Introducotion to real numbers

1_ Natural numbers (N):

The set of natural number is denoted by N

N={1,2,3,4,5,.....}

3∈ N, 5∈ N

3+5=8 ∈ N

N is closed under the operation of

Addition and miltepiction

1∈ N , 4∈ N,

N is closednot under the operation of subtruaction and division

$1-4=-3 \notin N$

$5 \in N, 7 \in N, \frac{5}{7} \notin N$

2_ Integer numbers (z):

$z=\{\ldots\ldots,-3,-2,-1,0,1,2,3,\ldots.\}$

z is closed under addition,multipication and subtraction and closednot under division .

$1-5=-4 \in z$

$-2*-3=6 \in z, 4-1=3 \in z, \frac{1}{5} \notin z$

3- **Rational numbers Q:**

$$Q = \{\frac{P}{q} , p, q \in Z , q \neq 0\}$$

Q is closed under (+,- ,∗, /)

4- **Irrational numbers $\boldsymbol{Q}^*$:**

$\sqrt{2}$, $\sqrt{7}$, π , e

5- **Real numbers :**

$$\mathrm{R} = \mathrm{Q} \cup Q^*$$

$$\mathrm{R} = (-\infty, \infty)$$

6- **Complex numbers :**

$$\mathrm{C} = \{\mathrm{a} + \mathrm{ib} : \mathrm{a}, \mathrm{b} \in R , i = \sqrt{-1} \}$$

Intervals

Let a,b be areal with a$< b$

1- The open interval defind by
   $(a, b) = \{x: a < x < b\}$
2- The closed interval defind by
   $[a, b] = \{x: a \leq x \leq b\}$
3- The half open interval defind by
   $[a, b) = \{x: a \leq x < b\}$

$(a, b] = \{x: a < x \leq b\}$

Absolut evalues :

The absolut evalues of real number is defind by

$|x| = \{x\ it\ x \geq 0\}$

$|x| = \{-x\ it - x < 0\}$

Properties:

1- $|x| \geq 0, x \in Q$

2- $|xy| = |x||y|, x, y \in Q$

3- $\left|\frac{x}{y}\right| = \frac{|x|}{|y|}\ , y \neq 0$

4- $|x + y| \leq |x| - |y|$

5- $|x - y| \geq |x| - |y|$

6- $|x| = \sqrt{x^2}$