CHAPTER 01

Rational Numbers

Associative property of natural numbers:

To understand the associative property of natural numbers. We already know about two properties, which are closure property and commutative property.

Associative property of natural numbers:

Over addition, while adding any three natural numbers we can group them in any order.

Example:

Is $2 + (3 + 4) = (2 + 3) + 4$?

Now,

Consider **LHS**: $2 + (3 + 4)$, which is equal to $2 + 7$ is equal to 9.

(And)

Consider **RHS**: $(2 + 3) + 4$, which is equal to $5 + 4$ is equal to 9.

In 1^{st} case, we grouped 3 and 4 and

In 2^{nd} case, we grouped 2 and 3.

In both the cases, we got same answer.

$\therefore 2 + (3 + 4) = (2 + 3) + 4$ is called associative property under addition of any three natural numbers.

We can conclude that $\boxed{a+(b+c)=(a+b)+c}$

Now, let us understand associative property under multiplication.

Consider three natural numbers 2, 3, 4.

Is 2 x (3 x 4) = (2 x 3) x 4?

Consider **LHS**: 2 x (3 x 4), which is equal to 2 x 12 is equal to 24.

Consider **RHS**: (2 x 3) x 4, which is equal to 6 x 4 is equal to 24.

$\therefore$(2 x 3) x 4 = 2 x (3 x 4) is called associative property under multiplication of any three natural numbers.

We can conclude that, (a x b) x c = a x (b x c)

Is (2 – 3) – 4 equal to 2 – (3 – 4)?

(2 – 3) – 4 is not equal to 2 – (3 – 4)

$-1 - 4 \neq 2 + 1$

$\boxed{-5 \neq 3}$

Associative property does not exists under subtraction of any three natural numbers.

Similarly,

Is $(8 \div 4) \div 2$ the same as $8 \div (4 \div 2)$?

$2 \div 2 \neq 8 \div 2$

$1 \neq 4$

Associative property does not exist under division. We can conclude that,

Associative property of natural numbers states that changing the grouping of the numbers being added or multiplied does not change the value of the answers.

So, it holds true for addition & multiplication.

In case of subtraction and division it does not holds true for natural numbers.

Distributive property:

Under **addition**:

a x (b + c) = (a x b) + (a x c)

2 x (3 + 4) = (2 x 3) + (2 x 4)

Under **subtraction**:

a x (b – c) = (a x b) – (a x c)

2 x (3 – 4) = (2 x 3) – (2 x 4)

Now,

1 + 0 = 1

2 + 0 = 2

3 + 0 = 3

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Similarly, for any natural number if we add zero, we are getting same number.

$\therefore$ $\boxed{a+0=0+a=a}$

In this case, ‘0’ is called additive identify of ‘a’.

Now,

$\therefore$ 1 x 1 = 1

2 x 1 = 2

3 x 1 = 3

Similarly, any natural number is multiplied by 1 we are getting same number.

$\therefore$ $\boxed{a\times 1=1\times a=a}$

$\therefore$In this case, ‘1’ is called multiplicative identity.