

Chapter 5

COMPLEX NUMBERS

Introduction:

In this chapter, we will learn about a new kind of number called as Complex number. Let us consider an equation $x^2 = 1$, then we happily conclude that 1, -1 are solutions of above equation but think of $x^2 = -1$.

Now what value of x will satisfy this? Here comes the introduction of complex numbers. For any real number, square of any real number can never be negative. So, we introduce a complex number called as iota (i) for which $i^2 = -1$. Here ' i ' is a complex number.

Complex Number:

Any number which is expressed in the form $z = x + iy$ where $x, y \in \mathbb{R}$ and $i^2 = -1$ or $i = \sqrt{-1}$ or $z = \{x + iy, x, y \in \mathbb{R}, i = \sqrt{-1}\}$.

For example, $2 + i.0$, $0 + i.2$, $2 + i$, $1 + 2i$ are complex numbers.

For any complex number $z = x + iy$, x is called as real part of z or $\text{Re}(z)$ and y is called as imaginary part of z (or) $\text{Im}(z)$.

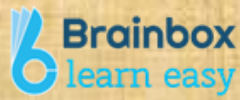
Thus, for $z = 2 + 3i$, $\text{Re}(z) = 2$ and $\text{Im}(z) = 3$.

For any complex number z , if $\text{Re}(z)$ is zero then z is called as purely imaginary.

For **example**, $z = 2i$, $-4i$ etc.

For any complex number z , if $\text{Im}(z)$ is zero then ' z ' is called as purely real.

Thus,



$$z = x + iy$$

If $x = 0$ then 'z' is purely imaginary

If $y = 0$ then 'z' is purely real

