$\sqrt{}$ This symbol is called a radical

it indicates finding a root, i.e. undoing an exponent.

The number in this spot is called the Index.

It indicates what root you are finding.

If there is no index it means Square Root.

$\sqrt[n]{a}$

This quantity is called the Radicand

$6^2 = 36$ and $(-6)^2 = 36$

What are the real square roots of 36? ± 6

What are the real square roots of 81? ± 9

Why are there no real square roots of -36?

Because no real number squared will equal -36

How many real square roots does any positive number have? 2

$3^4 =$ 81 $(-3)^4 =$ 81

What are the real fourth roots of 81? ± 3

What are the real fourth roots of 2401? ± 7

Are there any real fourth roots of -256?

No. No real number raised to the fourth power will be negative.

How many real fourth roots does any positive number have? 2

$5^3 =$ 125 $(-5)^3 =$ -125

How many cube roots does 125 have? 1

Find the cube root of -125 $\sqrt[3]{-125} = -5$

Find the cube root of -512 $\sqrt[3]{512} = -8$

How many cube roots does any number have? 1

The cube root of any number has what sign?

The same sign as the radicand

The number of REAL nth roots of a radicand.

$\sqrt[n]{\text{Radicand}}$

Radicand is	Index is even	Index is odd
Positive	2	1
Zero	1	1
Negative	0	1

There are 2 even roots of every positive number.

$-\sqrt{}$ asks for the Negative Root

$\pm\sqrt{}$ asks for the Pos & Neg Roots

$\sqrt{}$ asks for the Positive Root

The radical symbol $\sqrt{}$ by itself
means the positive root.
Also known as the PRINCIPAL ROOT

What numbers could you square and get 81? ±9

What are the square roots of 49? ±7

Solve. $x^2 = 36$ ±6

Simplify. $\sqrt{441}$ 21

no symbol in front of the radical means the positive answer

Solve. $x^2 = 25$

This is asking you to find all the numbers you could square and get 25.
Find ALL the square roots of 25.

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

Simplify: $\sqrt{25} = 5$

in this situation $\sqrt{\ }$ indicates the Principal Root

When there are two roots the Principal Root is the positive root.

$\sqrt[3]{-64} = -4$

$\sqrt[3]{125} = 5$

The answer to an odd root has the Same sign as the radicand.

Why is there no principal root of an odd radical?

By definition the Principal Root is the pos
when there are two roots but an odd radi
only one answ

$4^3 = 64$

$4^2 = 16$

$4^1 = 4$

$4^{\square} = \square$

$4^0 = 1$

Given the pattern shown the missing exponent must be one-half. It turns out this equals 2.

$4^{\frac{1}{2}} = 2$

$$4^{\frac{1}{2}} = \sqrt{4}$$

The exponent one-half actually represent the square root.

Rational exponents represent radicals.

The denominator of the rational exponent represents the INDEX of the radical.

If $4^{\frac{1}{2}} = \sqrt{4}$, then

what do these represent?

$4^{\frac{1}{3}} = \sqrt[3]{4}$ the cube root of 4

$4^{\frac{1}{4}} = \sqrt[4]{4}$ the fourth root of 4

$4^{\frac{1}{5}} = \sqrt[5]{4}$ the fifth root of 4

What would this represent?

$4^{\frac{1}{n}} = \sqrt[n]{4}$ the "n^{th}" root of 4

If $\sqrt{x} = x^{\frac{1}{2}}$

How would you write this as a power of x? $\sqrt{x^3}$

$$\sqrt{x^3} = x^{\frac{3}{2}}$$

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$ "the nth root of a"

The denominator of the rational exponent represents the INDEX of the radical.

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

Get a small white board, marker, and rag.

Write in exponential form:

This means to write each using rational exponents.

1. $\sqrt[4]{g^9}$

$g^{\frac{9}{4}}$

2. $\sqrt{h^5}$

$h^{\frac{5}{2}}$

3. $\sqrt[7]{a}$

$a^{\frac{1}{7}}$

Write in exponential form:

4. $\sqrt[5]{3c^2}$

$= (3c^2)^{\frac{1}{5}}$

or

$3^{\frac{1}{5}} c^{\frac{2}{5}}$

5. $\sqrt[4]{(11e)^7}$

$= (11e)^{\frac{7}{4}}$

or

$11^{\frac{7}{4}} e^{\frac{7}{4}}$

Write in exponential form:

6. $\sqrt[9]{x^3}$

$= x^{\frac{3}{9}}$

$= x^{\frac{1}{3}}$

7. $\sqrt{(2mn)^8}$

$= (2mn)^{8/2}$

$= (2mn)^4$

$= 16m^4n^4$

Write each in radical form.

1. $w^{\frac{2}{11}}$

$= \sqrt[11]{w^2}$

or

$\left(\sqrt[11]{w}\right)^2$

2. $k^{\frac{5}{2}}$

$= \sqrt{k^5}$

or

$\left(\sqrt{k}\right)^5$

3. $x^{\frac{1}{7}}$

$= \sqrt[7]{x}$