

Rational Numbers

EXERCISE 2 (A)

Question 1.

Write down a rational number whose numerator is the largest number of two digits and denominator is the smallest number of four digits.

Solution:

Largest two digit = 99

Smallest, number of four digit = 1000 Now numerator = 99 and denominator = 1000

∴ Rational number = $\frac{99}{1000}$

Question 2.

Write the numerator of each of the following rational numbers:

(i) $\frac{-125}{127}$

(ii) $\frac{37}{-137}$

(iii) $\frac{-85}{93}$

(iv) 2

(v) 0

Solution:

(i) $\frac{-125}{127}$

Numerator = -125

(ii) $\frac{37}{-137}$

Numerator = 37

(iii) $\frac{-85}{93}$

Numerator = -85

(iv) $2 = \frac{2}{1}$

Numerator = 2

(v) $0 = \frac{0}{1}$

Numerator = 0

Question 3.

Write the denominator of each of the following rational numbers:

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

$$(ii) \frac{-18}{29}$$

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

$$(iv) -7$$

$$(v) 0$$

Solution:

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

Denominator = -15

$$(ii) \frac{-18}{29}$$

Denominator = 29

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

Denominator = 4

$$(iv) -7 = \frac{-7}{1}$$

Denominator = 1

$$(v) 0 = \frac{0}{1}$$

Denominator = 1

Question 4.

Write down a rational number numerator $(-5) \times (-4)$ and denominator $(28 - 27) \times (8 - 5)$.

Solution:

$$\text{Numerator} = (-5) \times (-4) = 20$$

$$\begin{aligned}\text{Denominator} &= (28 - 27) \times (8 - 5) \\ &= (1) \times (3) = 3\end{aligned}$$

$$\therefore \text{Rational number} = \frac{20}{3} = \frac{4}{1} = 4$$

Question 5.

(i) $\frac{-15}{1}$ in integer form is

(ii) $\frac{23}{-1}$ in integer form is

(iii) If $18 = \frac{18}{a}$ then $a = \dots\dots\dots$

(iv) If $-57 = \frac{57}{a}$ then $a = \dots\dots\dots$

Solution:

(i) $\frac{-15}{1}$ in integer form is $= -15$

(ii) $\frac{23}{-1}$ in integer form is $= -23$

(iii) If $18 = \frac{18}{a}$ then $a = \frac{18}{18} = 1$

(iv) If $-57 = \frac{57}{a}$ then $a = \frac{57}{-57} = -1$

Question 6.

Separate positive and negative rational numbers from the following :

$$\frac{-3}{5}, \frac{3}{-5}, \frac{-3}{-5}, \frac{3}{5}, 0, \frac{-13}{-3}, \frac{15}{-8}, \frac{-15}{8}$$

Solution:

Positive rational numbers are $\frac{-3}{-5} = \frac{3}{5}$
(as both are negative)

$$\frac{-13}{-3} = \frac{13}{3} \quad (\text{as both are negative})$$

Negative rational numbers = $\frac{-3}{5}, \frac{3}{-5}, \frac{15}{-8}$

$$\text{and } \frac{-15}{8}$$

0 is neither positive nor negative integer.

Question 7.

Find three rational numbers equivalent to

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

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

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

$$(iv) \frac{8}{-15}$$

Solution:

$$(i) \frac{3}{5} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}, \frac{3 \times 3}{5 \times 3} = \frac{9}{15} \text{ and}$$

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

Hence, $\frac{6}{10}$, $\frac{9}{15}$ and $\frac{12}{20}$ are rational numbers equivalent to the given rational number $\frac{3}{5}$.

$$(ii) \frac{4}{-7} = \frac{4 \times 2}{-7 \times 2} = \frac{8}{-14}, \frac{4 \times 3}{-7 \times 3} = \frac{12}{-21}$$

$$\text{and } \frac{4 \times 4}{-7 \times 4} = \frac{16}{-28}$$

Hence $\frac{8}{-14}$, $\frac{12}{-21}$ and $\frac{16}{-28}$ are rational numbers equivalent to given rational number $\frac{4}{-7}$.

$$(iii) \frac{-5}{9} = \frac{-5 \times 2}{9 \times 2} = \frac{-10}{18}, \frac{-5 \times 3}{9 \times 3} = \frac{-15}{27} \text{ and}$$

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

Hence, $\frac{-10}{18}$, $\frac{-15}{27}$ and $\frac{-20}{36}$ are rational numbers equivalent to given rational number $\frac{-5}{9}$.

$$(iv) \frac{8}{-15} = \frac{8 \times 2}{-15 \times 2} = \frac{16}{-30},$$

$$\frac{8 \times 3}{-15 \times 3} = \frac{24}{-45} \text{ and } \frac{8 \times 4}{-15 \times 4} = \frac{32}{-60}$$

Hence, $\frac{16}{-30}$, $\frac{24}{-45}$ and $\frac{32}{-60}$ are rational numbers equivalent to given rational number

$$\frac{8}{-15}.$$

Question 8.

Which of the following are not rational numbers :

$$(i) -3$$

$$(ii) 0$$

$$(iii) \frac{0}{4}$$

$$(iv) \frac{8}{0}$$

$$(v) \frac{0}{0}$$

Solution:

$$(i) -3 = \frac{-3}{1} \text{ is a rational number.}$$

$$(ii) 0 = \frac{0}{1} \text{ is a rational number.}$$

$$(iii) \frac{0}{4} \text{ is a rational number.}$$

$$(iv) \frac{8}{0} \text{ is not a rational number.}$$

$$(v) \frac{0}{0} \text{ is not a rational number as numerator and denominator both are zero.}$$

Question 9.

Express each of the following integers as a rational number with denominator 7 :

(i) 5

(ii) -8

(iii) 0

(iv) -16

(v) 7

Solution:

$$(i) 5 = \frac{5 \times 7}{7} = \frac{35}{7}$$

$$(ii) -8 = \frac{-8 \times 7}{7} = \frac{-56}{7}$$

$$(iii) 0 = \frac{0 \times 7}{7} = \frac{0}{7}$$

$$(iv) -16 = \frac{-16 \times 7}{7} = \frac{-112}{7}$$

$$(v) 7 = \frac{7 \times 7}{7} = \frac{49}{7}$$

Question 10.

Express $\frac{3}{5}$ as a rational number with denominator:

Solution:

(i) 20

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

(ii) -20

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

(iii) 45

$$\frac{3}{5} = \frac{3 \times 9}{5 \times 9} = \frac{27}{45}$$

(iv) 25

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

(v) -35

$$\frac{3}{5} = \frac{3 \times -7}{5 \times -7} = \frac{-21}{-35}$$

Question 11.

Express $\frac{4}{7}$ as a rational number with numerator :

Solution:

(i) 12

$$\frac{4}{7} = \frac{4 \times 3}{7 \times 3} = \frac{12}{21}$$

(ii) -12

$$\frac{4}{7} = \frac{4 \times -3}{7 \times -3} = \frac{-12}{-21}$$

(iii) -16

$$\frac{4}{7} = \frac{4 \times -4}{7 \times -4} = \frac{-16}{-28}$$

(iv) -20

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

(v) 20

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

Question 12.

Find x, such that:

(i) $\frac{-2}{3} = \frac{6}{x}$

(ii) $\frac{7}{-4} = \frac{x}{8}$

(iii) $\frac{3}{7} = \frac{x}{-35}$

(iv) $\frac{-48}{x} = 6$

(v) $\frac{36}{x} = 3$

(vi) $\frac{-27}{x} = 9$

Solution:

$$(i) \frac{-2}{3} = \frac{6}{x}$$

$$-2x = 6 \times 3$$

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

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

OR

$$\frac{-2}{3} = \frac{6}{x}$$

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

$$\Rightarrow \frac{6}{-9} = \frac{6}{x}$$

$$\Rightarrow x = -9$$

$$(ii) \frac{7}{-4} = \frac{x}{8}$$

$$= -4x = 7 \times 8$$

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

$$x = -14$$

OR

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

$$\Rightarrow \frac{-14}{8} = \frac{x}{8}$$

$$x = -14$$

$$(iii) \frac{3}{7} = \frac{x}{-35}$$

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

$$\Rightarrow \frac{-15}{-35} = \frac{x}{-35}$$

$$\Rightarrow x = -15$$

$$(iv) \frac{-48}{x} = 6$$

$$\Rightarrow \frac{-48}{x} = \frac{6}{1}$$

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

$$\Rightarrow \frac{-48}{x} = \frac{-48}{-8}$$

$$\Rightarrow x = -8$$

$$(v) \frac{36}{x} = 3$$

$$\Rightarrow \frac{36}{x} = \frac{3}{1}$$

$$\Rightarrow \frac{36}{x} = \frac{3 \times 12}{1 \times 12}$$

$$\Rightarrow \frac{36}{x} = \frac{36}{12}$$

$$\Rightarrow x = 12$$

$$(vi) \frac{-27}{x} = 9$$

$$\Rightarrow \frac{-27}{x} = \frac{9}{1}$$

$$\Rightarrow \frac{-27}{x} = \frac{9 \times (-3)}{1 \times (-3)}$$

$$\Rightarrow \frac{-27}{x} = \frac{-27}{-3}$$

$$\Rightarrow x = -3$$

Question 13.

Express each of the following rational numbers to the lowest terms :

(i) $\frac{12}{15}$

(ii) $\frac{-120}{144}$

(iii) $\frac{-48}{-72}$

(iv) $\frac{14}{-56}$

Solution:

(i) $\frac{12}{15}$

$$\begin{array}{r} 12 \overline{)15}(1 \\ \underline{12} \\ 3 \overline{)12}(4 \\ \underline{12} \\ \hline \times \end{array}$$

(Dividing by 3, H.C.F. of 12 and 15)

$$\Rightarrow \frac{12 \div 3}{15 \div 3} = \frac{4}{5}$$

$$(ii) \frac{-120}{144}$$

$$\begin{array}{r} 120 \overline{)144}(1 \\ \underline{120} \\ 24 \overline{)120}(5 \\ \underline{120} \\ \hline \times \end{array}$$

(Dividing by 24, H.C.F. of -120 and 144)

$$\Rightarrow \frac{-120 \div 24}{144 \div 24} = \frac{-5}{6}$$

$$(iii) \frac{-48}{-72}$$

$$\begin{array}{r} 48 \overline{)72}(1 \\ \underline{48} \\ 24 \overline{)48}(2 \\ \underline{48} \\ \hline \times \end{array}$$

(Dividing by 24, H.C.F. of -48 and -72)

$$\Rightarrow \frac{-48 \div 24}{-72 \div 24} = \frac{-2}{-3} = \frac{2}{3}$$

$$(iv) \frac{14}{-56}$$

$$\begin{array}{r} 14 \overline{)56}(4 \\ \underline{56} \\ \hline \times \end{array}$$

(Dividing by 14, H.C.F. of 14 and -56)

$$\Rightarrow \frac{14 \div 14}{-56 \div 14} = \frac{1}{-4} \text{ or } \frac{-1}{4}$$

Question 14.

Express each of the following rational numbers in the standard form.

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

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

$$(iii) \frac{-7}{-20}$$

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

Solution:

We know that, a rational number is said to be in standard form, if its denominator is positive in lowest term.

$$(i) \frac{-7}{-8} = \frac{7}{8}$$

$$(ii) \frac{5}{-12} = \frac{-5}{12}$$

$$(iii) \frac{-7}{-20} = \frac{7}{20}$$

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

EXERCISE 2 (B)

Question 1.

Mark the following pairs of rational numbers on the separate number lines :

(i) $\frac{3}{4}$ and $-\frac{1}{4}$

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

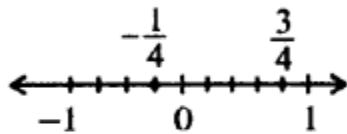
(iii) $\frac{5}{6}$ and $-\frac{2}{3}$

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

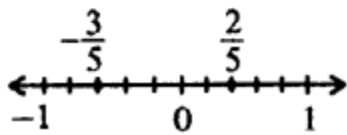
(v) $\frac{1}{4}$ and $-\frac{5}{4}$

Solution:

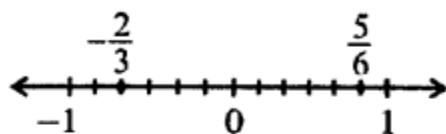
(i) $\frac{3}{4}$ and $-\frac{1}{4}$



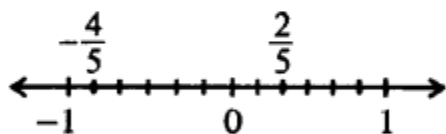
(ii) $\frac{2}{5}$ and $-\frac{3}{5}$



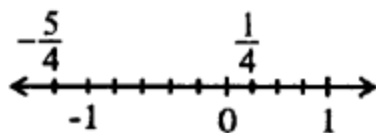
(iii) $\frac{5}{6}$ and $-\frac{2}{3}$



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



(v) $\frac{1}{4}$ and $-\frac{5}{4}$



Question 2.

Compare:

(i) $\frac{3}{5}$ and $\frac{5}{7}$

(ii) $\frac{-7}{2}$ and $\frac{5}{2}$

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

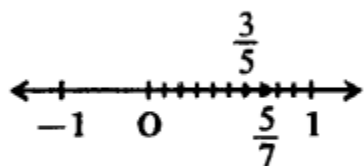
(iv) $-1\frac{1}{2}$ and 0

(v) 0 and $\frac{3}{4}$

(vi) 3 and -1

Solution:

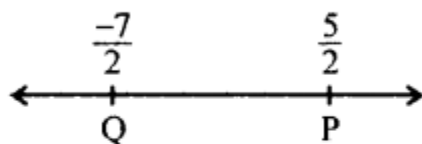
(i) $\frac{3}{5}$ and $\frac{5}{7}$



Since, $\frac{5}{7}$ is on the right side of the number line.

$$\therefore \frac{5}{7} > \frac{3}{5}$$

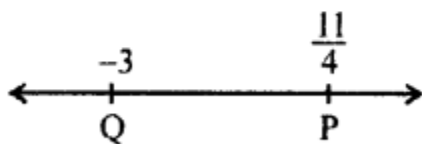
(ii) $\frac{-7}{2}$ and $\frac{5}{2}$



Since, P is on the right of Q.

$$\Rightarrow \frac{5}{2} > \frac{-7}{2}$$

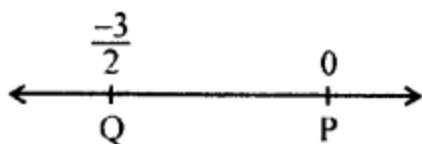
(iii) -3 and $2\frac{3}{4}$ or $\frac{11}{4}$



Since, P is on the right of Q.

$$\Rightarrow \frac{11}{4} > -3 \text{ or } 2\frac{3}{4} > -3$$

(iv) $-1\frac{1}{2}$ and 0 or $\frac{-3}{2}$ and 0



Since, P is on the right of Q

$$\Rightarrow 0 > \frac{-3}{2}$$

(iv) 0 and $\frac{3}{4}$



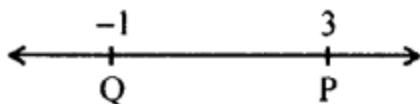
Since, P is on the right of Q

$$\Rightarrow \frac{3}{4} > 0$$

(vi) 3 and -1

Since, P is on the right of Q

$$\Rightarrow 3 > -1$$



Question 3.

Compare:

$$(i) -\frac{1}{4} \text{ and } 0 \quad (ii) \frac{1}{4} \text{ and } 0$$

$$(iii) -\frac{3}{8} \text{ and } \frac{2}{5} \quad (iv) \frac{-5}{8} \text{ and } \frac{7}{-12}$$

$$(v) \frac{5}{-9} \text{ and } \frac{-5}{-9} \quad (vi) \frac{-7}{8} \text{ and } \frac{5}{-6}$$

$$(vii) \frac{2}{7} \text{ and } \frac{-3}{-8} \quad (viii) \frac{-5}{8} \text{ and } \frac{7}{-12}$$

Solution:

$$(i) -\frac{1}{4} \text{ and } 0$$

Since, $-\frac{1}{4}$ is a negative rational number and always less than 0.

$$\therefore -\frac{1}{4} < 0$$

$$(ii) \frac{1}{4} \text{ and } 0$$

Since, $\frac{1}{4}$ is a positive rational number and always greater than 0.

$$\therefore \frac{1}{4} > 0$$

$$(iii) -\frac{3}{8} \text{ and } \frac{2}{5}$$

$$-3 \times 5 \text{ and } 2 \times 8$$

$$\left(\because \frac{a}{b} \text{ and } \frac{c}{d} \Rightarrow a \times d \text{ and } b \times c \right)$$

$$-15 < 16 \quad (\because a \times d < b \times c)$$

$$\therefore -\frac{3}{8} < \frac{2}{5}$$

$$(iv) \frac{-5}{8} \text{ and } \frac{7}{-12}$$

$$-5 \times -12 \text{ and } 7 \times 8$$

$$\left(\because \frac{a}{b} \text{ and } \frac{c}{d} \Rightarrow a \times d \text{ and } b \times c \right)$$

$$60 > 56 \quad (\because a \times d > b \times c)$$

$$\therefore \frac{-5}{8} > \frac{7}{-12}$$

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

$$5 \times -9 \text{ and } -5 \times -9$$

$$\left(\because \frac{a}{b} \text{ and } \frac{c}{d} \Rightarrow a \times d \text{ and } b \times c \right)$$

$$-45 < 45 \quad (\because a \times d < b \times c)$$

$$\therefore \frac{5}{-9} < \frac{-5}{-9}$$

$$(vi) \frac{-7}{8} \text{ and } \frac{5}{-6}$$

$$-7 \times -6 \text{ and } 5 \times 8$$

$$\left(\because \frac{a}{b} \text{ and } \frac{c}{d} \Rightarrow a \times d \text{ and } b \times c \right)$$

$$42 > 40$$

$$(\because a \times d > b \times c)$$

$$\therefore \frac{-7}{8} > \frac{5}{-6}$$

$$(vii) \frac{2}{7} \text{ and } \frac{-3}{-8}$$

$$2 \times 8 \text{ and } 7 \times -3$$

$$\left(\because \frac{a}{b} \text{ and } \frac{c}{d} \Rightarrow a \times d \text{ and } b \times c \right)$$

$$16 > -21$$

$$(\because a \times d > b \times c)$$

$$\therefore \frac{2}{7} > \frac{-3}{-8}$$

$$(viii) \frac{-5}{8} \text{ and } \frac{7}{-12}$$

$$-5 \times -12 \text{ and } 7 \times 8$$

$$60 > 56$$

$$\therefore \frac{-5}{8} > \frac{7}{-12}$$

Question 4.

Arrange the given rational numbers in ascending order :

$$(i) \frac{7}{10}, \frac{-11}{-30} \text{ and } \frac{5}{-15}$$

$$(ii) \frac{4}{-9}, \frac{-5}{12} \text{ and } \frac{2}{-3}$$

Solution:

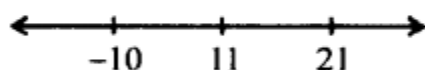
$$(i) \frac{7}{10}, \frac{-11}{-30} \text{ and } \frac{5}{-15}$$

$$= \frac{7}{10}, \frac{11}{30} \text{ and } \frac{-5}{15}$$

$$= \frac{7 \times 3}{10 \times 3}, \frac{11}{30} \text{ and } \frac{-5 \times 2}{15 \times 2}$$

($\because$ LCM of 10, 30 and 15 = 30)

$$= \frac{21}{30}, \frac{11}{30}, \frac{-10}{30}$$



Since, $-10 < 11 < 21$

$$\therefore \frac{-10}{30} < \frac{11}{30} < \frac{21}{30}$$

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

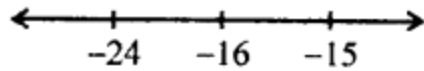
$$(ii) \frac{4}{-9}, \frac{-5}{12} \text{ and } \frac{2}{-3}$$

$$= \frac{-4}{9}, \frac{-5}{12} \text{ and } \frac{-2}{3}$$

$$= \frac{-4 \times 4}{9 \times 4}, \frac{-5 \times 3}{12 \times 3} \text{ and } \frac{-2 \times 12}{3 \times 12}$$

($\because$ LCM of 9, 12 and 3 = 36)

$$= \frac{-16}{36}, \frac{-15}{36} \text{ and } \frac{-24}{36}$$



Since, $-24 < -16 < -15$

$$\therefore \frac{-24}{36} < \frac{-16}{36} < \frac{-15}{36}$$

$$\Rightarrow \frac{2}{-3} < \frac{4}{-9} < \frac{-5}{12}$$

Question 5.

Arrange the given rational numbers in descending order:

(i) $\frac{5}{8}, \frac{13}{-16} \text{ and } \frac{-7}{12}$

(ii) $\frac{3}{-10}, \frac{-13}{30} \text{ and } \frac{8}{-20}$

Solution:

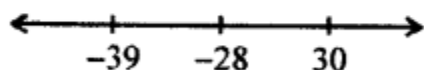
$$(i) \frac{5}{8}, \frac{13}{-16} \text{ and } \frac{-7}{12}$$

$$= \frac{5}{8}, \frac{-13}{16} \text{ and } \frac{-7}{12}$$

$$= \frac{5 \times 6}{8 \times 6}, \frac{-13 \times 3}{16 \times 3} \text{ and } \frac{-7 \times 4}{12 \times 4}$$

($\because$ LCM of 8, 16 and 12 = 48)

$$= \frac{30}{48}, \frac{-39}{48} \text{ and } \frac{-28}{48}$$



Since, $30 > -28 > -39$

$$\therefore \frac{30}{48} > \frac{-28}{48} > \frac{-39}{48}$$

$$\Rightarrow \frac{5}{8} > \frac{-7}{12} > \frac{-13}{16}$$

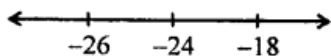
$$(ii) \frac{3}{-10}, \frac{-13}{30} \text{ and } \frac{8}{-20}$$

$$= \frac{-3}{10}, \frac{-13}{30} \text{ and } \frac{-8}{20}$$

$$= \frac{-3 \times 6}{10 \times 6}, \frac{-13 \times 2}{30 \times 2} \text{ and } \frac{-8 \times 3}{20 \times 3}$$

($\because$ LCM of 10, 20 and 30 = 60)

$$= \frac{-18}{60}, \frac{-26}{60} \text{ and } \frac{-24}{60}$$



Since, $-18 > -24 > -26$

$$\therefore \frac{-18}{60} > \frac{-24}{60} > \frac{-26}{60}$$

$$\Rightarrow \frac{-3}{10} > \frac{-8}{20} > \frac{-13}{30}$$

Question 6.

Fill in the blanks :

(i) $\frac{5}{8}$ and $\frac{3}{10}$ are on the side of zero.

(ii) $-\frac{5}{8}$ and $\frac{3}{10}$ are on the sides of zero.

(iii) $-\frac{5}{8}$ and $-\frac{3}{10}$ are on the side of zero.

(iv) $\frac{5}{8}$ and $-\frac{3}{10}$ are on the sides of zero.

Solution:

(i) $\frac{5}{8}$ and $\frac{3}{10}$ are on the **right** side of zero.

(ii) $-\frac{5}{8}$ and $\frac{3}{10}$ are on the **opposite** sides of zero.

(iii) $-\frac{5}{8}$ and $-\frac{3}{10}$ are on the **same/left** side of zero.

(iv) $\frac{5}{8}$ and $-\frac{3}{10}$ are on the **opposite** sides of zero.

EXERCISE 2 (C)

Question 1.

Add:

$$(i) \frac{7}{5} \text{ and } \frac{2}{5} \qquad (ii) \frac{-4}{9} \text{ and } \frac{2}{9}$$

$$(iii) \frac{5}{-12} \text{ and } \frac{1}{12} \qquad (iv) \frac{4}{-15} \text{ and } \frac{-7}{-15}$$

$$(v) \frac{-7}{25} \text{ and } \frac{9}{-25} \qquad (vi) \frac{-7}{26} \text{ and } \frac{7}{-26}$$

Solution:

$$(i) \frac{7}{5} \text{ and } \frac{2}{5} = \frac{7}{5} + \frac{2}{5}$$

$$= \frac{7+2}{5} = \frac{9}{5}$$

$$(ii) \frac{-4}{9} \text{ and } \frac{2}{9} = \frac{-4}{9} + \frac{2}{9}$$

$$= \frac{-4+2}{9} = \frac{-2}{9}$$

$$(iii) \frac{5}{-12} \text{ and } \frac{1}{12} = \frac{-5}{12} + \frac{1}{12}$$

$$= \frac{-5+1}{12} = \frac{-4}{12} = -\frac{4}{12}$$

$$(iv) \frac{4}{-15} \text{ and } \frac{-7}{-15} = \frac{-4}{15} + \frac{7}{15}$$

$$= \frac{-4+7}{15} = \frac{3}{15}$$

$$\begin{aligned} \text{(v)} \quad \frac{-7}{25} \text{ and } \frac{9}{-25} &= \frac{-7}{25} + \frac{-9}{25} \\ &= \frac{(-7)+(-9)}{25} = \frac{-16}{25} \end{aligned}$$

$$\begin{aligned} \text{(vi)} \quad \frac{-7}{26} \text{ and } \frac{7}{-26} &= \frac{-7}{26} + \frac{-7}{26} \\ &= \frac{(-7)+(-7)}{26} = \frac{-14}{26} \end{aligned}$$

Question 2.

Add:

$$\text{(i)} \quad \frac{-2}{5} \text{ and } \frac{3}{7} \qquad \text{(ii)} \quad \frac{-5}{6} \text{ and } \frac{4}{9}$$

$$\text{(iii)} \quad -3 \text{ and } \frac{2}{3} \qquad \text{(iv)} \quad \frac{-5}{9} \text{ and } \frac{7}{18}$$

$$\text{(v)} \quad \frac{-7}{24} \text{ and } \frac{-5}{48} \qquad \text{(vi)} \quad \frac{1}{-18} \text{ and } \frac{5}{-27}$$

$$\text{(vii)} \quad \frac{-9}{25} \text{ and } \frac{1}{-75} \qquad \text{(viii)} \quad \frac{13}{-16} \text{ and } \frac{-11}{24}$$

$$\text{(ix)} \quad \frac{-9}{-16} \text{ and } \frac{-11}{8}$$

Solution:

$$(i) \frac{-2}{5} \text{ and } \frac{3}{7}$$

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

($\because$ L.C.M. of 5 and 7 = 35)

$$= \frac{-14}{35} + \frac{15}{35}$$

$$= \frac{-14+15}{35} = \frac{1}{35}$$

$$(ii) \frac{-5}{6} \text{ and } \frac{4}{9} = \frac{-5}{6} + \frac{4}{9}$$

$$= \frac{-5 \times 6}{6 \times 6} + \frac{4 \times 4}{9 \times 4}$$

($\because$ L.C.M. of 6 and 9 = 36)

$$= \frac{-30}{36} + \frac{16}{36}$$

$$= \frac{-30+16}{36} = \frac{-14}{36}$$

$$(iii) -3 \text{ and } \frac{2}{3} = \frac{-3}{1} + \frac{2}{3}$$

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

($\because$ L.C.M. of 1 and 3 = 3)

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

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

$$(iv) \frac{-5}{9} \text{ and } \frac{7}{18} = \frac{-5}{9} + \frac{7}{18}$$

$$= \frac{-5 \times 2}{9 \times 2} + \frac{7 \times 1}{18 \times 1}$$

($\because$ L.C.M. of 9 and 18 = 18)

$$= \frac{-10}{18} + \frac{7}{18} = \frac{-10+7}{18} = \frac{-3}{18}$$

$$(v) \frac{-7}{24} \text{ and } \frac{-5}{48}$$

$$= \frac{-7 \times 2}{24 \times 2} + \frac{-5 \times 1}{48 \times 1}$$

($\because$ L.C.M. of 24 and 48 = 48)

$$= \frac{-14}{48} + \frac{-5}{48}$$

$$= \frac{(-14)+(-5)}{48} = \frac{-14-5}{48} = \frac{-19}{48}$$

$$(vi) \frac{1}{-18} \text{ and } \frac{5}{-27} = \frac{-1}{18} + \frac{-5}{27}$$

$$= \frac{-1 \times 3}{18 \times 3} + \frac{-5 \times 2}{27 \times 2}$$

($\because$ L.C.M. of 18 and 27 = 54)

$$= \frac{-3}{54} + \frac{-10}{54}$$

$$= \frac{(-3) + (-10)}{54} = \frac{-3 - 10}{54} = \frac{-13}{54}$$

$$(vii) \quad \frac{-9}{25} \text{ and } \frac{1}{-75} = \frac{-9}{25} + \frac{-1}{75}$$

$$= \frac{-9 \times 3}{25 \times 3} + \frac{-1 \times 1}{75 \times 1}$$

($\because$ L.C.M. of 25 and 75 = 75)

$$= \frac{-27}{75} + \frac{-1}{75}$$

$$= \frac{(-27) + (-1)}{75} = \frac{-27 - 1}{75} = \frac{-28}{75}$$

$$(viii) \quad \frac{13}{-16} \text{ and } \frac{-11}{24} = \frac{-13}{16} + \frac{-11}{24}$$

$$= \frac{-13 \times 3}{16 \times 3} + \frac{-11 \times 2}{24 \times 2}$$

($\because$ L.C.M. of 16 and 24 = 48)

$$= \frac{-39}{48} + \frac{-22}{48}$$

$$= \frac{(-39) + (-22)}{48} = \frac{-39 - 22}{48} = \frac{-61}{48}$$

$$(ix) \frac{-9}{-16} \text{ and } \frac{-11}{8} = \frac{9}{16} + \frac{-11}{8}$$

$$= \frac{9 \times 1}{16 \times 1} + \frac{-11 \times 2}{8 \times 2}$$

($\because$ L.C.M. of 16 and 8 = 16)

$$= \frac{9}{16} + \frac{-22}{16}$$

$$= \frac{9 + (-22)}{16} = \frac{9 - 22}{16} = \frac{-13}{16}$$

Question 3.

Evaluate:

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

$$(ii) \frac{-8}{9} + \frac{4}{9} + \frac{-2}{9}$$

$$(iii) \frac{5}{-24} + \frac{-1}{8} + \frac{3}{16}$$

$$(iv) \frac{-7}{6} + \frac{4}{-15} + \frac{-4}{-30}$$

$$(v) -2 + \frac{2}{5} + \frac{-2}{15}$$

$$(vi) \frac{-11}{12} + \frac{5}{16} + \frac{-3}{8}$$

Solution:

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

$$= \frac{-2+3-1}{5} = \frac{0}{5} = 0$$

$$(ii) \frac{-8}{9} + \frac{4}{9} + \frac{-2}{9}$$

$$= \frac{-8+4-2}{9} = \frac{-10+4}{9} = \frac{-6}{9}$$

$$(iii) \frac{5}{-24} + \frac{-1}{8} + \frac{3}{16}$$

$$= \frac{-5 \times 2}{24 \times 2} + \frac{-1 \times 6}{8 \times 6} + \frac{3 \times 3}{16 \times 3}$$

($\because$ L.C.M. of 8, 16, 24 = 48)

$$= \frac{-10}{48} + \frac{-6}{48} + \frac{9}{48}$$

$$= \frac{-10-6+9}{48} = \frac{-16+9}{48} = \frac{-7}{48}$$

$$(iv) \frac{-7}{6} + \frac{4}{-15} + \frac{-4}{-30}$$

$$= \frac{-7}{6} + \frac{-4}{15} + \frac{4}{30}$$

$$= \frac{-7 \times 5}{6 \times 5} + \frac{-4 \times 2}{15 \times 2} + \frac{4 \times 1}{30 \times 1}$$

($\because$ L.C.M. of 6, 15 and 30 = 30)

$$= \frac{-35}{30} + \frac{-8}{30} + \frac{4}{30}$$

$$= \frac{-35-8+4}{30} = \frac{-43+4}{30} = \frac{-39}{30}$$

$$(v) -2 + \frac{2}{5} + \frac{-2}{15}$$

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

$$= \frac{-2 \times 15}{1 \times 15} + \frac{2 \times 3}{5 \times 3} + \frac{-2 \times 1}{15 \times 1}$$

($\because$ L.C.M. of 1, 5 and 15 = 15)

$$= \frac{-30}{15} + \frac{6}{15} + \frac{-2}{15}$$

$$= \frac{-30+6-2}{15} = \frac{-32+6}{15} = \frac{-26}{15}$$

$$\begin{aligned}
 \text{(vi)} \quad & \frac{-11}{12} + \frac{5}{16} + \frac{-3}{8} \\
 &= \frac{-11 \times 4}{12 \times 4} + \frac{5 \times 3}{16 \times 3} + \frac{-3 \times 6}{8 \times 6} \\
 &\quad (\because \text{L.C.M. of 8, 12 and 16} = 48) \\
 &= \frac{-44}{48} + \frac{15}{48} + \frac{-18}{48} \\
 &= \frac{-44 + 15 - 18}{48} = \frac{-62 + 15}{48} = \frac{-47}{48}
 \end{aligned}$$

Question 4.

Evaluate:

$$(i) \quad -\frac{11}{18} + \frac{-3}{9} + \frac{2}{-3}$$

$$(ii) \quad \frac{-9}{4} + \frac{13}{3} + \frac{25}{6}$$

$$(iii) \quad -5 + \frac{5}{-8} + \frac{-5}{-12}$$

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

$$(v) \quad 5 + \frac{-3}{4} + \frac{-5}{8}$$

Solution:

$$(i) -\frac{11}{18} + \frac{-3}{9} + \frac{2}{-3}$$

$$= \frac{-11}{18} + \frac{-3}{9} + \frac{-2}{3}$$

$$= \frac{-11 \times 1}{18 \times 1} + \frac{-3 \times 2}{9 \times 2} + \frac{-2 \times 6}{3 \times 6}$$

($\because$ L.C.M. of 3, 9 and 18 = 18)

$$= \frac{-11}{18} + \frac{-6}{18} + \frac{-12}{18}$$

$$= \frac{-11-6-12}{18} = \frac{-29}{18}$$

$$(ii) \frac{-9}{4} + \frac{13}{3} + \frac{25}{6}$$

$$= \frac{-9 \times 6}{4 \times 6} + \frac{13 \times 8}{3 \times 8} + \frac{25 \times 4}{6 \times 4}$$

($\because$ L.C.M. of 4, 3 and 6 = 24)

$$= \frac{-54}{24} + \frac{104}{24} + \frac{100}{24}$$

$$= \frac{-54+104+100}{24} = \frac{150}{24} = \frac{25}{6}$$

$$\begin{aligned}
 \text{(iii)} \quad & -5 + \frac{5}{-8} + \frac{-5}{-12} \\
 &= \frac{-5}{1} + \frac{-5}{8} + \frac{5}{12} \\
 &= \frac{-5 \times 24}{1 \times 24} + \frac{-5 \times 3}{8 \times 3} + \frac{5 \times 2}{12 \times 2} \\
 &\quad (\because \text{L.C.M. of 1, 8 and 12} = 24) \\
 &= \frac{-120}{24} + \frac{-15}{24} + \frac{10}{24} \\
 &= \frac{-120 - 15 + 10}{24} = \frac{-125}{24}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad & -\frac{2}{3} + \frac{5}{2} + 2 \\
 &= -\frac{2}{3} + \frac{5}{2} + \frac{2}{1} \\
 &= \frac{-2 \times 2}{3 \times 2} + \frac{5 \times 3}{2 \times 3} + \frac{2 \times 6}{1 \times 6} \\
 &\quad (\because \text{L.C.M. of 3, 2 and 1} = 6) \\
 &= \frac{-4}{6} + \frac{15}{6} + \frac{12}{6} \\
 &= \frac{-4 + 15 + 12}{6} = \frac{23}{6}
 \end{aligned}$$

$$\begin{aligned}
 (v) \quad & 5 + \frac{-3}{4} + \frac{-5}{8} \\
 &= \frac{5}{1} + \frac{-3}{4} + \frac{-5}{8} \\
 &= \frac{5 \times 8}{1 \times 8} + \frac{-3 \times 2}{4 \times 2} + \frac{-5 \times 1}{8 \times 1} \\
 &\quad (\because \text{L.C.M. of 1, 4 and 8} = 8) \\
 &= \frac{40}{8} + \frac{-6}{8} + \frac{-5}{8} \\
 &= \frac{40 - 6 - 5}{8} = \frac{40 - 11}{8} = \frac{29}{8}
 \end{aligned}$$

Question 5.

Subtract :

$$(i) \quad \frac{2}{9} \text{ from } \frac{5}{9} \qquad (ii) \quad \frac{-6}{11} \text{ from } \frac{-3}{-11}$$

$$(iii) \quad \frac{-2}{15} \text{ from } \frac{-8}{15} \qquad (iv) \quad \frac{11}{18} \text{ from } \frac{-5}{18}$$

$$(v) \quad \frac{-4}{11} \text{ from } -2$$

Solution:

$$(i) \frac{2}{9} \text{ from } \frac{5}{9}$$

$$= \frac{5}{9} - \frac{2}{9} = \frac{5-2}{9} = \frac{3}{9} = \frac{1}{3}$$

$$(ii) \frac{-6}{11} \text{ from } \frac{-3}{-11}$$

$$= \frac{3}{11} - \left(-\frac{6}{11}\right)$$

$$= \frac{3}{11} + \frac{6}{11} = \frac{3+6}{11} = \frac{9}{11}$$

$$(iii) \frac{-2}{15} \text{ from } \frac{-8}{15}$$

$$= \frac{-8}{15} - \left(\frac{-2}{15}\right)$$

$$= \frac{-8}{15} + \frac{2}{15} = \frac{-8+2}{15} = \frac{-6}{15} = \frac{-2}{5}$$

$$(iv) \frac{11}{18} \text{ from } \frac{-5}{18}$$

$$= \frac{-5}{18} - \frac{11}{18} = \frac{-5-11}{18} = \frac{-16}{18} = \frac{-8}{9}$$

$$(v) \frac{-4}{11} \text{ from } -2$$

$$= \frac{-2}{1} - \left(\frac{-4}{11}\right) = \frac{-2 \times 11}{1 \times 11} + \frac{4 \times 1}{11 \times 1}$$

$$= \frac{-22}{11} + \frac{4}{11} = \frac{-22+4}{11} = \frac{-18}{11}$$

Question 6.**Subtract :**

$$(i) -\frac{3}{10} \text{ from } \frac{1}{5} \quad (ii) \frac{-6}{25} \text{ from } \frac{-8}{5}$$

$$(iii) \frac{-7}{4} \text{ from } -2 \quad (iv) \frac{-16}{21} \text{ from } 1$$

$$(v) \frac{-8}{15} \text{ from } 0 \quad (vi) 0 \text{ from } \frac{-3}{8}$$

$$(vii) -2 \text{ from } \frac{-3}{10} \quad (viii) \frac{5}{8} \text{ from } \frac{-5}{16}$$

$$(ix) 4 \text{ from } -\frac{3}{13}$$

Solution:

$$(i) -\frac{3}{10} \text{ from } \frac{1}{5}$$

$$= \frac{1}{5} - \left(-\frac{3}{10} \right)$$

$$= \frac{1 \times 2}{5 \times 2} + \frac{3}{10}$$

$$= \frac{2}{10} + \frac{3}{10} = \frac{2+3}{10} = \frac{5}{10}$$

$$(ii) \frac{-6}{25} \text{ from } \frac{-8}{5}$$

$$= \frac{-8}{5} - \left(\frac{-6}{25} \right)$$

$$= \frac{-8 \times 5}{5 \times 5} + \frac{6}{25} = \frac{-40}{25} + \frac{6}{25}$$

$$= \frac{-40+6}{25} = \frac{-34}{25}$$

$$(iii) \frac{-7}{4} \text{ from } -2$$

$$\begin{aligned}
&= \frac{-2}{1} - \left(\frac{-7}{4} \right) \\
&= \frac{-2 \times 4}{1 \times 4} + \frac{7}{4} = \frac{-8}{4} + \frac{7}{4} \\
&= \frac{-8+7}{4} = \frac{-1}{4}
\end{aligned}$$

(iv) $\frac{-16}{21}$ from 1

$$\begin{aligned}
&= \frac{1}{1} - \left(\frac{-16}{21} \right) \\
&= \frac{1}{1} + \frac{16}{21} = \frac{1 \times 21 + 16}{21} \\
&= \frac{21+16}{21} = \frac{37}{21}
\end{aligned}$$

(v) $\frac{-8}{15}$ from 0

$$\begin{aligned}
&= 0 - \left(\frac{-8}{15} \right) \\
&= 0 + \frac{8}{15} = \frac{8}{15}
\end{aligned}$$

(vi) 0 from $\frac{-3}{8}$

$$= \frac{-3}{8} - 0 = \frac{-3}{8}$$

$$(vii) -2 \text{ from } \frac{-3}{10}$$

$$= \frac{-3}{10} - \left(\frac{-2}{1} \right)$$

$$= \frac{-3}{10} + \frac{2}{1} = \frac{-3+2 \times 10}{10} = \frac{17}{10}$$

$$(viii) \frac{5}{8} \text{ from } \frac{-5}{16}$$

$$= \frac{-5}{16} - \left(\frac{5}{8} \right)$$

$$= \frac{-5}{16} - \frac{5 \times 2}{8 \times 2} = \frac{-5}{16} - \frac{10}{16}$$

$$= \frac{-5-10}{16} = \frac{-15}{16}$$

$$(ix) 4 \text{ from } -\frac{3}{13}$$

$$= -\frac{3}{13} - \frac{4}{1} = \frac{-3-4 \times 13}{13}$$

$$= \frac{-3-52}{13} = \frac{-55}{13}$$

Question 7.

The sum of two rational numbers is $\frac{11}{24}$. If one of them is $\frac{3}{8}$, find the other.

Solution:

$$\therefore \text{Sum of two rational number} = \frac{11}{24}$$

$$\text{and one of them} = \frac{3}{8}$$

$$\therefore \text{The other rational number} = \frac{11}{24} - \frac{3}{8}$$

$$= \frac{11}{24} - \frac{3 \times 3}{8 \times 3} = \frac{11}{24} - \frac{9}{24}$$

$$= \frac{11-9}{24} = \frac{2}{24}$$

Question 8.

The sum of two rational numbers is $\frac{-7}{12}$. If one of them is $\frac{13}{24}$, find the other.

Solution:

$$\therefore \text{Sum of two rational number} = \frac{-7}{12}$$

$$\text{One of them} = \frac{13}{24}$$

$$\therefore \text{Other rational number} = \frac{-7}{12} - \frac{13}{24}$$

$$= \frac{-7 \times 2}{12 \times 2} - \frac{13}{24}$$

$$= \frac{-14}{24} - \frac{13}{24}$$

$$= \frac{-14-13}{24} = \frac{-27}{24}$$

Question 9.

The sum of two rational numbers is -4. If one of them is $-\frac{13}{12}$, find the other.

Solution:

$$\therefore \text{Sum of two rational number} = -4$$

$$\text{and one of them} = -\frac{13}{12}$$

$$\therefore \text{Other rational number} = -4 - \left(-\frac{13}{12}\right)$$

$$= -4 + \frac{13}{12}$$

$$= \frac{-4 \times 12 + 13}{12} = \frac{-48 + 13}{12} = \frac{-35}{12}$$

Question 10.

What should be added to $-\frac{3}{6}$ to get $-\frac{11}{24}$?

Solution:

Let the required rational number be x

$$\text{Other number} = -\frac{3}{16}$$

$$\text{Sum of two number} = \frac{11}{24}$$

According to question,

$$-\frac{3}{16} + x = \frac{11}{24}$$

$$\Rightarrow x = \frac{11}{24} + \frac{3}{16}$$

$$x = \frac{11 \times 2}{24 \times 2} + \frac{3 \times 3}{16 \times 3}$$

($\because$ L.C.M. of 16 and 24 = 48)

$$x = \frac{22}{48} + \frac{9}{48}$$

$$x = \frac{22+9}{48} = \frac{31}{48}$$

Question 11.

What should be added to $\frac{-3}{5}$ to get 2?

Solution:

Let the required rational number be x

$$\text{Other number} = \frac{-3}{5}$$

Sum of two number = 2

According to question,

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

$$\Rightarrow x = 2 + \frac{3}{5}$$

$$= \frac{2 \times 5 + 3}{5} = \frac{10 + 3}{5} = \frac{13}{5}$$

Question 12.

What should be subtracted from $\frac{-4}{5}$ to get 1?

Solution:

Let the required rational number = x

$$\text{Other number} = \frac{-4}{5}$$

Difference of two number = 1

According to question,

$$\therefore \frac{-4}{5} - x = 1$$

$$\Rightarrow \frac{-4}{5} - 1 = x$$

$$\Rightarrow x = \frac{-4 - 1 \times 5}{5} = \frac{-4 - 5}{5} = \frac{-9}{5}$$

Question 13.

The sum of two numbers is $-\frac{6}{5}$. If one of them is -2, find the other.

Solution:

$$\therefore \text{Sum of two rational number} = -\frac{6}{5}$$

$$\text{and one of them} = -2$$

$$\therefore \text{Other rational number} = -\frac{6}{5} - \left(-\frac{2}{1}\right)$$

$$= \frac{-6 + 2 \times 5}{5} = \frac{-6 + 10}{5} = \frac{4}{5}$$

Question 14.

What should be added to $\frac{-7}{12}$ to get $\frac{3}{8}$?

Solution:

Let the required rational number be $= x$

$$\text{Other number} = \frac{-7}{12}$$

$$\text{Sum of two numbers} = \frac{3}{8}$$

$$\therefore \frac{-7}{12} + x = \frac{3}{8}$$

$$\Rightarrow x = \frac{3}{8} - \frac{-7}{12}$$

$$= \frac{3 \times 3}{8 \times 3} + \frac{7 \times 2}{12 \times 2}$$

($\because$ L.C.M. of 8 and 12 = 24)

$$= \frac{9}{24} + \frac{14}{24}$$

$$= \frac{9 + 14}{24} = \frac{23}{24}$$

Question 15.

What should be subtracted from $\frac{5}{9}$ to get $\frac{9}{5}$?

Solution:

Let the first number be x

$$\text{Other number} = \frac{5}{9}$$

$$\text{Difference of two number} = \frac{9}{5}$$

According to question,

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

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

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

($\because$ L.C.M. of 9 and 5 = 45)

$$x = \frac{25}{45} - \frac{81}{45}$$

$$x = \frac{25 - 81}{45} = -\frac{56}{45}$$

EXERCISE 2 (D)

Question 1.

Evaluate:

$$(i) \frac{5}{4} \times \frac{3}{7} \quad (ii) \frac{2}{3} \times -\frac{6}{7}$$

$$(iii) \left(\frac{-12}{5}\right) \times \left(\frac{10}{-3}\right) \quad (iv) \frac{-45}{39} \times \frac{-13}{15}$$

$$(v) 3\frac{1}{8} \times \left(-2\frac{2}{5}\right) \quad (vi) 2\frac{14}{25} \times \left(\frac{-5}{16}\right)$$

$$(vii) \left(\frac{-8}{9}\right) \times \left(\frac{-3}{16}\right) \quad (viii) \left(\frac{5}{-27}\right) \times \left(\frac{-9}{20}\right)$$

Solution:

$$(i) \frac{5}{4} \times \frac{3}{7} = \frac{5 \times 3}{4 \times 7} = \frac{15}{28}$$

$$(ii) \frac{2}{3} \times -\frac{6}{7} = \frac{2 \times -6}{3 \times 7} = \frac{2 \times -2}{7} = \frac{-4}{7}$$

$$(iii) \left(\frac{-12}{5}\right) \times \left(\frac{10}{-3}\right) \\ = \frac{(-12) \times 10}{5 \times (-3)} = 4 \times 2 = 8$$

$$(iv) \frac{-45}{39} \times \frac{-13}{15} \\ = \frac{(-45) \times (-13)}{39 \times 15} = \frac{(-3) \times (-1)}{3 \times 1} \\ = \frac{3}{3} = 1$$

$$(v) 3\frac{1}{8} \times \left(-2\frac{2}{5}\right) \\ = \frac{3 \times 8 + 1}{8} \times \left(-\frac{2 \times 5 + 2}{5}\right) \\ = \frac{25}{8} \times \left(-\frac{12}{5}\right) = \frac{25 \times (-12)}{8 \times 5} \\ = \frac{5 \times (-3)}{2 \times 1} = \frac{-15}{2}$$

$$(vi) 2\frac{14}{25} \times \left(\frac{-5}{16}\right)$$

$$= \frac{2 \times 25 + 14}{25} \times \left(\frac{-5}{16}\right)$$

$$= \frac{64}{25} \times \left(\frac{-5}{16}\right)$$

$$= \frac{64 \times (-5)}{25 \times 16} = \frac{4 \times (-1)}{5 \times 1} = -\frac{4}{5}$$

$$(vii) \left(\frac{-8}{9}\right) \times \left(\frac{-3}{16}\right)$$

$$= \frac{(-8) \times (-3)}{9 \times 16} = \frac{(-1) \times (-1)}{3 \times 2} = \frac{1}{6}$$

$$(viii) \left(\frac{5}{-27}\right) \times \left(\frac{-9}{20}\right)$$

$$= \frac{5 \times (-9)}{(-27) \times 20} = \frac{1 \times 1}{3 \times 4} = \frac{1}{12}$$

Question 2.

Multiply:

$$(i) \frac{3}{25} \text{ and } \frac{4}{5}$$

$$(ii) 1\frac{1}{8} \text{ and } 10\frac{2}{3}$$

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

$$(iv) \frac{-13}{15} \text{ and } \frac{-25}{26}$$

$$(v) 1\frac{1}{6} \text{ and } 18$$

$$(vi) 2\frac{1}{14} \text{ and } -7$$

$$(vii) 5\frac{1}{8} \text{ and } -16$$

$$(viii) 35 \text{ and } \frac{-18}{25}$$

$$(ix) 6\frac{2}{3} \text{ and } -\frac{3}{8}$$

$$(x) 3\frac{3}{5} \text{ and } -10$$

$$(xi) \frac{27}{28} \text{ and } -14$$

$$(xii) -24 \text{ and } \frac{5}{16}$$

Solution:

(i) $\frac{3}{25}$ and $\frac{4}{5}$

$$= \frac{3}{25} \times \frac{4}{5} = \frac{3 \times 4}{25 \times 5} = \frac{12}{125}$$

(ii) $1\frac{1}{8}$ and $10\frac{2}{3}$

$$= \frac{9}{8} \times \frac{32}{3} = \frac{9 \times 32}{8 \times 3} = 3 \times 4 = 12$$

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

$$= \frac{20}{3} \times \frac{(-3)}{8} = \frac{20 \times (-3)}{3 \times 8}$$

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

(iv) $\frac{-13}{15}$ and $\frac{-25}{26}$

$$= \frac{-13 \times -25}{15 \times 26} = \frac{-1 \times -5}{3 \times 2} = \frac{5}{6}$$

(v) $1\frac{1}{6}$ and 18

$$= \frac{7}{6} \times 18 = 7 \times 3 = 21$$

(vi) $2\frac{1}{14}$ and -7

$$= \frac{2 \times 14 + 1}{14} \times (-7) = \frac{29}{14} \times (-7)$$

$$= \frac{29 \times (-1)}{2} = \frac{-29}{2}$$

(vii) $5\frac{1}{8}$ and -16

$$= \frac{41}{8} \times (-16) = 41 \times -2 = -82$$

(viii) 35 and $\frac{-18}{25}$

$$= 35 \times \frac{-18}{25} = \frac{35 \times (-18)}{25} = \frac{7 \times (-18)}{5}$$

$$= \frac{-126}{5} = -25\frac{1}{5}$$

(ix) $6\frac{2}{3}$ and $-\frac{3}{8}$

$$= \frac{20}{3} \times \frac{-3}{8} = \frac{20 \times (-3)}{3 \times 8}$$

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

(x) $3\frac{3}{5}$ and -10

$$= \frac{3 \times 5 + 3}{5} \times (-10)$$

$$= \frac{18}{5} \times (-10) = 18 \times (-2) = -36$$

(xi) $\frac{27}{28}$ and -14

$$= \frac{27}{28} \text{ and } (-14)$$

$$= \frac{27 \times (-1)}{2} = \frac{-27}{2} = -13\frac{1}{2}$$

(xii) -24 and $\frac{5}{16}$

$$= \frac{-24 \times 5}{16} = \frac{-3 \times 5}{2}$$

$$= \frac{-15}{2} = -7\frac{1}{2}$$

Question 3.

Evaluate:

$$(i) \left(-6 \times \frac{5}{18} \right) - \left(-4 \frac{2}{9} \right)$$

$$(ii) \left(\frac{7}{8} \times \frac{8}{7} \right) + \left(\frac{-5}{9} \right) \times \left(\frac{6}{-25} \right)$$

$$(iii) \left(\frac{11}{-9} \times \frac{21}{44} \right) + \left(\frac{-5}{9} \right) \times \left(\frac{63}{-100} \right)$$

$$(iv) \left(\frac{-5}{9} \times \frac{6}{-25} \right) + \left(\frac{24}{21} \times \frac{7}{8} \right)$$

$$(v) \left(\frac{-35}{39} \times \frac{-13}{7} \right) - \left(\frac{7}{90} \times \frac{-18}{14} \right)$$

$$(vi) \left(\frac{-4}{5} \times \frac{3}{2} \right) + \left(\frac{9}{-5} \times \frac{10}{3} \right) - \left(\frac{-3}{2} \times \frac{-1}{4} \right)$$

Solution:

$$(i) \left(-6 \times \frac{5}{18} \right) - \left(-4 \frac{2}{9} \right)$$
$$= \left(-1 \times \frac{5}{3} \right) - \left(\frac{-(4 \times 9 + 2)}{9} \right)$$

$$\begin{array}{r|l} 3 & 3, 9 \\ 3 & 1, 3 \\ \hline & 1, 1 \end{array}$$

$$\text{L.C.M.} = 9$$

$$= \frac{-5}{3} - \left(\frac{-38}{9} \right)$$
$$= \frac{-5}{3} + \frac{38}{9} = \frac{-5 \times 3}{3 \times 3} + \frac{38 \times 1}{9 \times 1}$$
$$= \frac{-15 + 38}{9} \Rightarrow \frac{23}{9} = 2 \frac{5}{9}$$

$$(ii) \left(\frac{7}{8} \times \frac{8}{7} \right) + \left(\frac{-5}{9} \right) \times \left(\frac{6}{-25} \right)$$
$$= \left(\frac{7}{8} \times \frac{8}{7} \right) + \left(\frac{-5}{9} \times \frac{6}{(-25)} \right)$$
$$= \frac{1}{1} + \frac{1 \times 2}{3 \times 5} = \frac{1}{1} + \frac{2}{15}$$
$$= \frac{15 + 2}{15} = \frac{17}{15} = 1 \frac{2}{15}$$

$$\begin{aligned}
 (iii) \quad & \left(\frac{11}{-9} \times \frac{21}{44} \right) + \left(\frac{-5}{9} \right) \times \left(\frac{63}{-100} \right) \\
 &= \left(\frac{11}{-9} \times \frac{21}{44} \right) + \left(\frac{5}{9} \times \frac{63}{100} \right) \\
 &= -\frac{1 \times 7}{3 \times 4} + \frac{1 \times 7}{1 \times 20} = -\frac{7}{12} + \frac{7}{20} \\
 &= -\frac{7 \times 5}{12 \times 5} + \frac{7 \times 3}{20 \times 3} \\
 &\quad (\because \text{L.C.M. of 12 and 20} = 60) \\
 &= -\frac{35}{60} + \frac{21}{60} = \frac{-35+21}{60} = \frac{-14}{60}
 \end{aligned}$$

$$\begin{aligned}
 (iv) \quad & \left(\frac{-5}{9} \times \frac{6}{-25} \right) + \left(\frac{24}{21} \times \frac{7}{8} \right) \\
 &= \left(\frac{5}{9} \times \frac{6}{25} \right) + \left(\frac{24}{21} \times \frac{7}{8} \right) \\
 &= \frac{2}{3 \times 5} + 1 = \frac{2}{15} + 1 \\
 &= \frac{2+15}{15} = \frac{17}{15} = 1 \frac{2}{15}
 \end{aligned}$$

$$\begin{aligned}
 (v) \quad & \left(\frac{-35}{39} \times \frac{-13}{7} \right) - \left(\frac{7}{90} \times \frac{-18}{14} \right) \\
 &= \left(\frac{-35}{39} \times \frac{(-13)}{7} \right) - \left(\frac{7}{90} \times \frac{-18}{14} \right) \\
 &= \frac{(-5) \times (-1)}{3 \times 1} - \left(\frac{1 \times (-1)}{5 \times 2} \right) \\
 &= \frac{5}{3} - \left(\frac{-1}{10} \right) \\
 &= \frac{5 \times 10}{3 \times 10} + \frac{1}{10 \times 3} \\
 &= \frac{50+1}{30} = \frac{51}{30} = 1 \frac{17}{30}
 \end{aligned}$$

$$\begin{aligned}
 (vi) \quad & \left(\frac{-4}{5} \times \frac{3}{2} \right) + \left(\frac{9}{-5} \times \frac{10}{3} \right) - \left(\frac{-3}{2} \times \frac{-1}{4} \right) \\
 &= \left(\frac{-2 \times 3}{5 \times 1} \right) + \left(\frac{3 \times 2}{-1 \times 1} \right) - \left(\frac{-3 \times (-1)}{2 \times 4} \right) \\
 &= \left(\frac{-6}{5} \right) + \left(\frac{-6}{1} \right) - \left(\frac{3}{8} \right) \\
 &= \frac{-6 \times 8}{5 \times 8} - \frac{6 \times 40}{1 \times 40} - \frac{3 \times 5}{8 \times 5} \\
 &= \frac{-48 - 240 - 15}{40} \\
 &= \frac{-288 - 15}{40} = \frac{303}{40} = 5 \frac{3}{40}
 \end{aligned}$$

Question 4.

Find the cost of $3 \frac{1}{2}$ m cloth, if one metre cloth costs ₹ $325 \frac{1}{2}$.

Solution:

$$\text{Cost of 1 metre cloth} = ₹325 \frac{1}{2}$$

$$= \frac{2 \times 325 + 1}{2} = \frac{650 + 1}{2} = ₹ \frac{651}{2}$$

$$\text{Now cost of } 3 \frac{1}{2} \text{ m } \left(\frac{2 \times 3 + 1}{2} = \frac{7}{2} \right) \text{ m}$$

$$= \frac{651}{2} \times \frac{7}{2} = \frac{651 \times 7}{2 \times 2}$$

$$= \frac{4557}{4} = ₹1139 \frac{1}{4}$$

Question 5.

A bus is moving with a speed of $65\frac{1}{2}$ km per hour. How much distance will it cover in $1\frac{1}{3}$ hours.

Solution:

$$\text{Speed of bus per hour} = 65\frac{1}{2}$$

$$= \frac{2 \times 65 + 1}{2} = \frac{130 + 1}{2} = \frac{131}{2} \text{ km}$$

$$\text{Time taken} = 1\frac{1}{3} \text{ hour} = \frac{4}{3} \text{ hour}$$

$$= \frac{131}{2} \times \frac{4}{3} \Rightarrow \frac{131}{1} \times \frac{2}{3}$$

$$\text{Distance covered} = \text{Speed} \times \text{Time}$$

$$= \frac{131}{2} \times \frac{4}{3}$$

$$= \frac{131 \times 2}{1 \times 3} = \frac{262}{3} = 87\frac{1}{3} \text{ km}$$

Question 6.

Divide:

$$(i) \frac{15}{28} \text{ by } \frac{3}{4} \qquad (ii) \frac{-20}{9} \text{ by } \frac{-5}{9}$$

$$(iii) \frac{16}{-5} \text{ by } \frac{-8}{7} \qquad (iv) -7 \text{ by } \frac{-14}{5}$$

$$(v) -14 \text{ by } \frac{7}{-2} \qquad (vi) \frac{-22}{9} \text{ by } \frac{11}{18}$$

$$(vii) 35 \text{ by } \frac{-7}{9} \qquad (viii) \frac{21}{44} \text{ by } -\frac{11}{9}$$

Solution:

$$(i) \frac{15}{28} \text{ by } \frac{3}{4}$$

$$= \frac{15}{28} \div \frac{3}{4} \Rightarrow \frac{15}{28} \times \frac{4}{3}$$

$$= \frac{5}{7} \times \frac{1}{1} = \frac{5}{7}$$

$$(ii) \frac{-20}{9} \text{ by } \frac{-5}{9} = \frac{-20}{9} \div \frac{-5}{9}$$

$$\Rightarrow \frac{-20}{9} \times \frac{9}{-5} = \frac{-4}{-1} = \frac{4}{1} = 4$$

$$(iii) \frac{16}{-5} \text{ by } \frac{-8}{7}$$

$$= \frac{16}{-5} \div \frac{-8}{7} \Rightarrow \frac{16}{-5} \times \frac{7}{-8}$$

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

$$= \frac{2 \times 7}{-5 \times (-1)} = \frac{14}{5} = 2\frac{4}{5}$$

$$(iv) -7 \text{ by } \frac{-14}{5}$$

$$= -7 \div \frac{-14}{5} \Rightarrow -7 \times \frac{5}{-14} \Rightarrow 1 \times \frac{5}{2}$$

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

$$(v) -14 \text{ by } \frac{7}{-2}$$

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

$$= \frac{-2 \times (-2)}{1 \times 1} = 4$$

$$(vi) \frac{-22}{9} \text{ by } \frac{11}{18}$$

$$= \frac{-22}{9} \div \frac{11}{18} \Rightarrow \frac{-22}{9} \times \frac{18}{11}$$

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

$$= \frac{-2 \times 2}{1 \times 1} = \frac{-4}{1} = -4$$

$$(vii) 35 \text{ by } \frac{-7}{9}$$

$$= 35 \div \frac{-7}{9} \Rightarrow 35 \times \frac{9}{-7}$$

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

$$= \frac{5 \times 9}{-1} = \frac{45}{-1} = -45$$

$$(viii) \frac{21}{44} \text{ by } -\frac{11}{9}$$

$$= \frac{21}{44} \div \left(-\frac{11}{9}\right) \Rightarrow \frac{21}{44} \times -\frac{9}{11}$$

$$= \frac{21 \times (-9)}{44 \times 11} = -\frac{189}{484}$$

Question 7.**Evaluate:**

$$(i) 3\frac{5}{12} + 1\frac{2}{3} \qquad (ii) 3\frac{5}{12} - 1\frac{2}{3}$$

$$(iii) \left(3\frac{5}{12} + 1\frac{2}{3}\right) \div \left(3\frac{5}{12} - 1\frac{2}{3}\right)$$

Solution:

$$(i) 3\frac{5}{12} + 1\frac{2}{3}$$

$$= \frac{12 \times 3 + 5}{12} + \frac{3 \times 1 + 2}{3}$$

$$= \frac{41}{12} + \frac{5}{3} \quad (\because \text{L.C.M. of } 12, 3 = 12)$$

$$= \frac{41 \times 1}{12 \times 1} + \frac{5 \times 4}{3 \times 4} = \frac{41}{12} + \frac{20}{12}$$

$$= \frac{41 + 20}{12} = \frac{61}{12} = 5\frac{1}{12}$$

$$(ii) 3\frac{5}{12} - 1\frac{2}{3}$$

$$= \frac{12 \times 3 + 5}{12} - \frac{3 \times 1 + 2}{3}$$

$$= \frac{41}{12} - \frac{5}{3} \quad (\because \text{L.C.M. of } 12, 3 = 12)$$

$$= \frac{41 \times 1}{12 \times 1} - \frac{5 \times 4}{3 \times 4}$$

$$= \frac{41 - 20}{12} = \frac{21}{12} = \frac{7}{4} = 1\frac{3}{4}$$

$$\begin{aligned}
& \text{(iii)} \left(3\frac{5}{12} + 1\frac{2}{3} \right) \div \left(3\frac{5}{12} - 1\frac{2}{3} \right) \\
&= \left(\frac{12 \times 3 + 5}{12} + \frac{3 \times 1 + 2}{3} \right) \\
&\quad \div \left(\frac{12 \times 3 + 5}{12} - \frac{3 \times 1 + 2}{3} \right) \\
&\left(\frac{41}{12} + \frac{5}{3} \right) \div \left(\frac{41}{12} - \frac{5}{3} \right) \\
&\quad (\because \text{L.C.M. of } 12, 3 = 12) \\
&= \left(\frac{41 + 20}{12} \right) \div \left(\frac{41 - 20}{12} \right) \\
&= \frac{61}{12} \div \frac{21}{12} \Rightarrow \frac{61}{12} \times \frac{12}{21} \\
&= \frac{61}{21} = 2\frac{19}{21}
\end{aligned}$$

Question 8.

The product of two numbers is 14. If one of the numbers is $\frac{-8}{7}$, find the other.

Solution:

$\because$ Product of two numbers = 14

and one of these two numbers = $\frac{-8}{7}$

The other number = $14 \div \frac{-8}{7}$

$$= 14 \times -\frac{7}{8} = -\frac{98}{8} = -\frac{49}{4}$$

Question 9.

The cost of 11 pens is ₹ $3\frac{2}{3}$. Find the cost of one pen.

Solution:

$$\text{The cost of 11 pens} = ₹3\frac{2}{3}$$

$$= \frac{3 \times 3 + 2}{3} = ₹\frac{11}{3}$$

$$\text{The cost of one pen} = \frac{11}{3} \div 11$$

$$= \frac{11}{3} \times \frac{1}{11} = ₹\frac{1}{3}$$

Question 10.

If 6 identical articles can be bought for ₹2 $\frac{6}{17}$. Find the cost of each article.

Solution:

$$\text{Cost of 6 articles} = ₹2\frac{6}{17}$$

$$= \frac{2 \times 17 + 6}{17} = ₹\frac{40}{17}$$

$$\text{Cost of each article} = \frac{40}{17} \div 6$$

$$= \frac{40}{17} \times \frac{1}{6} = ₹\frac{20}{51}$$

Question 11.

By what number should $\frac{-3}{8}$ be multiplied so that the product is $\frac{-9}{16}$?

Solution:

$$\text{Number} = \frac{-3}{8} \div \left(\frac{-9}{16} \right)$$

$$= \frac{-3}{8} \times \frac{16}{-9} = \frac{2}{3} = 1\frac{1}{3}$$

Question 12.

By what number should $\frac{-5}{7}$ be divided so -15 that the result is $\frac{-15}{28}$?

Solution:

$$\begin{aligned}\text{Number} &= \frac{-15}{28} \div \frac{-5}{7} \\ &= \frac{-15}{28} \times \frac{-7}{5} = \frac{3}{4}\end{aligned}$$

Question 13.

Evaluate :

$$\left(\frac{32}{15} + \frac{8}{5}\right) \div \left(\frac{32}{15} - \frac{8}{5}\right).$$

Solution:

$$\begin{aligned}&\left(\frac{32}{15} + \frac{8}{5}\right) \div \left(\frac{32}{15} - \frac{8}{5}\right) \\ &\left(\frac{32 \times 1}{15 \times 1} + \frac{8 \times 3}{5 \times 3}\right) \div \left(\frac{32 \times 1}{15 \times 1} - \frac{8 \times 3}{5 \times 3}\right) \\ &\quad (\because \text{L.C.M. of } 15, 5 = 15) \\ &= \left(\frac{32 + 24}{15}\right) \div \left(\frac{32 - 24}{15}\right) \\ &= \frac{56}{15} \div \frac{8}{15} \Rightarrow \frac{56}{15} \times \frac{15}{8} = 7\end{aligned}$$

Question 14.

Seven equal piece are made out of a rope 5 of $21\frac{5}{7}$ m. Find the length of each piece.

Solution:

$$\text{Length of 7 pieces of rope} = 21\frac{5}{7} \text{ m}$$

$$= \frac{21 \times 7 + 5}{7} = \frac{152}{7}$$

$$\text{Length of each piece} = \frac{152}{7} \div 7$$

$$= \frac{152}{7} \times \frac{1}{7} = \frac{152}{49} = 3\frac{5}{49} \text{ m}$$

EXERCISE 2 (E)

Question 1.

Evaluate:

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

$$(ii) \frac{7}{-27} + \frac{11}{18}$$

$$(iii) \frac{-3}{8} + \frac{-5}{12}$$

$$(iv) \frac{9}{-16} + \frac{-5}{-12}$$

$$(v) \frac{-5}{9} + \frac{-7}{12} + \frac{11}{18}$$

$$(vi) \frac{7}{-26} + \frac{16}{39}$$

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

$$(viii) -\frac{5}{7} - \left(-\frac{3}{8}\right)$$

$$(ix) \frac{7}{26} + 2 + \frac{-11}{13}$$

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

Solution:

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

$$\begin{array}{r|l} 3 & 3, 4 \\ 4 & 1, 4 \\ \hline & 1, 1 \end{array}$$

L.C.M. of 3 and 4 = $3 \times 4 = 12$

$$\Rightarrow \frac{-2 \times 4}{3 \times 4} + \frac{3 \times 3}{4 \times 3}$$

($\because$ L.C.M. of 3 and 4 = 12)

$$\Rightarrow \frac{-8+9}{12} = \frac{1}{12}$$

$$(ii) \frac{7}{-27} + \frac{11}{18}$$

$$\begin{array}{r|l} 2 & 27, 18 \\ 3 & 27, 9 \\ 3 & 9, 3 \\ 3 & 3, 1 \\ \hline & 1, 1 \end{array}$$

L.C.M. of 27 and 18 = $2 \times 3 \times 3 \times 3 = 54$

$$\Rightarrow \frac{7 \times 2}{-27 \times 2} + \frac{11 \times 3}{18 \times 3}$$

($\because$ L.C.M. of -27 and 18 = 54)

$$\Rightarrow \frac{-14+33}{54} = \frac{19}{54}$$

$$(iii) \frac{-3}{8} + \frac{-5}{12}$$

$$\begin{array}{r|l} 2 & 8, 12 \\ \hline 2 & 4, 6 \\ \hline 2 & 2, 3 \\ \hline 3 & 1, 3 \\ \hline & 1, 1 \end{array}$$

$$\text{L.C.M. of 8 and 12} = 2 \times 2 \times 2 \times 3 = 24$$

$$\Rightarrow \frac{-3 \times 3}{8 \times 3} + \frac{(-5 \times 2)}{12 \times 2}$$

$$(\because \text{L.C.M. of 8, 12} = 24)$$

$$\Rightarrow \frac{-9-10}{24} = \frac{-19}{24}$$

$$(iv) \frac{9}{-16} + \frac{-5}{-12} \text{ or } \frac{-5}{-12} = \frac{5}{12}$$

$$\begin{array}{r|l} 2 & 16, 12 \\ \hline 2 & 8, 6 \\ \hline 2 & 4, 3 \\ \hline 2 & 2, 3 \\ \hline 3 & 1, 3 \\ \hline & 1, 1 \end{array}$$

$$\text{L.C.M. of 16 and 12} = 2 \times 2 \times 2 \times 2 \times 3 = 48$$

$$\Rightarrow \frac{9 \times 3}{-16 \times 3} + \frac{5 \times 4}{12 \times 4}$$

$$(\because \text{L.C.M. of 16 and 12} = 48)$$

$$\Rightarrow \frac{-27 + 20}{48} = \frac{-7}{48}$$

$$(v) \frac{-5}{9} + \frac{-7}{12} + \frac{11}{18}$$

$$\begin{array}{r|l} 2 & 9, 12, 18 \\ \hline 2 & 9, 6, 9 \\ \hline 3 & 9, 3, 9 \\ \hline 3 & 3, 1, 3 \\ \hline & 1, 1, 1 \end{array}$$

$$\text{L.C.M. of 9, 12 and 18} = 2 \times 2 \times 3 \times 3 = 36$$

$$\Rightarrow \frac{-5 \times 4}{9 \times 4} - \frac{7 \times 3}{12 \times 3} + \frac{11 \times 2}{18 \times 2}$$

$$(\because \text{L.C.M. of 9, 12 and 18} = 36)$$

$$\Rightarrow \frac{-20 - 21 + 22}{36}$$

$$\Rightarrow \frac{-41 + 22}{36} = \frac{-19}{36}$$

$$(vi) \frac{7}{-26} + \frac{16}{39}$$

$$\begin{array}{r|l} 2 & 26, 39 \\ \hline 3 & 13, 39 \\ \hline 13 & 13, 13 \\ \hline & 1, 1 \end{array}$$

$$\text{L.C.M. of 26 and 39} = 2 \times 3 \times 13 = 78$$

$$\Rightarrow \frac{-7 \times 3}{26 \times 3} + \frac{16 \times 2}{39 \times 2}$$

$$(\text{L.C.M. of } -26 \text{ and } 39 = 78)$$

$$\Rightarrow \frac{-21 + 32}{78} = \frac{11}{78}$$

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

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

$$\begin{array}{r|l} 3 & 3, 7 \\ 7 & 1, 7 \\ \hline & 1, 1 \end{array}$$

$$\text{L.C.M. of 3 and 7} = 3 \times 7 = 21$$

$$\Rightarrow \frac{-2 \times 7}{3 \times 7} + \frac{5 \times 3}{7 \times 3}$$

$$(\because \text{L.C.M. of 3 and 7} = 21)$$

$$\Rightarrow \frac{-14 + 15}{21} = \frac{1}{21}$$

$$(viii) -\frac{5}{7} - \left(-\frac{3}{8}\right)$$

$$\Rightarrow -\frac{5}{7} + \frac{3}{8}$$

$$\begin{array}{r|l} 2 & 7, 8 \\ \hline 2 & 7, 4 \\ \hline 2 & 7, 2 \\ \hline 7 & 7, 1 \\ \hline & 1 \end{array}$$

$$\text{L.C.M. of 7 and 8} = 2 \times 2 \times 2 \times 7 = 56$$

$$\Rightarrow \frac{-5 \times 8}{7 \times 8} + \frac{3 \times 7}{8 \times 7}$$

$$(\because \text{LCM of 7 and 8} = 56)$$

$$\Rightarrow \frac{-40 + 21}{56} = \frac{-19}{56}$$

$$(ix) \frac{7}{26} + 2 + \frac{-11}{13}$$

$$\Rightarrow \frac{7}{26} + \frac{2}{1} + \frac{-11}{13}$$

$$\begin{array}{r|l} 2 & 26, 13 \\ \hline 13 & 13, 13 \\ \hline & 1, 1 \end{array}$$

$$\text{L.C.M. of 26 and 13} = 2 \times 13 = 26$$

$$\Rightarrow \frac{7 \times 1}{26 \times 1} + \frac{2 \times 26}{1 \times 26} - \frac{11 \times 2}{13 \times 2}$$

$$(\because \text{L.C.M. of 26, 13} = 26)$$

$$\Rightarrow \frac{7 + 52 - 22}{26}$$

$$\Rightarrow \frac{59-22}{26} = \frac{37}{26}$$

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

$$\begin{array}{r|l} 2 & 3, 6 \\ \hline 3 & 3, 3 \\ \hline & 1, 1 \end{array}$$

$$\text{L.C.M. of 3 and 6} = 2 \times 3 = 6$$

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

$$(\because \text{L.C.M. of 3 and 6} = 6)$$

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

$$= \frac{-10 + 5}{6} = \frac{-5}{6}$$

Question 2.

The sum of two rational numbers is $\frac{-3}{8}$. If one of them is $\frac{3}{16}$, find the other,

Solution:

$$\text{Sum of two numbers} = \frac{-3}{8}$$

$$\text{One number} = \frac{3}{16}$$

$$\therefore \text{Second number} = \frac{-3}{8} - \frac{3}{16}$$

$$\begin{array}{r|l} 2 & 8, 16 \\ \hline 2 & 4, 8 \\ \hline 2 & 2, 4 \\ \hline 2 & 1, 2 \\ \hline & 1, 1 \end{array}$$

$$\text{L.C.M. of 8 and 16} = 2 \times 2 \times 2 \times 2 = 16$$

$$= \frac{-3 \times 2}{8 \times 2} - \frac{3 \times 1}{16 \times 1}$$

$$(\because \text{L.C.M. of 8 and 16} = 16)$$

$$= \frac{-6-3}{16} = \frac{-9}{16}$$

$$\therefore \text{Second number} = \frac{-9}{16}$$

Question 3.

The sum of two rational numbers is -5. If one of them is $\frac{-52}{25}$, find the other.

Solution:

$$\text{Sum of two numbers} = -5$$

$$\text{One number} = \frac{-52}{25}$$

$$\text{Second number} = -5 - \left(\frac{-52}{25} \right)$$

$$= \frac{-5 \times 25}{1 \times 25} + \frac{52 \times 1}{25 \times 1}$$

$$= \frac{-125 + 52}{25} = \frac{-77}{25}$$

$$\therefore \text{Second number} = \frac{-77}{25}$$

Question 4.

What rational number should be added to $-\frac{3}{16}$ to get $\frac{11}{24}$

Solution:

$$\text{Sum of two number} = \frac{11}{24}$$

$$\text{One number} = -\frac{3}{16}$$

$$\therefore \text{The required number} = \frac{11}{24} - \left(-\frac{3}{16}\right)$$

$$\Rightarrow \frac{11}{24} + \frac{3}{16}$$

$$\begin{array}{r|l} 2 & 24, 16 \\ \hline 2 & 12, 8 \\ \hline 2 & 6, 4 \\ \hline 2 & 3, 2 \\ \hline 3 & 3, 1 \\ \hline & 1 \end{array}$$

$$\begin{aligned} \text{L.C.M. of 16 and 24} &= 2 \times 2 \times 2 \times 2 \times 3 \\ &= 48 \end{aligned}$$

$$(\because \text{L.C.M. of 24, 16} = 48)$$

$$= \frac{11 \times 2}{24 \times 2} + \frac{3 \times 3}{16 \times 3}$$

$$= \frac{22+9}{48} = \frac{31}{48}$$

Question 5.

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

Solution:

$$\text{The required number} = 2 - \left(-\frac{3}{5}\right)$$

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

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

$$= \frac{10+3}{5} = \frac{13}{5} = 2\frac{3}{5}$$

Question 6.

What rational number should be subtracted from $-\frac{5}{12}$ to get $\frac{5}{24}$?

Solution:

$$\text{The required number} = \frac{-5}{12} - \frac{5}{24}$$

$$\begin{array}{r|l} 2 & 12, 24 \\ \hline 2 & 6, 12 \\ \hline 2 & 3, 6 \\ \hline 3 & 3, 3 \\ \hline & 1, 1 \end{array}$$

$$\begin{aligned} \text{L.C.M. of 12 and 24} &= 2 \times 2 \times 2 \times 3 \times 3 \\ &= 72 \end{aligned}$$

$$\Rightarrow \frac{-5 \times 6}{12 \times 6} - \frac{5 \times 3}{24 \times 3}$$

($\because$ L.C.M. of 12, 24 = 72)

$$\Rightarrow \frac{-30-15}{72} = \frac{-45}{72} \text{ or } \frac{-5}{8}$$

Question 7.

What rational number should be subtracted from $\frac{5}{8}$ to get $\frac{8}{5}$?

Solution:

$$\text{The required number} = \frac{5}{8} - \frac{8}{5}$$

$$\begin{array}{r|l} 2 & 8, 5 \\ \hline 2 & 4, 5 \\ \hline 2 & 2, 5 \\ \hline 5 & 1, 5 \\ \hline & 1, 1 \end{array}$$

$$\Rightarrow \frac{5 \times 5}{8 \times 5} - \frac{8 \times 8}{5 \times 8} \quad (\text{L.C.M. of } 8, 5 = 40)$$

$$\Rightarrow \frac{25 - 64}{40} = \frac{-39}{40}$$

Question 8.

Evaluate:

$$(i) \left(\frac{7}{8} \times \frac{24}{21} \right) + \left(\frac{-5}{9} \times \frac{6}{-25} \right)$$

$$(ii) \left(\frac{8}{15} \times \frac{-25}{16} \right) + \left(\frac{-18}{35} \times \frac{5}{6} \right)$$

$$(iii) \left(\frac{18}{33} \times \frac{-22}{27} \right) - \left(\frac{13}{25} \times \frac{-75}{26} \right)$$

$$(iv) \left(\frac{-13}{7} \times \frac{-35}{39} \right) - \left(\frac{-7}{45} \times \frac{9}{14} \right)$$

Solution:

$$(i) \left(\frac{7}{8} \times \frac{24}{21} \right) + \left(\frac{-5}{9} \times \frac{6}{-25} \right)$$

$$\Rightarrow \frac{7 \times 24}{8 \times 21} + \frac{-5 \times 6}{9 \times (-25)}$$

$$\Rightarrow \frac{1 \times 3}{1 \times 3} + \frac{1 \times 2}{3 \times 5}$$

$$\Rightarrow \frac{3}{3} + \frac{2}{15}$$

$$\begin{array}{r|l} 3 & 3, 15 \\ 5 & 1, 5 \\ \hline & 1, 1 \end{array}$$

($\because$ L.C.M. of 3 and 15 = 15)

$$\Rightarrow \frac{3 \times 5}{3 \times 5} + \frac{2 \times 1}{15 \times 1}$$

$$\Rightarrow \frac{15 + 2}{15} = \frac{17}{15} = 1 \frac{2}{15}$$

$$(ii) \left(\frac{8}{15} \times \frac{-25}{16} \right) + \left(\frac{-18}{35} \times \frac{5}{6} \right)$$

$$\Rightarrow \frac{8 \times (-25)}{15 \times 16} + \frac{-18 \times 5}{35 \times 6}$$

$$\Rightarrow \frac{1 \times (-5)}{3 \times 2} + \left(\frac{-3 \times 1}{7 \times 1} \right)$$

$$\Rightarrow \frac{-5}{6} - \frac{3}{7}$$

$$\begin{array}{r|l} 2 & 6, 7 \\ 3 & 3, 7 \\ 7 & 1, 7 \\ \hline & 1, 1 \end{array}$$

L.C.M. of 6 and 7 = $2 \times 3 \times 7 = 42$

($\because$ L.C.M. of 6 and 7 = 42)

$$\Rightarrow \frac{-5 \times 7}{6 \times 7} - \frac{3 \times 6}{7 \times 6}$$

$$\Rightarrow \frac{-35 - 18}{42} = \frac{-53}{42}$$

$$(iii) \left(\frac{18}{33} \times \frac{-22}{27} \right) - \left(\frac{13}{25} \times \frac{-75}{26} \right)$$

$$\Rightarrow \frac{18 \times (-22)}{33 \times 27} - \frac{13 \times (-75)}{25 \times 26}$$

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

$$\Rightarrow \frac{-4}{9} - \left(\frac{-3}{2} \right)$$

$$\Rightarrow \frac{-4}{9} + \frac{3}{2}$$

$$\begin{array}{r|l} 2 & 9, 2 \\ \hline 3 & 9, 1 \\ \hline 3 & 3, 1 \\ \hline & 1, 1 \end{array}$$

L.C.M. of 9 and 2 = $2 \times 3 \times 3 = 18$

$$\Rightarrow \frac{-4 \times 2}{9 \times 2} + \frac{3 \times 9}{2 \times 9} \quad (\because \text{L.C.M. of 9 and 2} = 18)$$

$$\Rightarrow \frac{-8 + 27}{18} = \frac{19}{18} = 1 \frac{1}{18}$$

$$(iv) \left(\frac{-13}{7} \times \frac{-35}{39} \right) - \left(\frac{-7}{45} \times \frac{9}{14} \right)$$

$$\Rightarrow \frac{-13 \times (-35)}{7 \times 39} + \frac{7 \times 9}{45 \times 14}$$

$$\Rightarrow \frac{-1 \times (-5)}{1 \times 3} + \frac{1 \times 1}{5 \times 2}$$

$$\Rightarrow \frac{5}{3} + \frac{1}{10}$$

$$\begin{array}{r|l} 2 & 3, 10 \\ \hline 3 & 3, 5 \\ \hline 5 & 1, 5 \\ \hline & 1, 1 \end{array}$$

L.C.M. of 3 and 10 = $2 \times 3 \times 5 = 10$

$$\Rightarrow \frac{5 \times 10}{3 \times 10} + \frac{1 \times 3}{10 \times 3}$$

($\because$ L.C.M. of 3 and 10 = 30)

$$\Rightarrow \frac{50+3}{30} = \frac{53}{30} = 1 \frac{23}{30}$$

Question 9.

The product of two rational numbers is 24. If one of them is $-\frac{36}{11}$, find the other.

Solution:

Product of two numbers = 24

$$\text{One number} = \frac{-36}{11}$$

$$\therefore \text{Second number} = 24 \div \left(\frac{-36}{11} \right)$$

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

$$= 2 \times \frac{(-11)}{3} = \frac{-22}{3}$$

Question 10.

By what rational number should we multiply $\frac{20}{-9}$, so that the product may be $\frac{-5}{9}$?

Solution:

$$\text{Required number} = \frac{-5}{9} \div \left(\frac{20}{-9} \right)$$

$$\Rightarrow \frac{-5}{9} \times \left(\frac{-9}{20} \right) = \frac{1}{4}$$

$$\therefore \text{Required number} = \frac{1}{4}$$