CHAPTER 01

Rational Numbers

Associative property:

Consider the integers – 3, –2 and –5.

Look at (–5) + [(–3) + (–2)] and [(–5) + (–3)] + (–2)

In first case, (–3) and (–2) are grouped together.

In second case, (–5) and (–3) are grouped together. We got same result.

∴We can say that, while adding any three integers we can group them in any order.

Therefore, from the above example we can conclude that,

$$\boxed{a+(b+c)=(a+b)+c}$$

Which is true for associative property under addition.

Consider three integers –6, 7 and 3.

Is –6 – (7–3) equal to (–6 –7) – 3?

No, –6 – (7–3) is not equal to (–6–7) –3.

LHS: –6 –4 = –10

RHS: –13–3 = –16

Both sides answers are not same.

∴Because in LHS, we grouped 7 and 3 where as In RHS, we grouped –6 and 7.

∴We can conclude that, the associative property does not exist under subtraction of any three integers.

For any three integers a, b and c we can say that,

$$\boxed{a-(b-c)\neq(a-b)-c}$$

We have discussed already associative property exists under multiplication of natural numbers and whole numbers.

Is this applicable for integers also?

Example:

[3 x (–5) x (–2)] is equal to 3 x (+10), which is equal to 30.

In first case, we grouped (–5) and (–2) together and

In second case, we grouped 3 and (–5) together, We got same result.

∴We can say that, while multiplying any three integers. We can group then in any order.

Therefore, from the above example, we can conclude that

$$\boxed{a\times(b\times c)=(a\times b)\times c}$$

Division of any three integers exists associative property or not?

Consider three integers –10, 3 and 2.

$-10\div(3\div2)$, which is not equal to $(-10\div3)\div2$.

Because, while dividing any three integers, we cannot we cannot group them in any order.

∴We can conclude that,

a ÷(b ÷c) is not equal to (a ÷ b) ÷c.

So, associative property does not exist under division of integers.

Can we say that the distributive property exists under addition of integers?

Yes, in general for any integers a, b and c we can conclude that,

$$\boxed{a\times(b+c)=(a\times b)+(a\times c)}$$

Similarly, we can say distributive property exists under subtraction of integers.

In general, for any integers a, b and c, we can conclude that,

$$\boxed{a\times(b-c)=(a\times b)-(a\times c)}$$

Now,

–2 + 0 = –2

+5 + 0 = +5

–3 + 0 = –3

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∴For any integer if we add zero, we are getting same integer only.

From the above examples, we can say that a + 0 = 0 + a = a.

We can conclude that, '0' is called additive identity and

a + (–a) = (–a) + a = 0 (∴ –a is called additive inverse)

Now,

– 2 x 1 = –2

+ 5 x 1 = +5

– 3 x 1 = – 3

Similarly, any integer if we multiply with 1, then we will get same integer.

From the above examples, we can conclude that 1 is called additive identity.