Properties of Rational Numbers:

(i) Closure Property:

The sum of any two rational numbers is always a rational number. This is called 'Closure property of addition' of rational numbers. Thus, Q is closed under addition

If a/b and c/d are any two rational numbers, then

(a/b) + (c/d) is also a rational number

(ii) Commutative Property:

Addition of two rational numbers is commutative.

If a/b and c/d are any two rational numbers, then

(a/b) + (c/d) = (c/d) + (a/b)

(iii) Associative Property:

Addition of rational numbers is associative.

If a/b, c/d and e/f are any three rational numbers, then

a/b + (c/d + e/f) = (a/b + c/d) + e/f

(iv) Additive Identity:

The sum of any rational number and zero is the rational number itself.

If a/b is any rational number, then

a/b + 0 = 0 + a/b = a/b

Zero is the additive identity for rational numbers.

(v) Additive Inverse :

(-a/b) is the negative or additive inverse of (a/b).

If a/b is a rational number,then there exists a rational number (-a/b) such that

a/b + (-a/b) = (-a/b) + a/b = 0

Multiplication

(vi) Commutative Property:

Multiplication of rational numbers is commutative.

If a/b and c/d are any two rational numbers, then

$(a/b) \times (c/d) = (c/d) \times (a/b)$

(vii) Associative Property:

Multiplication of rational numbers is associative.

If a/b, c/d and e/f are any three rational numbers, then

$a/b \times (c/d \times e/f) = (a/b \times c/d) \times e/f$

(viii) Multiplicative Identity:

The product of any rational number and 1 is the rational number itself. 'One' is the multiplicative identity for rational numbers.

If a/b is any rational number, then

$a/b \times 1 = 1 \times a/b = a/b$

(ix) Multiplicative Inverse or Reciprocal:

For every rational number a/b, $b \neq 0$, there exists a rational number c/d such that $a/b \times c/d = 1$.

Then,

c/d is the multiplicative inverse of a/b.

If b/a is a rational number, then

a/b is the multiplicative inverse or reciprocal of it.