CHAPTER – 1
NUMBER SYSTEM

1.1 INTRODUCTION

CLASSIFICATION OF NUMBERS

(I) Natural numbers:

Set of all non-fractional number from 1 to + ∞ , N = {1,2,3,4,....}.

(II) Whole numbers :

Set of numbers from 0 to + ∞ , W = {0,1,2,3,4,.....}.

(III) Integers :

Set of all-non fractional numbers from ∞ to + ∞ , I or Z = {...., -3,-2,-1,0,1,2,3,....}.

(IV) Rational numbers :

These are real numbers which can be expressed in the form of p/q, where **p** and **q** are integers and q ≠ 0.

e.g. 2/3, 37/15, -17/19.

- All natural numbers, whole numbers and integers are rational.
- Rational numbers include all Integers (without any decimal part to it), terminating fractions (fractions in which the decimal parts terminating e.g. 0.75, - 0.02 etc.) and also non-terminating but recurring decimals e.g. 0.666...., -2.333....., etc.

Fractions :

(a) Common fraction : Fractions whose denominator is not 10.

(b) Decimal fraction : Fractions whose denominator is 10 or any power of 10.

(c) Proper fraction : Numerator < Denominator i.e. $\frac{3}{5}$.

(d) Improper fraction : Numerator > Denominator i.e. $\frac{5}{3}$.

(e) Mixed fraction : Consists of integral as well as fractional part i.e. $3\frac{2}{7}$.

(f) Compound fraction : Fraction whose numerator and denominator themselves are fractions. i.e. $\frac{2/3}{5/7}$.

- Improper fraction can be written in the form of mixed fractions.

(v) Irrational Numbers :

All real number which are not rational are irrational numbers. These are non-recurring as well as non-terminating type of decimal numbers e.g. $\sqrt{2}, \sqrt[3]{4}, 2+\sqrt{3}, \sqrt{2+\sqrt{3}}, \sqrt[4]{7\sqrt{3}}$ etc.

(vi) Real numbers : Number which can represent actual physical quantities in a meaningful way are known as **real numbers.** These can be represented on the number line. Number line in geometrical straight line with arbitrarily defined zero (origin).

(vii) Prime number : All natural numbers that have one and itself only as their factors are called prime numbers i.e. prime numbers are exactly divisible by 1 and themselves. e.g. 2,3,5,7,11,13,17,19,23....etc. If P is the set of prime number then **P** = {2,3,5,7....}.

(viii) Composite numbers : All natural number, which are not prime are composite numbers. If C is the set of composite number then C = {4,6,8,9,10,12,.....}.

❖ 1 is neither prime nor composite number.

(ix) Co-prime numbers : If the H.C.F. of the given numbers (not necessarily prime) is 1 then they are known as co-prime numbers. e.g. 4, 9, are co-prime as H.C.F. of (4, 9) = 1.

❖ Any two consecutive numbers will always be co-prime.

(x) Even Numbers : All integers which are divisible by 2 are called even numbers. Even numbers are denoted by the expression 2n, where n is any integer. So, if E is a set even numbers, then E = {...., -4, -2, 0, 2, 4,....}.

(xi) Odd Numbers: All integers which are not divisible by 2 are called odd numbers. Odd numbers are denoted by the general expression 2n - 1 where n is any integer. If O is a set of odd numbers, then O = {...., -5, -3, -1, 1, 3, 5,....}.

(xii) Imaginary Numbers: All the numbers whose square is negative are called imaginary numbers. e.g. 3i, 4i, i, ... where $i = \sqrt{-1}$.

(xiii) Complex Numbers : The combined form of real and imaginary numbers is known as complex numbers. It is denoted by Z = A + iB where A is real part and B is imaginary part of Z and A, B $\in$ R.

❖ The set of complex number is the super set of all the sets of numbers.

IDENTIFICATION PRIME NUMBER

Step 1 : Find approximate square root of given number.

Step 2 : Divide the given number by prime numbers less than approximate square root of number. If given number is not divisible by any of this prime number then the number is prime otherwise not.

Ex.1 571, is it a prime ?

Sol. Approximate square root of 571 = 24.

Prime number < 24 are 2, 3, 5, 7, 11, 13, 17, 19, & 23. But 571 is not divisible by any of these prime numbers so 571 is a prime number.

Ex.2 Is 1 prime or composite number ?

Sol. 1 is neither prime nor composite number.