

Multiplication

$$\sqrt[n]{x} \times \sqrt[n]{y} = \sqrt[n]{x \times y}$$

$$\text{ex: } \sqrt[3]{2} \times \sqrt[3]{5} = \sqrt[3]{2 \times 5} \Leftrightarrow \sqrt[3]{10}$$

Division

$$\sqrt[n]{x} \div \sqrt[n]{y} = \sqrt[n]{\frac{x}{y}}$$

$$\text{ex: } \sqrt[4]{8} \div \sqrt[4]{3} = \sqrt[4]{\frac{8}{3}}$$

Addition

$$a\sqrt[n]{x} \pm b\sqrt[n]{x} = (a \pm b)\sqrt[n]{x}$$

$$\text{ex: } 4\sqrt[3]{5} - 2\sqrt[3]{5} = (4 - 2)\sqrt[3]{5} \Leftrightarrow 2\sqrt[3]{5}$$

Exponents

$$(\sqrt[n]{x})^p = \sqrt[n]{x^p}$$

$$\text{ex: } (\sqrt{2})^3 = \sqrt{2^3} \Leftrightarrow \sqrt{8}$$

Radicals

$$\sqrt[n]{\sqrt[p]{x}} = \sqrt[n \cdot p]{x}$$

$$\text{ex: } \sqrt[3]{\sqrt{5}} = \sqrt[3 \cdot 2]{5} \Leftrightarrow \sqrt[6]{5}$$

Exponentiation

$$\sqrt[n]{a^m} = a^{\frac{m}{n}}$$

$$\text{ex: } \sqrt[3]{4^5} = 4^{\frac{5}{3}}$$

Simplifying Radicals

$$(\sqrt[n]{a})^n = a$$

$$\text{ex: } (\sqrt{3})^2 = 3$$

$$(\sqrt[n]{a})^m = \sqrt[n]{a^m}$$

$$\text{ex: } (\sqrt{4})^5 = \sqrt{4^5}$$