

CHAPTER-9

Rational Numbers

Ex 9.1:-

Question 1

List five rational numbers between:

- (i) -1 and 0
- (ii) -2 and -1
- (iii) -45 and -23
- (iv) 12 and 23

Solution:

- (i) -1 and 0

Converting each of rational numbers as a denominator $5 + 1 = 6$, we have

$$-1 = \frac{-1 \times 6}{6} = \frac{-6}{6} \text{ and } \frac{0 \times 6}{6} = \frac{0}{6}$$

$$\text{So, } \frac{-6}{6} < \frac{-5}{6}, \frac{-4}{6}, \frac{-3}{6}, \frac{-2}{6}, \frac{-1}{6} < \frac{0}{6}$$

$$\text{or } -1 < \frac{-5}{6}, \frac{-2}{3}, \frac{-1}{2}, \frac{-1}{3}, \frac{-1}{6} < 0$$

Hence, the required five rational numbers between -1 and 0

are -56, -23, -12, -13 and -16

- (ii) -2 and -1

Converting each of rational numbers as a denominator $5 + 1 = 6$, we have

$$-2 = \frac{-2 \times 6}{6} = \frac{-12}{6},$$

$$-1 = \frac{-1 \times 6}{6} = \frac{-6}{6}$$

$$\text{So, } \frac{-12}{6} < \frac{-11}{6} < \frac{-10}{6} < \frac{-9}{6} < \frac{-8}{6} < \frac{-7}{6} < \frac{-6}{6}$$

$$\text{or } -2 < \frac{-11}{6} < \frac{-5}{3} < \frac{-3}{2} < \frac{-4}{3} < \frac{-7}{6} < -1$$

Hence, the required rational numbers are

$$\frac{-11}{6}, \frac{-5}{3}, \frac{-3}{2}, \frac{-4}{3} \text{ and } \frac{-7}{6}.$$

- (iii) -45 and -23

Converting each of the rational numbers as a denominator $5 \times 3 = 15$, we have

(\because LCM of 5 and 3 = 15)

$$-\frac{4}{5} = -\frac{4 \times 3}{5 \times 3} = -\frac{12}{15},$$

$$-\frac{2}{3} = \frac{-2 \times 5}{3 \times 5} = \frac{-10}{15}$$

Since there is only one integer i.e. -11 between -12 and -10, we have to find equivalent rational numbers.

$$\frac{-12}{15} = \frac{-12 \times 3}{15 \times 3} = \frac{-36}{45},$$

$$\frac{-10}{15} = \frac{-10 \times 3}{15 \times 3} = \frac{-30}{45}$$

$$\therefore \frac{-36}{45} < \frac{-35}{45} < \frac{-34}{45} < \frac{-33}{45} < \frac{-32}{45}$$

$$< \frac{-31}{45} < \frac{-30}{45}$$

$$\text{or } \frac{-4}{5} < \frac{-7}{9} < \frac{-34}{45} < \frac{-11}{15} < \frac{-32}{45} < \frac{-31}{45} < \frac{-2}{3}$$

Hence, the required rational numbers are

$$-\frac{7}{9}, \frac{-34}{45}, \frac{-11}{15}, \frac{-32}{45}, \frac{-31}{45}$$

(iv) 12 and 23

Converting each of the rational numbers in their equivalent rational numbers, we have

$$\frac{1}{2} = \frac{1 \times 18}{2 \times 18} = \frac{18}{36}$$

$$\frac{2}{3} = \frac{2 \times 12}{3 \times 12} = \frac{24}{36}$$

$$\therefore \frac{18}{36} < \frac{19}{36} < \frac{20}{36} < \frac{21}{36} < \frac{22}{36} < \frac{23}{36} < \frac{24}{36}$$

$$\text{or } \frac{1}{2} < \frac{19}{36} < \frac{5}{9} < \frac{7}{12} < \frac{11}{18} < \frac{23}{36} < \frac{2}{3}$$

Hence, the required rational numbers are

$$\frac{19}{36}, \frac{5}{9}, \frac{7}{12}, \frac{11}{18} \text{ and } \frac{23}{36}.$$

Question 2

Write four more rational numbers in each of the following patterns:

$$(i) \frac{-3}{5}, \frac{-6}{10}, \frac{-9}{15}, \frac{-12}{20}, \dots$$

$$(ii) \frac{-1}{4}, \frac{-2}{8}, \frac{-3}{12}, \dots$$

$$(iii) \frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24}, \dots$$

$$(iv) \frac{-2}{3}, \frac{2}{-3}, \frac{4}{-6}, \frac{6}{-9}, \dots$$

Solution:

(i) Given pattern is

$$\begin{aligned}\frac{-3}{5} &= \frac{-3 \times 1}{5 \times 1} \\ \frac{-6}{10} &= \frac{-3 \times 2}{5 \times 2} \\ \frac{-9}{15} &= \frac{-3 \times 3}{5 \times 3} \\ \frac{-12}{20} &= \frac{-3 \times 4}{5 \times 4}\end{aligned}$$

Proceeding with the same pattern, we have

$$\begin{aligned}\frac{-3 \times 5}{5 \times 5} &= \frac{-15}{25} \\ \frac{-3 \times 6}{5 \times 6} &= \frac{-18}{30} \\ \frac{-3 \times 7}{5 \times 7} &= \frac{-21}{35} \\ \frac{-3 \times 8}{5 \times 8} &= \frac{-24}{40}\end{aligned}$$

Hence, the required rational numbers are

$$\frac{-15}{25}, \frac{-18}{30}, \frac{-21}{35} \text{ and } \frac{-24}{40}$$

(ii) Given pattern is:

$$\begin{aligned}\frac{-1}{4} &= \frac{-1 \times 1}{4 \times 1} \\ \frac{-2}{8} &= \frac{-1 \times 2}{4 \times 2} \\ \frac{-3}{12} &= \frac{-1 \times 3}{4 \times 3}\end{aligned}$$

Proceeding with the same pattern, we have

$$\frac{-1 \times 4}{4 \times 4} = \frac{-4}{16}$$

$$\frac{-1 \times 5}{4 \times 5} = \frac{-5}{20}$$

$$\frac{-1 \times 6}{4 \times 6} = \frac{-6}{24}$$

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

Hence, the required rational numbers is

$$\frac{-4}{16}, \frac{-5}{20}, \frac{-6}{24} \text{ and } \frac{-7}{28}$$

(iii) Given pattern is:

$$\frac{1}{6} = \frac{1 \times 1}{6 \times 1}$$

$$\frac{2}{-12} = \frac{-2}{12} = \frac{-1 \times 2}{6 \times 2}$$

$$\frac{3}{-18} = \frac{-3}{18} = \frac{-1 \times 3}{6 \times 3}$$

$$\frac{4}{-24} = \frac{-4}{24} = \frac{-1 \times 4}{6 \times 4}$$

Proceeding with the same pattern, we have

$$\frac{1 \times 5}{-6 \times 5} = \frac{5}{-30}$$

$$\frac{1}{-6} \times \frac{6}{6} = \frac{6}{-36}$$

$$\frac{1}{-6} \times \frac{7}{7} = \frac{7}{-42}$$

$$\frac{1}{-6} \times \frac{8}{8} = \frac{8}{-48}$$

Hence, the required rational numbers are

$$\frac{5}{-30}, \frac{6}{-36}, \frac{7}{-42} \text{ and } \frac{8}{-48}$$

(iv) The given pattern is:

$$\frac{-2}{3} = -\frac{2 \times 1}{3 \times 1}$$

$$\frac{2}{-3} = \frac{2}{-3} = \frac{2 \times 1}{-3 \times 1}$$

$$\frac{4}{-6} = \frac{-4}{6} = \frac{-2 \times 2}{3 \times 2}$$

$$\frac{6}{-9} = \frac{-6}{9} = \frac{-2 \times 3}{3 \times 3}$$

Proceeding with the same pattern, we have

$$\frac{-2 \times 4}{3 \times 4} = \frac{-8}{12} \text{ or } \frac{8}{-12}$$

$$\frac{-2 \times 5}{3 \times 5} = \frac{-10}{15} \text{ or } \frac{10}{-15}$$

$$\frac{-2 \times 6}{3 \times 6} = \frac{-12}{18} \text{ or } \frac{12}{-18}$$

$$\frac{-2 \times 7}{3 \times 7} = \frac{-14}{21} \text{ or } \frac{14}{-21}$$

Hence, the required rational numbers are

$$\frac{8}{-12}, \frac{10}{-15}, \frac{12}{-18}, \frac{14}{-21}$$

Question 3

Give four rational numbers equivalent to:

(i) $\frac{-2}{7}$ (ii) $\frac{5}{-3}$ (iii) $\frac{4}{9}$

Solution:

$$(i) \frac{-2}{7} = \frac{-2 \times 2}{7 \times 2} = \frac{-4}{14}$$

$$\frac{-2}{7} = \frac{-2 \times 3}{7 \times 3} = \frac{-6}{21}$$

$$\frac{-2}{7} = \frac{-2 \times 4}{7 \times 4} = \frac{-8}{28}$$

$$\frac{-2}{7} = \frac{-2 \times 5}{7 \times 5} = \frac{-10}{35}$$

Hence, the required equivalent rational numbers are

$$\frac{-4}{14}, \frac{-6}{21}, \frac{-8}{28}, \frac{-10}{35}$$

$$(ii) \frac{5}{-3} = \frac{5 \times 2}{-3 \times 2} = \frac{10}{-6}$$

$$\frac{5}{-3} = \frac{5 \times 3}{-3 \times 3} = \frac{15}{-9}$$

$$\frac{5}{-3} = \frac{5 \times 4}{-3 \times 4} = \frac{20}{-12}$$

$$\frac{5}{-3} = \frac{5 \times 5}{-3 \times 5} = \frac{25}{-15}$$

Hence, the required equivalent rational numbers are

$$\frac{10}{-6}, \frac{15}{-9}, \frac{20}{-12}, \frac{25}{-15}$$

$$(iii) \frac{4}{9} = \frac{4 \times 2}{9 \times 2} = \frac{8}{18}$$

$$\frac{4}{9} = \frac{4 \times 3}{9 \times 3} = \frac{12}{27}$$

$$\frac{4}{9} = \frac{4 \times 4}{9 \times 4} = \frac{16}{36}$$

$$\frac{4}{9} = \frac{4 \times 5}{9 \times 5} = \frac{20}{45}$$

Hence, the required equivalent rational numbers are

$$\frac{8}{18}, \frac{12}{27}, \frac{16}{36}, \frac{20}{45}$$

Question 4

Draw a number line and represent the following rational numbers on it:

(i) $\frac{3}{4}$

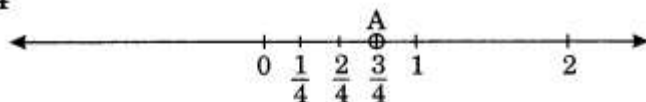
(ii) $\frac{-5}{8}$

(iii) $-\frac{7}{4}$

(iv) $\frac{7}{8}$

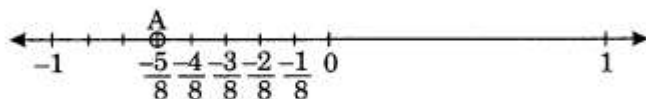
Solution:

(i) $\frac{3}{4}$



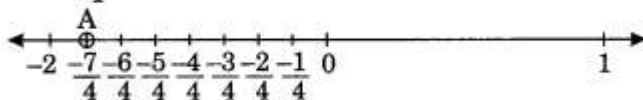
Here, A represents $\frac{3}{4}$.

(ii) $\frac{-5}{8}$



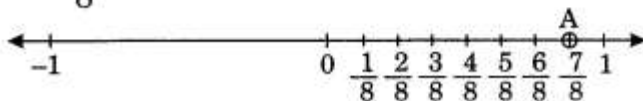
Here, A represents $\frac{-5}{8}$.

(iii) $-\frac{7}{4}$



Here, A represents $-\frac{7}{4}$.

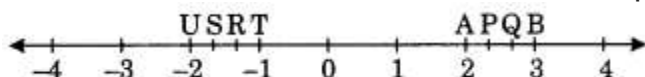
(iv) $\frac{7}{8}$



Here, A represents $\frac{7}{8}$.

Question 5

The points P, Q, R, S, T, U, A and B on the number line are such that, $TR = RS = SU$ and $AP = PQ = QB$. Name the rational numbers represented by P, Q, R and S.



Solution:

Rational numbers represented by P, Q, R and S.

$\frac{7}{8}, \frac{3}{4}, -\frac{1}{4}$ and $-\frac{5}{8}$ respectively.

Question 6

Which of the following pairs represent the same rational number?

(i) $\frac{-7}{21}$ and $\frac{3}{9}$

(ii) $\frac{-16}{20}$ and $\frac{20}{-25}$

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

(iv) $\frac{-3}{5}$ and $\frac{-12}{20}$

(v) $\frac{8}{-5}$ and $\frac{-24}{15}$

(vi) $\frac{1}{3}$ and $\frac{-1}{9}$

(vii) $\frac{-5}{-9}$ and $\frac{5}{-9}$

Solution:

(i) $\frac{-7}{21}$ and $\frac{3}{9}$

$$\Rightarrow \frac{-7 \times 9}{21 \times 9} \text{ and } \frac{3 \times 21}{9 \times 21}$$

$$\Rightarrow -\frac{63}{189} \text{ and } \frac{63}{189}$$

Since $-63 \neq 63$, so $-\frac{7}{21}$ and $\frac{3}{9}$ do not represent the same rational numbers.

(ii) $\frac{-16}{20}$ and $\frac{20}{-25}$

$$\Rightarrow \frac{-16 \times -25}{20 \times -25} \text{ and } \frac{20 \times 20}{-25 \times 20}$$

$$\Rightarrow \frac{400}{-500} \text{ and } \frac{400}{-500}$$

Since $400 = 400$, so $-\frac{16}{20}$ and $\frac{20}{-25}$ represent the same rational numbers.

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

Here, we have the same numerator and denominator. So $\frac{-2}{-3}$ and $\frac{2}{3}$ represent the same rational numbers.

$$(iv) \frac{-3}{5} \text{ and } \frac{-12}{20}$$

$$\Rightarrow \frac{-3 \times 20}{5 \times 20} \text{ and } \frac{-12 \times 5}{20 \times 5}$$

$$\Rightarrow \frac{-60}{100} \text{ and } \frac{-60}{100}$$

Hence, $-60 = -60$, so $-\frac{3}{5}$ and $-\frac{12}{20}$ represent the same rational numbers.

$$(v) \frac{8}{-5} \text{ and } \frac{-24}{15}$$

$$\Rightarrow \frac{8 \times 15}{-5 \times 15} \text{ and } \frac{-24 \times -5}{15 \times -5}$$

$$\Rightarrow \frac{120}{-75} \text{ and } \frac{120}{-75}$$

Here, $120 = 120$, so $\frac{8}{-5}$ and $\frac{-24}{15}$ represents the same rational numbers.

$$(vi) \frac{1}{3} \text{ and } \frac{-1}{9}$$

$$\Rightarrow \frac{1 \times 9}{3 \times 9} \text{ and } \frac{-1 \times 3}{9 \times 3}$$

$$\Rightarrow \frac{9}{27} \text{ and } \frac{-3}{27}$$

Here $9 \neq -3$, so $\frac{1}{3}$ and $-\frac{1}{9}$ do not represent the same rational numbers.

$$(vii) \frac{-5}{-9} \text{ and } \frac{5}{-9}$$

Here, denominators are same and $-5 \neq 5$ so, $\frac{-5}{-9}$ and $\frac{5}{-9}$ do not represent the same rational numbers.

Question 7

Rewrite the following rational numbers in the simplest form:

$$(i) \frac{-8}{6} \quad (ii) \frac{25}{45} \quad (iii) \frac{-44}{72}$$

Solution:

$$(i) \frac{-8}{6} = \frac{-8 \div 2}{6 \div 2} = \frac{-4}{3}$$

$[\because \text{HCF of 8 and 6} = 2]$

$$(ii) \frac{25}{45} = \frac{25 \div 5}{45 \div 5} = \frac{5}{9}$$

$[\because \text{HCF of 25 and 45} = 5]$

$$(iii) \frac{-44}{72} = \frac{-44 \div 4}{72 \div 4} = \frac{-11}{18}$$

$[\because \text{HCF of 44 and 72} = 4]$

Question 8

Fill in the boxes with the correct symbol out of $>$, $<$ and $=$.

$$(i) \frac{-5}{7} \square \frac{2}{3} \quad (ii) \frac{-4}{5} \square \frac{-5}{7}$$

$$(iii) \frac{-7}{8} \square \frac{14}{-16} \quad (iv) \frac{-8}{5} \square \frac{-7}{4}$$

$$(v) \frac{1}{-3} \square \frac{-1}{4} \quad (vi) \frac{5}{-11} \square \frac{-5}{11}$$

$$(vii) 0 \square \frac{-7}{6}$$

Solution:

$$(i) \frac{-5}{7} \square \frac{2}{3} \Rightarrow \frac{-5 \times 3}{7 \times 3} \square \frac{2 \times 7}{3 \times 7}$$

$$\Rightarrow \frac{-15}{21} \square \frac{14}{21}$$

$$\text{Hence, } \frac{-5}{7} \square \frac{2}{3}$$

$$(ii) \frac{-4}{5} \square \frac{-5}{7} \Rightarrow \frac{-4 \times 7}{5 \times 7} \square \frac{-5 \times 5}{7 \times 5}$$

$$\Rightarrow \frac{-28}{35} \square \frac{-25}{35}$$

$$\text{Hence, } \frac{-4}{5} \square \frac{-5}{7}$$

$$(iii) \frac{-7}{8} \square \frac{14}{-16}$$

$$\Rightarrow \frac{-7 \times -16}{8 \times -16} \square \frac{14 \times 8}{-16 \times 8}$$

$$\Rightarrow \frac{112}{-128} \square \frac{112}{-128}$$

$$\text{Hence, } \frac{-7}{8} \square \frac{14}{-16}$$

$$(iv) \frac{-8}{5} \square \frac{-7}{4} \Rightarrow \frac{-8 \times 4}{5 \times 4} \square \frac{-7 \times 5}{4 \times 5}$$

$$\Rightarrow \frac{-32}{20} \square \frac{-35}{20}$$

$$\text{Hence, } \frac{-8}{5} \square \frac{-7}{4}$$

$$(v) \frac{1}{-3} \square \frac{-1}{4} \Rightarrow \frac{1 \times 4}{-3 \times 4} \square \frac{-1 \times -3}{4 \times -3}$$

$$\Rightarrow \frac{4}{-12} \square \frac{3}{-12}$$

$$\text{Hence, } \frac{1}{-3} \square \frac{-1}{4}$$

$$(vi) \frac{5}{-11} \square \frac{-5}{11}$$

$$\Rightarrow \frac{5 \times 11}{-11 \times 11} \square \frac{-5 \times -11}{11 \times -11}$$

$$\Rightarrow \frac{55}{-121} \square \frac{55}{-121}$$

$$\text{Hence, } \frac{5}{-11} \square \frac{-5}{11}$$

$$(vii) 0 \square \frac{-7}{6}$$

$$\Rightarrow 0 \square \frac{-7}{6}$$

[\because 0 is greater than every negative number]

Question 9

Which is greater in each of the following:

$$(i) \frac{2}{3}, \frac{5}{2} \quad (ii) \frac{-5}{6}, \frac{-4}{3}$$

$$(iii) \frac{-3}{4}, \frac{2}{-3} \quad (iv) \frac{-1}{4}, \frac{1}{4}$$

$$(v) -3\frac{2}{7}, -3\frac{4}{5}$$

Solution:

$$(i) \frac{2}{3}, \frac{5}{2} \Rightarrow \frac{2 \times 2}{3 \times 2}, \frac{5 \times 3}{2 \times 3} \Rightarrow \frac{4}{6}, \frac{15}{6}$$

$$\text{Since, } \frac{15}{6} > \frac{4}{6}, \text{ So } \frac{5}{2} > \frac{2}{3}.$$

$$(ii) \frac{-5}{6}, \frac{-4}{3} \Rightarrow \frac{-5 \times 3}{6 \times 3}, \frac{-4 \times 6}{3 \times 6}$$

$$\Rightarrow \frac{-15}{18}, \frac{-24}{18}$$

$$\text{Since, } \frac{-15}{18} > \frac{-24}{18}, \text{ so, } \frac{-5}{6} > \frac{-4}{3}$$

$$(iii) \frac{-3}{4}, \frac{2}{-3} \Rightarrow \frac{-3 \times -3}{4 \times -3}, \frac{2 \times 4}{-3 \times 4}$$

$$\Rightarrow \frac{9}{-12}, \frac{8}{-12}$$

$$\text{Since } \frac{9}{-12} < \frac{8}{-12}$$

$$\text{So, } \frac{2}{-3} > \frac{-3}{4}$$

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

$$\Rightarrow \frac{1}{4} > \frac{-1}{4} \quad [\because \text{ Each positive number is greater than its negative}]$$

$$(v) -3\frac{2}{7}, -3\frac{4}{5}$$

$$\Rightarrow -\frac{23}{7}, -\frac{19}{5} = \frac{-23 \times 5}{7 \times 5}, \frac{-19 \times 7}{5 \times 7}$$

$$\Rightarrow \frac{-115}{35}, \frac{-133}{35}$$

$$\text{Since } \frac{-115}{35} > \frac{-133}{35}$$

$$\text{So, } -3\frac{2}{7} > -3\frac{4}{5}$$

Question 10.

Write the following rational numbers in ascending order:

$$(i) \frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5} \quad (ii) \frac{1}{3}, \frac{-2}{9}, \frac{-4}{3}$$

$$(iii) \frac{-3}{7}, \frac{-3}{2}, \frac{-3}{4}$$

Solution:

$$(i) \frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5}$$

Here, denominators are same.

$$\therefore -3 < -2 < -1$$

Hence, the required ascending order is

$$\frac{-3}{5} < \frac{-2}{5} < \frac{-1}{5}$$

$$(ii) \frac{1}{3}, \frac{-2}{9}, \frac{-4}{3}$$

LCM of 3, 9 and 3 = 9

$$\frac{1 \times 3}{3 \times 3}, \frac{-2 \times 1}{9 \times 1}, \frac{-4 \times 3}{3 \times 3}$$

$$\Rightarrow \frac{3}{9}, \frac{-2}{9}, \frac{-12}{9}$$

$$\text{Since } \frac{-12}{9} < \frac{-2}{9} < \frac{3}{9}$$

Hence, the required ascending order is

$$\frac{-4}{3} < \frac{-2}{9} < \frac{1}{3}$$

$$(iii) \frac{-3}{7}, \frac{-3}{2}, \frac{-3}{4}$$

LCM of 7, 2 and 4 = 28

$$\frac{-3 \times 4}{7 \times 4}, \frac{-3 \times 14}{2 \times 14}, \frac{-3 \times 7}{4 \times 7}$$

$$\Rightarrow \frac{-12}{28}, \frac{-42}{28}, \frac{-21}{28}$$

$$\text{Since, } \frac{-42}{28} < \frac{-21}{28} < \frac{-12}{28}$$

Hence, the required ascending order is

$$\frac{-3}{2} < \frac{-3}{4} < \frac{-3}{7}$$

Question 1:

List five rational numbers between:

(i) -1 and 0 (ii) -2 and -1

(iii) $-\frac{4}{5}$ and $-\frac{2}{3}$ (iv) $\frac{1}{2}$ and $\frac{2}{3}$

Answer:

(i) -1 and 0

$$\frac{-1}{10}, \frac{-1}{20}, \frac{-1}{30}, \frac{-1}{40}, \frac{-1}{50}$$

(ii) -2 and -1

$$-2 = \frac{-12}{6} \text{ and } -1 = \frac{-6}{6}$$

Five rational numbers are

$$\frac{-11}{6}, \frac{-10}{6}, \frac{-9}{6}, \frac{-8}{6}, \frac{-7}{6}$$

(iii) $-\frac{4}{5}$ and $-\frac{2}{3}$

$$\frac{-4}{5} = \frac{-4 \times 9}{5 \times 9} = \frac{-36}{45} \text{ and } \frac{-2}{3} = \frac{-2 \times 15}{3 \times 15} = \frac{-30}{45}$$

Five rational numbers are

$$\frac{-35}{45}, \frac{-34}{45}, \frac{-33}{45}, \frac{-32}{45}, \frac{-31}{45}$$

(iv) $\frac{1}{2}$ and $\frac{2}{3}$

$$\frac{1}{2} = \frac{1 \times 18}{2 \times 18} = \frac{18}{36} \text{ and } \frac{2}{3} = \frac{2 \times 12}{3 \times 12} = \frac{24}{36}$$

Five rational numbers are

$$\frac{19}{36}, \frac{20}{36}, \frac{21}{36}, \frac{22}{36}, \frac{23}{36}$$

Question 2:

Write four more rational numbers in each of the following patterns:

$$(i) \frac{-3}{5}, \frac{-6}{10}, \frac{-9}{15}, \frac{-12}{20}, \dots \quad (ii) \frac{-1}{4}, \frac{-2}{8}, \frac{-3}{12}, \dots$$

$$(iii) \frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24}, \dots \quad (iv) \frac{-2}{3}, \frac{2}{-3}, \frac{4}{-6}, \frac{6}{-9}, \dots$$

Answer:

$$(i) \frac{-3}{5}, \frac{-6}{10}, \frac{-9}{15}, \frac{-12}{20}, \dots$$

$$\frac{-3}{5}, \frac{-3 \times 2}{5 \times 2}, \frac{-3 \times 3}{5 \times 3}, \frac{-3 \times 4}{5 \times 4}, \dots$$

It can be observed that the numerator is a multiple of 3 while the denominator is a multiple of 5 and as we increase them further, these multiples are increasing. Therefore, the next four rational numbers in this pattern are

$$\frac{-3 \times 5}{5 \times 5}, \frac{-3 \times 6}{5 \times 6}, \frac{-3 \times 7}{5 \times 7}, \frac{-3 \times 8}{5 \times 8}, \dots$$

$$\frac{-15}{25}, \frac{-18}{30}, \frac{-21}{35}, \frac{-24}{40}, \dots$$

(ii)

$$\frac{-1}{4}, \frac{-2}{8}, \frac{-3}{12}, \dots$$

$$\frac{-1}{4}, \frac{-1 \times 2}{4 \times 2}, \frac{-1 \times 3}{4 \times 3}, \dots$$

The next four rational numbers in this pattern are

$$\frac{-1 \times 4}{4 \times 4}, \frac{-1 \times 5}{4 \times 5}, \frac{-1 \times 6}{4 \times 6}, \frac{-1 \times 7}{4 \times 7}, \dots$$

$$\frac{-4}{16}, \frac{-5}{20}, \frac{-6}{24}, \frac{-7}{28}, \dots$$

(iii)

$$\frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24}, \dots$$

$$\frac{-1}{6}, \frac{1 \times 2}{-6 \times 2}, \frac{1 \times 3}{-6 \times 3}, \frac{1 \times 4}{-6 \times 4}, \dots$$

The next four rational numbers in this pattern are

$$\frac{1 \times 5}{-6 \times 5}, \frac{1 \times 6}{-6 \times 6}, \frac{1 \times 7}{-6 \times 7}, \frac{1 \times 8}{-6 \times 8} \dots$$

$$\frac{5}{-30}, \frac{6}{-36}, \frac{7}{-42}, \frac{8}{-48} \dots$$

$$(iv) \frac{-2}{3}, \frac{2}{-3}, \frac{4}{-6}, \frac{6}{-9} \dots$$

$$\frac{-2}{3}, \frac{2}{-3}, \frac{2 \times 2}{-3 \times 2}, \frac{2 \times 3}{-3 \times 3} \dots$$

The next four rational numbers in this pattern are

$$\frac{2 \times 4}{-3 \times 4}, \frac{2 \times 5}{-3 \times 5}, \frac{2 \times 6}{-3 \times 6}, \frac{2 \times 7}{-3 \times 7} \dots$$

$$\frac{8}{-12}, \frac{10}{-15}, \frac{12}{-18}, \frac{14}{-21} \dots$$

Question 3:

Give four rational numbers equivalent to:

$$(i) \frac{-2}{7} \quad (ii) \frac{5}{-3} \quad (iii) \frac{4}{9}$$

Answer:

$$(i) \frac{-2}{7}$$

Four rational numbers are

$$\frac{-2 \times 2}{7 \times 2}, \frac{-2 \times 3}{7 \times 3}, \frac{-2 \times 4}{7 \times 4}, \frac{-2 \times 5}{7 \times 5}$$

$$\frac{-4}{14}, \frac{-6}{21}, \frac{-8}{28}, \frac{-10}{35}$$

$$(ii) \frac{5}{-3}$$

Four rational numbers are

$$\frac{5 \times 2}{-3 \times 2}, \frac{5 \times 3}{-3 \times 3}, \frac{5 \times 4}{-3 \times 4}, \frac{5 \times 5}{-3 \times 5}$$

$$\frac{10}{-6}, \frac{15}{-9}, \frac{20}{-12}, \frac{25}{-15}$$

$$(iii) \frac{4}{9}$$

Four rational numbers are

$$\frac{4 \times 2}{9 \times 2}, \frac{4 \times 3}{9 \times 3}, \frac{4 \times 4}{9 \times 4}, \frac{4 \times 5}{9 \times 5}$$

$$\frac{8}{18}, \frac{12}{27}, \frac{16}{36}, \frac{20}{45}$$

Question 4:

Draw the number line and represent the following rational numbers on it:

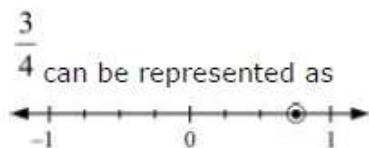
$$(i) \frac{3}{4} \quad (ii) \frac{-5}{8}$$

$$(iii) \frac{-7}{4} \quad (iv) \frac{7}{8}$$

Answer:

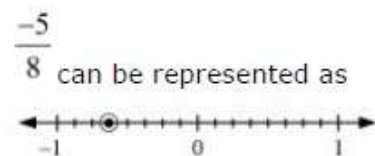
$$(i) \frac{3}{4}$$

This fraction represents 3 parts out of 4 equal parts. Therefore, each space between two integers on number line must be divided into 4 equal parts.



$$(ii) \frac{-5}{8}$$

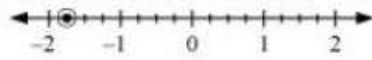
This fraction represents 5 parts out of 8 equal parts. Negative sign represents that it is on the negative side of number line. Therefore, each space between two integers on number line must be divided into 8 equal parts.



$$(iii) \frac{-7}{4} = -1\frac{3}{4}$$

This fraction represents 1 full part and 3 parts out of 4 equal parts. Negative sign represents that it is on the negative side of number line. Therefore, each space between two integers on number line must be divided into 4 equal parts.

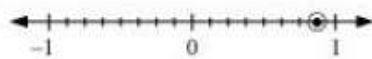
$-\frac{7}{4}$ can be represented as



(iv) $\frac{7}{8}$

This fraction represents 7 parts out of 8 equal parts. Therefore, each space between two integers on number line must be divided into 8 equal parts.

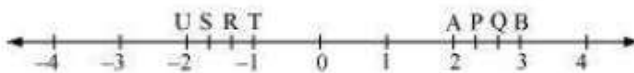
$\frac{7}{8}$ can be represented as



Question 5:

The points P, Q, R, S, T, U, A and B on the number line are such that,

$TR = RS = SU$ and $AP = PQ = QB$. Name the rational numbers represented by P, Q, R and S.



Answer:

Distance between U and T = 1 unit

It is divided into 3 equal parts.

$$TR = RS = SU = \frac{1}{3}$$

$$R = -1 - \frac{1}{3} = -\frac{3}{3} - \frac{1}{3} = -\frac{4}{3}$$

$$S = -1 - \frac{2}{3} = -\frac{3}{3} - \frac{2}{3} = -\frac{5}{3}$$

Similarly,

$AB = 1$ unit

It is divided into 3 equal parts.

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

$$Q = 2 + \frac{2}{3} = \frac{6}{3} + \frac{2}{3} = \frac{8}{3}$$

Question 6:

Which of the following pairs represent the same rational number?

(i) $\frac{-7}{21}$ and $\frac{3}{9}$ (ii) $\frac{-16}{20}$ and $\frac{20}{-25}$ (iii) $\frac{-2}{-3}$ and $\frac{2}{3}$

(iv) $\frac{-3}{5}$ and $\frac{-12}{20}$ (v) $\frac{8}{-5}$ and $\frac{-24}{15}$ (vi) $\frac{1}{3}$ and $\frac{-1}{9}$

(vii) $\frac{-5}{-9}$ and $\frac{5}{-9}$

Answer:

(i) $\frac{-7}{21}$ and $\frac{3}{9}$

$$\frac{-7}{21} = \frac{-1}{3}$$

$$\frac{3}{9} = \frac{1}{3}$$

As $\frac{-1}{3} \neq \frac{1}{3}$, therefore, it does not represent same rational numbers.

(ii) $\frac{-16}{20}$ and $\frac{20}{-25}$

$$\frac{-16}{20} = \frac{-4}{5}$$

$$\frac{-20}{25} = \frac{-4}{5}$$

Therefore, it represents same rational numbers.

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

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

Therefore, it represents same rational numbers.

$$(iv) \quad \frac{-3}{5} \text{ and } \frac{-12}{20}$$

$$\frac{-12}{20} = \frac{-3}{5}$$

Therefore, it represents same rational numbers.

$$(v) \quad \frac{8}{-5} \text{ and } \frac{-24}{15}$$

$$\frac{-24}{15} = \frac{-8}{5}$$

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

Therefore, it represents same rational numbers.

$$(vi) \quad \frac{1}{3} \text{ and } \frac{-1}{9}$$

As $\frac{1}{3} \neq \frac{-1}{9}$, therefore, it does not represent same rational numbers.

$$(vii) \quad \frac{-5}{-9} \text{ and } \frac{5}{-9}$$

$$\frac{-5}{-9} = \frac{5}{9}$$

As $\frac{5}{9} \neq \frac{-5}{9}$, therefore, it does not represent same rational numbers.

Question 7:

Rewrite the following rational numbers in the simplest form:

$$(i) \quad \frac{-8}{6} \quad (ii) \quad \frac{25}{45}$$

$$(iii) \quad \frac{-44}{72} \quad (iv) \quad \frac{-8}{10}$$

Answer:

$$(i) \quad \frac{-8}{6} = \frac{-4 \times 2}{3 \times 2} = \frac{-4}{3}$$

$$(ii) \frac{25}{45} = \frac{5 \times 5}{9 \times 5} = \frac{5}{9}$$

$$(iii) \frac{-44}{72} = \frac{-11 \times 4}{18 \times 4} = \frac{-11}{18}$$

$$(iv) \frac{-8}{10} = \frac{-4 \times 2}{5 \times 2} = \frac{-4}{5}$$

Question 8:

Fill in the boxes with the correct symbol out of $>$, $<$, and $=$

$$(i) \frac{-5}{7} \square \frac{2}{3} \quad (ii) \frac{-4}{5} \square \frac{-5}{7} \quad (iii) \frac{-7}{8} \square \frac{14}{-16}$$

$$(iv) \frac{-8}{5} \square \frac{-7}{4} \quad (v) \frac{1}{-3} \square \frac{-1}{4} \quad (vi) \frac{5}{-11} \square \frac{-5}{11}$$

$$(vii) 0 \square \frac{-7}{6}$$

Answer:

(i)

$$\frac{-5}{7} = \frac{-5 \times 3}{7 \times 3} = \frac{-15}{21}$$

$$\frac{2}{3} = \frac{2 \times 7}{3 \times 7} = \frac{14}{21}$$

As $-15 < 14$,

$$\text{Therefore, } \frac{-5}{7} \square \frac{2}{3}$$

(ii)

$$\frac{-4}{5} = \frac{-4 \times 7}{5 \times 7} = \frac{-28}{35}$$

$$\frac{-5}{7} = \frac{-5 \times 5}{7 \times 5} = \frac{-25}{35}$$

As $-28 < -25$

$$\text{Therefore, } \frac{-4}{5} \square \frac{-5}{7}$$

$$(iii) \text{ Here, } \frac{14}{-16} = \frac{7 \times 2}{-8 \times 2} = \frac{7}{-8} = \frac{-7}{8}$$

$$\frac{-7}{8} \boxed{=} \frac{14}{-16}$$

Therefore,

(iv)

$$\frac{-8}{5} = \frac{-8 \times 4}{5 \times 4} = \frac{-32}{20}$$

$$\frac{-7}{4} = \frac{-7 \times 5}{4 \times 5} = \frac{-35}{20}$$

As $-32 > -35$,

$$\frac{-8}{5} \boxed{>} \frac{-7}{4}$$

Therefore,

(v)

$$\frac{-1}{3} = \frac{-1 \times 4}{3 \times 4} = \frac{-4}{12}$$

$$\frac{-1}{4} = \frac{-1 \times 3}{4 \times 3} = \frac{-3}{12}$$

As $-4 < -3$,

$$\frac{-1}{3} \boxed{<} \frac{-1}{4}$$

Therefore,

$$(vi) \frac{5}{-11} \boxed{=} \frac{-5}{11}$$

$$(vii) 0 \boxed{>} \frac{-7}{6}$$

Question 9:

Which is greater in each of the following?

$$(i) \frac{2}{3}, \frac{5}{2} \quad (ii) \frac{-5}{6}, \frac{-4}{3} \quad (iii) \frac{-3}{4}, \frac{2}{-3}$$

$$(iv) \frac{-1}{4}, \frac{1}{4} \quad (v) -3\frac{2}{7}, -3\frac{4}{5}$$

Answer:

$$(i) \frac{2}{3}, \frac{5}{2}$$

By converting these into like fractions,

$$\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$$

$$\frac{5}{2} = \frac{5 \times 3}{2 \times 3} = \frac{15}{6}$$

As $15 > 4$, therefore, $\frac{5}{2}$ is greater.

$$(ii) \frac{-5}{6}, \frac{-4}{3}$$

$$\frac{-4}{3} = \frac{-4 \times 2}{3 \times 2} = \frac{-8}{6}$$

As $-5 > -8$, therefore, $\frac{-5}{6}$ is greater.

(iii)

$$\frac{-3}{4}, \frac{2}{-3}$$

$$\text{Or, } \frac{-3}{4}, \frac{-2}{3}$$

By converting these into like fractions,

$$\frac{-3}{4} = \frac{-3 \times 3}{4 \times 3} = \frac{-9}{12}$$

$$\frac{-2}{3} = \frac{-2 \times 4}{3 \times 4} = \frac{-8}{12}$$

As $-8 > -9$, therefore, $\frac{-2}{3}$ is greater.

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

$$\frac{1}{4} > \frac{-1}{4}$$

$$(v) -3\frac{2}{7}, -3\frac{4}{5}$$

$$\frac{-23}{7}, \frac{-19}{5}$$

By converting these into like fractions,

$$\frac{-23}{7} = \frac{-23 \times 5}{7 \times 5} = \frac{-115}{35}$$

$$\frac{-19}{5} = \frac{-19 \times 7}{5 \times 7} = \frac{-133}{35}$$

As $-115 > -133$, therefore, $-3\frac{2}{7}$ is greater.

Question 10:

Write the following rational numbers in ascending order:

$$(i) \frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5} \quad (ii) \frac{-1}{3}, \frac{-2}{9}, \frac{-4}{3} \quad (iii) \frac{-3}{7}, \frac{-3}{2}, \frac{-3}{4}$$

Answer:

$$(i) \frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5}$$

As $-3 < -2 < -1$,

$$\therefore \frac{-3}{5} < \frac{-2}{5} < \frac{-1}{5}$$

$$(ii) \frac{-1}{3}, \frac{-2}{9}, \frac{-4}{3}$$

By converting these into like fractions,

$$\frac{-1 \times 3}{3 \times 3}, \frac{-2}{9}, \frac{-4 \times 3}{3 \times 3}$$

$$\frac{-3}{9}, \frac{-2}{9}, \frac{-12}{9}$$

As $-12 < -3 < -2$,

$$\therefore \frac{-4}{3} < \frac{-1}{3} < \frac{-2}{9}$$

$$(iii) \frac{-3}{7}, \frac{-3}{2}, \frac{-3}{4}$$

By converting these into like fractions,

$$\frac{-3 \times 4}{7 \times 4}, \frac{-3 \times 14}{2 \times 14}, \frac{-3 \times 7}{4 \times 7}$$

$$\frac{-12}{28}, \frac{-42}{28}, \frac{-21}{28}$$

As $-42 < -21 < -12$,

$$\therefore \frac{-3}{2} < \frac{-3}{4} < \frac{-3}{7}$$

Question 1:

Find the sum:

$$(i) \frac{4}{5} + \left(\frac{-11}{4}\right) \quad (ii) \frac{5}{3} + \frac{3}{5} \quad (iii) \frac{-9}{10} + \frac{22}{15}$$

$$(iv) \frac{-3}{-11} + \frac{5}{9} \quad (v) \frac{-8}{19} + \frac{(-2)}{57} \quad (vi) \frac{-2}{3} + 0$$

$$(vii) -2\frac{1}{3} + 4\frac{3}{5}$$

Answer:

$$(i) \frac{5}{4} + \left(\frac{-11}{4}\right) = \frac{5}{4} - \frac{11}{4} = \frac{5-11}{4} = \frac{-6}{4} = \frac{-3}{2}$$

$$(ii) \frac{5}{3} + \frac{3}{5}$$

L.C.M of 3 and 5 is 15.

$$\frac{5}{3} + \frac{3}{5} = \frac{5 \times 5}{3 \times 5} + \frac{3 \times 3}{5 \times 3} = \frac{25}{15} + \frac{9}{15} = \frac{25+9}{15} = \frac{34}{15}$$

$$(iii) \frac{-9}{10} + \frac{22}{15}$$

L.C.M of 10 and 15 is 30.

$$\frac{-9}{10} + \frac{22}{15} = \frac{-9 \times 3}{10 \times 3} + \frac{22 \times 2}{15 \times 2} = \frac{-27}{30} + \frac{44}{30} = \frac{-27+44}{30} = \frac{17}{30}$$

$$(iv) \frac{-3}{-11} + \frac{5}{9} = \frac{3}{11} + \frac{5}{9}$$

L.C.M of 11 and 9 is 99.

$$\frac{3}{11} + \frac{5}{9} = \frac{3 \times 9}{11 \times 9} + \frac{5 \times 11}{9 \times 11} = \frac{27}{99} + \frac{55}{99} = \frac{27+55}{99} = \frac{82}{99}$$

$$(v) \frac{-8}{19} + \frac{(-2)}{57} = -\frac{8}{19} - \frac{2}{57}$$

L.C.M of 19 and 57 is 57.

$$-\frac{8}{19} - \frac{2}{57} = -\frac{8 \times 3}{19 \times 3} - \frac{2}{57} = -\frac{24}{57} - \frac{2}{57} = \frac{-24-2}{57} = \frac{-26}{57}$$

$$(vi) \quad \frac{-2}{3} + 0 = \frac{-2}{3}$$

$$(vii) \quad -2\frac{1}{3} + 4\frac{3}{5} = \frac{-7}{3} + \frac{23}{5}$$

L.C.M of 3 and 5 is 15.

$$\frac{-7}{3} + \frac{23}{5} = \frac{-7 \times 5}{3 \times 5} + \frac{23 \times 3}{5 \times 3} = \frac{-35}{15} + \frac{69}{15} = \frac{-35+69}{15} = \frac{34}{15}$$

Question 2:

Find

$$(i) \quad \frac{7}{24} - \frac{17}{36} \quad (ii) \quad \frac{5}{63} - \left(\frac{-6}{21}\right) \quad (iii) \quad \frac{-6}{13} - \left(\frac{-7}{15}\right)$$

$$(iv) \quad \frac{-3}{8} - \frac{7}{11} \quad (v) \quad -2\frac{1}{9} - 6$$

Answer:

$$(i) \quad \frac{7}{24} - \frac{17}{36}$$

L.C.M of 24 and 36 is 72.

$$\frac{7}{24} - \frac{17}{36} = \frac{7 \times 3}{24 \times 3} - \frac{17 \times 2}{36 \times 2} = \frac{21}{72} - \frac{34}{72} = \frac{21-34}{72} = \frac{-13}{72}$$

$$(ii) \quad \frac{5}{63} - \left(\frac{-6}{21}\right) = \frac{5}{63} + \frac{2}{7}$$

L.C.M of 63 and 7 is 63.

$$\frac{5}{63} + \frac{2}{7} = \frac{5}{63} + \frac{2 \times 9}{7 \times 9} = \frac{5}{63} + \frac{18}{63} = \frac{5+18}{63} = \frac{23}{63}$$

$$(iii) \quad \frac{-6}{13} - \left(\frac{-7}{15}\right) = \frac{-6}{13} + \frac{7}{15}$$

L.C.M of 13 and 15 is 195.

$$\frac{-6}{13} + \frac{7}{15} = \frac{-6 \times 15}{13 \times 15} + \frac{7 \times 13}{15 \times 13} = \frac{-90}{195} + \frac{91}{195} = \frac{-90+91}{195} = \frac{1}{195}$$

$$(iv) \frac{-3}{8} - \frac{7}{11}$$

L.C.M of 8 and 11 is 88.

$$\frac{-3}{8} - \frac{7}{11} = \frac{-3 \times 11}{8 \times 11} - \frac{7 \times 8}{11 \times 8} = \frac{-33}{88} - \frac{56}{88} = \frac{-33-56}{88} = \frac{-89}{88}$$

$$(v) -2\frac{1}{9} - 6 = -\frac{19}{9} - \frac{6}{1}$$

L.C.M of 9 and 1 is 9.

$$-\frac{19}{9} - \frac{6}{1} = -\frac{19}{9} - \frac{6 \times 9}{1 \times 9} = -\frac{19}{9} - \frac{54}{9} = \frac{-19-54}{9} = \frac{-73}{9}$$

Question 3:

Find the product:

$$(i) \frac{9}{2} \times \left(\frac{-7}{4}\right) \quad (ii) \frac{3}{10} \times (-9) \quad (iii) \frac{-6}{5} \times \frac{9}{11}$$

$$(iv) \frac{3}{7} \times \left(\frac{-2}{5}\right) \quad (v) \frac{3}{11} \times \frac{2}{5} \quad (vi) \frac{3}{-5} \times \frac{-5}{3}$$

Answer:

$$(i) \frac{9}{2} \times \left(\frac{-7}{4}\right) = \frac{9 \times (-7)}{2 \times 4} = \frac{-63}{8}$$

$$(ii) \frac{3}{10} \times (-9) = \frac{3}{10} \times \frac{(-9)}{1} = \frac{3 \times (-9)}{10 \times 1} = \frac{-27}{10}$$

$$(iii) \frac{-6}{5} \times \frac{9}{11} = \frac{-6 \times 9}{5 \times 11} = \frac{-54}{55}$$

$$(iv) \frac{3}{7} \times \left(\frac{-2}{5}\right) = \frac{3 \times (-2)}{7 \times 5} = \frac{-6}{35}$$

$$(v) \frac{3}{11} \times \frac{2}{5} = \frac{3 \times 2}{11 \times 5} = \frac{6}{55}$$

$$(vi) \frac{3}{-5} \times \frac{-5}{3} = \frac{3 \times (-5)}{(-5) \times 3} = \frac{-15}{-15} = 1$$

Question 4:

Find the value of:

$$(i) \quad (-4) \div \frac{2}{3} \quad (ii) \quad \frac{-3}{5} \div 2 \quad (iii) \quad \frac{-4}{5} \div (-3)$$

$$(iv) \quad \frac{-1}{8} \div \frac{3}{4} \quad (v) \quad \frac{-2}{13} \div \frac{1}{7} \quad (vi) \quad \frac{-7}{12} \div \left(\frac{-2}{13}\right)$$

$$(vii) \quad \frac{3}{13} \div \left(\frac{-4}{65}\right)$$

Answer:

$$(i) \quad -4 \div \frac{2}{3} = -4 \times \frac{3}{2} = \frac{-12}{2} = -6$$

$$(ii) \quad \frac{-3}{5} \div 2 = \frac{-3}{5} \times \frac{1}{2} = \frac{-3 \times 1}{5 \times 2} = \frac{-3}{10}$$

$$(iii) \quad \frac{-4}{5} \div (-3) = \frac{-4}{5} \times \frac{1}{-3} = \frac{(-4) \times 1}{5 \times (-3)} = \frac{-4}{-15} = \frac{4}{15}$$

$$(iv) \quad \frac{-1}{8} \div \frac{3}{4} = \frac{-1}{8} \times \frac{4}{3} = \frac{-1 \times 4}{8 \times 3} = \frac{-4}{24} = -\frac{1}{6}$$

$$(v) \quad \frac{-2}{13} \div \frac{1}{7} = \frac{-2}{13} \times 7 = \frac{-14}{13}$$

$$(vi) \quad \frac{-7}{12} \div \left(\frac{-2}{13}\right) = \frac{-7}{12} \times \frac{13}{-2} = \frac{(-7) \times 13}{12 \times (-2)} = \frac{-91}{-24} = \frac{91}{24}$$

$$(vii) \quad \frac{3}{13} \div \left(\frac{-4}{65}\right) = \frac{3}{13} \times \frac{65}{-4} = \frac{3 \times 65}{13 \times (-4)} = \frac{195}{-52} = -\frac{15}{4}$$

Ex 9.2:-

Question 1

Find the sum:

$$(i) \frac{5}{4} + \left(\frac{-11}{4} \right)$$

$$(ii) \frac{5}{3} + \frac{3}{5}$$

$$(iii) \frac{-9}{10} + \frac{22}{15}$$

$$(iv) \frac{-3}{-11} + \frac{5}{9}$$

$$(v) \frac{-8}{19} + \frac{(-2)}{57}$$

$$(vi) \frac{-2}{3} + 0$$

$$(vii) -2\frac{1}{3} + 4\frac{3}{5}$$

Solution:

$$(i) \frac{5}{4} + \left(\frac{-11}{4} \right) = \frac{5-11}{4} = \frac{-6}{4} = \frac{-6 \div 2}{4 \div 2} = \frac{-3}{2}$$

$$(ii) \frac{5}{3} + \frac{3}{5} = \frac{5 \times 5}{3 \times 5} + \frac{3 \times 3}{5 \times 3}$$

[\because LCM of 3 and 5 = 15]

$$= \frac{25}{15} + \frac{9}{15} = \frac{25+9}{15} = \frac{34}{15} = 2\frac{4}{15}$$

$$(iii) \frac{-9}{10} + \frac{22}{15} = \frac{-9 \times 3}{10 \times 3} + \frac{22 \times 2}{15 \times 2}$$

[LCM of 10 and 15 = 30]

$$= \frac{-27}{30} + \frac{44}{30} = \frac{-27+44}{30} = \frac{17}{30}$$

$$(iv) \frac{-3}{-11} + \frac{5}{9} = \frac{3}{11} + \frac{5}{9}$$

$$= \frac{3 \times 9}{11 \times 9} + \frac{5 \times 11}{9 \times 11} \quad [\text{LCM of 9 and 11} = 99]$$

$$= \frac{27}{99} + \frac{55}{99} = \frac{27+55}{99} = \frac{82}{99}$$

$$(v) \frac{-8}{19} + \frac{(-2)}{57} = \frac{-8 \times 3}{19 \times 3} - \frac{2 \times 1}{57 \times 1}$$

$$= \frac{-24}{57} - \frac{2}{57} = \frac{-24-2}{57} = \frac{-26}{57}$$

$$(vi) \frac{-2}{3} + 0 = \frac{-2}{3} + \frac{0}{3} = \frac{-2+0}{3} = \frac{-2}{3}$$

$$(vii) -2\frac{1}{3} + 4\frac{3}{5} = \frac{-7}{3} + \frac{23}{5} = \frac{-7 \times 5}{3 \times 5} + \frac{23 \times 3}{5 \times 3}$$

[LCM of 3 and 5 = 15]

$$= \frac{-35}{15} + \frac{69}{15} = \frac{-35+69}{15} = \frac{34}{15} = 2\frac{4}{15}$$

Question 2.

Find:

$$(i) \frac{7}{24} - \frac{17}{36} \quad (ii) \frac{5}{63} - \left(-\frac{6}{21}\right)$$

$$(iii) \frac{-6}{13} - \left(-\frac{7}{15}\right) \quad (iv) \frac{-3}{8} - \frac{7}{11}$$

$$(v) -2\frac{1}{9} - 6$$

Solution:

$$(i) \frac{7}{24} - \frac{17}{36} \quad \text{LCM of 24 and 36} = 72$$

$$= \frac{7 \times 3}{24 \times 3} - \frac{17 \times 2}{36 \times 2} = \frac{21}{72} - \frac{34}{72} = \frac{-13}{72}$$

$$(ii) \frac{5}{63} - \left(-\frac{6}{21}\right) = \frac{5}{63} + \frac{6}{21}$$

$$\text{LCM of 63 and 21} = 63$$

$$= \frac{5 \times 1}{63 \times 1} + \frac{6 \times 3}{21 \times 3} = \frac{5}{63} + \frac{18}{63} = \frac{5+18}{63} = \frac{23}{63}$$

$$(iii) \frac{-6}{13} - \left(-\frac{7}{15}\right) = \frac{-6}{13} + \frac{7}{15}$$

$$\text{LCM of 13 and 15} = 195$$

$$= \frac{-6 \times 15}{13 \times 15} + \frac{7 \times 13}{15 \times 13}$$

$$= \frac{-90}{195} + \frac{91}{195} = \frac{-90+91}{195} = \frac{1}{195}$$

$$(iv) \frac{-3}{8} - \frac{7}{11} \quad \text{LCM of 8 and 11} = 88$$

$$\frac{-3 \times 11}{8 \times 11} - \frac{7 \times 8}{11 \times 8} = \frac{-33}{88} - \frac{56}{88}$$

$$= \frac{-33-56}{88} = \frac{-89}{88} = -1\frac{1}{88}$$

$$(v) -2\frac{1}{9} - 6 = -\frac{19}{9} - \frac{6}{1} \quad [\text{LCM of 9 and 1} = 9]$$

$$\therefore \frac{-19 \times 1}{9 \times 1} - \frac{6 \times 9}{1 \times 9} = \frac{-19}{9} - \frac{54}{9} = \frac{-19-54}{9}$$

$$= \frac{-73}{9} = -8\frac{1}{9}$$

Question 3

Find the product:

$$(i) \frac{9}{2} \times \left(\frac{-7}{4}\right) \quad (ii) \frac{3}{10} \times (-9)$$

$$(iii) \frac{-6}{5} \times \frac{9}{11} \quad (iv) \frac{3}{7} \times \left(\frac{-2}{5}\right)$$

$$(v) \frac{3}{11} \times \frac{2}{5} \quad (vi) \frac{3}{-5} \times \frac{-5}{3}$$

Solution:

$$(i) \frac{9}{2} \times \left(\frac{-7}{4}\right) = \frac{9 \times (-7)}{2 \times 4} = \frac{-63}{8} = -7\frac{7}{8}$$

$$(ii) \frac{3}{10} \times (-9) = \frac{3}{10} \times \frac{-9}{1} \\ = \frac{3 \times (-9)}{10 \times 1} = \frac{-27}{10} = -2\frac{7}{10}$$

$$(iii) \frac{-6}{5} \times \frac{9}{11} = \frac{-6 \times 9}{5 \times 11} = \frac{-54}{55}$$

$$(iv) \frac{3}{7} \times \left(\frac{-2}{5}\right) = \frac{3 \times (-2)}{7 \times 5} = \frac{-6}{35}$$

$$(v) \frac{3}{11} \times \frac{2}{5} = \frac{3 \times 2}{11 \times 5} = \frac{6}{55}$$

$$(vi) \frac{3}{-5} \times \frac{-5}{3} = \frac{-3}{5} \times \frac{-5}{3} = \frac{(-3) \times (-5)}{5 \times 3} = \frac{15}{15} = 1$$

Question 4

Find the value of:

$$(i) (-4) \div \frac{2}{3} \quad (ii) \frac{-3}{5} \div 2$$

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

$$(v) \frac{-2}{13} \div \frac{1}{7} \quad (vi) \frac{-7}{12} \div \left(\frac{-2}{13}\right)$$

$$(vii) \frac{3}{13} \div \left(\frac{-4}{65}\right)$$

Solution:

$$\begin{aligned}(i) (-4) \div \frac{2}{3} &= -4 \times \frac{3}{2} \\ &= \frac{-4}{1} \times \frac{3}{2} = \frac{-12}{2} = \frac{-12 \div 2}{2 \div 2} = -6\end{aligned}$$

$$(ii) \frac{-3}{5} \div 2 = \frac{-3}{5} \div \frac{2}{1} = \frac{-3}{5} \times \frac{1}{2} = \frac{-3}{10}$$

$$\begin{aligned}(iii) \frac{-4}{5} \div (-3) &= \frac{-4}{5} \div \frac{-3}{1} = \frac{-4}{5} \times \frac{-1}{3} \\ &= \frac{(-4) \times (-1)}{5 \times 3} = \frac{4}{15}\end{aligned}$$

$$\begin{aligned}(iv) \frac{-1}{8} \div \frac{3}{4} &= \frac{-1}{8} \times \frac{4}{3} \\ &= \frac{-1 \times 4}{8 \times 3} = \frac{-4}{24} = \frac{-4 \div 4}{24 \div 4} = \frac{-1}{6}\end{aligned}$$

$$\begin{aligned}(v) \frac{-2}{13} \div \frac{1}{7} &= \frac{-2}{13} \times \frac{7}{1} \\ &= \frac{-2 \times 7}{13 \times 1} = \frac{-14}{13} = -1\frac{1}{13}\end{aligned}$$

$$\begin{aligned}(vi) \frac{-7}{12} \div \left(\frac{-2}{13}\right) &= \frac{-7}{12} \times \left(\frac{-13}{2}\right) \\ &= \frac{(-7) \times (-13)}{12 \times 2} = \frac{91}{24} = 3\frac{19}{24}\end{aligned}$$

$$\begin{aligned}(vii) \frac{3}{13} \div \left(\frac{-4}{65}\right) &= \frac{3}{13} \times \left(\frac{65}{-4}\right) = \frac{3 \times 65}{-13 \times 4} = \frac{195}{-52} \\ &= \frac{195 \div 13}{-52 \div 13} = \frac{15}{-4} = -3\frac{3}{4}\end{aligned}$$

Question 1:

Find the sum:

$$(i) \frac{4}{5} + \left(\frac{-11}{4}\right) \quad (ii) \frac{5}{3} + \frac{3}{5} \quad (iii) \frac{-9}{10} + \frac{22}{15}$$

$$(iv) \frac{-3}{-11} + \frac{5}{9} \quad (v) \frac{-8}{19} + \frac{(-2)}{57} \quad (vi) \frac{-2}{3} + 0$$

$$(vii) -2\frac{1}{3} + 4\frac{3}{5}$$

Answer:

$$(i) \frac{5}{4} + \left(\frac{-11}{4}\right) = \frac{5}{4} - \frac{11}{4} = \frac{5-11}{4} = \frac{-6}{4} = \frac{-3}{2}$$

$$(ii) \frac{5}{3} + \frac{3}{5}$$

L.C.M of 3 and 5 is 15.

$$\frac{5}{3} + \frac{3}{5} = \frac{5 \times 5}{3 \times 5} + \frac{3 \times 3}{5 \times 3} = \frac{25}{15} + \frac{9}{15} = \frac{25+9}{15} = \frac{34}{15}$$

$$(iii) \frac{-9}{10} + \frac{22}{15}$$

L.C.M of 10 and 15 is 30.

$$\frac{-9}{10} + \frac{22}{15} = \frac{-9 \times 3}{10 \times 3} + \frac{22 \times 2}{15 \times 2} = \frac{-27}{30} + \frac{44}{30} = \frac{-27+44}{30} = \frac{17}{30}$$

$$(iv) \frac{-3}{-11} + \frac{5}{9} = \frac{3}{11} + \frac{5}{9}$$

L.C.M of 11 and 9 is 99.

$$\frac{3}{11} + \frac{5}{9} = \frac{3 \times 9}{11 \times 9} + \frac{5 \times 11}{9 \times 11} = \frac{27}{99} + \frac{55}{99} = \frac{27+55}{99} = \frac{82}{99}$$

$$(v) \frac{-8}{19} + \frac{(-2)}{57} = -\frac{8}{19} - \frac{2}{57}$$

L.C.M of 19 and 57 is 57.

$$-\frac{8}{19} - \frac{2}{57} = -\frac{8 \times 3}{19 \times 3} - \frac{2}{57} = -\frac{24}{57} - \frac{2}{57} = \frac{-24-2}{57} = \frac{-26}{57}$$

$$(vi) \quad \frac{-2}{3} + 0 = \frac{-2}{3}$$

$$(vii) \quad -2\frac{1}{3} + 4\frac{3}{5} = \frac{-7}{3} + \frac{23}{5}$$

L.C.M of 3 and 5 is 15.

$$\frac{-7}{3} + \frac{23}{5} = \frac{-7 \times 5}{3 \times 5} + \frac{23 \times 3}{5 \times 3} = \frac{-35}{15} + \frac{69}{15} = \frac{-35+69}{15} = \frac{34}{15}$$

Question 2:

Find

$$(i) \quad \frac{7}{24} - \frac{17}{36} \quad (ii) \quad \frac{5}{63} - \left(\frac{-6}{21}\right) \quad (iii) \quad \frac{-6}{13} - \left(\frac{-7}{15}\right)$$

$$(iv) \quad \frac{-3}{8} - \frac{7}{11} \quad (v) \quad -2\frac{1}{9} - 6$$

Answer:

$$(i) \quad \frac{7}{24} - \frac{17}{36}$$

L.C.M of 24 and 36 is 72.

$$\frac{7}{24} - \frac{17}{36} = \frac{7 \times 3}{24 \times 3} - \frac{17 \times 2}{36 \times 2} = \frac{21}{72} - \frac{34}{72} = \frac{21-34}{72} = \frac{-13}{72}$$

$$(ii) \quad \frac{5}{63} - \left(\frac{-6}{21}\right) = \frac{5}{63} + \frac{2}{7}$$

L.C.M of 63 and 7 is 63.

$$\frac{5}{63} + \frac{2}{7} = \frac{5}{63} + \frac{2 \times 9}{7 \times 9} = \frac{5}{63} + \frac{18}{63} = \frac{5+18}{63} = \frac{23}{63}$$

$$(iii) \quad \frac{-6}{13} - \left(\frac{-7}{15}\right) = \frac{-6}{13} + \frac{7}{15}$$

L.C.M of 13 and 15 is 195.

$$\frac{-6}{13} + \frac{7}{15} = \frac{-6 \times 15}{13 \times 15} + \frac{7 \times 13}{15 \times 13} = \frac{-90}{195} + \frac{91}{195} = \frac{-90+91}{195} = \frac{1}{195}$$

$$(iv) \frac{-3}{8} - \frac{7}{11}$$

L.C.M of 8 and 11 is 88.

$$\frac{-3}{8} - \frac{7}{11} = \frac{-3 \times 11}{8 \times 11} - \frac{7 \times 8}{11 \times 8} = \frac{-33}{88} - \frac{56}{88} = \frac{-33-56}{88} = \frac{-89}{88}$$

$$(v) -2\frac{1}{9} - 6 = -\frac{19}{9} - \frac{6}{1}$$

L.C.M of 9 and 1 is 9.

$$-\frac{19}{9} - \frac{6}{1} = -\frac{19}{9} - \frac{6 \times 9}{1 \times 9} = -\frac{19}{9} - \frac{54}{9} = \frac{-19-54}{9} = \frac{-73}{9}$$

Question 3:

Find the product:

$$(i) \frac{9}{2} \times \left(\frac{-7}{4}\right) \quad (ii) \frac{3}{10} \times (-9) \quad (iii) \frac{-6}{5} \times \frac{9}{11}$$

$$(iv) \frac{3}{7} \times \left(\frac{-2}{5}\right) \quad (v) \frac{3}{11} \times \frac{2}{5} \quad (vi) \frac{3}{-5} \times \frac{-5}{3}$$

Answer:

$$(i) \frac{9}{2} \times \left(\frac{-7}{4}\right) = \frac{9 \times (-7)}{2 \times 4} = \frac{-63}{8}$$

$$(ii) \frac{3}{10} \times (-9) = \frac{3}{10} \times \frac{(-9)}{1} = \frac{3 \times (-9)}{10 \times 1} = \frac{-27}{10}$$

$$(iii) \frac{-6}{5} \times \frac{9}{11} = \frac{-6 \times 9}{5 \times 11} = \frac{-54}{55}$$

$$(iv) \frac{3}{7} \times \left(\frac{-2}{5}\right) = \frac{3 \times (-2)}{7 \times 5} = \frac{-6}{35}$$

$$(v) \frac{3}{11} \times \frac{2}{5} = \frac{3 \times 2}{11 \times 5} = \frac{6}{55}$$

$$(vi) \frac{3}{-5} \times \frac{-5}{3} = \frac{3 \times (-5)}{(-5) \times 3} = \frac{-15}{-15} = 1$$

Question 4:

Find the value of:

$$(i) \quad (-4) \div \frac{2}{3} \quad (ii) \quad \frac{-3}{5} \div 2 \quad (iii) \quad \frac{-4}{5} \div (-3)$$

$$(iv) \quad \frac{-1}{8} \div \frac{3}{4} \quad (v) \quad \frac{-2}{13} \div \frac{1}{7} \quad (vi) \quad \frac{-7}{12} \div \left(\frac{-2}{13}\right)$$

$$(vii) \quad \frac{3}{13} \div \left(\frac{-4}{65}\right)$$

Answer:

$$(i) \quad -4 \div \frac{2}{3} = -4 \times \frac{3}{2} = \frac{-12}{2} = -6$$

$$(ii) \quad \frac{-3}{5} \div 2 = \frac{-3}{5} \times \frac{1}{2} = \frac{-3 \times 1}{5 \times 2} = \frac{-3}{10}$$

$$(iii) \quad \frac{-4}{5} \div (-3) = \frac{-4}{5} \times \frac{1}{-3} = \frac{(-4) \times 1}{5 \times (-3)} = \frac{-4}{-15} = \frac{4}{15}$$

$$(iv) \quad \frac{-1}{8} \div \frac{3}{4} = \frac{-1}{8} \times \frac{4}{3} = \frac{-1 \times 4}{8 \times 3} = \frac{-4}{24} = -\frac{1}{6}$$

$$(v) \quad \frac{-2}{13} \div \frac{1}{7} = \frac{-2}{13} \times 7 = \frac{-14}{13}$$

$$(vi) \quad \frac{-7}{12} \div \left(\frac{-2}{13}\right) = \frac{-7}{12} \times \frac{13}{-2} = \frac{(-7) \times 13}{12 \times (-2)} = \frac{-91}{-24} = \frac{91}{24}$$

$$(vii) \quad \frac{3}{13} \div \left(\frac{-4}{65}\right) = \frac{3}{13} \times \frac{65}{-4} = \frac{3 \times 65}{13 \times (-4)} = \frac{195}{-52} = -\frac{15}{4}$$