# CHAPTER 1 RATIONAL NUMBERS

# Question 1.

Using appropriate properties find:

$$\begin{aligned} (i) &-\frac{2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6} \\ (ii) &\frac{2}{5} \times \left(\frac{-3}{7}\right) - \frac{1}{6} \times \frac{3}{2} + \frac{1}{14} \times \frac{2}{5} \\ \\ \text{Solution:} \\ (i) \text{ We have } &-\frac{2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6} \\ &= \frac{-2}{3} \times \frac{3}{5} - \frac{3}{5} \times \frac{1}{6} + \frac{5}{2} \quad \text{(By regrouping)} \\ &= \frac{3}{5} \times \left(\frac{-2}{3} - \frac{1}{6}\right) + \frac{5}{2} \\ &\quad \text{(Using distributive property)} \\ &= \frac{3}{5} \times \left(\frac{-2 \times 2}{3 \times 2} - \frac{1 \times 1}{6 \times 1}\right) + \frac{5}{2} \\ &= \frac{3}{5} \times \left(\frac{-4}{6} - \frac{1}{6}\right) + \frac{5}{2} = \frac{3}{5} \times \left(\frac{-4 - 1}{6}\right) + \frac{5}{2} \\ &= \frac{3}{5} \times \left(\frac{-5}{6}\right) + \frac{5}{2} \end{aligned}$$

$$= -\frac{1}{2} + \frac{5}{2} = \left(\frac{-1+5}{2}\right) = \frac{4}{2} = 2.$$
$$\left[\because \frac{\cancel{\beta}^1}{\cancel{\beta}_1} \times \frac{-\cancel{\beta}^1}{\cancel{\beta}_2} = \frac{-1}{2}\right]$$

Thus, the required value = 2.

(*ii*) We have  $\frac{2}{5} \times \left(\frac{-3}{7}\right) - \frac{1}{6} \times \frac{3}{2} + \frac{1}{14} \times \frac{2}{5}$   $= \frac{2}{5} \times \left(\frac{-3}{7}\right) + \frac{1}{14} \times \frac{2}{5} - \frac{1}{6} \times \frac{3}{2}$  [By regrouping]  $= \frac{2}{5} \times \left[\frac{-3}{7} + \frac{1}{14}\right] - \frac{1}{6} \times \frac{3}{2}$ [Using distributive property]  $= \frac{2}{5} \times \left[\frac{-3 \times 2}{7 \times 2} + \frac{1 \times 1}{14 \times 1}\right] - \frac{1}{6} \times \frac{3}{2}$   $= \frac{2}{5} \times \left[\frac{-6}{14} + \frac{1}{14}\right] - \frac{1}{6} \times \frac{3}{2}$   $= \frac{2}{5} \times \left[\frac{-5}{14} - \frac{1}{4}\right]$   $\left[\because \frac{1}{\beta_2} \times \frac{\beta^1}{2} = \frac{1}{4}\right]$  $= -\frac{1}{7} - \frac{1}{4}$   $\left[\because \frac{2}{\beta} \times \frac{-\beta^1}{14\gamma} = \frac{-1}{7}\right]$ 

$$= \frac{-1 \times 4}{7 \times 4} - \frac{1 \times 7}{4 \times 7} = \frac{-4}{28} - \frac{7}{28} = \frac{-4 - 7}{28} = \frac{-11}{28}$$

Thus, the required value =  $\frac{-11}{28}$ .

#### **Question 2**.

Write the additive inverse of each of the following: (i) 2/8 (ii) -5/9 (iii) -6/-5

(iv) 2/-9

(v) 19/-6

(i) Additive inverse of 
$$\frac{2}{8} = \frac{-2}{8}$$
  
[::  $a + (-a) = 0$ ]  
(ii) Additive inverse of  $\frac{-5}{9} = -\left(\frac{-5}{9}\right) = \frac{5}{9}$   
(iii)  $\frac{-6}{-5} = \frac{6}{5}$   
.: Additive inverse of  $\frac{6}{5} = \frac{-6}{5}$   
(iv) Standard form of  $\frac{2}{-9} = \frac{-2}{9}$   
.: Additive inverse of  $\frac{-2}{9} = \frac{2}{9}$   
(v) Standard form of  $\frac{19}{-6} = \frac{-19}{6}$   
.: Additive inverse of  $\frac{-19}{6} = \frac{19}{6}$ 

Question 3. Verify that -(-x) = x for (i) x = 11/5(ii) x = -13/17

(i) We have 
$$x = \frac{11}{15}$$
  
 $\therefore -x = \frac{-11}{15}$   
 $-(-x) = -\left(\frac{-11}{15}\right) = \frac{11}{15} = x$  (verified)  
 $[\because (-) \times (-) = (+)]$   
(ii) We have  $x = -\frac{13}{17}$   
 $\therefore -x = -\left(\frac{-13}{17}\right) = \frac{13}{17}$   $[\because (-) \times (-) = (+)]$   
 $-(-x) = \frac{-13}{17} = x$  (verified)

# Question 4.

Find the multiplicative inverse of the following: -13

(i) -13  
(ii) 
$$\frac{-13}{19}$$
  
(iii)  $\frac{1}{5}$   
(iv)  $\frac{-5}{8} \times \frac{-3}{7}$   
(v)  $-1 \times \frac{-2}{5}$   
(vi)  $-1$ 

We know that multiplicative inverse of a is  $\frac{1}{a}$ .

$$\left[\because a \times \frac{1}{a} = 1\right]$$

(i) Multiplicative inverse of

$$-13 = \frac{-1}{13} \qquad \qquad \left[ \because -13 \times \frac{-1}{13} = 1 \right]$$

(ii) Multiplicative inverse of

$$\frac{-13}{19} = \frac{-19}{13} \qquad \qquad \left[ \because \frac{-13}{19} \times \frac{-19}{13} = 1 \right]$$

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

$$\left[\because \frac{1}{5} \times 5 = 1\right]$$

(iv) Multiplicative inverse of

 $\frac{-5}{8} \times \frac{-3}{7} = \frac{-8}{5} \times \frac{-7}{3} = \frac{56}{15}$ Alternatively;  $\frac{-5}{8} \times \frac{-3}{7} = \frac{15}{56}$   $\therefore$  Multiplicative inverse of  $\frac{15}{56} = \frac{56}{15} \qquad \left[ \because \frac{15}{56} \times \frac{56}{15} = 1 \right]$   $(v) -1 \times \frac{-2}{5} = \frac{2}{5}$   $\therefore$  Multiplicative inverse of  $\frac{2}{5} = \frac{5}{2}$   $\left[ \because \frac{2}{5} \times \frac{5}{2} = 1 \right]$  (vi) Multiplicative inverse of  $-1 = \frac{1}{-1} = -1$   $\left[ \because -1 \times \frac{1}{-1} = 1 \right]$ 

### Question 5.

Name the property under multiplication used in each of the following:

(*i*) 
$$\frac{-4}{5} \times 1 = 1 \times \frac{-4}{5} = \frac{-4}{5}$$
  
(*ii*)  $\frac{-13}{17} \times \frac{-2}{7} = \frac{-2}{7} \times \frac{-13}{17}$ 

(*iii*) 
$$\frac{-19}{29} \times \frac{29}{-19} = 1$$

### Solution:

(i) Commutative property of multiplication(ii) Commutative property of multiplication

(iii) Multiplicative inverse property

### Question 6.

Multiply 6/13 by the reciprocal of -7/16.

Reciprocal of 
$$\frac{-7}{16} = \frac{16}{-7} = \frac{-16}{7}$$
  
 $\therefore \frac{6}{13} \times \frac{-16}{7} = \frac{6 \times (-16)}{13 \times 7} = \frac{-96}{91}$ 

# Question 7.

Tell what property allows you to compute

$$\frac{1}{3} \times \left(6 \times \frac{4}{3}\right) \operatorname{as}\left(\frac{1}{3} \times 6\right) \times \frac{4}{3}$$

# Solution:

Since  $a \times (b \times c) = (a \times b) \times c$  shows the associative property of multiplications.

$$\therefore \frac{1}{3} \times \left( 6 \times \frac{4}{3} \right) = \left( \frac{1}{3} \times 6 \right) \times \frac{4}{3} \text{ shows the associative}$$

property of multiplication.

# Question 8.

Is 8/9 the multiplicative inverse of -11/8? Why or Why not? Solution: Here -11/8 = -9/8.

Since multiplicative inverse of 8/9 is 9/8 but not -9/8 89 is not the multiplicative inverse of -11/8

# Question 9.

If 0.3 the multiplicative inverse of 31/3? Why or why not? **Solution:** 

Here 
$$3\frac{1}{3} = \frac{10}{3}$$
 and  $0.3 = \frac{3}{10}$   
Also,  $\frac{10}{3} \times \frac{3}{10} = 1$ 

Multiplicative inverse of 0.3 or 3/10 is 10/3. Thus, 0.3 is the multiplicative inverse of 31/3.

# Question 10.

Write:

(i) The rational number that does not have a reciprocal.

- (ii) The rational numbers that are equal to their reciprocals.
- (iii) The rational number that is equal to its negative.

(i) 0 is the rational number which does not have its reciprocal
[: 1/0 is not defined]
(ii) Reciprocal of 1 = 1/1 = 1
Reciprocal of -1 = 1/-1 = -1
Thus, 1 and -1 are the required rational numbers.

(iii) 0 is the rational number which is equal to its negative.