

Section 2.1 Organization of Numbers

Real Numbers (\mathbb{R}): Every number we will meet in this course is a real number. The symbol \mathbb{R}^+ means all positive Reals. Remember... 0 is not considered to be positive or negative.

Rational Numbers (\mathbb{Q}): The word “rational” contains the word “ratio.” This is a clue. All numbers that can be described as ratios (fractions, integers, terminating decimals, repeating decimals) are rational numbers. The symbol comes from the word Quotient.

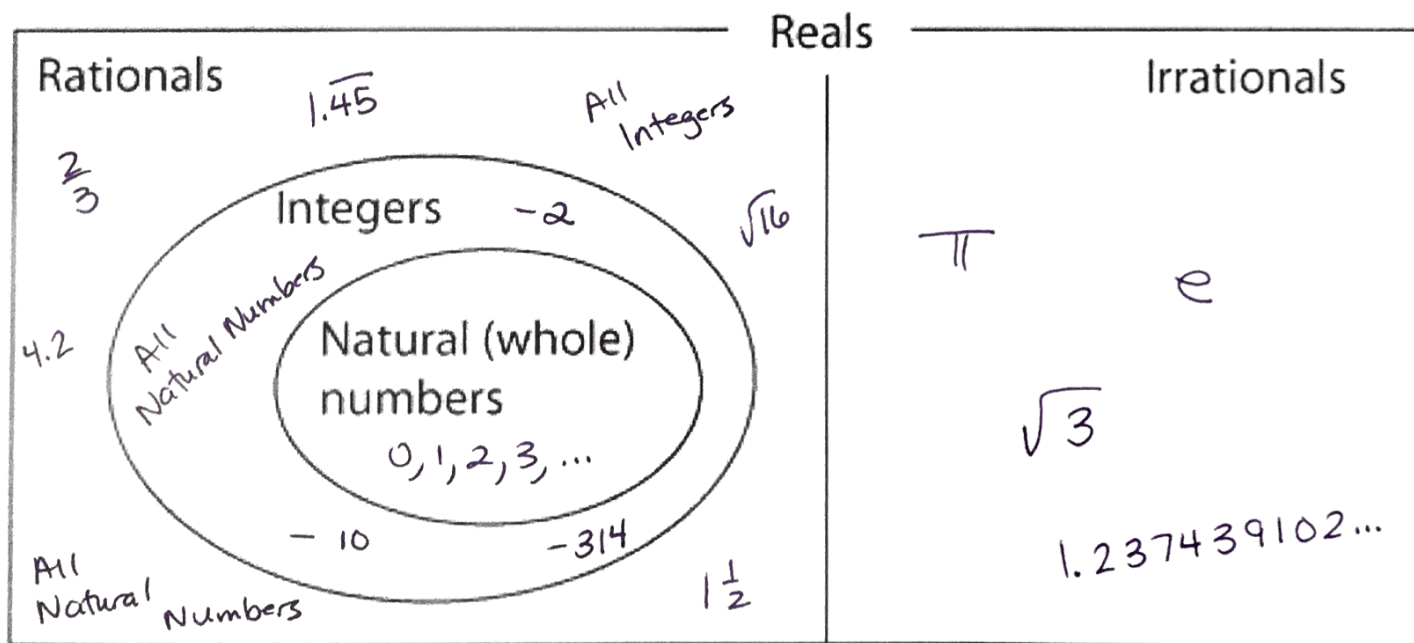
Note: Other numbers, like decimals that don't end or repeat in any place (such as the square root of 5, π and the natural number e) are irrational.

The symbol for irrational is \mathbb{Q}'

Integers (\mathbb{Z}): These are positive whole numbers, negative whole numbers and zero. The symbol comes from the German word “Zahlen” which means number.

Natural Numbers (\mathbb{N}): These are the numbers that you can count using your fingers. In this course that means 0, 1, 2, etc.

Note: In some places Natural Numbers mean 1, 2, 3, etc. Whole Numbers mean 0, 1, 2, 3, etc. Our course doesn't use the term Whole Numbers.



Example: Consider the numbers below and the sets \mathbb{N} , \mathbb{Z} , \mathbb{Q} , and \mathbb{R} . Complete the following table by placing a check mark in the appropriate box if the number is an element of the set.

	\mathbb{N}	\mathbb{Z}	\mathbb{Z}^+	\mathbb{Q}	\mathbb{Q}'	\mathbb{R}
$\sqrt{3}$					✓	✓
72	✓	✓	✓	✓		✓
-5		✓		✓		✓
$\frac{70}{14}$ (aka 5)	✓	✓	✓	✓		✓
6.4				✓		✓
7	✓	✓	✓	✓		✓
$-\sqrt{196}$ (aka -14)		✓		✓		✓
$\frac{2}{9}$				✓		✓
$-\sqrt{12}$					✓	✓

Example: A is defined to be the set of numbers $\{-5, 1, -2.5, -2, 0, \sqrt{2}, \sqrt{9}, 12\}$

a) List the elements in A but not in \mathbb{N}

The only Natural Numbers are 0 and 12... so $\{-5, 1, -2.5, -2, \sqrt{2}, \sqrt{9}\}$

b) List the elements in A and in \mathbb{Q}

The only number NOT Rational is $\sqrt{2}$... so $\{-5, 1, -2.5, -2, 0, \sqrt{9}, 12\}$

Note: Prime numbers are numbers greater than 1 whose only factors are 1 and itself.

Example: 7 is prime... its factors are 1 and 7. 14 is not prime... its factors are 1, 2, 7, and 14.