

Tishk International University
Architecture Department
First Grade
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Calculus

Lecture -1- Set of Numbers

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1. Natural Numbers

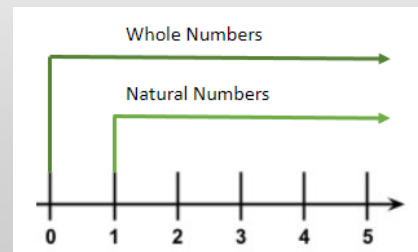


- Natural numbers are also called “counting numbers” which contains the set of positive integers from 1 to infinity. The set of natural numbers is represented by the letter “N”. The natural number set is defined by:
- $N = \{1, 2, 3, 4, 5, \dots\}$
- Examples: 35, 59, 110, etc.

2. Whole Numbers



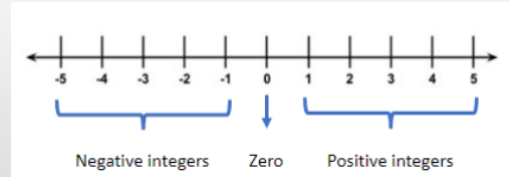
- Whole numbers are also known as natural numbers with zero. The set consists of non-negative integers where it does not contain any decimal or fractional part. The whole number set is represented by the letter “W”. The natural number set is defined by:
- $W = \{0, 1, 2, 3, 4, 5, \dots\}$
- Examples: 67, 0, 49, 52, etc.



3. Integers

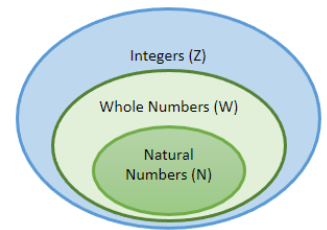


- Integers are defined as the set of all whole numbers with a negative set of natural numbers. The integer set is represented by the symbol “Z”. The set of integers is defined as:



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

- Examples: -52, 0, -1, 16, 82, etc.

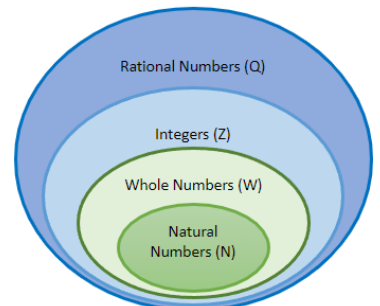


4. Rational Numbers



- Any number that can be written in the form of p/q , i.e., a ratio of one number over another number is known as rational numbers. A rational number can be represented by the letter “Q”.

- Examples: $7/1$, $10/2$, $1/1$, etc.



5. Irrational Numbers



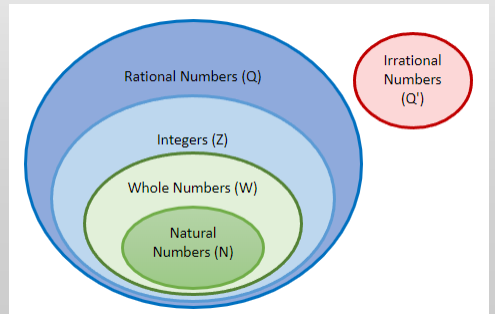
- The number that cannot be expressed in the form of p/q . It means a number that cannot be written as the ratio of one over another is known as irrational numbers. It is represented by the letter "P".
- Examples: $\sqrt{2}$, π , Euler's constant, etc

- $\sqrt{2} = 1.41421356237 \dots$
- $\sqrt{3} = 1.7320508075 \dots$
- $\sqrt{5} = 2.2360679774 \dots$
- $\pi = 3.14159265358 \dots$

As you can see

- *Number of decimals are unlimited and*
- *They are not similar to each other.*

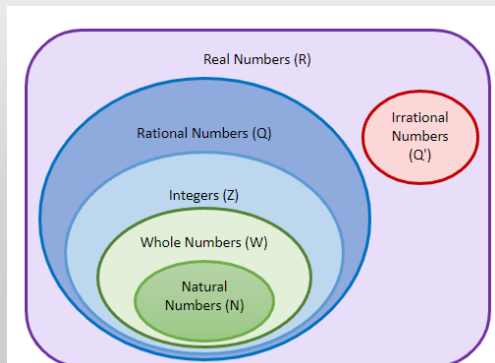
Therefore, they are irrational number.



6. Real Numbers



- Real numbers include all the numbers that you can think of, which you can find in the real world, apart from imaginary numbers.
- Any number such as positive integers, negative integers, fractional numbers or decimal numbers without imaginary numbers are called the real numbers. It is represented by the letter "R".
- Examples: $\frac{3}{4}$, 0.333, $\sqrt{2}$, 0, -10, 20, etc.



7. Imaginary Numbers



- We know that we can't take the square root of negative numbers, because there is no number that when squared will result in a negative number. In this case, we need to use imaginary numbers.
- The imaginary numbers are categorized under complex numbers. It is the product of real numbers with the imaginary unit "i". The imaginary part of the complex numbers is defined by $\text{Im}(Z)$.
- $i = \sqrt{-1}$
- Examples: $\sqrt{2}$, $i2$, $3i$, etc.
- Example: What is the square root of -16? Write your answer in terms of the imaginary number i .

Answer = $4i$

- $1 \times i = i$
- $i \times i = -1$
- $-1 \times i = -i$
- $-i \times i = 1$

8. Complex Numbers



- An imaginary number is combined with a real number to obtain a complex number. It is represented as $a + bi$, where a is the real part and b is the complex part of the complex number.

$$\underbrace{a}_{\text{Real Part}} + \underbrace{ib}_{\text{Imaginary Part}}$$

Set of Numbers Test -1-

20-12-2023



1. _____ is the set of numbers that includes positive and negative numbers.
 - A. Whole numbers
 - B. Rational numbers
 - C. Natural numbers
 - D. Integers

2. To which number set does -3.5 belong?
 - A. Real numbers
 - B. Whole numbers
 - C. Natural numbers
 - D. Integers

3. The number that can be written as a fraction is _____ .
 - A. Natural number
 - B. Rational number
 - C. Whole number
 - D. All of the above

4. Which number set would be best used to measure temperatures?
 - A. Whole numbers
 - B. Natural numbers
 - C. Integers
 - D. None of the above

5. Choose the equation(s) that fit the pattern $N/N = 1$.

- A. $3/3 = 1$
- B. $0/0 = 1$
- C. $1,435/1,435 = 1$
- D. $1.5/1.5 = 1$

6. Which number is not an integer?

- A. -1
- B. 0
- C. $7/1$
- D. 4.3

7. Identify the set(s) to which the number $-1/8$ belongs.

- A. Natural numbers
- B. Whole numbers
- C. Integers
- D. Rational numbers

8. Choose the rational number between 1 and 4.

- A. 2
- B. $3/2$
- C. 3
- D. $1/2$



References

- Thomas-Calculus-14th-Edition
- Internet sources

