Lord Buddha national Public school
Sareibifca Jaunpur
Online class part - III

Class - VIII Subject - Maths

Properties of subtraction:-

Property - 1 → Closure property.

If $\frac{a}{b}$ and $\frac{c}{d}$ are any two rational numbers, then $\frac{a}{b} - \frac{c}{d}$ is also a rational number.

Example → $\frac{4}{5} - \frac{3}{10}$

$$\frac{2\times4 - 1\times3}{10} = \frac{8-3}{10} = \frac{5}{10} = \frac{1}{2}$$

which is a rational number.

Property 2 - Existence of right identity.

In case of addition we have $\frac{a}{b} + 0 = 0 + \frac{a}{b} = \frac{a}{b}$ but in case of subtraction, for any rational number $\frac{a}{b}$, $\frac{a}{b} - 0 = \frac{a}{b}$ but $0 - \frac{a}{b} = -\frac{a}{b}$ Therefore only right identity exists for subtraction.

Multiplication →
If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational number then

$$\left(\frac{a}{b} \times \frac{c}{d}\right) = \left(\frac{c \times a}{d \times b}\right)$$

For example $\frac{3}{25} \times \frac{10}{9}$

$$\frac{\cancel{3} \times \cancel{10}^{2}}{\cancel{25}_{5} \times \cancel{9}_{3}} = \frac{1 \times 2}{5 \times 3} = \frac{2}{15}$$

Properties of Multiplication of Rational number

Property 1 (Closure)
The product of two rational number is always a rational number.
ie If $\frac{a}{b}$ and $\frac{c}{d}$ are any two rational number then $\left(\frac{a}{b} \times \frac{c}{d}\right)$ is also a rational number.

Property 2 (Commutative) Two rational numbers can be multiplied in any order.

Thus If $\frac{a}{b}$ and $\frac{c}{d}$ are any rational number then $\left(\frac{a}{b} \times \frac{c}{d}\right) = \left(\frac{c}{d} \times \frac{a}{b}\right)$

Property 4 (Property of 1) →

If $\frac{a}{b}$ ~~ar~~ is a rational number then

$\frac{a}{b} \times 1 = 1 \times \frac{a}{b} = \frac{a}{b}$

Property 5 (Multiplication by 0)

Every rational number multiplied with 0 gives 0.

Thus if $\frac{a}{b}$ is any rational number then $\frac{a}{b} \times 0 = 0 = 0 \times \frac{a}{b}$.

Property 6 (Distributive of multiplication over addition)

The multiplication of rational number is distributive over addition.

Thus if $\frac{a}{b}$, $\frac{c}{d}$ and $\frac{e}{f}$ are rational number, then

$$\frac{a}{b} \times \left(\frac{c}{d} + \frac{e}{f}\right) = \frac{a}{b} \times \frac{c}{d} + \frac{a}{b} \times \frac{e}{f}$$

Property 7 (Existence of multiplicative inverse)

Every non zero rational number $\frac{a}{b}$ has multiplicative inverse $\frac{b}{a}$, Thus.

$$\left(\frac{a}{b} \times \frac{b}{a}\right) = \left(\frac{b}{a} \times \frac{a}{b}\right) = 1$$

∴ $\frac{b}{a}$ is called the reciprocal of $\frac{a}{b}$ it is denoted by $\left(\frac{a}{b}\right)^{-1}$. Thus $\left(\frac{a}{b}\right)^{-1} = \left(\frac{b}{a}\right)$

The reciprocal of 0 does not exist. Reciprocal of 1 is 1 and the Reciprocal of −1 is −1.

Division → If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers such that $\frac{c}{d} \neq 0$ then $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times$ reciprocal of $\frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$

Properties of Division -

Property 1 → If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational number such that $\frac{c}{d} \neq 0$, then $\frac{a}{b} \div \frac{c}{d}$ is always rational number

That is the set of all non-zero rational number is closed under division

Property 2 → For any rational number $\frac{a}{b}$ we have $\frac{a}{b} \div 1 = \frac{a}{b}$ and $\frac{a}{b} \div (-1) = -\frac{a}{b}$

Property 3 → For every non zero rational number $\frac{a}{b}$, we have.

[i] $\frac{a}{b} \div \frac{a}{b} = 1$ [ii] $\frac{a}{b} \div \left(-\frac{a}{b}\right) = -1$

[iii] $-\frac{a}{b} \div \frac{a}{b} = -1$

Exercise.

(1) **Subtract**

[I] $\frac{1}{5}$ from $\frac{3}{5}$ [II] $\frac{4}{9}$ from $\frac{-1}{6}$

[III] $\frac{-4}{15}$ from $\frac{3}{10}$ [IV] $\frac{3}{-4}$ from $\frac{4}{5}$

[2] The sum of two rational number is $\frac{5}{18}$. If one of the number is $\frac{1}{8}$, find the other

[3] **Multiply** [I] $\frac{6}{7}$ by $\frac{2}{3}$ [II] $\frac{-12}{13}$ by $\frac{-5}{18}$

[III] $\frac{-90}{11}$ by $\frac{-55}{72}$ [IV] $5\frac{1}{7}$ by $-2\frac{1}{3}$

[4] **Simplify** [I] $\left(\frac{-6}{7} \times \frac{-28}{18}\right) + \left(\frac{-11}{13} \times \frac{65}{22}\right)$

[II] $\left(\frac{-4}{5} \times \frac{15}{8}\right) + \left(\frac{-1}{3} \times \frac{-9}{7}\right) - \left(\frac{2}{9} \times \frac{27}{14}\right)$

[5] **Divide** [I] $\frac{5}{9}$ by 15 [II] $\frac{7}{18}$ by $\frac{-14}{51}$

[III] $\frac{10}{33}$ by $\frac{2}{-11}$ [IV] $\frac{-24}{50}$ by $\frac{-4}{75}$

[6] **Evaluate:** [I] $\left(\frac{5}{9} \div \frac{15}{36}\right) \div \left(-\frac{5}{6}\right)$

[II] $\left(\frac{-3}{29} \div \frac{9}{87}\right) \div \frac{-1}{7}$