

CHAPTER 01

Number System

Introduction:

Natural numbers:

The numbers 1, 2, 3, 4... are called “Natural numbers” or “Positive numbers”. They are also called “Counting numbers” as they are used for counting objects. The set of natural numbers is denoted by ‘N’.

$$N = \{1, 2, 3, 4...\}$$

Whole numbers:

If ‘0’ is included in the set of natural numbers the set obtained is the set of “Whole numbers”. This set is represented by ‘W’.

$$W = \{0, 1, 2, 3...\}$$

Negative integers:

When a negative sign is written before a positive integer, negative integer is obtained. Thus, -1, -2, -3 ... are all ‘Negative integers’.

$$I^- = \{... -3, -2, -1\}$$

Integers:

The set, which includes negative and positive integers along with '0' is called the set of integers. It is denoted by 'I' or 'Z'.

$$I = \{ \dots -3, -2, -1, 0, 1, 2, 3 \dots \}$$

Note:

- '0' is neither positive nor negative.
- Every natural number is a whole number but every whole number is not a natural number.
- Every natural number and whole number is an integer.

Synopsis:**Rational numbers:**

Any number that can be expressed in the form $\frac{p}{q}$ (where $q \neq 0$ and p, q are integers) is called a rational number. It is denoted by 'Q'.

$$Q = \{ \frac{p}{q}, \text{ where } p, q \text{ are integers and } q \neq 0 \}$$

Note:

- All integers, all recurring decimals and all terminating decimals are rational numbers (i.e.. Every natural number and whole number is a rational number).
- Any recurring decimal can be expressed in the form $\frac{p}{q}$ ($q \neq 0$).

Example:

$$(i) 0.1666... = \frac{1}{6}$$

$$(ii) 0.333 = \frac{1}{3}$$

- Any terminating decimal, can be expressed in the form $\frac{p}{q}$ ($q \neq 0$).

Example:

$$(i) 0.25 = \frac{25}{100} \text{ (or) } \frac{1}{4}$$

$$(ii) 0.5 = \frac{5}{10} \text{ (or) } \frac{1}{2}$$

- Every rational number can also represented on number line.

Note:

- The rational numbers are closed under the operation of addition, subtraction and multiplication but not division because division by '0' is not defined.
- The operations addition and multiplication are commutative as well as associative for rational numbers.
- For rational number, '0' is the additive identify and '1' is the multiplicative identity.

i.e... $0 + a = a + 0 = a$ and $a.1 = 1.a = a$, where 'a' is in the form of p/q .

- The additive and multiplicative inverse of a rational numbers $\frac{a}{b}$ are $\frac{-a}{b}$ and $\frac{b}{a}$ respectively, where $a, b \neq 0$.
- Two rational numbers are said to be equivalent, if numerators and denominators of both rational numbers are in same proportion.

