Exponent: 1/n

Rational Exponents

Consider the following:

$\sqrt{4} = \sqrt{2^2} = 2^1 = 2$ $\qquad$ $\sqrt[3]{8} = \sqrt[3]{2^3} = 2^1 = 2$

$\sqrt{16} = \sqrt{2^4} = 2^2 = 4$

$\sqrt{64} = \sqrt{2^6}$ or $\sqrt{64} = 8$ or $\sqrt{2^6} = 2^3$

$\sqrt[3]{64} = \sqrt[3]{2^6}$ or $\sqrt[3]{64} = 4$ or $\sqrt[3]{2^6} = 2^2$

What is the relationship between the power (the exponent) and the index (the root) and the exponent of the answer?

What is $\sqrt{4^6}$ = _____ $\qquad$ What is $\sqrt[3]{10^{12}}$ = _____

What have you discovered? $\sqrt[n]{x^m} = x^{m/n} = x^{\frac{power}{root}}$

The numerator (m) indicates the **power** to which the base is to be raised, and
The denominator (n) indicates the **index** [**root** to be taken].

If the rational exponent can be reduced, do so. $\sqrt[4]{3^8} = 3^{8/4} = 3^2 = 9$

Definition of $a^{1/n}$

If *n* is any positive integer, then $a^{1/n} = \sqrt[n]{a}$, provided that $\sqrt[n]{a}$ is a real number.

$256^{1/4} = \sqrt[4]{256} = 4$ $\qquad$ $(-8)^{1/3} = \sqrt[3]{-8} = -2$ $\qquad$ $\left(\frac{81}{16}\right)^{1/4} = \sqrt[4]{\frac{81}{16}} = \frac{\sqrt[4]{81}}{\sqrt[4]{16}} = \frac{3}{2}$

TRY:

Rewrite as a radical and evaluate.

$16^{1/2}$ $\qquad$ $(-32)^{1/5}$ $\qquad$ $\left(\frac{27}{125}\right)^{1/3}$