

Leadership for Academicians Programme

(LeAP)

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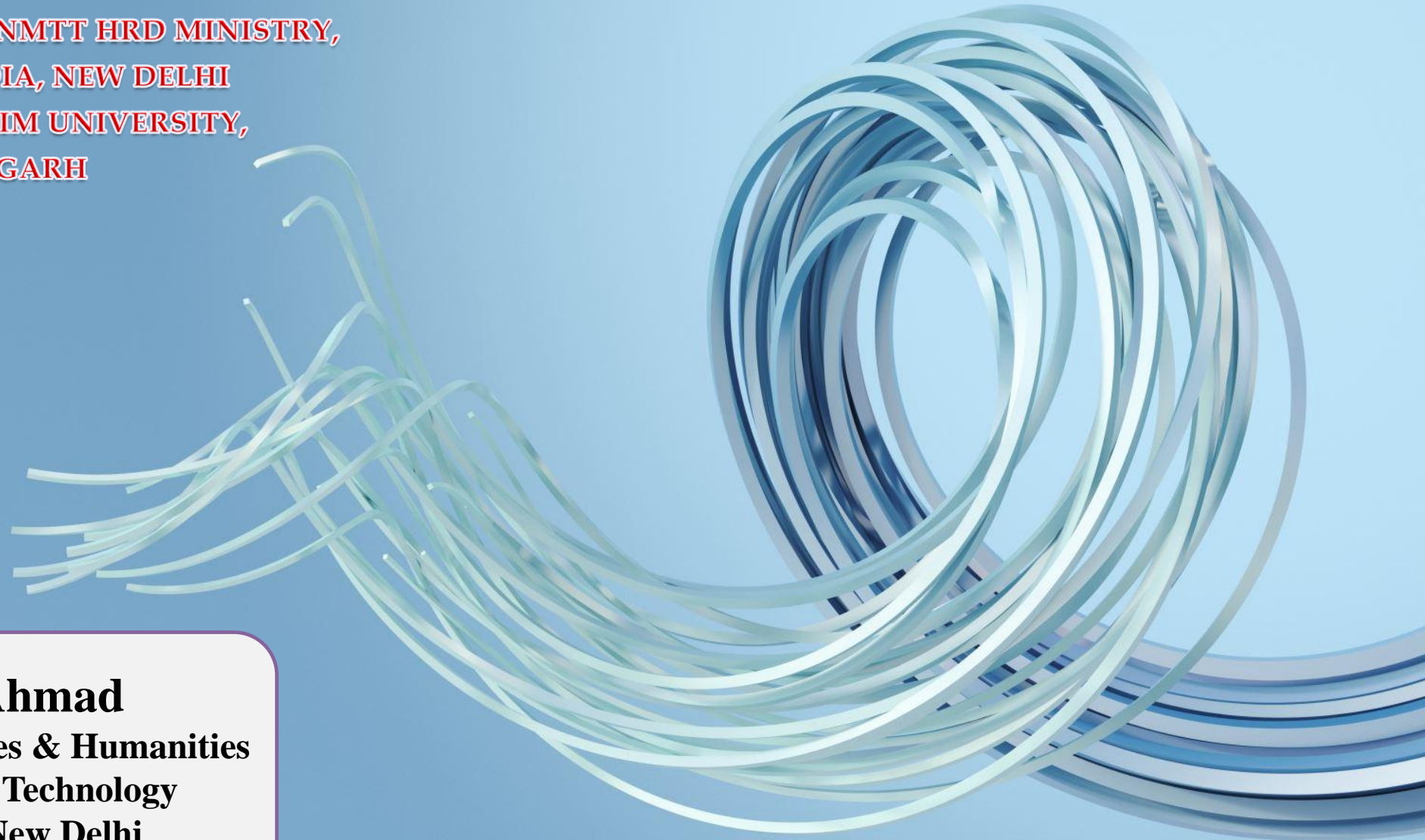
GOVT OF INDIA, NEW DELHI

ALIGARH MUSLIM UNIVERSITY,

ALIGARH



Jamia Millia Islamia






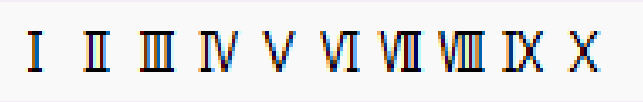
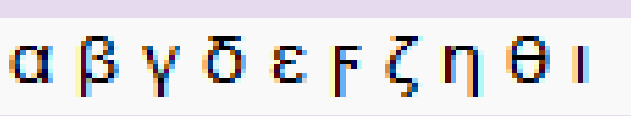

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DIFFERENT TYPES OF NUMERALS

Name:	Sample:	Approx. first appearance:
Babylonian numerals		3100 BC
Chinese numerals, Japanese numerals, Korean numerals		Unknown
Hindu-Arabic Numerals		1st century
Roman numerals		1000 BC
Greek numerals		After 100 BC
Chinese rod numerals		1st century

NUMBER SYSTEM

- A number system is a writing system for expressing numbers, that is, a mathematical notation for representing numbers of a given set, using digits or other symbols in a consistent manner.
- The number system we have today, commonly called Hindu-Arabic Numerals.
- It came about because human beings wanted to solve problems and mainly, wanted to know the quantity of a particular thing. So they started creating numbers to solve these problems.
- In olden days, The **counting numbers** satisfied people for a long time.

For example: Counting through fingers



NATURAL NUMBER

- The natural numbers are the ordinary numbers, 1, 2, 3, . . . with which humans count. Sometimes they are called the counting numbers. Natural numbers have been called natural because much of human experience from infancy deals with discrete objects such as fingers, balls, peanuts, etc. People quickly, if not naturally, learn to count them.
- The natural numbers are presumed to have started before recorded history when humans began to count things. The Babylonians developed a place-value system based on the numerals for 1 (one) and 10 (ten). The ancient Egyptians added to this system to include all the powers of 10 up to one million. Natural numbers were first studied seriously by such Greek philosophers and mathematicians as Pythagoras (582–500 BC) and Archimedes (287–212 BC).
- Natural numbers are represented by \mathbb{N} .



DISCOVERY OF ZERO

- Though humans have always understood the concept of nothing or having nothing, the concept of zero is relatively new.
- They wanted to find some number to represent a nil value. So they found 0 to represent a nil value.
- Many mathematicians of different era has suggested for symbolizing '**NOTHING**'. Then they introduced the symbol "0" for symbolizing nothing, to the world and made complicated things easier.
- Indian texts used a Sanskrit word Shunye or shunya to refer to the concept of void. In mathematics texts this word often refers to the number zero.

INTEGERS

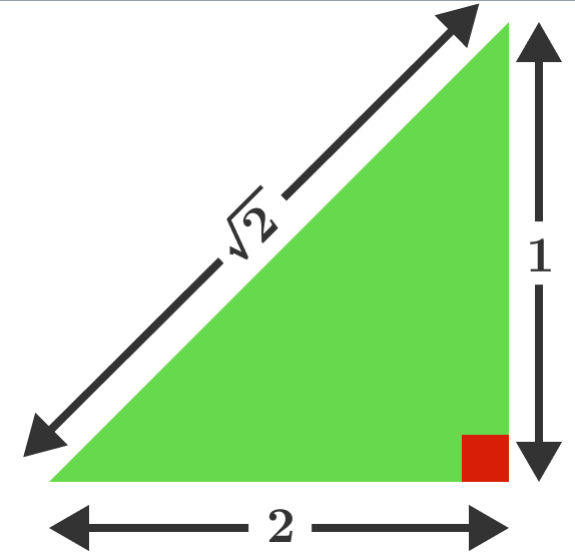
- When mathematician solved the equation of the type $x + 2 = 0$ the solution was $x = -2$, which is not a natural number so a new number system was discovered at that time and mathematician of that time called it integers number system.
- Integers are union of natural numbers, negative natural numbers and zero. When you add/subtract/multiply two integers together you will always get an integer as the result.
- However dividing two integers could end in a non-integer.
- The integer was introduced in the year 1563 by Arbermouth Holst.
- Then in 1890 Japanese mathematicians worked on it and created 'integers'. A latin word meaning "untouched".
- The symbol for integers is a 'Z' because of 'Zahlen', the German word for integers or number.

RATIONAL NUMBERS

numerator and a non-zero integer denominator.

- When mathematician solved the equation of the type $3x + 2 = 0$ the solution was $x = -2/3$, which is not a natural number or an integer so a new number system was discovered at that time and mathematician of that time called it rational number system.
- Pythagoras is the ancient Greek mathematician who mainly invented the rational numbers.
- The field of rational numbers is usually denoted by a boldface **Q**

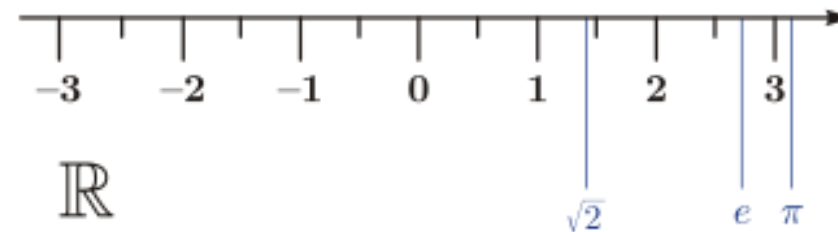
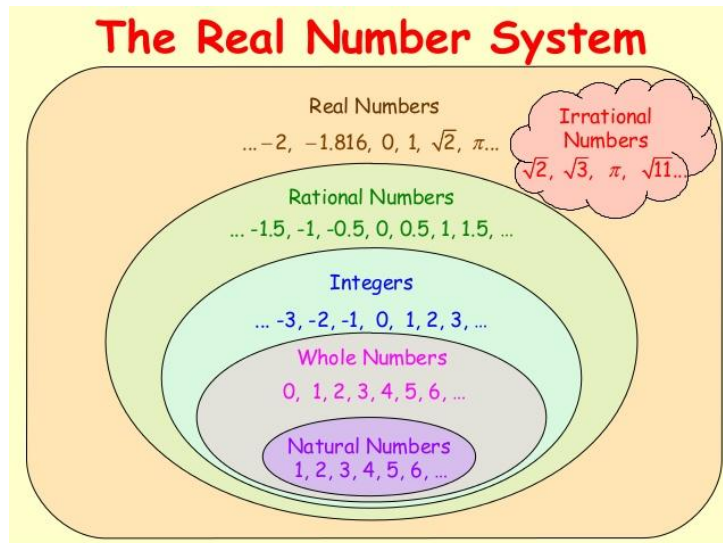
IRRATIONAL NUMBERS



- Hippassus of Metapontum was an Ancient Greek philosopher of the Pythagorean school of thought. Supposedly, he tried to use his teacher's famous theorem $a^2 + b^2 = c^2$ to find the length of the diagonal of a unit square. This revealed that a square's sides are incommensurable with its diagonal, and
- that this length cannot be expressed as the ratio of two integers. So they invented a new number system called irrational number system.
- The set of irrational number is denoted by IR .

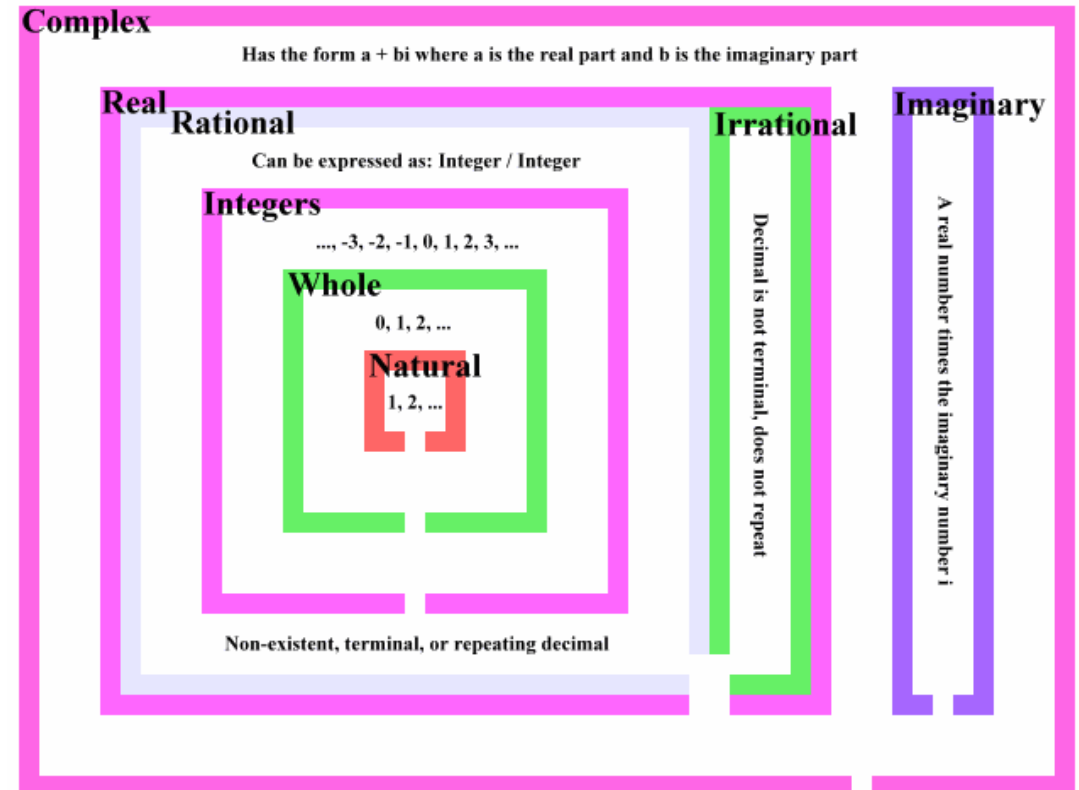
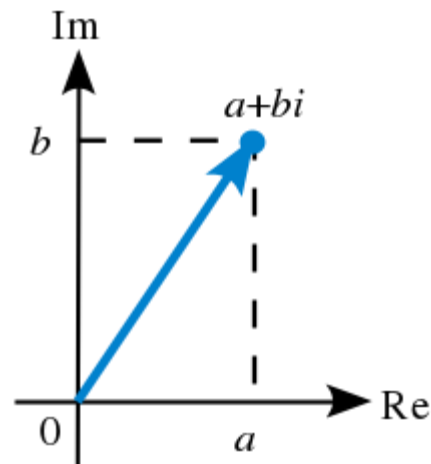
REAL NUMBERS

- In mathematics, a real number is a value of a continuous quantity that can represent a distance along a line. The adjective real in this context was introduced in the 17th century by René Descartes. The real numbers include all the rational numbers, such as the integer -5 and the fraction $4/3$, and all the irrational numbers, such as $\sqrt{2}$ (1.41421356..., the square root of 2, an irrational algebraic number). Included within the irrationals are the transcendental numbers, such as π (3.14159265...). In addition to measuring distance, real numbers can be used to measure quantities such as time, mass, energy, velocity, and many more.
- Real numbers can be thought of as points on an infinitely long line called the number line or real line, where the points corresponding to integers are equally spaced. Any real number can be determined by a possibly infinite decimal representation, such as that of 8.632, where each consecutive digit is measured in units one tenth the size of the previous one.



COMPLEX NUMBER SYSTEM

- When the equation of the type $x^2 + 4 = 0$ appeared, the mathematician solved it as $x = \pm\sqrt{-4}$ but the square of a real number can never be a negative quantity. So they called it as an imaginary quantity.
- A complex number is a number that can be expressed in the form $a + bi$, where a and b are real numbers, and i is a solution of the equation $x^2 = -1$. Because no real number satisfies this equation, i is called an imaginary number. For the complex number $a + bi$, a is called the real part, and b is called the imaginary part.
- A complex number of the form $a + ib$ can be represented as a point in the plane as depicted in the figure.





Thank you