

Unit 2

RATIONAL NUMBERS

EXERCISE NO. 2.1

Q.1 Write True or False for each of the following statements.

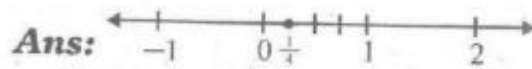
- (i) $\frac{0}{5}$ is a rational number **(True)**
- (ii) $\frac{5}{0}$ is a rational number **(False)**
- (iii) 0 is not a rational number. **(False)**
- (iv) $2\frac{1}{5}$ is a rational number between 5 and 6. **(False)**
- (v) Negative integers are rational numbers. **(True)**
- (vi) Positive integers are not rational number. **(False)**
- (vii) Every integer is also a rational number. **(True)**
- (viii) Every natural number is also a rational number. **(True)**
- (ix) In rational number $\frac{p}{q}$, q is always zero. **(False)**
- (x) There is only one rational number between 2 and 3. **(False)**
- (xi) Rational number are in the form $\frac{p}{q}$ where p and q are always natural number. **(False)**

2. Write three rational numbers between 2 and 3.

Ans: $\left(2\frac{1}{2}, 2\frac{1}{3}, 2\frac{1}{4}\right)$

3. Represent the following rational numbers on a number line.

(i) $\frac{1}{4}$



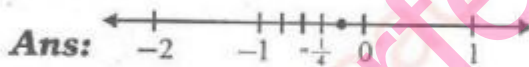
(ii) $\frac{7}{2}$



(iii) $\frac{11}{3}$



(iv) $-\frac{2}{5}$



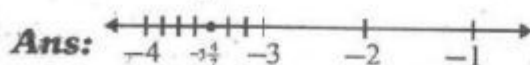
(v) $-\frac{12}{5}$



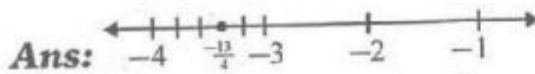
(vi) $2\frac{5}{6}$



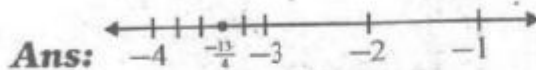
(vii) $-3\frac{4}{7}$



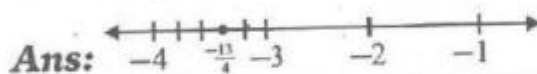
(viii) $\frac{13}{4}$



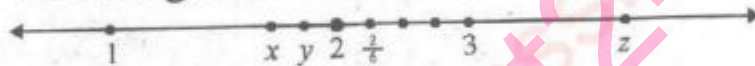
(ix) $\frac{15}{8}$



(x) $4\frac{2}{3}$



4. For the given number line, write true or false.



- (i) The value of x is 0. (False)
- (ii) The value of x is 2. (True)
- (iii) The value of y is $2\frac{1}{6}$. (True)
- (iv) The value of y is $3\frac{2}{5}$. (False)
- (v) The value of z is 4. (True)
- (vi) The value of z is -4. (False)

EXERCISE 2.2

1. Find the reciprocals of the following rational numbers.

(i) $\frac{19}{17}$

Ans: $\frac{17}{19}$

(ii) -3

Ans: $-\frac{1}{3}$

$$(iii) \frac{1}{10}$$

Ans: 10

$$(iv) \frac{-6}{25}$$

Ans: $\frac{-25}{6}$

2. Simplify:

$$(i) \frac{9}{7} + \frac{15}{7}$$

Solution:

$$\begin{aligned} &= \frac{9}{7} + \frac{15}{7} \\ &= \frac{24}{7} \\ \text{Ans: } &= \frac{24}{7} \end{aligned}$$

$$(ii) \frac{5}{9} - \frac{2}{9}$$

Solution:

$$\begin{aligned} &= \frac{5}{9} - \frac{2}{9} \\ &= \frac{5-2}{9} = \frac{3}{9} = \frac{1}{3} \\ \text{Ans: } &= \frac{1}{3} \end{aligned}$$

$$(iii) \frac{3}{5} - \left[-\frac{7}{5} \right]$$

Solution:

$$\begin{aligned} &= \frac{3}{5} - \left[-\frac{7}{5} \right] \\ &= \frac{3}{5} + \frac{7}{5} \\ &= \frac{3+7}{5} = \frac{10}{5} \\ &= \frac{10}{5} = 2 \\ \text{Ans: } &= 2 \end{aligned}$$

$$(iv) \frac{5}{6} + \frac{2}{6} - \frac{1}{6}$$

Solution:

$$\begin{aligned} &= \frac{5}{6} + \frac{2}{6} - \frac{1}{6} \\ &= \frac{5}{6} + \frac{2}{6} \\ &= \frac{5+2}{6} = \frac{7}{6} \\ &= \frac{7}{6} - \frac{1}{6} \\ &= \frac{7-1}{6} = \frac{6}{6} \\ &= \frac{6}{6} = 1 \\ \text{Ans: } &= 1 \end{aligned}$$

(v) $\frac{5}{8} - \frac{4}{5}$

Solution:

$$= \frac{5}{8} - \frac{4}{5}$$

$$= \frac{25 - 32}{40} = -\frac{7}{40}$$

Ans: $-\frac{7}{40}$

(vi) $-\frac{2}{7} + \frac{7}{6}$

Solution:

$$= -\frac{2}{7} + \frac{7}{6}$$

$$= \frac{12 - 49}{42}$$

$$= -\frac{37}{42}$$

Ans: $-\frac{37}{42}$

(vii) $\frac{2}{3} + \frac{5}{7} - \frac{1}{6}$

Solution:

$$= \frac{2}{3} + \frac{5}{7} - \frac{1}{6}$$

2	3, 7, 6
3	3, 7, 3
7	1, 7, 1
	1, 1, 1

$$= \frac{28 + 30 - 7}{42}$$

$$= \frac{51}{42} = \frac{17}{14}$$

Ans: $\frac{17}{14}$

(viii) $\frac{4}{5} - \frac{1}{7} + \frac{3}{70}$

Solution:

$$= \frac{4}{5} - \frac{1}{7} + \frac{3}{70}$$

2	5, 7, 70
5	5, 7, 35
7	1, 7, 7
	1, 1, 1

$$= \frac{56 - 10 + 3}{70} = \frac{4}{7}$$

$$= \frac{49}{70} - \frac{7}{10}$$

Ans: $\frac{4}{7}$

$$(ix) \frac{2}{9} - \left[-\frac{3}{6} \right] + \frac{5}{8}$$

Solution:

$$= \frac{2}{9} - \left[-\frac{3}{6} \right] + \frac{5}{8}$$

2	6, 8, 9
2	3, 4, 9
2	3, 2, 9
3	3, 1, 9
3	1, 1, 3
	1, 1, 1

$$\frac{16 + 36 + 45}{72} = \frac{97}{72}$$

$$\text{Ans:} = \frac{97}{72}$$

$$(x) \frac{17}{10} + \frac{11}{20} - \frac{4}{5}$$

Solution:

$$= \frac{17}{10} + \frac{11}{20} - \frac{4}{5}$$

2	5, 10, 20
2	5, 5, 10
5	5, 5, 5
	1, 1, 1

$$= \frac{34 + 11 - 16}{20} = \frac{29}{20}$$

$$\text{Ans:} = \frac{29}{20}$$

3. Find the additive and multiplicative envers of each of the following:

(i) $\frac{17}{15}$:

Solution:

Additive = $-\frac{17}{15}$

Multiplicative = $\frac{15}{17}$

(ii) -26 :

Solution:

Additive = 26

Multiplicative = $-\frac{1}{26}$

(iii) $-\frac{1}{20}$:

Solution:

Additive = $+\frac{1}{20}$

Multiplicative = 20

(iv) $-\frac{5}{19}$:

Solution:

Additive = $+\frac{5}{19}$

Multiplicative = $-\frac{19}{5}$

(v) 0:

Solution:

Additive = 0

Multiplicative inverse does, not exist

(vi) 8:

Solution:

Additive = -8

Multiplicative = $\frac{1}{8}$

(vii) $\frac{1}{9}$

Solution:

Additive = $-\frac{1}{9}$

Multiplicative = 9

(viii) $\frac{200}{7}$

Solution:

Additive = $-\frac{200}{7}$

Multiplicative = $\frac{7}{200}$

4. Simply:

(i) $\frac{5}{8} \times \frac{3}{2}$

Solution:

$$\begin{aligned} &= \frac{5}{8} \times \frac{3}{2} \\ &= \frac{5}{8} \times \frac{3}{2} = \frac{15}{16} \\ &= \frac{15}{16} \end{aligned}$$

Ans: $= \frac{15}{16}$

(ii) $\frac{6}{7} \div \frac{2}{5}$

Solution:

$$\begin{aligned} &= \frac{6}{7} \div \frac{2}{5} \\ &= \frac{6}{7} \times \frac{5}{2} = \frac{15}{7} \\ &= \frac{15}{7} \end{aligned}$$

Ans: $= \frac{15}{7}$

(iii) $\frac{2}{3} \times \frac{1}{7} \times \frac{4}{5}$

Solution:

$$\begin{aligned} &= \frac{2}{3} \times \frac{1}{7} \times \frac{4}{5} \\ &= \frac{2}{3} \times \frac{1}{7} \times \frac{4}{5} = \frac{8}{105} \\ &= \frac{8}{105} \end{aligned}$$

Ans: $= \frac{8}{105}$

(iv) $\frac{14}{5} \div \frac{7}{25}$

Solution:

$$\begin{aligned} &= \frac{14}{5} \div \frac{7}{25} \\ &= \frac{14}{5} \times \frac{25}{7} = 10 \\ &= 10 \end{aligned}$$

Ans: $= 10$

(v) $\frac{9}{4} \times \left[-\frac{4}{9}\right] \times \left[\frac{2}{3}\right]$

Solution:

$$\begin{aligned} &= \frac{9}{4} \times \left[-\frac{4}{9}\right] \times \left[\frac{2}{3}\right] \\ &= \frac{9 \times (-4) \times 2}{4 \times 9 \times 3} = -\frac{4}{6} \\ &= -\frac{4}{6} = -\frac{2}{3} \\ &= -\frac{2}{3} \end{aligned}$$

Ans: $= -\frac{2}{3}$

(vi) $\frac{1}{8} \times \frac{2}{5} \times \frac{15}{4}$

Solution:

$$\begin{aligned} &= \frac{1}{8} \times \frac{2}{5} \times \frac{15}{4} = -\frac{3}{16} \\ &= -\frac{3}{16} \end{aligned}$$

Ans: $= -\frac{3}{16}$

(vii) $\left[-\frac{2}{3}\right] \times \left[-\frac{4}{6}\right] \times \left[-\frac{3}{4}\right]$

Solution:

$$\begin{aligned} &= \left[-\frac{2}{3}\right] \times \left[-\frac{4}{6}\right] \times \left[-\frac{3}{4}\right] \\ &= -\frac{\cancel{2}}{\cancel{3}} \times -\frac{\cancel{4}}{\cancel{6}_3} \times -\frac{\cancel{3}}{\cancel{4}} = -\frac{1}{3} \\ &= -\frac{1}{3} \end{aligned}$$

Ans: $= -\frac{1}{3}$

EXERCISE 2.3

1. Verify the following

(i) $\frac{2}{3} + \left[-\frac{4}{3}\right] = \left[-\frac{4}{3}\right] + \frac{2}{3}$

Solution:

$$\begin{aligned} \text{L.H.S} &= \frac{2}{3} + \left[-\frac{4}{3}\right] \\ &= \frac{-2 + 4}{3} = \frac{\cancel{-2} + 2}{3} \\ &= -2 \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= \left[-\frac{4}{3}\right] + \frac{2}{3} \\ &= -\frac{4}{3} + \frac{2}{3} \\ &= \frac{-4 + 2}{3} = \frac{\cancel{-4} + 2}{3} - 2 \\ &= -2 \end{aligned}$$

Ans: $= \text{L.H.S} = \text{R.H.S} = \text{Verified}$

$$(ii) \frac{4}{7} \times \frac{2}{5} = \frac{2}{5} \times \frac{4}{7}$$

Solution:

$$\begin{aligned} \text{L.H.S} &= \frac{4}{7} \times \frac{2}{5} \\ &= \frac{4}{7} \times \frac{2}{5} = \frac{8}{35} \\ &= \frac{8}{35} \end{aligned} \quad \begin{aligned} \text{R.H.S} &= \frac{2}{5} \times \frac{4}{7} \\ &= \frac{2}{5} \times \frac{4}{7} = \frac{8}{35} \\ &= \frac{8}{35} \end{aligned}$$

Ans: = L.H.S = R.H.S

$$(iii) \frac{3}{4} + \left[\frac{5}{6} + \frac{4}{8} \right] = \left[\frac{3}{4} + \frac{5}{6} \right] + \frac{4}{8}$$

Solution:

$$\begin{aligned} \text{L.H.S} &= \frac{3}{4} + \left[\frac{5}{6} + \frac{4}{8} \right] \\ &= \frac{3}{4} + \left[\frac{20+12}{24} \right] \\ &= \frac{3}{4} + \frac{32}{24} \\ &= \frac{3}{4} + \frac{4}{3} \\ &= \frac{3}{4} + \frac{4}{3} = \frac{9+16}{12} \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= \frac{9+10}{12} = \frac{19}{12} \\ &= \frac{19}{12} + \frac{4}{8} \\ &= \frac{38+12}{24} = \frac{50}{24} \\ &= \frac{50}{24} = \frac{25}{12} \\ &= \frac{25}{12} \end{aligned}$$

Ans: = L.H.S = R.H.S verified

$$(iv) \frac{7}{15} \times \left[\frac{3}{4} \times \frac{5}{7} \right] = \left[\frac{7}{15} \times \frac{3}{4} \right] \times \frac{5}{7}$$

Solution:

$$L.H.S = \frac{7}{15} \times \left[\frac{3}{4} \times \frac{5}{7} \right]$$

$$= \frac{7}{15} \times \frac{15}{28}$$

$$= \frac{\cancel{7}}{15} \times \frac{15}{28} = 4$$

$$R.H.S = \left[\frac{7}{15} \times \frac{3}{4} \right] \times \frac{5}{7}$$

$$= \left[\frac{\cancel{7}}{15} \times \frac{3}{4} \right]$$

$$= \frac{7}{20} \times \frac{5}{7} = \frac{\cancel{7}}{20} \times \frac{5}{\cancel{7}}$$

$$= 4$$

Ans: = L.H.S = R.H.S verified

$$(v) \frac{2}{7} \times \left[\frac{3}{4} - \frac{1}{2} \right] = \frac{2}{7} \times \frac{3}{4} - \frac{2}{7} \times \frac{1}{2}$$

Solution:

$$L.H.S = \frac{2}{7} \times \left[\frac{3}{4} - \frac{1}{2} \right]$$

$$= \frac{2}{7} \times \left[\frac{3-2}{4} \right]$$

$$= \frac{\cancel{2}}{7} \times \frac{1}{\cancel{4}} = \frac{1}{14}$$

$$R.H.S = \frac{2}{7} \times \frac{3}{4} - \frac{2}{7} \times \frac{1}{2}$$

$$= \frac{\cancel{2}}{7} \times \frac{3}{\cancel{4}} - \frac{2}{7} \times \frac{1}{2}$$

$$= -\frac{2}{7} \times \frac{1}{2} = -\frac{1}{7}$$

$$= -\frac{3}{14} - \frac{1}{7} = \frac{3-2}{14}$$

$$= \frac{1}{14}$$

Ans: = L.H.S = R.H.S verified

$$(vi) \frac{4}{5} \times \left[\frac{7}{8} + \frac{3}{5} \right] = \frac{4}{5} \times \frac{7}{8} + \frac{4}{5} \times \frac{3}{5}$$

Solution:

$$\begin{aligned} L.H.S &= \frac{4}{5} \times \left[\frac{7}{8} + \frac{3}{5} \right] \\ &= \frac{4}{5} \times \left[\frac{35 + 20}{40} \right] \\ &= \frac{4}{5} \times \frac{55}{40} \\ &= \frac{\cancel{4}}{\cancel{5}} \times \frac{55}{4\cancel{0}} \\ &= \frac{5\cancel{0}}{\cancel{50}} = 1 \end{aligned}$$

$$\begin{aligned} R.H.S &= \frac{4}{5} \times \frac{7}{8} + \frac{4}{5} \times \frac{3}{5} \\ &= \frac{\cancel{4}}{\cancel{5}} \times \frac{7}{\cancel{8}} \\ &= \frac{7}{10} + \frac{12}{25} \\ &= \frac{175}{200} + \frac{96}{200} \\ &= \frac{271}{200} \\ &= \frac{271}{200} = 1 \end{aligned}$$

2	8, 25
2	4, 25
2	2, 25
5	1, 25
5	1, 5
	1, 1

Ans: = L.H.S = R.H.S verified

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2. Verify associative property w.r.t, addition for $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$.

Solution:

$$\frac{1}{2} + \left[\frac{1}{4} + \frac{1}{3} \right] = \left[\frac{1}{2} + \frac{1}{3} \right] + \frac{1}{4}$$

$$\begin{aligned} \text{L.H.S} &= \frac{1}{2} + \left[\frac{1}{4} + \frac{1}{3} \right] \\ &= \frac{1}{2} + \left[\frac{3+4}{12} \right] \\ &= \frac{1}{2} + \frac{7}{12} \\ &= \frac{6+7}{12} = \frac{13}{12} \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= \left[\frac{1}{2} + \frac{1}{3} \right] + \frac{1}{4} \\ &= \frac{3+2}{6} = \frac{5}{6} \\ &= \frac{5}{6} + \frac{1}{4} \\ &= \frac{10+3}{12} = \frac{13}{12} \end{aligned}$$

Ans: = L.H.S = R.H.S verified

3. Verify associative property w.r.t. multiplication for $\frac{2}{7}$, $\frac{4}{5}$, $\frac{3}{4}$

Solution:

$$\frac{2}{7} \times \left[\frac{4}{5} \times \frac{3}{4} \right] = \left[\frac{2}{7} \times \frac{4}{5} \right] \times \frac{3}{4}$$

$$\begin{aligned} \text{L.H.S} &= \frac{2}{7} \times \left[\frac{4}{5} \times \frac{3}{4} \right] \\ &= \frac{2}{7} \times \left[\frac{4}{5} \times \frac{3}{4} \right] \end{aligned}$$

$$\begin{aligned} &= \frac{2}{7} \times \frac{3}{5} \\ &= \frac{6}{35} \\ \text{R.H.S} &= \left[\frac{2}{7} \times \frac{4}{5} \right] \times \frac{3}{4} \\ &= \left[\frac{2}{7} \times \frac{4}{5} \right] \times \frac{3}{4} \\ &= \frac{\cancel{8}}{35} \times \frac{3}{\cancel{4}} = \frac{6}{35} \end{aligned}$$

Ans: = L.H.S = R.H.S verified

4. **Verify distributive property of multiplication over addition for $\frac{3}{4}$, $\frac{4}{5}$ and $\frac{7}{8}$.**

Solution:

$$\frac{3}{4} \times \left[\frac{4}{5} + \frac{7}{8} \right] = \frac{3}{4} \times \frac{4}{5} + \frac{3}{4} \times \frac{7}{8}$$

$$\begin{aligned} \text{L.H.S} &= \frac{3}{4} \times \left[\frac{4}{5} + \frac{7}{8} \right] \\ &= \frac{3}{4} \times \left[\frac{32+35}{40} \right] \\ &= \frac{3}{4} \times \frac{67}{40} = \frac{201}{160} \\ &= \frac{201}{160} \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= \frac{3}{4} \times \frac{4}{5} + \frac{3}{4} \times \frac{7}{8} \\ &= \frac{3}{\cancel{4}} \times \frac{\cancel{4}}{5} + \frac{3}{4} \times \frac{7}{8} \\ &= \frac{3}{4} \times \frac{7}{8} + \frac{21}{32} \\ &= \frac{96+105}{160} = \frac{201}{160} \\ &= \frac{201}{160} \end{aligned}$$

Ans: = L.H.S = R.H.S verified

5. Verify distributive property of multiplication over subtraction for

$$\frac{5}{7}, \frac{3}{4} \text{ and } \frac{1}{5}.$$

Solution:

$$\frac{5}{7} \times \left[\frac{3}{4} - \frac{1}{5} \right] = \frac{5}{7} \times \frac{3}{4} - \frac{5}{7} \times \frac{1}{5}$$

$$\text{L.H.S} = \frac{5}{7} \times \left[\frac{3}{4} - \frac{1}{5} \right]$$

$$= \frac{5}{7} \times \left[\frac{15-4}{20} \right]$$

$$= \frac{5}{7} \times \frac{11}{20}$$

$$= \frac{5}{7} \times \frac{11}{20}$$

$$= \frac{11}{28}$$

$$\text{R.H.S} = \frac{5}{7} \times \frac{3}{4}$$

$$= \frac{15}{28} - \frac{5}{7} \times \frac{1}{5}$$

$$= \frac{15}{28} - \frac{5}{7} \times \frac{1}{5}$$

$$= \frac{15-4}{28} = \frac{11}{28}$$

$$= \frac{11}{28}$$

Ans: = L.H.S = R.H.S verified

6. Arrange the following rational numbers in descending order.

(i) $\frac{1}{2}, \frac{2}{3}, \frac{8}{9}$

Solution:

Descending order

Ans: $\frac{8}{9}, \frac{2}{3}, \frac{1}{2}$

(ii) $\frac{1}{6}, \frac{3}{4}, \frac{1}{2}$

Solution:

Descending order

Ans: $\frac{3}{4}, \frac{1}{2}, \frac{1}{6}$

(iii) $\frac{3}{8}, \frac{3}{4}, \frac{1}{2}$

Solution:

Descending order

Ans: $\frac{3}{4}, \frac{1}{2}, \frac{3}{8}$

7. Arrange the following rational number in ascending order.

(i) $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$

Solution:

Ascending order

Ans: $\frac{1}{4}, \frac{1}{3}, \frac{1}{2}$

(ii) $\frac{4}{5}, \frac{1}{10}, \frac{2}{15}$

Solution:

Ascending order

Ans: $\frac{1}{10}, \frac{2}{15}, \frac{4}{5}$

(iii) $\frac{3}{8}, \frac{1}{4}, \frac{5}{6}$

Solution:

Ascending order

Ans: $\frac{1}{4}, \frac{3}{8}, \frac{5}{6}$

8. Arrange the following numbers in ascending & descending order.

(i) $\frac{4}{3}, \frac{5}{7}, \frac{1}{4}$

Solution:

Ascending order

Ans: $\frac{1}{4}, \frac{5}{7}, \frac{4}{3}$

Descending order

Ans: $\frac{4}{3}, \frac{5}{7}, \frac{1}{4}$

(ii) $\frac{1}{2}, \frac{2}{5}, \frac{1}{11}$

Solution:

Ascending order

Ans: $\frac{1}{11}, \frac{2}{5}, \frac{1}{2}$

Descending order

Ans: $\frac{1}{2}, \frac{2}{5}, \frac{1}{11}$

(iii) $\frac{2}{9}, \frac{5}{3}, \frac{1}{2}, \frac{5}{6}$

Solution:

Ascending order

Ans: $\frac{2}{9}, \frac{1}{2}, \frac{5}{6}, \frac{5}{3}$

Descending order

Ans: $\frac{5}{3}, \frac{5}{6}, \frac{1}{2}, \frac{2}{9}$

(iv) $\frac{4}{20}, \frac{20}{15}, \frac{1}{2}, \frac{9}{7}$

Solution:

Ascending order

Ans: $\frac{4}{20}, \frac{1}{2}, \frac{9}{7}, \frac{20}{15}$

Descending order

Ans: $\frac{20}{15}, \frac{9}{7}, \frac{1}{2}, \frac{4}{20}$

REVIEW EXERCISE 2

1. Answer the following question.

(i) Define a rational number and give its examples.

Ans: Rational Numbers:

We use natural numbers and integers in counting, measuring and representing quantities. There are certain quantities which can not be represented by these numbers, for example:

If the price of 1 kilogram of potatoes = 15 rupees

Then the price of half kilogram of potatoes = $\frac{15}{2}$ rupees

We observe that $\frac{15}{2}$ is neither natural number nor integer. It is a rational number. The numbers $\frac{-2}{3}, \frac{1}{7}, \frac{3}{4}, \frac{-15}{17}$ are some more examples of rational numbers.

Rational number is a number that can be expressed in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

(ii) Write the additive inverse of the rational number " a ".

Ans: $= -a$

(iii) What is the reciprocal of the rational number $\frac{p}{q}$, $q \neq 0$?

Ans: $\frac{q}{p}$

(iv) Write the sum of two rational numbers

$$\frac{p}{q} \text{ and } \frac{r}{s} \text{ (q \& s are non zero).}$$

Ans: $\frac{ps + qr}{qs}$

(v) What is the rule of finding the product of two rational numbers. Product of two rational numbers is found by multiplying numerators and denominators

separately. i.e $\left(\frac{a}{b}\right) \times \left(\frac{c}{d}\right) = \frac{ac}{bd}$

Example: Find the product of:

(a) $\frac{2}{7}$ and $\frac{3}{4} = \frac{2 \times 3}{7 \times 4}$

Solution:

Product of $\frac{2}{7}$ and $\frac{3}{4} = \frac{2}{7} \times \frac{3}{4} = \frac{6}{28} = \frac{3}{14}$

(vi) What are the inverse operations of addition and multiplication and: subtraction and division.

2. Fill in the blanks:

(i) Every fraction as well as integer is rational numbers.

(ii) The rational number $\frac{p}{q}$ and $\frac{-p}{q}$ are called additive inverse of each other.

(iii) A number that can be expressed in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is called a rational number.

(iv) The rational number 0 has no multiplicative inverse.

- (v) The multiplicative inverse of a rational number is its reciprocal.

3. Chose the correct answer.

- (i) A number that can be expressed in the form of $\frac{p}{q}$ where $p, q \in \mathbb{Z}, q \neq 0$ is called.

- (a) integer (b) rational number
(c) Whole number (d) positive number

Ans: (b) rational number

- (ii) The additive inverse of $\frac{2}{3}$ is:

- (a) $-\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $\frac{1}{3}$ (d) $-\frac{3}{2}$

Ans: (a) $-\frac{2}{3}$

- (iii) The multiplicative inverse of $-\frac{4}{7}$ is:

- (a) $\frac{4}{7}$ (b) $\frac{7}{4}$ (c) $-\frac{7}{4}$ (d) $\frac{1}{7}$

- (iv) $\frac{1}{3} + \frac{1}{2} = \underline{\hspace{2cm}}$.

- (a) $\frac{1}{5}$ (b) $\frac{1}{6}$ (c) $\frac{2}{5}$ (d) $\frac{5}{6}$

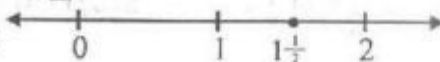
Ans: (d) $\frac{5}{6}$

- (v) $\frac{2}{5} + \left(-\frac{4}{5}\right) = \underline{\hspace{2cm}}$.

- (a) 2 (b) -2 (c) $-\frac{1}{2}$ (d) $-\frac{2}{5}$

4. Draw the number lines and represent the following rational numbers on number lines.

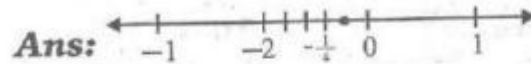
- (i) $1\frac{1}{2}$

Ans: 

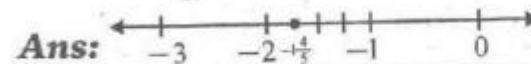
(ii) $3\frac{1}{3}$



(iii) $-\frac{1}{4}$



(iv) $-1\frac{4}{5}$



5. Find the additive and multiplicative inverse of the following.

(i) -14 :

Ans: Additive inverse = 14

Multiplicative inverse = $-\frac{1}{14}$

(ii) $\frac{1}{5}$:

Ans: Additive inverse = $-\frac{1}{5}$

Multiplicative inverse = 5

(iii) $-\frac{2}{3}$:

Ans: Additive inverse = $\frac{2}{3}$

Multiplicative inverse = $-\frac{3}{2}$

(iv) $-\frac{11}{27}$

Ans: Additive inverse = $\frac{11}{27}$

Multiplicative inverse = $-\frac{27}{11}$

6. Put the correct sign $>$ or $<$ between the following pair of the rational numbers.

(i) $\frac{2}{3}, \frac{1}{5}$ (ii) $\frac{10}{13}, \frac{11}{14}$ (iii) $\frac{1}{4}, \frac{1}{2}$

Ans: $\frac{2}{3} > \frac{1}{5}$ Ans: $\frac{10}{13} < \frac{11}{14}$ Ans: $\frac{1}{4} > \frac{1}{2}$

(iv) $\frac{11}{17}, \frac{3}{8}$ (v) $-\frac{4}{9}, -\frac{2}{5}$ (vi) $-\frac{5}{22}, -\frac{11}{25}$

Ans: $\frac{11}{17} < \frac{3}{8}$ Ans: $-\frac{4}{9} < -\frac{2}{5}$ Ans: $-\frac{5}{22} > -\frac{11}{25}$

7. Solve the following:

(i) $\frac{1}{2} + \frac{1}{3} + \frac{1}{6}$

Solution:

2	2, 3, 6	$= \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$
3	1, 3, 3	$= \frac{3+2+1}{6} = \frac{6}{6}$
	1, 1, 1	$= \frac{6}{6} = 1$

Ans: = 1

(ii) $\frac{2}{7} + \frac{1}{2} - \frac{3}{14}$

Solution:

$$\begin{aligned}
 &= \frac{2}{7} + \frac{1}{2} - \frac{3}{14} \\
 &= \frac{2}{7} + \frac{1}{2} \\
 &= \frac{4+7}{14} = \frac{11}{14} \\
 &= \frac{11}{14} - \frac{3}{14} \\
 &= \frac{11-3}{14} = \frac{8}{14}
 \end{aligned}$$

$$= \frac{\cancel{8}}{\cancel{14}} \cdot \frac{4}{7} = \frac{4}{7}$$

$$\text{Ans: } = \frac{4}{7}$$

$$(iii) \frac{5}{8} - \frac{1}{5} - \frac{3}{4}$$

Solution:

2	4, 5, 8	$= \frac{5}{8} - \frac{1}{5} - \frac{3}{4}$
2	2, 5, 4	
2	1, 5, 2	
5	1, 5, 1	
1, 1, 1		$= \frac{25 - 8 - 30}{40} = \frac{13}{40}$

$$\text{Ans: } = -\frac{13}{40}$$

$$(iv) \left[-\frac{1}{3} \right] + \left[-\frac{1}{4} \right] + \frac{1}{2}$$

Solution:

2,	3, 4	$\left[-\frac{1}{3} \right] + \left[-\frac{1}{4} \right] + \frac{1}{2}$
2	3, 2	
3	3, 1	
1, 1		

$$= \frac{-4 - 3}{12} = \frac{7}{12}$$

$$= -\frac{7}{12} + \frac{1}{2}$$

$$= -\frac{7 + -6}{12} = -\frac{1}{12}$$

$$\text{Ans: } = -\frac{1}{12}$$

$$(v) \left[\frac{11}{15} \right] + \left[\frac{3}{5} \right] + \frac{5}{4}$$

Solution:

$$\begin{aligned} & \left[\frac{11}{15} \right] + \left[\frac{3}{5} \right] + \frac{5}{4} \\ &= \left[\frac{11}{15} \right] + \left[\frac{3}{5} \right] \\ &= -\frac{11 + -9}{15} = \frac{20}{15} \\ &= -\frac{20}{15} + \frac{5}{4} \\ &= -\frac{80 + 75}{60} = -\frac{-5}{60} \end{aligned}$$

$$\text{Ans: } = -\frac{-5}{60}$$

$$(vi) \left[-\frac{19}{55} \right] + \frac{51}{55} + \left[-\frac{21}{55} \right]$$

Solution:

$$\begin{aligned} &= \left[-\frac{19}{55} \right] + \frac{51}{55} + \left[-\frac{21}{55} \right] \\ &= -\frac{19 + 51}{55} = \frac{32}{55} \\ &= \frac{32}{55} - \frac{21}{55} \\ &= -\frac{32 - 21}{55} = -\frac{11}{55} = -\frac{11}{55} = -\frac{1}{5} \end{aligned}$$

$$\text{Ans: } = -\frac{1}{5}$$

8. Simplify the following:

$$(i) \left[-\frac{1}{100} \right] \div \left[-\frac{1}{10} \right]$$

Solution:

$$\begin{aligned} & \left[-\frac{1}{100} \right] \div \left[-\frac{1}{10} \right] \\ &= -\frac{1}{100} \div \frac{1}{10} \\ &= -\frac{1}{100} \times \frac{10}{1} \\ &= -\frac{1}{10} \\ \text{Ans: } &= \frac{1}{10} \end{aligned}$$

$$(ii) \frac{1}{5} \times \frac{2}{3} \times \left[-\frac{30}{44} \right]$$

Solution:

$$\begin{aligned} &= \frac{1}{5} \times \frac{2}{3} \times \left[-\frac{30}{44} \right] \\ &= \frac{1}{5} \times \frac{2}{3} \times \frac{2}{15} \\ &= \frac{2}{15} \times \left[-\frac{30}{44} \right] \\ &= \frac{2}{15} \times \frac{30}{44} = \frac{2}{22} \\ &= \frac{1}{11} \\ \text{Ans: } &= \frac{1}{11} \end{aligned}$$

$$(iii) \frac{2}{3} \div \frac{16}{21} \times \frac{27}{49}$$

Solution:

$$\begin{aligned} &= \frac{2}{3} \div \frac{16}{21} \times \frac{27}{49} \\ &= \frac{2}{3} \times \frac{21}{16} \times \frac{27}{49} \\ &= \frac{2}{2} \times \frac{7}{8} \times \frac{27}{49} \\ &= \frac{7}{8} \times \frac{27}{49} \\ &= \frac{27}{56} \\ \text{Ans: } &= \frac{27}{56} \end{aligned}$$

$$(iv) \frac{8}{21} \div \frac{7}{12}$$

Solution:

$$\begin{aligned} &= \frac{8}{21} \times \frac{12}{7} \\ &= \frac{8}{21} \times \frac{12}{7} = \frac{96}{147} \\ &= \frac{32}{49} \\ \text{Ans: } &= \frac{32}{49} \end{aligned}$$

$$(v) \frac{1}{6} \times \left[-\frac{2}{3} \right] \div \left[-\frac{11}{6} \right]$$

Solution:

$$\begin{aligned} &= \frac{1}{6} \times \left[-\frac{2}{3} \right] \div \left[-\frac{11}{6} \right] \\ &= \frac{1}{\cancel{6}} \times \frac{\cancel{2}}{3} = -\frac{1}{9} \\ &= -\frac{1}{9} \div -\frac{11}{63} \\ &= -\frac{1}{\cancel{9}} \times \frac{\cancel{63}}{11} = -\frac{7}{11} \\ &= -\frac{7}{11} \end{aligned}$$

$$\text{Ans:} = -\frac{7}{11}$$

$$(vi) -\frac{2}{7} \div \frac{3}{4} \times \frac{63}{100}$$

Solution:

$$\begin{aligned} &= -\frac{2}{7} \div \frac{3}{4} \times \frac{63}{100} \\ &= -\frac{8}{21} \times \frac{63}{100} \\ &= -\frac{\cancel{24} \cdot 8}{\cancel{21} \cdot 100} = -\frac{6}{25} \\ &= -\frac{6}{25} \end{aligned}$$

$$\text{Ans:} = -\frac{6}{25}$$

9. **Prove that:**

$$(i) \quad [-1] + \frac{35}{54} = \frac{35}{54} + [-1]$$

Solution:

$$\begin{aligned} \text{L.H.S} &= [-1] + \frac{35}{54} \\ &= -\frac{-1 + 35}{54} = -\frac{\cancel{34}}{\cancel{54}} = -\frac{17}{27} \\ \text{R.H.S} &= \frac{\cancel{35}}{\cancel{54}} + [-1] \\ &= \frac{35 + (-1)}{54} = -\frac{34}{54} \\ &= -\frac{34}{54} = -\frac{17}{27} \end{aligned}$$

$$\text{Ans:} = \text{L.H.S} = \text{R.H.S} \text{ Proved}$$

$$(ii) \left[-\frac{121}{169} \right] \times \left[-\frac{13}{11} \right] = \left[-\frac{13}{11} \right] \times \left[\frac{121}{169} \right]$$

Solution:

$$\begin{aligned} L.H.S &= \left[\frac{121}{169} \right] \times \left[-\frac{13}{11} \right] \\ &= \frac{11}{13} \frac{121}{169} \times \frac{13}{11} = -\frac{11}{13} \\ &= \frac{11}{13} \end{aligned}$$

$$\begin{aligned} R.H.S &= \left[-\frac{13}{11} \right] \times \left[-\frac{121}{169} \right] \\ &= \frac{13}{11} \times -\frac{121}{169} = -\frac{11}{13} \end{aligned}$$

Ans: = L.H.S = R.H.S Proved

$$(iii) \frac{4}{9} \times \left[\frac{2}{3} \times \frac{5}{7} \right] = \left[\frac{4}{9} \times \frac{2}{3} \right] \times \frac{5}{7}$$

Solution:

$$\begin{aligned} L.H.S &= \frac{4}{9} \times \frac{2}{3} \times \frac{5}{7} \\ &= \frac{4}{9} \times -\frac{2}{3} \times \frac{5}{7} = \frac{40}{189} \\ &= \frac{40}{189} \end{aligned}$$

$$\begin{aligned} R.H.S &= \left[\frac{4}{9} \times \frac{2}{3} \right] \times \frac{5}{7} \\ &= \frac{4}{9} \times \frac{2}{3} \times \frac{5}{7} = \frac{40}{189} \\ &= \frac{40}{189} \end{aligned}$$

Ans: = L.H.S = R.H.S Proved

$$(iv) -\frac{4}{5} \times \left[\frac{1}{8} + \frac{11}{12} \right] = \left[-\frac{4}{5} \times \frac{1}{8} \right] + \left[-\frac{4}{5} \times \frac{11}{12} \right]$$

Solution:

$$\begin{aligned} L.H.S &= -\frac{4}{5} \times \left[\frac{1}{8} + \frac{11}{12} \right] \\ &= -\frac{4}{5} \times \left[\frac{1}{8} + \frac{11}{12} \right] \\ &= -\frac{4}{5} \times \frac{3+22}{24} = \frac{25}{24} \end{aligned}$$

$$\begin{aligned} &= -\frac{4}{5} \times \frac{25}{24} \\ &= -\frac{4}{5} \times \frac{25}{24} = -\frac{5}{6} \end{aligned}$$

$$R.H.S = \left[-\frac{4}{5} \times \frac{1}{8} \right] + \left[-\frac{4}{5} \times \frac{11}{12} \right]$$

$$= -\frac{4}{5} \times \frac{1}{8}$$

$$= -\frac{4}{5} \times \frac{1}{8} = \frac{1}{10}$$

$$= -\frac{4}{5} \times \frac{11}{12} = \frac{11}{15}$$

$$= -\frac{4}{5} \times \frac{11}{12}$$

$$= -\frac{1}{10} + \frac{11}{15}$$

$$= -\frac{3+22}{30} = -\frac{25}{30}$$

$$= -\frac{25}{30} - \frac{5}{6}$$

$$= -\frac{5}{6}$$

Ans: = L.H.S = R.H.S Proved

$$(v) \quad -\frac{1}{4} + \left[\frac{1}{6} + \frac{3}{5} \right] = \left[\frac{1}{4} + \frac{1}{6} \right] + \frac{3}{5}$$

Solution:

$$\begin{aligned} \text{L.H.S} &= -\frac{1}{4} + \left[\frac{1}{6} + \frac{3}{5} \right] \\ &= -\frac{1}{4} + \left[\frac{1}{6} + \frac{3}{5} \right] \\ &= -\frac{1}{4} + \frac{5+18}{30} = \frac{23}{30} \\ &= -\frac{1}{4} + \frac{23}{30} \\ &= -\frac{15+46}{60} = \frac{61}{60} \\ &= -\frac{61}{60} \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= \left[\frac{1}{4} + \frac{1}{6} \right] + \frac{3}{5} \\ &= -\frac{1}{4} + \frac{1}{6} \\ &= -\frac{3+2}{12} = -\frac{5}{12} \\ &= -\frac{5}{12} + \frac{3}{5} \\ &= -\frac{25+36}{60} = -\frac{61}{60} \\ &= -\frac{61}{60} \end{aligned}$$

Ans: = L.H.S = R.H.S Proved

10. Name the properties used in the following.

$$(i) \quad \left[-\frac{1}{2} \right] + \frac{1}{3} = \frac{1}{3} + \left[-\frac{1}{2} \right]$$

Ans: Commutative property w.r.t addition.

$$(ii) -\frac{10}{11} \times \left[-\frac{5}{44}\right] = \left[-\frac{5}{44}\right] \times \left[-\frac{10}{11}\right]$$

Ans: Comutative property w.r.t multiplication.

$$(iii) -\frac{2}{3} \times \left[\frac{7}{8} \times \frac{9}{14}\right] = \left[-\frac{2}{3} \times \frac{7}{8}\right] \times \frac{9}{14}$$

Ans: Associative property w.r.t. multiplication.

$$(iv) -\frac{3}{5} + \left[\frac{1}{2} + \frac{7}{10}\right] = \left[-\frac{3}{5} + \frac{1}{2}\right] + \frac{7}{10}$$

Ans: Associative property w.r.t multiplication

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

Ans: Associative property w.r.t addition.

$$(vi) \frac{2}{3} \times \left[\frac{1}{2} + \frac{5}{6}\right] = \left[\frac{2}{3} \times \frac{1}{2}\right] + \left[\frac{2}{3} \times \frac{5}{6}\right]$$

Ans: Distributive property of multiplication over addition

$$(vii) \left[-\frac{12}{105}\right] \times \left[\frac{15}{84}\right] = \left[-\frac{15}{84}\right] \times \left[-\frac{12}{105}\right]$$

Ans: Commulative property w.r.t multiplication.

$$(viii) \frac{1}{4} \times \left[\frac{8}{9} - \frac{12}{15}\right] = \left[\frac{1}{4} \times \frac{8}{9}\right] - \left[\frac{1}{4} \times \frac{12}{15}\right]$$

Ans: Distributive property of multiplication over subtraction.

$$(ix) -\frac{5}{8} \times \left[\frac{4}{7} - \frac{2}{3}\right] = \left[-\frac{5}{8} \times \frac{4}{7}\right] - \left[-\frac{5}{8} \times \frac{2}{3}\right]$$

Ans: Distribution property of multiplication over subtraction.

$$(x) \frac{24}{49} \times \left[\frac{7}{8} + \frac{14}{6}\right] = \left[\frac{24}{49} \times \frac{7}{8}\right] + \left[\frac{24}{49} \times \frac{14}{6}\right]$$

Ans: Distribution property of multiplication over addition.

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