SETS OF NUMBERS

Natural (or Counting) Numbers
$\boldsymbol{N}$ **= {1, 2, 3, 4, 5, ...}**

Makes sense, we start counting with the number 1 and continue with 2, 3, 4, 5, and so on.

Whole Numbers
{0, 1, 2, 3, 4, 5, ...}

The only difference between this set and the one above is that **this set not only contains all the natural numbers, but it also contains 0,** where as 0 is not an element of the set of natural numbers.

Integers
$\boldsymbol{Z}$ **= {..., -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, ...}**

This set **adds on the negative counterparts to the already existing whole numbers** (which, remember, includes the number 0).

The natural numbers and the whole numbers are both subsets of integers.

Rational Numbers

$Q = \{ \frac{a}{b} \mid$ **a and b are integers and** $b \neq 0 \}$

In other words, **a rational number is a number that can be written as one integer over another.**

Be very careful. **Remember that a whole number can be written as one integer over another integer.** The integer in the denominator is 1 in that case. For example, 5 can be written as 5/1.

The natural numbers, whole numbers, and integers are all subsets of rational numbers.

Irrational Numbers

$I = \{x \mid x$ **is a real number that is not rational**$\}$

In other words, an irrational number is a number that can not be written as one integer over another. It is a non-repeating, non-terminating decimal.

One big example of irrational numbers is roots of numbers that are not perfect roots - for example $\sqrt{17}$ or $\sqrt[3]{5}$. 17 is not a perfect square - **the answer is a non-terminating, non-repeating decimal, which CANNOT be written as one integer over another**. Similarly, 5 is not a perfect cube. It's answer is also a non-terminating, non-repeating decimal.

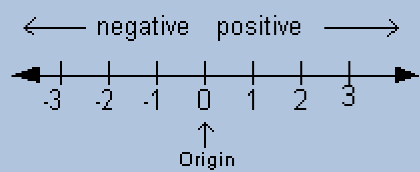
Another famous irrational number is π (pi). Even though it is more commonly known as 3.14, that is a rounded value for pi. Actually it is 3.1415927... It would keep going and going and going without any real repetition or pattern. In other words, it would be a non terminating, non repeating decimal, which again, can not be written as a rational number, 1 integer over another integer.

Real Numbers

***R* = {*x* | *x* corresponds to point on the number line}**

Any number that belongs to either the rational numbers or irrational numbers would be considered a real number. That would include natural numbers, whole numbers and integers.

Real Number Line



Above is an illustration of a number line. **Zero**, on the number line, is called the **origin**. It separates the **negative numbers (located to the left of 0)** from the **positive numbers (located to the right of 0)**.

I feel sorry for 0, it does not belong to either group. It is neither a positive or a negative number.

Examples:

1. List the elements of the following sets that are also elements of the given set {-4, 0, 2.5, π, $\sqrt{22}$, $\sqrt{25}$, 11/2, 7}

a. Natural numbers:

b. whole numbers:
c. integers:
d. rational numbers:
e. irrational numbers:
f. real numbers:

2. List the elements of the following set that are also elements of the given set: {-1.5, 0, 2, $\sqrt{9}$, $\sqrt{11}$ }

a. Natural numbers:
b. whole numbers:
c. integers:
d. rational numbers:
e. irrational numbers:
f. real numbers: