Calculate powers and roots of real numbers :

Exponents

An exponent (or power) tells you how many times the base number appears as a factor. In the expressions 2^4, two is the base and four is the exponent. Here are a few rules to remember when evaluating exponents:

- 1. A base with an exponent of 0 equals 1
- 2. A base with exponent of 1 equals the base of the number
- 3. A positive base with a positive exponent equals a positive number
- 4. A negative base with an even exponent equals a positive number
- 5. A negative base with an odd exponent equals a negative number
- 6. A base with a negative sign in front equals a negative number
- 7. A base with a negative exponent equals the reciprocal of the base with a positive exponent.

Activity 1

Each of the following problems matches one of the rules above. First, simplify the problem and then match it to the rule above.

A. 10^0 B. 5^{-3} C. $(-3)^2$ D. 4^2

E. 10^1 F. -3^3 G. $(-3)^3$

Roots

The *n*th root of a number x is represented by the symbol $\sqrt[n]{x}$. The $\sqrt{\ }$ is called the radical sign, the *n* is called the index (tells which root to take), and *x* is called the radicand. Finding the *n*th root of a number is the inverse of raising a number to the *n*th power. Therefore, $\sqrt[n]{x} = r$ if and only if $r^n = x$. If *n* is even, then there are two roots of *x*, *r* and $-r$, since both $r^n = x$ and $(-r)^n = x$. Most times, however, $\sqrt[n]{x}$ represents the principal or positive, *n*th root of *x*.

Simplify square roots and cube roots (with variables) :

Monomial

A monomial is a single term that is a product of constants and variables. Sometimes the variables of a monomial have an exponent. You can identify monomials that are perfect squares and perfect cubes.

Perfect squares

A perfect square monomial has a perfect square coefficient and even exponents on every variable. To find the square root of a monomial, find the square root of the coefficient and divide the exponent(s) of the variable(s) by 2. Recall that each perfect square has two roots, one positive and one negative. So, which root should you use? In most cases, you will use the positive (principal) square root.

Perfect cubes

A perfect cube monomial has a perfect cube coefficient and exponents that are multiples of three. To find the cube root of a monomial, find the cube root of the coefficient and divide the exponent(s) of the variable(s) by 3.

Solve Square root radical equations :

Radical equations

A radical equation has a variable in the radicand (the term inside the $\sqrt{\ }$). To solve a radical equation, you need to understand that squaring an expression and evaluating the square root of an expression are inverses. For example, remember that addition and subtraction, as well as multiplication and division, are inverses. The following shows how the squaring and the square root processes are related.

- $\left(\sqrt{x}\right)^2 = x$
- $\left(\sqrt{4x-3}\right)^2 = 4x-3$
- $\left(\sqrt{3x^2+4x-2}\right)^2 = 3x^2+4x-2$

To solve any radical equation:

- Isolate the term with the $\sqrt{\ }$. (Get it by itself on one side of the equal sign)
- Square both sides of the equation.
- Solve the remaining equation; check for any extraneous roots (roots that do not satisfy the original equation)