac{4\sqrt[5]{7^3}}{\sqrt[5]{7^5}} = \frac{4\sqrt[5]{7^3}}{7}$$