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# VIII Maths

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## ch-1 Rational numbers

Introduction of ch-1

Properties of Rational numbers

(1) Closure Property  $\rightarrow$  For any two rational numbers  $a$  and  $b$ ,  $a+b$  is also a rational number

eg.  $\frac{3}{7} + \frac{1}{7} = \frac{3+1}{7} = \frac{4}{7}$  which is also a rational number

Numbers

(a) Rational numbers are closed under addition

eg.  $\frac{2}{3} + \frac{5}{3} = \frac{2+5}{3} = \frac{7}{3}$  which is a rational no.

(b) Rational numbers are closed under subtraction

eg.  $\frac{5}{8} - \frac{4}{5} = \frac{25-32}{40} = \frac{-7}{40}$  which is a rational no.

(c) Rational numbers are closed under multiplication

eg.  $\frac{3}{4} \times \frac{2}{5} = \frac{6}{20}$  which is a rational no.

(d) Rational numbers are closed under division exclude (zero)

eg.  $\frac{5}{3} \div \frac{2}{5} = \frac{5 \times 5}{3 \times 2} = \frac{25}{6}$  which is also a rational number

But in case of zero eg.  $\frac{5}{0} \rightarrow$  not defined or not exist

(2) For Rational numbers  $\rightarrow$  Commutative Property

For any two rational numbers  $a$  and  $b$

$$\Rightarrow a+b = b+a$$

For ex  $\rightarrow \frac{2}{3} + \frac{5}{7} = \frac{5}{7} + \frac{2}{3}$

$$\frac{14+15}{21} = \frac{15+14}{21}$$

$$\frac{29}{21} = \frac{29}{21}$$

(a) Addition is commutative for rational numbers eg.  $\frac{3}{5} + \frac{1}{4} = \frac{1}{4} + \frac{3}{5}$

$$= \frac{12+5}{20} = \frac{5+12}{20}$$

$$= \frac{17}{20} = \frac{17}{20}$$

(b) Subtraction is not commutative for rational numbers

$$\text{eg } \frac{7}{5} - \frac{1}{4} \neq \frac{1}{4} - \frac{7}{5}$$

$$\Rightarrow \frac{7}{5} - \frac{1}{4} \neq \frac{1}{4} - \frac{7}{5}$$

$$\frac{28-5}{20} \neq \frac{5-28}{20}$$

$$\frac{23}{20} \neq -\frac{23}{20}$$

(c) Multiplication is commutative for rational numbers

$$\text{eg } \frac{7}{3} \times \frac{6}{5} = \frac{6}{5} \times \frac{7}{3}$$

$$= \frac{42}{15} = \frac{42}{15}$$

(d) Division is not commutative for rational numbers

$$\text{eg } \frac{1}{5} \div \frac{2}{3} \neq \frac{2}{3} \div \frac{1}{5}$$

$$= \frac{1}{5} \times \frac{3}{2} \neq \frac{2}{3} \times \frac{5}{1}$$

$$= \frac{3}{10} \neq \frac{10}{3}$$

(3) Distributivity of rational numbers  
For all rational numbers  $a$ ,  $b$  and  $c$

$$a(b+c) = ab+ac$$

and

$$a(b-c) = ab-ac$$

## Ex 1.1

Q1 Using appropriate properties find

$$-\frac{2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6}$$

Sol:  $\rightarrow -\frac{2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6}$

$$= -\frac{2}{3} \times \frac{3}{5} - \frac{3}{5} \times \frac{1}{6} + \frac{5}{2} \text{ (By Commutativity)}$$

$$= \frac{3}{5} \left( -\frac{2}{3} - \frac{1}{6} \right) + \frac{5}{2} \text{ (Distributivity)}$$

$$= \frac{3}{5} \left( \frac{-4-1}{6} \right) + \frac{5}{2}$$

$$= \frac{3}{5} \cdot \left( \frac{-5}{6} \right) + \frac{5}{2} \Rightarrow \frac{-1}{2} + \frac{5}{2} = \frac{-1+5}{2}$$

$$= \frac{4}{2} = 2$$

Q2 Write the additive inverse of the following

(i)  $\frac{2}{8}$  (ii)  $-\frac{6}{5}$  (iii)  $\frac{19}{-6}$

Sol: (i) Additive inverse of  $\frac{2}{8} = -\frac{2}{8}$

$$\therefore \frac{2}{8} + \frac{-2}{8} = \frac{2+(-2)}{8} = \frac{0}{8} = 0$$

(ii) Additive inverse of  $-\frac{6}{5}$  or  $\frac{6}{5} = -\frac{6}{5}$

$$\therefore \frac{6}{5} + \frac{-6}{5} = \frac{6+(-6)}{5} = \frac{0}{5} = 0$$

(iii) Additive inverse of  $\frac{19}{-6} = \frac{19}{6}$

$$\therefore \frac{-19}{6} + \frac{19}{6} = \frac{-19+19}{6} = \frac{0}{6} = 0$$

Q3. Verify that  $-(-x) = x$   
for  $x = \frac{11}{15}$

Sol  $\rightarrow$  Given  $x = \frac{11}{15}$

$\Rightarrow$  Additive inverse of  $x = \frac{11}{15} = -x = -\frac{11}{15}$

This equality  $\frac{11}{15} + -\frac{11}{15} = 0$

Shows that  $-\left(-\frac{11}{15}\right) = \frac{11}{15}$

i.e.  $-(-x) = x$

Q.4 Find the multiplicative inverse of  
(i)  $-13$  (ii)  $\frac{1}{5}$  (iii)  $-\frac{5}{8} \times -\frac{3}{7}$  (iv)  $-1$

Sol (i) Multiplicative inverse (Reciprocal) of  $-13 = -\frac{1}{13}$

(ii) Multiplicative inverse (Reciprocal) of  $\frac{1}{5} = \frac{5}{1}$

(iii) The multiplicative inverse of  $-\frac{5}{8} \times -\frac{3}{7}$   
 $= \frac{15}{56} = \frac{56}{15}$

(iv) The multiplicative inverse of  $-1 = -1$

Q5 Multiply  $\frac{6}{13}$  by the reciprocal of  $-\frac{7}{16}$

The reciprocal of  $-\frac{7}{16} = -\frac{16}{7}$

$\therefore \frac{6}{13} \times -\frac{16}{7} = -\frac{96}{91}$  Ans.