Number System and Operations

In Mathematics we frequently come across different types of numbers. The different types of numbers are natural numbers, whole numbers/ rational numbers, integers/ irrational numbers, and real numbers« The natural number starts form 1 and goes to infinity. Thus we can say that all the positive real numbers starting from 1 are called natural numbers. The whole numbers are all counting numbers together with 0. The set of all natural numbers, 0 and negative of all natural numbers including 0 are called integers. The rational numbers are the numbers which can be written in the P form of $\frac{p}{q}$, where p and q are integers and $q \neq 0.$.

Properties of Rational Number

Rational numbers satisfy various properties which are given below:

Closure Property

When we add two rational numbers the result is also a rational number i.e. rational numbers are closed under addition.

For example, $\frac{5}{6} + \frac{8}{9} = \frac{31}{18}$ which is also by a rational number.

- The difference between two rational numbers is also a rational number. For example, $\frac{5}{6} - \frac{8}{9} = \frac{-1}{18}$

- Multiplication and division of two rational numbers are not necessarily a rational number.

Commutative Property

The two rational numbers can be added in any order, the result in both cases will be same. Hence we can say that addition of two rational numbers is commutative.

For example, $\frac{2}{3} + \frac{5}{6} = \frac{5}{6} + \frac{2}{3} = \frac{9}{6}$.

This is called the commutative property of addition.

- ❖ Subtraction is not commutative for rational numbers.
- ❖ Multiplication is commutative for rational numbers i.e. for any two rational numbers x and y, $x \times y = y \times x$.
- ❖ Division is not commutative for rational numbers.

Associative Property

- ❖ Addition is associative for rational numbers i.e. for any three rational numbers x, y and z, $x + (y + z) = (x + y) + z$

- ❖ Subtraction is not associative for rational numbers.

❖ Multiplication is associative for rational numbers i.e. for any three rational numbers x, y and z, $x \times (y \times z) = (x \times y) \times z$.

❖ Division is not associative for rational numbers.

Distributive Property

For all rational numbers x, y and z, we have:

❖ $x(y+z) = xy + xz$

❖ $x(y-z) = xy - xz$

Rules of Divisibility

❖ 2 is a factor of all numbers whose unit digit can be divided by 2.

❖ 3 is a factor if the sum of digits can be divided by 3.

❖ 4 is a factor if the number composed of the last two digits cam be divided by 4.

❖ 5 is a factor if the last digit be either 0 or 5.

❖ 6 is a factor if both 2 and 3 are factors.

❖ 8 is a factor if the last three digits of a number can be divided by 8.

❖ 9 is a factor if the sum of digits can be divided by 9.

❖ 11 is a factor if the difference between the sum of the alternative digits of the number is 0 or divided by 11.