

Other Operations on Real Numbers

Exponents

Just as multiplication is shorthand notation for repeated addition of Whole Numbers, exponents are shorthand notation for repeated multiplication of Whole Numbers. The factor that is repeated is called the **base**; the number of times it is repeated is called the **exponent**. In the example below, the base is 3 and the exponent is 4, and we say “3 raised to the 4th power”: $3 * 3 * 3 * 3 = 3^4$

When a number is raised to the 1st power, we usually do not write the 1, $2^1 = 2$

When a number is raised to the 2nd power, we usually say that number is squared.

When a number is raised to the 3rd power, we usually say that number is cubed.

When a negative number is raised to an even power, the result is positive.

When a negative number is raised to an odd power, the result is negative.

WARNING!

$$-2^2 = -4$$

$$(-2)^2 = +4$$

This is because of the Order of Operations (see below), Exponents are evaluated before Subtraction is performed, in this case the application of the minus sign!

Examples:

$$3^4 = 81$$

$$5^3 = 125$$

$$23^5 = 6436343$$

Roots or Radicals

The symbol $\sqrt{\quad}$ is used to denote the square root of what is inside. $\sqrt{4} = 2$, means that when 2 is squared we get 4. When no sign, + or -, is in front of the radical we want the positive root.

The symbol is also called a radical sign, $\sqrt[a]{b}$, this time we want to know what number raised to the a power will give us b, or we can say what is the ath root of b, for some whole number a, and some real number b.

When taking the square root or nth root, we are undoing exponents.

When looking for a square or other even root, we cannot have a negative under the radical and have a real number solution.

Examples:

$$\sqrt{4} = 2$$

$$\sqrt{100} = 10$$

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

$$\sqrt[5]{6436343} = 23$$