

CHAPTER 01**Rational Numbers****Laws of natural numbers:**

- Closure property
- Commutative property
- Associative property
- Distributive property

Closure property:

Consider any two natural numbers.

Example: 2 and 5

$$2 + 5 = 7$$

‘2’ is a natural number and 5 is a natural number by adding these numbers, we got 7 is also a natural number.

∴ Closure property exists under addition of any two natural numbers.

Product of any two natural numbers:

Let us multiply 2 and 5.

$$2 \times 5 = 10 \text{ is also a natural numbers.}$$

∴ Closure property exists under multiplication also.

Now, let us subtract two natural numbers.

$$5 - 2 = 3 \text{ is a natural number}$$

But $4 - 7 = -3$ is not a natural number

\therefore Subtraction of any two natural numbers may or may not be natural number.

If $a > b$ then $a - b$ is a natural number.

Example:

$5 > 4$, then $5 - 4 = 1$ is a natural number

$4 - 5 = -1$ is not a natural number

Division of any two natural numbers:

Example:

$10 \div 5 = 2$ is a natural number

But, $5 \div 10 = \frac{1}{2}$ is not a natural number

\therefore Division of any two natural numbers may or may not be a natural number.

Commutative property:

To understand the commutative property of any two natural numbers under addition,

Take two natural numbers 3 and 4.

Is $3 + 4$ equal to $4 + 3$?

Yes, $3 + 4 = 4 + 3$, that is equal to 7.

∴ Two natural numbers can be added in any order.

We can conclude that $a + b = b + a$

So, commutative property exists under addition.

Similarly, is 3×4 equal to 4×3 ?

Yes, $3 \times 4 = 4 \times 3$, that is equal to 12.

∴ Two natural numbers can be multiplied in any order. We can conclude that $a \times b = b \times a$.

So, commutative property exists under multiplication.

Now, is $3 - 4$ equal to $4 - 3$?

No, $3 - 4 \neq 4 - 3$

$$-1 \neq +1$$

∴ Two natural numbers cannot be subtracted in any order. We can conclude that $a - b \neq b - a$.

So, commutative property does not exist under subtraction of any two natural numbers.

Similarly, is $3 \div 4$ equal to $4 \div 3$?

$$\text{No, } \frac{3}{4} \neq \frac{4}{3}$$

∴ Two natural numbers cannot be divided in any order.

So, division of any two natural numbers does not exist commutative property.

