Exponent raised to an Exponent

$$(a^m)^n = a^{m \cdot n}$$

Because an exponent raised to an exponent is the product of the exponents.

$$a^{\frac{m}{n}} = (a^{\frac{1}{n}})^m = (a^m)^{\frac{1}{n}} = \sqrt[n]{a^m}$$

Dividing

$$\frac{a^m}{a^n} = a^{m-n}$$

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

e.g. $a^5 = \underbrace{a \cdot a \cdot a \cdot a \cdot a}_{\text{5 as multiplied together}}$

when the exponent is a whole #

a^n means n number of as multiplied together

$\sqrt[n]{a}$ means the number that can be multiplied by itself n times to get a

Roots & Exponents are inverse/opposite

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

the root cancels out the exponent

when the exponent is a fraction

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

e.g. $a^{\frac{1}{3}} = \sqrt[3]{a} \rightarrow (a^{\frac{1}{3}})^3 = a$

$$\left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^m$$

e.g.

$2^2 = 4$) $\div 2$
$2^1 = 2$) $\div 2$
$2^0 = 1$) $\div 2$
$2^{-1} = \frac{1}{2}$) $\div 2$
$2^{-2} = \frac{1}{4}$

exponent goes down by 1

multiplying

$$a^m \cdot a^n = a^{m+n}$$

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{a \cdot b}$$

When one of the factors has a perfect root, you can simplify

e.g.

$\sqrt{20} = \sqrt{4} \cdot \sqrt{5}$

$= 2\sqrt{5}$