

Essential Question: What are the sets of real numbers?

Sets of Numbers

Natural: The set of natural numbers is comprised of the counting numbers

$$N = \{1, 2, 3, \dots\}$$

Whole: The set of whole numbers includes the set of counting numbers + zero

$$W = \{0, 1, 2, 3, \dots\}$$

Integers: The set of whole numbers and their opposites

$$Z = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$$

Rational: A rational number is a number that can be expressed as a ratio of 2 integers, $\frac{a}{b}$ where a and b both represent integers. $b \neq 0$

$$Q = \{\text{rational \#s}\}$$

ex. $-\frac{7}{5}$ $\sqrt{49}$ $.721$
 $.145\overline{145}$

includes decimals that are terminating or repeating with the same exact pattern

Irrational: Irrational Numbers cannot be expressed as a ratio of 2 integers. These numbers include non-terminating, non-repeating decimals.

complement of Q

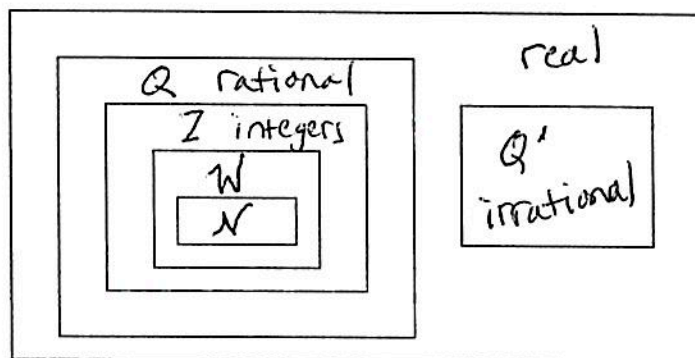
$$\rightarrow Q' = \{\text{irrational \#s}\}$$

ex. π

$.1535335333\dots$

$\sqrt{17}$ non perfect square

Real: The real number system is the combined set of rational and irrational numbers.





Here's a little something extra

Imaginary Number: An *imaginary number* is a mathematical term for a number whose square is a negative real number. Imaginary numbers are represented with the letter i , which stands for the square root of -1 ($\sqrt{-1} = i$). Any imaginary number can be represented by using i . For example, the square root of -4 is $2i$.

$$\text{ex. } \sqrt{-25} = \sqrt{25}\sqrt{-1} \\ = 5i$$

Complex Number: A *complex number*, in mathematics, is a number comprising of a real number part and an imaginary number part; it can be written in the form $a + bi$, where a and b are real numbers, and i is the imaginary unit.

$$\text{ex. } 3 + 7i$$

Examples:

- List all the whole numbers less than 10. $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$
- List all natural numbers between 4 and 9. $\{5, 6, 7, 8\}$
- List all integers less than or equal to 3. $\{\dots, -2, -1, 0, 1, 2, 3\}$
- List the set of whole numbers less than 0. $\{\}$ or \emptyset
empty null
- T/F: Between any two whole numbers there is another whole number. False 3 and 4
- Is every whole number an integer? Yes
- Is every integer a whole number? no ex. -3
- T/F: Some numbers are both rational and irrational. no totally separate
- T/F: There is a fraction that will produce the decimal .34334333433334 etc. False
(it's irrational)
- A/S/N: The square root of a natural number is rational. S $\sqrt{36} = 6$
 $\sqrt{17} = \text{irrational}$
- A/S/N: A rational number divided by a rational number equals a rational number. S
(exception \div by 0)