

Chapter 3

Rational Numbers

Exercise 3.1

Question 1.

Which of the following are positive rational numbers?

$$\frac{5}{8}, \frac{-3}{11}, \frac{0}{5}, 7, -4, \frac{-3}{-13}, \frac{-17}{-6}, \frac{9}{-20}$$

Solution :

$$\frac{5}{8}, \frac{0}{5}, 7, \frac{-3}{-13} \text{ or } \frac{3}{13}, \frac{-17}{-6} \text{ or } \frac{17}{6} \text{ are positive rational numbers.}$$

Question 2.

Which of the following are negative rational numbers?

$$\frac{-5}{7}, \frac{4}{-3}, \frac{-3}{-11}, -6, 9, 0, \frac{-28}{5}, \frac{31}{7}$$

Solution :

$$\frac{-5}{7}, \frac{4}{-3}, -6, \frac{-28}{5}, \text{ are negative rational numbers.}$$

Question 3.

Find four rational numbers equivalent to each of the following rational numbers:

(i) $\frac{3}{-7}$

(b) $\frac{-5}{-9}$

Solution :

(i) $\frac{3}{-7}$ first (multiply and divide by 2)

$$\Rightarrow \frac{3}{-7} \times \frac{2}{2} = \frac{6}{-14}$$

Second (multiply and divide by 3)

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

Third (Multiply and divide by 4)

$$\Rightarrow \frac{3}{-7} \times \frac{4}{4} = \frac{12}{-28}$$

Fourth, (multiply and divide by 5)

$$\Rightarrow \frac{3}{-7} \times \frac{5}{5} = \frac{15}{-35}$$

Hence for equivalent rational numbers are:

$$\frac{6}{-14}, \frac{9}{-21}, \frac{12}{-28}, \frac{15}{-35}$$

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

First equivalent rational number

$\frac{-5}{-9}$ (Multiply and divide by 2)

$$\Rightarrow \frac{-5}{-9} \times \frac{2}{2} = \frac{-10}{-18}$$

Second, $\frac{-5}{-9}$ (Multiply and divide by 3)

$$\Rightarrow \frac{-5}{-9} \times \frac{3}{3} = \frac{-15}{-27} = \frac{15}{27} = \frac{5}{9}$$

Third, $\frac{-5}{-9}$ (Multiply and divide by 4)

$$\Rightarrow \frac{-5}{-9} \times \frac{4}{4} = \frac{-20}{-36} = \frac{20}{36}$$

Hence four equivalent rational numbers are:

$$\frac{-10}{-18}, \frac{-15}{-27}, \frac{5}{9}, \frac{20}{36}$$

Question 4.

Write each of the following rational numbers with positive denominators:

(i) $\frac{4}{-9}$

(ii) $\frac{17}{-33}$

(iii) $\frac{-15}{-38}$

Solution

(i) $\frac{4}{-9} = \frac{-4}{9}$

(ii) $\frac{17}{-33} = \frac{-17}{33}$

(iii) $\frac{-15}{-38} = \frac{15}{38}$

Question 5.

Write next four rational numbers in each of the following petterns:

(i) $\frac{-1}{4}, \frac{-2}{8}, \frac{-3}{12}, \frac{-4}{16}, \dots\dots\dots$

$$(ii) \frac{2}{-3}, \frac{-4}{6}, \frac{-6}{9}, \frac{-8}{12}, \dots\dots\dots$$

Solution :

Next four rational numbers in the same patterns.

$$(i) \frac{-1}{4}, \frac{-2}{8}, \frac{-3}{12}, \frac{-4}{16}, \frac{-5}{20}, \frac{-6}{24}, \frac{-7}{28}, \frac{-8}{32}$$

$$(ii) \frac{2}{-3}, \frac{-4}{6}, \frac{-6}{9}, \frac{-8}{12}, \frac{-10}{15}, \frac{-12}{18}, \frac{-14}{21}, \frac{-16}{24},$$

Question 6.

Which of the following pairs of rational numbers are equal?

$$(i) \frac{-3}{-7} \text{ and } \frac{15}{35}$$

$$(ii) \frac{-6}{8} \text{ and } \frac{10}{-15}$$

$$(iii) \frac{6}{-10} \text{ and } \frac{-12}{20}$$

Solution :

$$(i) \frac{-3}{-7} \text{ and } \frac{15}{35} = \frac{15}{35} = \frac{3}{7}$$

$$-3 \times 35 = 15 \times (-7)$$

$$= -105 = -105$$

$$(ii) \frac{-6}{8} \text{ and } \frac{10}{-15}$$

$$\text{If } -6 \times (-15) = 10 \times 8$$

90 = 80 which is not true?

$$\frac{-6}{8} \neq \frac{10}{-15}$$

$$(iii) \frac{6}{-10} \neq \frac{-12}{20}$$

$120 = 120$ which is true

$$\frac{6}{-10} = \frac{-12}{20}$$

Question 7.

Which of the following pairs represent the same rational number

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

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

$$(iii) \frac{-3}{5}, \frac{-12}{20}$$

$$(iv) \frac{8}{-5}, \frac{-24}{15}$$

Solution :

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

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

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

From (i) and (ii)

$$\frac{-1}{3} \neq \frac{1}{3}$$

$\frac{-7}{21}$ and $\frac{3}{9}$ are not same rational numbers.

$$(ii) \frac{-3}{5}, \frac{-12}{20}$$

$$\frac{-12}{20} = \frac{-3}{5} \dots\dots (i)$$

$$\frac{-3}{5} = \frac{-3}{5} \dots\dots\dots \text{(ii)}$$

$\frac{-3}{5}, \frac{-12}{20}$ are same rational numbers.

$$\text{(iv)} \quad \frac{8}{-5}, \frac{-24}{15}$$

$$\frac{8}{-5} = \frac{-8}{5} \dots\dots \text{(i)}$$

$$\frac{-24}{15} = \frac{-8}{5} \dots\dots \text{(ii)}$$

From (i) and (ii) $\frac{8}{-5}, \frac{-24}{15}$ are some rational numbers.

Question 8

Fill in the blanks :

$$\text{(i)} \quad \frac{5}{4} = \frac{\dots}{16} = \frac{25}{\dots} = \frac{-15}{\dots}$$

$$\text{(ii)} \quad \frac{-3}{7} = \frac{\dots}{14} = \frac{6}{\dots} = \frac{-6}{\dots}$$

Solution :

$$\text{(i)} \quad \frac{5}{4} = \frac{\dots}{16} = \frac{25}{\dots} = \frac{-15}{\dots}$$

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

$$\frac{25}{\dots} = \frac{5 \times 5}{4 \times 5} = \frac{25}{20}$$

$$\frac{-15}{\dots} = \frac{5 \times (-3)}{4 \times (-3)} = \frac{-15}{-12}$$

$$\text{(ii)} \quad \frac{-3}{7} = \frac{\dots}{14} = \frac{6}{\dots} = \frac{-6}{\dots}$$

$$= \frac{-3}{7} = \frac{-3 \times 2}{7 \times 2} = \frac{-6}{14}$$

$$= \frac{-3 \times (-3)}{7 \times (-3)} = \frac{9}{-21}$$

$$= \frac{-3 \times 2}{7 \times 2} = \frac{-6}{14}$$

$$= \frac{-3}{7} = \frac{-6}{14} = \frac{9}{-21} \neq \frac{-6}{14}$$

Question 9.

Reduce each of the following rational numbers in standard

(i) $\frac{-45}{30}$

(ii) $\frac{16}{-36}$

(iii) $\frac{-3}{-15}$

(iv) $\frac{68}{-119}$

Solution :

(i) $\frac{-45}{30} = \frac{-45 \div 3}{30 \div 3} = \frac{-3}{2}$ (H.C.F 45,30 15)

(ii) $\frac{16}{-36} = \frac{16 \div 4}{-36 \div 4} = \frac{4}{-9}$ (H.C.F 16, 36 4)

(iii) $\frac{-3}{-15} = \frac{-3 \div (-3)}{-15 \div (-3)} = \frac{1}{5}$ (H.C.F 3,15.....3)

(iv) $\frac{68}{-119} = \frac{68 \div 17}{-119 \div 17} = \frac{4}{-7}$ (H.C.F 68,119..... 17)

Exercise 3.2

Question 1.

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

(i) $\frac{3}{8}$

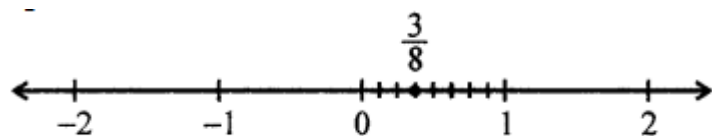
(ii) $\frac{-3}{4}$

(iii) $\frac{-7}{8}$

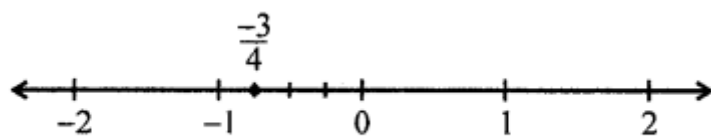
(iv) $\frac{-17}{8}$

Solution :

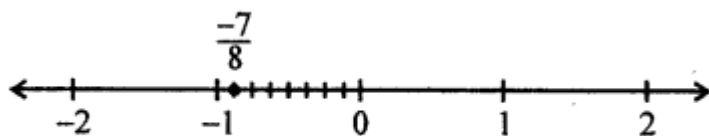
(i) $\frac{3}{8}$



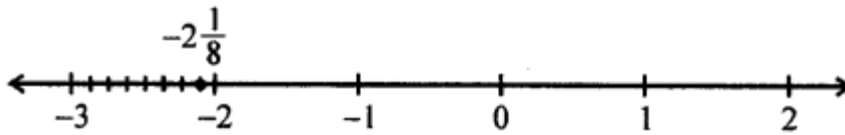
(ii) $\frac{-3}{4}$



(iii) $\frac{-7}{8}$

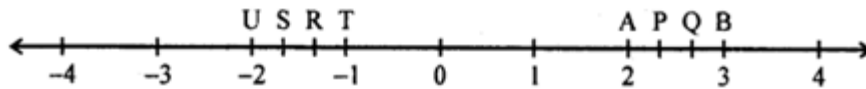


(iv) $\frac{-17}{8}$



Question 2.

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



Solution :

Points P,Q,R,S,T,U,A and B are on numbers line such that $TR = RS = SU$ and $AP = PQ = QB$.

From the number line, we see that

$$TU = -1 \text{ then } TR = RS = SU = \frac{-1}{3}$$

And $AB = 1$, then

$$AP = PQ = QB = \frac{1}{3}$$

$$\text{The point P represents } = 2 + \frac{1}{3} = 2\frac{1}{3} = \frac{7}{3}$$

$$\text{Q represents } = 2 + \frac{2}{3} = 2\frac{2}{3} = \frac{8}{3}$$

$$\text{R represents } = -1 - \frac{2}{3} = -\frac{5}{3}$$

Question 3.

State whether the following statements are true or false:

- (i) The rational number $-\frac{13}{-5}$ lies to the right of zero in the number line.
- (ii) The rational numbers $\frac{-5}{-7}$ and $\frac{7}{-9}$ lie on opposite sides of zero on the number line.
- (iii) the rational numbers $\frac{-17}{6}$ and $\frac{8}{-15}$ lie on opposite sides of zero on the number line.

Solution :

On a number line,

- (i) $\frac{-13}{-5} = \frac{13}{5}$ which lies to the right side of zero (**True**)
- (ii) $\frac{-5}{-7} = \frac{5}{7}$ and $\frac{7}{-9} = \frac{-7}{9}$ lie on opposite sides of zero (**True**).
- (iii) $\frac{-17}{6}$ and $\frac{8}{-15} = \frac{-8}{15}$ lie on the same side of zero.

On opposite sides is false. (**False**)

Question 4.

Which of the two rational numbers is greater in each of the following pairs?

- (i) $\frac{-4}{7}$, 0
- (ii) $\frac{5}{-9}$, $\frac{3}{7}$
- (iii) $\frac{-9}{-5}$, 0

$$(iv) \frac{7}{-5}, \frac{-21}{-23}$$

Solution :

$$(i) \frac{-4}{7}, 0$$

0 is greater than $\frac{-4}{7}$

$$(ii) \frac{5}{-9}, \frac{3}{7}$$

$\frac{3}{7}$ is greater than $\frac{5}{-9}$

$$(iii) \frac{-9}{-5}, 0$$

$\frac{9}{5}$ is greater than 0

$$(iv) \frac{7}{-5}, \frac{-21}{-23} = \frac{21}{23}$$

$\frac{21}{23}$ is greater than $\frac{7}{-5}$

Question 5.

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

$$(i) \frac{-4}{5} \boxed{} \frac{-5}{7}$$

$$(ii) \frac{-8}{5} \boxed{} \frac{-7}{4}$$

$$(iii) \frac{-7}{8} \boxed{} \frac{42}{-48}$$

$$(iv) \frac{1}{-3} \boxed{} \frac{-1}{4}$$

$$(v) -\frac{3}{8} \boxed{} -\frac{2}{7}$$

$$(vi) \frac{-4}{3} \boxed{} - \frac{3}{2}$$

Solution

$$(i) \frac{-4}{5} \qquad \frac{-5}{7}$$

LCM of 5,7 = 35

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

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

$$\frac{-28}{35} < \frac{-25}{35}$$

$$= \frac{-4}{5} \boxed{<} \frac{-5}{7}$$

$$(ii) \frac{-8}{5} \boxed{} \frac{-7}{4}$$

LCM of 5,4 = 20

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

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

$$\frac{-32}{20} > \frac{-35}{20}$$

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

$$(iii) \frac{-7}{8} \boxed{} \frac{42}{-48}$$

LCM of 8, 48 = 48

$$\frac{-7}{8} = \frac{-7 \times 6}{8 \times 6} = \frac{-42}{48}$$

$$\frac{-42}{48} = \frac{42}{-48}$$

$$\frac{-7}{8} \boxed{=} \frac{42}{-48}$$

$$(iv) \frac{1}{-3} \boxed{} \frac{-1}{4}$$

LCM of 3,4 = 12

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

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

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

$$\frac{-4}{12} < \frac{-3}{12}$$

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

$$(v) -\frac{3}{8} \boxed{} -\frac{2}{7}$$

LCM of 8,7 = 56

$$\frac{3}{8} = -\frac{3 \times 7}{8 \times 7} = -\frac{21}{56}$$

$$\frac{2}{7} = -\frac{2 \times 8}{8 \times 7} = -\frac{16}{56}$$

$$= -\frac{21}{56} < -\frac{16}{56}$$

$$= -\frac{3}{8} \boxed{<} -\frac{2}{7}$$

$$(vi) \frac{-4}{3} \boxed{} - \frac{3}{2}$$

LCM of 8,7 = 56

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

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

$$\frac{-8}{6} > -\frac{9}{6}$$

$$\frac{-4}{3} \boxed{>} -\frac{3}{2}$$

Question 6.

Arrange the following rational numbers in ascending order:

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

$$(ii) \frac{-3}{4}, \frac{5}{-12}, \frac{9}{-24}, \frac{-7}{16}$$

Solution .

Arranging and ascending order:

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

Numerator are the same:

Greater denominator is less than the smaller denominator.

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

$$(ii) \frac{-3}{4}, \frac{5}{-12}, \frac{9}{-24}, \frac{-7}{16}$$

LCM of 4, 12, 24, 16 = 48

$$\frac{-3}{4} = \frac{-3 \times 12}{4 \times 12} = \frac{-36}{48}$$

$$\frac{5}{-12} = \frac{5 \times (-4)}{-12 \times (-4)} = \frac{-20}{48}$$

$$\frac{-9}{24} = \frac{9 \times (-2)}{-24 \times (-2)} = \frac{-18}{48}$$

$$\frac{-7}{16} = \frac{-7 \times 3}{16 \times 3} = \frac{-21}{48}$$

Arranging in ascending order,

$$\frac{-36}{48} < \frac{-21}{48} < \frac{-20}{48} < \frac{-18}{48}$$

$$\frac{-3}{4} < \frac{-7}{16} < \frac{5}{-12} < \frac{-9}{24}$$

Question 7.

Arrange the following rational numbers in descending order:

(i) $\frac{-3}{10}, \frac{-11}{20}, \frac{-7}{15}, \frac{17}{-30}$

(ii) $\frac{-7}{10}, \frac{-11}{15}, \frac{2}{-5}, \frac{19}{-30}$

Solution :

(i) $\frac{-3}{10}, \frac{-11}{20}, \frac{-7}{15}, \frac{17}{-30}$

LCM of 10,20,15,30 = 60

$$\frac{-3}{10} = \frac{-3 \times 6}{10 \times 6} = \frac{-18}{60}$$

$$\frac{-11}{20} = \frac{-11 \times 3}{20 \times 3} = \frac{-33}{60}$$

$$\frac{-7}{15} = \frac{-7 \times 4}{15 \times 4} = \frac{-28}{60}$$

$$\frac{-17}{30} = \frac{-17 \times (-2)}{-30 \times (-2)} = \frac{-34}{60}$$

Arranging in ascending order,

$$\frac{-18}{60} < \frac{-28}{60} < \frac{-33}{60} < \frac{-34}{60}$$

$$\frac{-3}{10} < \frac{-7}{15} < \frac{-11}{20} < \frac{-34}{60}$$

$$(ii) \frac{-7}{10}, \frac{-11}{15}, \frac{2}{-5}, \frac{19}{-30}$$

Solution :

LCM of 10,15,5,30 = 30

$$\frac{-7}{10} = \frac{-7 \times 3}{10 \times 3} = \frac{-21}{30}$$

$$\frac{-11}{15} = \frac{-11 \times 2}{15 \times 2} = \frac{-22}{30}$$

$$\frac{-2}{5} = \frac{2 \times (-6)}{-5 \times (-6)} = \frac{-12}{30}$$

$$\frac{-19}{30} = \frac{-19 \times (-1)}{-30 \times (-1)} = \frac{-19}{30}$$

Arranging in ascending order,

$$\frac{-12}{30} < \frac{-19}{30} < \frac{-21}{30} < \frac{-22}{30}$$

$$\frac{2}{-5} < \frac{19}{-30} < \frac{-7}{10} < \frac{-11}{15}$$

Question 8.

Insert five rational numbers between:

(i) -3 and -2

(ii) $\frac{-2}{3}$ and $\frac{-1}{3}$

Solution :

(i) 5 rational numbers between -3 and -2

$$\frac{-3}{1}, \frac{-2}{1}$$

We have to find 5 rational numbers between -3 and -2 multiplying by $(5+1) = 6$ to numerator and denominator

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

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

Five rational numbers between -3 and -2 are

$$\frac{-17}{6}, \frac{-16}{6}, \frac{-15}{6}, \frac{-14}{6}, \frac{-13}{6}$$

$$\frac{-17}{6}, \frac{-8}{3}, \frac{-5}{2}, \frac{-7}{3}, \frac{-13}{6}$$

(ii) 5 rational numbers between $\frac{-2}{3}$ and $\frac{-1}{3}$

Multiply number and denominator by

$$5+1 = 6 \text{ therefore,}$$

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

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

Five rational numbers will be

$$\frac{-11}{18}, \frac{-10}{18}, \frac{-9}{18}, \frac{-8}{18}, \frac{-7}{18}$$

$$\frac{-11}{18}, \frac{-5}{18}, \frac{-1}{18}, \frac{-4}{18}, \frac{-7}{18}$$

Question 9.

Insert five rational numbers between :

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

(ii) $\frac{-1}{2}$ and $\frac{2}{3}$

Solution :

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

$$\text{LCM of } 3, 5 = 15$$

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

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

Between -10 and -12 there are is one rational

Multiplying numerator and denominator by

$$5 + 1 = 6$$

$$\frac{-12}{15} = \frac{-12 \times 6}{15 \times 6} = \frac{-72}{90}$$

$$\frac{-10}{15} = \frac{-10 \times 6}{15 \times 6} = \frac{-60}{90}$$

5 rational numbers between $\frac{-72}{90}$ and $\frac{-60}{90}$

$$\frac{-71}{90}, \frac{-70}{90}, \frac{-69}{90}, \frac{-68}{90}, \frac{-67}{90}$$

$$\frac{-71}{90}, \frac{-7}{90}, \frac{-23}{90}, \frac{-34}{90}, \frac{-67}{90}$$

(ii) - $\frac{1}{2}$ and $\frac{2}{3}$

LCM of 2,3 = 6

$$- \frac{1}{2} = \frac{-1 \times 3}{2 \times 3} = \frac{-3}{6}$$

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

Now 5 rational numbers between

- $\frac{1}{2}$ and $\frac{2}{3}$

$$\frac{-2}{6}, \frac{-1}{6}, \frac{1}{6}, \frac{2}{6}, \frac{3}{6}$$

Exercise 3.3

Question 1.

Add the following pairs of rational numbers:

(i) $\frac{3}{11}, \frac{-5}{11}$

(ii) $\frac{4}{9}, \frac{5}{-9}$

(iii) $\frac{5}{-7}, \frac{-2}{7}$

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

Solution :

(i) $\frac{3}{11}, \frac{-5}{11}$

$$= \frac{3}{11} + \frac{-5}{11}$$

$$= \frac{3-5}{11}$$

$$= \frac{-2}{11}$$

(ii) $\frac{4}{9}, \frac{5}{-9}$

$$= \frac{4}{9} + \frac{5}{-9}$$

$$= \frac{4}{9} + \frac{5 \times (-1)}{-9 \times (-1)}$$

$$= \frac{4}{9} - \frac{5}{-9}$$

$$= \frac{4-5}{9}$$

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

$$\text{(iii)} \quad \frac{5}{-7}, \frac{-2}{-7}$$

$$= \frac{5}{-7} + \frac{-2}{-7}$$

$$= \frac{5 \times (-1)}{-7 \times (-1)} + \frac{2}{7}$$

$$= \frac{-5}{7} + \frac{2}{7}$$

$$= \frac{-5+2}{7}$$

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

$$\text{(iv)} \quad \frac{-2}{5}, \frac{3}{4}$$

$$= \frac{-2}{5} + \frac{3}{4}$$

$$= \frac{(-2 \times 4) + (3 \times 5)}{20}$$

$$= \frac{-8+15}{20}$$

$$= \frac{7}{20}$$

Question 2.

Find the sum.

$$(i) \frac{-27}{4} + \frac{15}{8}$$

$$(ii) \frac{-1}{18} + \frac{-3}{8}$$

$$(iii) -3\frac{1}{6} + 2\frac{3}{8}$$

$$(iv) -2\frac{4}{5} + 4\frac{3}{10}$$

Solution .

$$(i) \frac{-27}{4} + \frac{15}{8}$$

$$= \frac{27 \times (-1)}{-4 \times (-1)} + \frac{-15}{8}$$

$$= \frac{-27}{4} + \frac{15}{8}$$

$$= \frac{(-27 \times 2) + (-15)}{8}$$

$$= \frac{-54 + (-15)}{8}$$

$$= \frac{-54 - 15}{8}$$

$$= \frac{-69}{8}$$

$$(ii) \frac{-1}{18} + \frac{-3}{8}$$

$$= \frac{(-1 \times 4) + (-3 \times 9)}{72} \text{ (LCM 18 , 8 = 72)}$$

$$= \frac{-4 + (-27)}{72}$$

$$= \frac{-4-27}{72}$$

$$= \frac{-31}{72}$$

$$\text{(iii) } -3\frac{1}{6} + 2\frac{3}{8}$$

$$= \frac{-19}{6} + \frac{19}{8}$$

$$= \frac{(-19 \times 4) + (19 \times 3)}{24} \quad (\text{LCM } 6, 8 = 24)$$

$$= \frac{-76+54}{24}$$

$$= \frac{-19}{24}$$

$$\text{(iv) } -2\frac{4}{5} + 4\frac{3}{10}$$

$$= \frac{-14}{5} + \frac{43}{10}$$

$$= \frac{(-14 \times 2) + 43}{10} \quad (\text{LCM } 5, 10 = 10)$$

$$= \frac{-28+43}{10}$$

$$= \frac{15}{10}$$

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

$$= 1\frac{1}{2}$$

Question 3.

$$(i) \frac{-6}{13} \text{ from } \frac{4}{13}$$

$$(ii) \frac{-1}{2} \text{ from } \frac{-2}{3}$$

$$(iii) \frac{5}{9} \text{ from } \frac{-2}{3}$$

Solution .

$$(i) \frac{-6}{13} \text{ from } \frac{4}{13}$$

$$= \frac{4}{13} - \frac{-6}{13}$$

$$= \frac{4}{13} + \frac{6}{13}$$

$$= \frac{4+6}{13}$$

$$= \frac{10}{13}$$

$$(ii) \frac{-1}{2} \text{ from } \frac{-2}{3}$$

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

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

$$= \frac{-4+3}{6}$$

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

$$(iii) \frac{5}{9} \text{ from } \frac{-2}{3}$$

$$= \frac{-2}{3} - \frac{5}{9}$$

$$= \frac{-6-5}{9}$$

$$= \frac{-11}{9}$$

Question 4.

Find .

$$(i) \frac{5}{63} - \left(\frac{-6}{21}\right)$$

$$(ii) \frac{-6}{13} - \left(\frac{-7}{15}\right)$$

$$(iii) 3\frac{1}{8} - \left(-1\frac{5}{6}\right)$$

Solution :

$$(i) \frac{5}{63} - \left(\frac{-6}{21}\right)$$

$$= \frac{5}{63} - \frac{6}{21}$$

$$= \frac{5+18}{63}$$

$$= \frac{23}{63} \text{ (LCM of 63,21 = 63)}$$

$$(ii) \frac{-6}{13} - \left(\frac{-7}{15}\right)$$

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

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

$$= \frac{1}{195} (\text{LCM of } 13, 15 = 195)$$

$$\text{(iii) } 3\frac{1}{8} - \left(-1\frac{5}{6}\right)$$

$$= \frac{25}{8} + \frac{11}{6}$$

$$= \frac{75+44}{24}$$

$$= \frac{119}{24}$$

$$= 4\frac{23}{24}$$

Question 5.

The sum of two rational numbers is $\frac{2}{5}$ if one of them is $\frac{-4}{7}$ find the other.

Solution :

$$\text{Sum of two rational numbers} = \frac{2}{5}$$

$$\text{One of them} = \frac{-4}{7}$$

$$\text{Other} = \frac{2}{5} - \frac{-4}{7}$$

$$= \frac{14+20}{35}$$

$$= \frac{34}{35}$$

Question 6.

What rational number should added to $\frac{-5}{12}$ to get $\frac{-7}{8}$?

Solution :

Sum of two rational numbers = $\frac{-7}{8}$

One number = $\frac{-5}{12}$

Required number = $\frac{-7}{8} - \frac{-5}{12}$

$$= \frac{-7}{8} + \frac{5}{12}$$

$$= \frac{-21+10}{24} \text{ (LCM of 8,12 = 24)}$$

$$= \frac{-11}{24}$$

Question 7.

What rational number should be subtracted from $\frac{-2}{3}$ to get $\frac{-5}{6}$?

Solution :

Required number = $\frac{-2}{3} + \frac{5}{6}$

$$= \frac{-4+5}{6}$$

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

Question 8.

Find the product:

$$(i) \frac{2}{3} \times \frac{-7}{8}$$

$$(ii) \frac{-6}{7} \times \frac{5}{7}$$

$$(iii) \frac{-2}{9} \times (-5)$$

$$(iv) \frac{-5}{11} \times \frac{11}{-5}$$

$$(v) \frac{8}{35} \times \frac{21}{-32}$$

$$(vi) \frac{-105}{128} \times (1 - \frac{29}{35})$$

Solution :

$$(i) \frac{2}{3} \times \frac{-7}{8}$$

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

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

$$(ii) \frac{-6}{7} \times \frac{5}{7}$$

$$= \frac{-6 \times 5}{7 \times 7}$$

$$= \frac{-30}{49}$$

$$\text{(iii)} \frac{-2}{9} \times (-5)$$

$$= \frac{-2}{9} \times \frac{-5}{1}$$

$$= \frac{-2 \times (-5)}{9 \times 1}$$

$$= \frac{10}{9}$$

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

$$\text{(iv)} \frac{-5}{11} \times \frac{11}{-5}$$

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

$$= 1$$

$$\text{(v)} \frac{8}{35} \times \frac{21}{-32}$$

$$= \frac{1 \times 3}{5 \times (-4)}$$

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

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

$$\text{(vi)} \frac{-105}{128} \times \left(1 - \frac{29}{35}\right)$$

$$= \frac{-105}{128} \times \frac{-64}{35}$$

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

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

$$= 1\frac{1}{2}$$

Question 9.

Find the value of:

$$(i) (-6) \div \frac{2}{5}$$

$$(ii) \frac{-1}{10} \div \frac{-8}{5}$$

$$(iii) \frac{-65}{14} \div \frac{13}{7}$$

$$(iv) (-6) \div 3\frac{3}{5}$$

$$(v) \frac{-48}{49} \div \frac{72}{-35}$$

$$(vi) 3\frac{1}{7} \div \frac{-33}{34}$$

Solution :

$$(i) (-6) \div \frac{2}{5}$$

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

$$= -3 \times 5$$

$$= -15$$

$$(ii) \frac{-1}{10} \div \frac{-8}{5}$$

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

$$= \frac{-1}{2} \times \frac{-1}{8}$$

$$= \frac{1}{16}$$

$$\text{(iii)} \quad \frac{-65}{14} \div \frac{13}{7}$$

$$= \frac{-65}{14} \times \frac{-7}{13}$$

$$= \frac{(-5)(-1)}{2}$$

$$= \frac{5}{2}$$

$$= 2\frac{1}{2}$$

$$\text{(iv)} \quad (-6) \div 3\frac{3}{5}$$

$$= (-6) \div \frac{18}{5}$$

$$= (-6) \times \frac{5}{18}$$

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

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

$$\text{(v)} \quad \frac{-48}{49} \div \frac{72}{-35}$$

$$= \frac{-48}{49} \div \frac{-35}{72}$$

$$= \frac{-2 \times -5}{7 \times 3}$$

$$= \frac{10}{21}$$

$$(vi) 3\frac{1}{7} \div \frac{-33}{34}$$

$$= \frac{22}{7} \div \frac{-33}{34}$$

$$= \frac{22}{7} \div \frac{-34}{33}$$

$$= \frac{2 \times 34}{7 \times 1 - 3}$$

$$= \frac{68}{-21}$$

$$= \frac{-68}{21}$$

$$= -3\frac{5}{21}$$

Question 10.

The product of two rational numbers is $\frac{18}{35}$ if one of them is $\frac{-2}{5}$

Find the other.

Solution :

Product of two rational numbers = $\frac{18}{35}$

One of them = $\frac{-2}{5}$

Second number = $\frac{18}{35} \div \frac{-2}{5}$

$$= \frac{18}{35} \times \frac{-2}{5}$$

$$= \frac{9 \times 1}{7 \times (-1)}$$

$$= \frac{-9}{7}$$

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

Question 11

Find the value of :

$$(i) \left(\frac{13}{21} \div \frac{39}{42} \right) \times \left(\frac{-3}{5} \right)$$

$$(ii) \left(-5\frac{5}{21} \right) \div \left(\frac{7}{11} \times \frac{5}{12} \right)$$

Solution .

$$(i) = \left(\frac{13}{21} \div \frac{39}{42} \right) \times \left(\frac{-3}{5} \right)$$

$$= \left(\frac{13}{21} \times \frac{42}{39} \right) \times \left(\frac{-3}{5} \right)$$

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

$$= \frac{2 \times (-1)}{1 \times 5}$$

$$= \frac{-2}{5}$$

$$(ii) \left(-5\frac{5}{21} \right) \div \left(\frac{7}{11} \times \frac{5}{12} \right)$$

$$= \left(\frac{-110}{21} \right) \div \left(\frac{7}{11} \times \frac{5}{12} \right)$$

$$= \frac{-110}{21} \div \frac{35}{132}$$

$$= \frac{-110}{21} \times \frac{132}{35}$$

$$= \frac{-22 \times 44}{7 \times 7}$$

$$= \frac{-968}{49}$$

$$= -19\frac{37}{49}$$

Question 12

Find the reciprocal of the following .

$$(i) \frac{3}{13} \div \frac{-4}{65}$$

$$(ii) \left(-5 \times \frac{12}{15}\right) - \left(-3 \times \frac{2}{9}\right)$$

Solution :

$$(i) \frac{3}{13} \div \frac{-4}{65}$$

$$= \frac{3}{13} \times \frac{65}{-4}$$

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

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

$$\text{Reciprocal of it} = \frac{15}{-4}$$

$$\text{Reciprocal of it} = \frac{15}{-4}$$

$$(ii) \left(-5 \times \frac{12}{15}\right) - \left(-3 \times \frac{2}{9}\right)$$

$$= (-4) - \frac{-2}{3}$$

$$= -4 + \frac{2}{3}$$

$$= \frac{-12+2}{3}$$

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

$$\text{Reciprocal of it} = \frac{-3}{10}$$

Rational Numbers objective type Question

Question 1.

Fill in the blanks:

(i) Two rational numbers are called equivalent if they have value.

(ii) The number $\frac{-4}{7}$ lies to the of zero on the number

(iii) The rational number $\frac{-5}{-11}$ lies to the of zero on the line.

(iv) The rational number $\frac{84}{156}$ reduced to simplest form is....

(v) The standard form of the rational number $\frac{14}{-12}$ is

(vi) there are rational numbers between two different rational numbers.

(vii) Two rational numbers are equal if and only if $q \times r$

(viii) The multiplicative inverse of $-3\frac{1}{5}$ is

(ix) $\frac{-3}{7} \div \frac{-7}{3} =$

(x) If P and Q are positive integers, then $\frac{p}{q}$ is a rational number and $\frac{p}{-q}$ is a

Solution :

(i) Two rational numbers are called equivalent if they have same value.

(ii) The number $\frac{-4}{7}$ lies to the left of zero on the number line.

(iii) The rational number $\frac{-5}{-11}$ or $\frac{5}{11}$ lies to the right of zero on the numbers line.

(iv) The rational number $\frac{84}{156}$ reduced to simplest form is $\frac{-7}{13}$

(v) The standard form of the rational number $\frac{14}{-12}$ is $\frac{-7}{6}$

(vi) there are infinitely many rational numbers between two different rational numbers.

(vii) Two rational numbers $\frac{p}{q}$ and $\frac{r}{s}$ are equal if and only if $q \times r = p \times s$

(viii) The multiplicative inverse of $-3\frac{1}{5}$ is $\frac{-5}{16}$

(ix) $\frac{-3}{7} \div \frac{-7}{3} = \dots$

$$= \frac{-3}{7} \times \frac{3}{-7} = \frac{-9}{49} \div \frac{9}{49}$$

(x) If P and Q are positive integers, then $\frac{p}{q}$ is a positive rational number and $\frac{p}{-q}$ is a negative rational number.

Question 2.

State whether the following statements are true (T) or false (F) .

(i) zero is the smallest rational number.

(ii) Every integer is a rational number.

(iii) Every rational number is an integer.

(iv) Every fraction is a rational number.

(v) Every rational number is a fraction.

(vi) The reciprocal of -1 is -1.

- (vii) The quotient of two integers is always a rational number.
- (viii) The value of a rational number remains the same if both its numerator and denominator are multiplied (or divided) by the same (nonzero) integer.
- (ix) Between two distinct integers, we can always insert an integer.
- (x) Between two distinct rational numbers, we can always insert a rational number.
- (xi) There exists atleast one integer between two different rational numbers.
- (xii) The reciprocal of $2\frac{6}{7}$ is $\frac{-7}{20}$.
- (xiii) All terminating decimal numbers are rational numbers.

Solution

(i) Zero is the smallest rational number. **(False)**

Correct:

(There is no end of smallest rational numbers)

(ii) Every integer is a rational number. **(True)**

(iii) Every rational number is an integer. **(False)**

Correct:

Every rational number is not an integer.

(iv) Every fraction is a rational number. **(True)**

(v) Every rational number is a fraction. **(False)**

(vi) The reciprocal of -1 is -1. **(True)**

(vii) The quotient of two integers is always a rational number. **(False)**

(viii) The value of a rational number remains the same if both its numerator and denominator are multiplied (or divided) by the same (nonzero) integer. **(True)**

(ix) Between two distinct integers, we can always insert an integer. **(False)**

Correct:

Between two integers, we can insert rational numbers.

(x) Between two distinct rational numbers, we can always insert a rational number. **(True)**

(xi) There exists atleast one integer between two different rational numbers. **(False)**

Correct:

It is not necessary that one integer will exist between two different rational numbers.

(xii) The reciprocal of $2\frac{6}{7}$ is $\frac{-7}{20}$. **(False)**

Correct:

The reciprocal of $2\frac{6}{7}$ or $\frac{7}{20}$ is $\frac{7}{20}$ not $\frac{-7}{20}$

(xiii) All terminating decimal numbers are rational numbers. **(True)**

Multiple choice Question

Choose the correct answer from the given four options (3 to 14)

Question 3.

The rational number $\frac{110}{-132}$ when reduced to standard form is

(a) $\frac{10}{-12}$

(b) $\frac{5}{-6}$

(c) $\frac{-5}{6}$

(d) $\frac{110}{-132}$

Solution :

$$\begin{aligned} & \frac{110}{-132} \\ &= \frac{110 \div (-22)}{-132 \div (-22)} \\ &= \frac{-5}{6} \end{aligned}$$

Question 4.

The additive inverse of $\frac{-7}{12}$ is

(a) $\frac{12}{-7}$

(b) $\frac{-7}{12}$

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

(d) $\frac{7}{12}$

Solution :

Additive inverse of $\frac{-7}{12} = \frac{7}{12}$

Question 5.

The multiplicative inverse of $\frac{-4}{9}$ is

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

(b) $\frac{-9}{4}$

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

(d) none of these

Solution:

Multiplicative inverse of $\frac{-4}{9}$

$$= \frac{9}{-4}$$

$$= \frac{9(-1)}{-4(-1)}$$

$$= \frac{-9}{4}$$

Question 6.

The reciprocal of the rational number $-2\frac{3}{7}$ is

(a) $\frac{-17}{7}$

(b) $\frac{7}{17}$

(c) $\frac{-7}{17}$

(d) none of these

Solution:

Reciprocal of $-2\frac{3}{7}$ or $\frac{-17}{7} = \frac{-7}{17}$

Question 7.

The product of rational number $\frac{-2}{5}$ and its multiplicative inverse is

(a) 1

(b) 0

(c) $\frac{4}{25}$

(d) $\frac{2}{5}$

Solution :

Product of rational number $\frac{-2}{5}$ and its multiplicative inverse is $\frac{-2}{5} \times \frac{-5}{2} = 1$

Question 8.

The product of rational number $\frac{-2}{3}$ and its additive inverse is

(a) 1

(b) $\frac{-2}{3}$

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

(d) $\frac{-4}{9}$

Solution :

Additive inverse of $\frac{2}{3}$ is $\frac{2}{3} = \frac{-4}{9}$

Question 9.

The sum of rational number $\frac{-1}{3}$ and its reciprocal is

(a) 0

(b) 1

(c) $\frac{-10}{3}$

(d) $\frac{-3}{10}$

Solution :

Reciprocal of $\frac{-1}{3}$ is $\frac{-3}{1}$

Sum of rational number and its reciprocal

$$\frac{-1}{3} + \left(\frac{-3}{1}\right) = \frac{-1-9}{3} = \frac{-10}{3}$$

Question 10 .

$\frac{-3}{1} - \frac{-2}{15}$ is equal to

(a) $\frac{-11}{5}$

(b) $\frac{-1}{15}$

(c) $\frac{-7}{15}$

(d) $\frac{7}{15}$

Solution:

$$\frac{-3}{5} - \frac{-2}{15} = \frac{-3}{5} + \frac{2}{15} = \frac{-9+2}{15} = \frac{-7}{15}$$

Question 11.

$\left(-5\frac{1}{3}\right) \times \left(-1\frac{7}{8}\right)$ is equal to

(a) 10

(b) -10

(c) $5\frac{7}{24}$

(d) $-5\frac{7}{24}$

Solution :

$$\left(-5\frac{1}{3}\right) \times \left(-1\frac{7}{8}\right) = \frac{16}{3} \times \frac{15}{8} = 10$$

Question 12.

$\left(-2\frac{1}{3}\right) \div 2\frac{11}{12}$ is equal to

(a) $-\frac{4}{5}$

(b) $\frac{4}{5}$

(c) $\frac{4}{11}$

(d) $-\frac{4}{11}$

Solution:

$$\left(-2-\right) \div 2\frac{11}{12} = \frac{-7}{3} \div \frac{35}{12} = \frac{-7}{3} \div \frac{12}{35} = \frac{-7}{3} \div \frac{-4}{5}$$

Question 13.

In the standard form of a rational number, the denominator is always

- (a) 0
- (b) a negative integer
- (c) 1
- (d) a positive integer

Solution :

In a standard form of a rational number, the denominator is always a positive integer. (d)

Question 14.

The sum of two rational numbers is -1. If one of them is $\frac{-5}{7}$, then the other is

- (a) $\frac{5}{7}$
- (b) $\frac{-2}{7}$
- (c) $\frac{12}{7}$
- (d) $\frac{-12}{7}$

Solution

The sum of two rational number is -1 one of them = $\frac{-5}{7}$

The other will be = $-1 - \left(\frac{-5}{7}\right) = -1 + \frac{5}{7} = \frac{-7+5}{7} = \frac{-2}{7}$

Value Based Questions

Question 1.

Rohit donated $\frac{1}{5}$ of his monthly income to an NGO working for the education of old women, $\frac{1}{4}$ of his salary spent on food, $\frac{1}{3}$ on rent and $\frac{1}{15}$

On other expenses, if he is left with 9000, find his monthly income.
What values are being promoted?

Solution:

Let salary = 1

Then donation to NGO = $\frac{1}{5}$ of 1 = $\frac{1}{5}$

Spent on food = $\frac{1}{4}$ of 1 = $\frac{1}{4}$

On rent = $\frac{1}{3}$ of 1 = $\frac{1}{3}$

And other expenses = $\frac{1}{15}$

Remaining income = $1 - \left[\frac{1}{5} + \frac{1}{4} + \frac{1}{3} + \frac{1}{15} \right]$

$$= \frac{60 - (12 + 15 + 20 + 4)}{60}$$

$$= \frac{60 - 51}{60}$$

$$= \frac{9}{60}$$

; $\frac{9}{60}$ of total income = 9000

$$\text{Total income} = \frac{9000 \times 60}{9} = 60000$$

His donation to NGO who is working for the education of the old women is remarkable.

Higher order thinking skills (HOTS)

Question 1.

From a rope 15 m long, $4\frac{1}{3}$ m is cut off and $\frac{3}{5}$ of the remaining is cut off again. Find the length of the remaining part of the rope.

Solution:

Length of a rope = 15m

Length of piece cut off = $4\frac{1}{3} = \frac{13}{3}$ m

Remaining length of rope = $15 - \frac{13}{3}$

$$= \frac{45-13}{3} = \frac{32}{3}\text{m}$$

Remaining length of rope = $\frac{32}{3} - \frac{32}{5}$

$$= \frac{160-96}{15}$$

$$= \frac{64}{15}$$

$$= 4\frac{4}{15}$$

Question 2.

Perimeter of a rectangle is 2m less than $\frac{2}{5}$ of the perimeter of a square, if the perimeter of the square is 40m, find the length and breadth of the rectangle given that the breadth is $\frac{1}{3}$ of the length.

Solution:

Perimeter of a square = 40m

Perimeter of rectangle = $\frac{2}{5}$ of 40 - 2 = 14m

Perimeter of rectangle = 2 (length + Breadth)

$$\text{Length} + \text{Breadth} = \frac{\text{perimeter}}{2} = \frac{14}{2} = 7m$$

If length is 1, then breadth = $\frac{1}{3}$

$$L + b = 1 + \frac{1}{3} = \frac{4}{3}$$

Now divide 7m in the ratio of $1:\frac{1}{3} = 3:1$

$$\text{Length} = \frac{7}{3+1} \times 1$$

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

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

Rational numbers check your progress

Question 1.

Write five rational numbers equivalent to $\frac{5}{-11}$

Solution :

Five rational numbers equivalent to $\frac{5}{-11}$ will be

$$\frac{10}{-22}, \frac{15}{-33}, \frac{20}{-44}, \frac{25}{-55}, \frac{30}{-66}$$

Question 2.

Express $\frac{9}{-15}$ as a rational number with:

(i) denominator 5

(ii) numerator -12

(iii) denominator 30

Solution:

$$\frac{9}{-15}$$

(i) Denominator 5, then $\frac{9 \div (-3)}{-15 \div (-3)} = \frac{-3}{5}$

(ii) Numerator -12 then $\frac{-3 \times 4}{5 \times 4} = \frac{-12}{20}$

(iii) Denominator 30, then $\frac{-3 \times 6}{5 \times 6} = \frac{-18}{30}$

Question 3.

Write each of the following numbers in standard form:

$$(i) \frac{78}{-91}$$

$$(ii) \frac{-216}{162}$$

$$(iii) \frac{-195}{-520}$$

Solution :

$$(i) \frac{78}{-91}$$

$$= \frac{78 \div 13}{-91 \div 13}$$

$$= \frac{6}{-7} \text{ (HCF of 78, 91 = 13)}$$

$$(ii) \frac{-216}{162}$$

$$= \frac{-216 \div 54}{162 \div 54}$$

$$= \frac{-1}{3} \text{ (HCF of 216 , 162 = 54)}$$

$$(iii) \frac{-195}{-520}$$

$$= \frac{195}{520}$$

$$= \frac{195 \div 65}{520 \div 65}$$

$$= \frac{3}{8} \text{ (LCM of 195 , 520 , = 65)}$$

Question 4.

Which of the following are pairs of equivalent rational numbers

(i) $\frac{-4}{13}, \frac{60}{-195}$

(ii) $\frac{7}{-15}, \frac{-35}{-75}$

(iii) $\frac{16}{-20}, \frac{-56}{70}$

Solution:

(i) $\frac{-4}{13}, \frac{60}{-195}$

$$= \frac{60}{-195}$$

$$= \frac{-4}{-13}$$

$$= \frac{4(-1)}{-13(-1)}$$

$$= \frac{-4}{13}$$

$\frac{-4}{13}$ and $\frac{60}{-195}$ are equivalent.

(ii) $\frac{7}{-15}, \frac{-35}{-75}$

$$= \frac{-35}{-75}$$

$$= \frac{-7}{-15}$$

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

$\frac{7}{-15}$ and $\frac{-35}{-75}$ are not equivalent.

$$(iii) \frac{16}{-20}, \frac{-56}{70}$$

$$= \frac{16 \div 4}{20 \div 4}$$

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

$$\frac{-56}{70}$$

$$= \frac{-56 \div 14}{70 \div 14}$$

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

(i) and (ii) are equivalent rational .

Question. 5.

Arrange the following rational numbers in ascending order:

$$(i) \frac{-5}{-6}, \frac{-17}{18}, \frac{23}{-24}, \frac{-11}{-13},$$

$$(ii) \frac{-25}{6}, \frac{15}{-4}, \frac{-17}{8}, \frac{-53}{12}$$

Solution :

$$(i) \frac{-5}{-6}, \frac{-17}{18}, \frac{23}{-24}, \frac{-11}{-13},$$

LCM of 6,18,24,13 = 936

$$\frac{-5}{-6} = \frac{-5 \times 156}{-6 \times 156} = \frac{-780}{936}$$

$$\frac{-17}{18} = \frac{23 \times (-39)}{-24 \times (-39)} = \frac{-884}{936}$$

$$\frac{23}{-24} = \frac{23 \times (-39)}{-24 \times (-39)} = \frac{-897}{936}$$

$$\frac{-11}{-13} = \frac{-11 \times (-72)}{-13 \times (-72)} = \frac{792}{936}$$

Arranging in ascending order,

$$\frac{-897}{936}, \frac{-884}{936}, \frac{-780}{936}, \frac{792}{936}$$

$$\frac{23}{-24}, \frac{-17}{18}, \frac{-5}{-6}, \frac{-11}{-13} \text{ are in ascending order}$$

$$(ii) \frac{-25}{6}, \frac{15}{-4}, \frac{-17}{8}, \frac{-53}{12}$$

LCM of 4,6,8,12 = 24

$$\frac{-25}{6} = \frac{-25 \times 4}{6 \times 4} = \frac{-100}{24}$$

$$\frac{15}{-4} = \frac{-15 \times (-6)}{-4 \times (-6)} = \frac{-90}{24}$$

$$\frac{-17}{8} = \frac{-17 \times 3}{8 \times 3} = \frac{-51}{24}$$

$$\frac{-53}{-12} = \frac{-53 \times 2}{12 \times 2} = \frac{-106}{24}$$

Arranging in ascending order,

$$\frac{-106}{24}, \frac{-100}{24}, \frac{-90}{24}, \frac{-51}{24}$$

$$\frac{-53}{12}, \frac{-25}{6}, \frac{15}{4}, \frac{-17}{8} \text{ are in ascending order}$$

Question 6.

Arrange the rational numbers $\frac{-7}{10}, \frac{5}{-8}, \frac{2}{-3}, \frac{-1}{4}, \frac{-3}{5}$

In the descending order.

Solution

$$\frac{-7}{10}, \frac{5}{-8}, \frac{2}{-3}, \frac{-1}{4}, \frac{-3}{5}$$

LCM of 10, 8, 3, 4, 5 = 120

$$\frac{-7}{10} = \frac{-7 \times 12}{10 \times 12} = \frac{-84}{120}$$

$$\frac{5}{-8} = \frac{5 \times (-15)}{-8 \times (-15)} = \frac{-75}{120}$$

$$\frac{2}{-3} = \frac{2 \times (-40)}{-3 \times (-40)} = \frac{-80}{120}$$

$$\frac{-1}{4} = \frac{-1 \times 30}{12 \times 2} = \frac{-30}{120}$$

$$\frac{-3}{5} = \frac{-3 \times 24}{5 \times 24} = \frac{-72}{120}$$

Now arranging in descending order,

$$\frac{-30}{120}, \frac{-72}{120}, \frac{-75}{120}, \frac{-80}{120}, \frac{-84}{120}$$

$$\frac{-1}{4}, \frac{-3}{5}, \frac{5}{-8}, \frac{2}{-3}, \frac{-7}{10} \text{ are in ascending order}$$

Question 7.

Insert five rational numbers between $\frac{-3}{5}$ and $\frac{-1}{2}$,

Solution :

5 rational numbers between $\frac{-3}{5}$ and $\frac{-1}{2}$

LCM of 5, 2 = 10

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

$$\frac{-1}{2} = \frac{-1 \times 5}{2 \times 5} = \frac{-5}{10}$$

Multiplying (5+1) to the numerator and denominator.

$$\frac{-6}{10} = \frac{-6 \times 6}{10 \times 6} = \frac{-36}{60}$$

$$\frac{-5}{10} = \frac{-5 \times 6}{10 \times 6} = \frac{-30}{60}$$

Rational number is:

$$\frac{-31}{60}, \frac{-32}{60}, \frac{-33}{60}, \frac{-34}{60}, \frac{-35}{60}$$

$$\frac{-35}{60}, \frac{-34}{60}, \frac{-33}{60}, \frac{-32}{60}, \frac{-31}{60}$$

$$\frac{-7}{12}, \frac{-17}{30}, \frac{-11}{20}, \frac{-8}{15}, \frac{-31}{60}$$

Question 8.

Find the sum:

$$(i) \frac{-2}{3} + \left(\frac{5}{-7}\right)$$

$$(ii) -1\frac{1}{12} + \frac{-5}{9}$$

$$(iii) 2\frac{2}{5} + \left(-4\frac{3}{10}\right)$$

Solution

$$(i) \frac{-2}{3} + \left(\frac{5}{-7}\right)$$

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

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

$$= -1\frac{8}{21}$$

$$\text{(ii)} -1\frac{1}{12} + \frac{-5}{9}$$

$$= \frac{-13}{12} - \frac{-5}{9}$$

$$= \frac{-39-0}{36}$$

$$= -1\frac{23}{36}$$

$$\text{(iii)} 2\frac{2}{5} + \left(-4\frac{3}{10}\right)$$

$$= \frac{-12}{5} - \frac{43}{10}$$

$$= \frac{24-43}{10}$$

$$= \frac{-19}{10}$$

$$= -1\frac{9}{10}$$

Question 9.

Subtract:

$$\text{(i)} \frac{-11}{24} \text{ from } \frac{-5}{36}$$

$$= \frac{-5}{36} - \left(\frac{-11}{24}\right)$$

$$= \frac{-5}{36} + \frac{11}{24}$$

$$= \frac{-10+33}{72} \text{ (LCM = 36,24 = 72)}$$

$$= \frac{23}{72}$$

$$\text{(ii) } \frac{-8}{15} \text{ from } -1\frac{2}{5}$$

$$= -1\frac{2}{5} - \frac{8}{-15}$$

$$= \frac{-21+8}{15}$$

$$= \frac{-13}{15}$$

$$\text{(iii) } -2\frac{2}{9} \text{ from } -3\frac{5}{12}$$

$$= -3\frac{5}{12} - (-2\frac{2}{9})$$

$$= \frac{-41}{12} + \frac{20}{9}$$

$$= \frac{-123+80}{36}$$

$$= \frac{-36}{43}$$

$$= -1\frac{7}{36}$$