Numbers

Complex numbers: $Z = R + iI$, R and I are Real numbers and: $i = \sqrt{-1}$

"R" Is the real part and "iI" is the imaginary part. *Ex.: Z = 2 – i3*

1. **Real numbers "*R*":** all numbers including "Rational" and "Irrational" numbers as follows.

Rational numbers "***Q***" is defined as the ratio of ($\frac{m}{n}$), m and n are Integers but n $\neq 0$. ***Q*** ∈***R***

The ratio can be summarized in one of the following cases:

Ex.: $\frac{-12}{4}$ *= - 3, an integer.*

$\frac{19}{8} = 2.375$, *an ending decimal.*

$\frac{7}{3} = 2.33333 \ldots = 2.\overline{3}$, *a repeating decimal.*

Note: A rational number cannot be an endless decimal, but due to limitation of number of digits in calculators sometimes the end or repeating digits cannot be seen:

$\frac{17}{13}$ = 1.30769230769 or $\frac{19}{23}$ = 0.82608695652

Natural numbers "***N***", are whole numbers used for counting: $\{0, 1, 2, 3, 4, 5, \ldots \ldots\}$. ***N*** ∈ ***Z*** ∈ ***Q*** ∈ ***R***

Note: In some sources, Zero is included in Whole numbers "W", but excluded in Natural numbers.

Integers "***Z***": are positive and negative natural numbers, **Z** = +/ **-** { ***N*** }. ***Z*** ∈ ***Q*** ∈ ***R***

Irrational numbers "$\overline{Q}$": or ***Q'***: are endless decimals, it happen in the case of "not perfect root". $\overline{Q} \in R$

Ex.: $\sqrt{5}$, $\sqrt[3]{4}$ *, this set also includes "π"= 3.14159265359 and "e" =2.71828182846 (natural log base).*

Transcendental numbers; π and e, means they are not a solution of an algebraic equation

Ex.: $x^2 - 5 = 0$ $in\ which$: $x = \mp\sqrt{5}$

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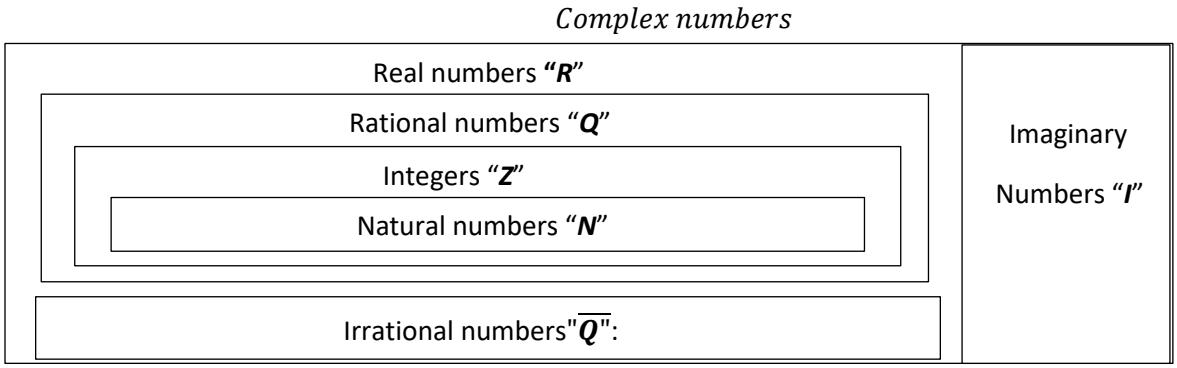
Numbers are summarized in the following diagram:



2. Imaginary numbers: are the square root of a negative number which will be treated with 2 separate factors: $\sqrt{-1}$ represented by "i" and a real number "***I***"

Ex.: $Z = 3 + \sqrt{-2} = 3 + i\sqrt{2}$

Notes: $i = \sqrt{-1}$ $\quad i^2 = -1$

$i^3 = -1i = -i$ $\quad i^4 = +1$

Prime Numbers:

Are natural numbers which are only divisible by 1, and themselves, means their only factors are 1 and themselves. 0, 1 are not a prime number.

Ex. $\{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 91, 97, \ldots.\}$

Factorial: n! = 1x2x3x4x5x…….. (n - 2).(n - 1).n

Ex.: 6! = 1.2.3.4.5.6 = 720

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