

# 1. Rational Numbers

## Exercise 1A

### 1. Question

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

(i) 20 (ii) -30 (iii) 35 (iv) -40

### Answer

For a fraction,  $\frac{a}{b}$

$$\frac{a}{b} = \frac{a \times n}{b \times n}$$

Where,  $n \neq 0$

(i) We have to express  $\frac{-3}{5}$  as a rational number with denominator 20.

In order to make the denominator 20, multiply 5 by 4.

Therefore,

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

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

(ii) We have to express  $\frac{-3}{5}$  as a rational number with denominator -30.

In order to make the denominator -30, multiply 5 by -6.

Therefore,

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

$$\Rightarrow \frac{-3}{5} = \frac{18}{-30}$$

(iii) We have to express  $\frac{-3}{5}$  as a rational number with denominator 35.

In order to make the denominator 35, multiply 5 by 7.

Therefore,

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

$$\Rightarrow \frac{-3}{5} = \frac{-21}{35}$$

(iv) We have to express  $\frac{-3}{5}$  as a rational number with denominator -40.

In order to make the denominator 20, multiply 5 by -8.

Therefore,

$$\frac{-3}{5} = \frac{-3 \times -8}{5 \times -8}$$

$$\Rightarrow \frac{-3}{5} = \frac{24}{-40}$$

## 2. Question

Express  $\frac{-42}{98}$  as a rational number with denominator 7.

### Answer

For a fraction,  $\frac{a}{b}$

$$\frac{a}{b} = \frac{a \div n}{b \div n}$$

Where,  $n \neq 0$  and  $n$  divides both  $a$  and  $b$

(i) We have to express  $\frac{-42}{98}$  as a rational number with denominator 7.

In order to make the denominator 7, divide 98 by 14.

Therefore,

$$\begin{aligned} \frac{-42}{98} &= \frac{-42 \div 14}{98 \div 14} \\ \Rightarrow \frac{-42}{98} &= \frac{-3}{7} \end{aligned}$$

## 3. Question

Express  $\frac{-48}{60}$  as a rational number with denominator 5.

### Answer

For a fraction,  $\frac{a}{b}$

$$\frac{a}{b} = \frac{a \div n}{b \div n}$$

Where,  $n \neq 0$  and  $n$  divides both  $a$  and  $b$

We have to express  $\frac{-48}{60}$  as a rational number with denominator 5.

In order to make the denominator 5, divide 60 by 12.

Therefore,

$$\begin{aligned} \frac{-48}{60} &= \frac{-48 \div 12}{60 \div 12} \\ \Rightarrow \frac{-48}{60} &= \frac{-4}{5} \end{aligned}$$

## 4. Question

Express each of the following rational numbers in standard form:

$$(i) \frac{-12}{30} \quad (ii) \frac{-14}{49} \quad (iii) \frac{24}{-64} \quad (iv) \frac{-36}{-63}$$

### Answer

A rational number is in standard or simplest or lowest form when-

1. Numerator and denominator have only 1 as its highest common factor.
2. Denominator is a positive integer.

(i) The HCF of 12 and 30 is 6

Therefore,

$$\frac{-12}{30} = \frac{-12 \div 6}{30 \div 6}$$
$$\Rightarrow \frac{-12}{30} = \frac{-2}{5}$$

(ii) The HCF of 49 and 14 is 7

Therefore,

$$\frac{-14}{49} = \frac{-14 \div 7}{49 \div 7}$$
$$\Rightarrow \frac{-14}{49} = \frac{-2}{7}$$

(iii) The HCF of 24 and 64 is 8

Therefore,

$$\frac{24}{-64} = \frac{24 \div 8}{-64 \div 8}$$
$$\Rightarrow \frac{24}{-64} = \frac{3}{-8}$$

In order, to make the denominator positive, multiply both numerator and denominator by -1

$$\Rightarrow \frac{24}{-64} = \frac{3}{-8} = \frac{3 \times -1}{-8 \times -1}$$
$$\Rightarrow \frac{24}{-64} = \frac{-3}{8}$$

(iv) The HCF of 36 and 63 is 9

Therefore,

$$\frac{-36}{-63} = \frac{-36 \div 9}{-63 \div 9}$$
$$\Rightarrow \frac{-36}{-63} = \frac{-4}{-7}$$

In order, to make the denominator positive, multiply both numerator and denominator by -1

$$\Rightarrow \frac{-36}{-63} = \frac{-4}{-7} = \frac{-4 \times -1}{-7 \times -1}$$
$$\Rightarrow \frac{-36}{-63} = \frac{4}{7}$$

## 5. Question

Which of the two rational numbers is greater in the given pair?

- (i)  $\frac{3}{8}$  or 0 (ii)  $\frac{-2}{9}$  or 0 (iii)  $\frac{-3}{4}$  or  $\frac{1}{4}$

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

### Answer

(i)  $\frac{3}{8}$  is a positive number and all positive numbers are greater than 0.

Therefore,  $\frac{3}{8} > 0$

(ii)  $\frac{-2}{9}$  is a negative number and all negative numbers are less than 0.

Therefore,  $0 > \frac{-2}{9}$

(iii) Both  $\frac{-3}{4}$  and  $\frac{1}{4}$  have the same denominator 4.

Therefore, we can directly compare both the numbers.

Since,  $1 > -3$

Therefore,  $\frac{-3}{4} > \frac{1}{4}$

(iv) Both  $\frac{-5}{7}$  and  $\frac{-4}{7}$  have the same denominator 7.

Therefore, we can directly compare both the numbers.

Since,  $-4 > -5$

Therefore,  $\frac{-4}{7} > \frac{-5}{7}$

(v)  $\frac{2}{3}$  and  $\frac{3}{4}$  have different denominators.

Therefore, we take LCM of 3 and 4 that is 12.

Now,

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

And,

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

Since,  $9 > 8$

Therefore,  $\frac{9}{12} > \frac{8}{12}$

Hence,  $\frac{2}{3} > \frac{3}{4}$

(vi) We can write  $-1 = \frac{-1}{1}$

$\frac{-1}{2}$  and  $\frac{-1}{1}$  have different denominators.

Therefore, we take LCM of 1 and 2 that is 2.

Now,

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

And,

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

Since,  $-1 > -2$

Therefore,  $\frac{-1}{2} > \frac{-2}{2}$

Hence,  $\frac{-1}{2} > -1$

## 6. Question

Which of the two rational numbers is greater in the given pair?

(i)  $\frac{-4}{3}$  or  $\frac{-8}{7}$  (ii)  $\frac{7}{-9}$  or  $\frac{-5}{8}$  (iii)  $\frac{-1}{3}$  or  $\frac{4}{-5}$

(iv)  $\frac{9}{-13}$  or  $\frac{7}{-12}$  (v)  $\frac{4}{-5}$  or  $\frac{-7}{10}$  (vi)  $\frac{-12}{5}$  or  $-3$

## Answer

(i)  $\frac{-4}{3}$  and  $\frac{-8}{7}$  have different denominators.

Therefore, we take LCM of 3 and 7 that is 21.

Now,

$$\frac{-4}{3} = \frac{-4 \times 7}{3 \times 7} = \frac{-28}{21}$$

And,

$$\frac{-8}{7} = \frac{-8 \times 3}{7 \times 3} = \frac{-24}{21}$$

Since,  $-24 > -28$

Therefore,  $\frac{-24}{21} > \frac{-28}{21}$

Hence,  $\frac{-8}{7} > \frac{-4}{3}$

(ii)

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

$\frac{-7}{9}$  and  $\frac{-5}{8}$  have different denominators.

Therefore, we take LCM of 9 and 8 that is 72.

Now,

$$\frac{-7}{9} = \frac{-7 \times 8}{9 \times 8} = \frac{-56}{72}$$

And,

$$\frac{-5}{8} = \frac{-5 \times 9}{8 \times 9} = \frac{-45}{72}$$

Since,  $-45 > -56$

Therefore,  $\frac{-45}{72} > \frac{-56}{72}$

Hence,  $\frac{-5}{8} > \frac{-7}{9}$

(iii)

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

$\frac{-1}{3}$  and  $\frac{-4}{5}$  have different denominators.

Therefore, we take LCM of 3 and 5 that is 15.

Now,

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

And,

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

Since,  $-5 > -12$

Therefore,  $\frac{-5}{15} > \frac{-12}{15}$

Hence,  $\frac{-1}{3} > \frac{-4}{5}$

(iv)

$$\frac{9}{-13} = \frac{9 \times -1}{-13 \times -1} = \frac{-9}{13}$$

And,

$$\frac{7}{-12} = \frac{7 \times -1}{-12 \times -1} = \frac{-7}{12}$$

$\frac{-9}{13}$  and  $\frac{-7}{12}$  have different denominators.

Therefore, we take LCM of 13 and 12 that is 156.

Now,

$$\frac{-9}{13} = \frac{-9 \times 12}{13 \times 12} = \frac{-108}{156}$$

And,

$$\frac{-7}{12} = \frac{-7 \times 13}{12 \times 13} = \frac{-91}{156}$$

Since,  $-91 > -108$

Therefore,  $\frac{-91}{156} > \frac{-108}{156}$

Hence,  $\frac{-7}{12} > \frac{-9}{13}$

(v)

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

$\frac{-7}{10}$  and  $\frac{-4}{5}$  have different denominators.

Therefore, we take LCM of 10 and 5 that is 10.

Now,

$$\frac{-7}{10} = \frac{-7 \times 1}{10 \times 1} = \frac{-7}{10}$$

And,

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

Since,  $-7 > -8$

Therefore,  $\frac{-7}{10} > \frac{-8}{10}$

Hence,  $\frac{-7}{10} > \frac{-4}{5}$

(vi)

We can write  $-3 = \frac{-3}{1}$

$\frac{-3}{1}$  and  $\frac{-12}{5}$  have different denominators.

Therefore, we take LCM of 1 and 5 that is 5.

Now,

$$\frac{-12}{5} = \frac{-12 \times 1}{5 \times 1} = \frac{-12}{5}$$

And,

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

Since,  $-12 > -15$

Therefore,  $\frac{-12}{5} > \frac{-15}{5}$

Hence,  $\frac{-12}{5} > -3$

## 7. Question

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

(i)  $\frac{6}{-13} \dots \frac{6}{-13}$  (ii)  $\frac{5}{-13} \dots \frac{-35}{91}$  (iii)  $-2 \dots \frac{-13}{5}$

(iv)  $\frac{-2}{3} \dots \frac{5}{-8}$  (v)  $0 \dots \frac{-3}{-5}$  (vi)  $\frac{-8}{9} \dots \frac{-9}{10}$

## Answer

(i) Clearly,

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

(ii)

$$\frac{5}{-13} = \frac{5 \times -1}{-13 \times -1} = \frac{-5}{13}$$

$\frac{-5}{13}$  and  $\frac{-35}{91}$  have different denominators.

Therefore, we take LCM of 13 and 91 that is 91.

Now,

$$\frac{-5}{13} = \frac{-5 \times 7}{13 \times 7} = \frac{-35}{91}$$

And,

$$\frac{-35}{91} = \frac{-35 \times 1}{91 \times 1} = \frac{-35}{91}$$

Clearly,  $\frac{-35}{91} = \frac{-35}{91}$

Hence,

$$\frac{5}{-13} = \frac{-35}{91}$$

(iii) We can write  $-2 = \frac{-2}{1}$

$\frac{-2}{1}$  and  $\frac{-13}{5}$  have different denominators.

Therefore, we take LCM of 1 and 5 that is 5.

Now,

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

And,

$$\frac{-13}{5} = \frac{-13 \times 1}{5 \times 1} = \frac{-13}{5}$$

Since,  $-10 > -13$

Therefore,  $\frac{-10}{5} > \frac{-13}{5}$

Hence,  $-2 > \frac{-13}{5}$

$$(iv) \frac{5}{-8} = \frac{5 \times -1}{-8 \times -1} = \frac{-5}{8}$$

$\frac{-2}{3}$  and  $\frac{-5}{8}$  have different denominators.

Therefore, we take LCM of 3 and 8 that is 24.

Now,

$$\frac{-2}{3} = \frac{-2 \times 8}{3 \times 8} = \frac{-16}{24}$$

And,

$$\frac{-5}{8} = \frac{-5 \times 3}{8 \times 3} = \frac{-15}{24}$$

Since,  $-16 < -15$

Therefore,  $\frac{-16}{24} < \frac{-15}{24}$



Hence,  $\frac{-2}{3} < \frac{-5}{8}$

(v)

$$\frac{-3}{-5} = \frac{-3 \times -1}{-5 \times -1} = \frac{3}{5}$$

$\frac{3}{5}$  is a positive number and all positive numbers are greater than 0.

Therefore,  $0 < \frac{3}{5}$

Hence,  $0 < \frac{-3}{-5}$

(vi)  $\frac{-8}{9}$  and  $\frac{-9}{10}$  have different denominators.

Therefore, we take LCM of 9 and 10 that is 90.

Now,

$$\frac{-8}{9} = \frac{-8 \times 10}{9 \times 10} = \frac{-80}{90}$$

And,

$$\frac{-9}{10} = \frac{-9 \times 9}{10 \times 9} = \frac{-81}{90}$$

Since,  $-80 > -81$

Therefore,  $\frac{-80}{90} > \frac{-81}{90}$

Hence,  $\frac{-8}{9} > \frac{-9}{10}$

## 8. Question

Arrange the following rational numbers in ascending order:

(i)  $\frac{4}{-9}, \frac{-5}{12}, \frac{7}{-18}, \frac{-2}{3}$  (ii)  $\frac{-3}{4}, \frac{5}{-12}, \frac{-7}{16}, \frac{9}{-24}$

(iii)  $\frac{3}{-5}, \frac{-7}{10}, \frac{-11}{15}, \frac{-13}{20}$  (iv)  $\frac{-4}{7}, \frac{-9}{14}, \frac{13}{-28}, \frac{-23}{42}$

## Answer

(i)

$$\frac{4}{-9} = \frac{4 \times -1}{-9 \times -1} = \frac{-4}{9}$$

And,

$$\frac{7}{-18} = \frac{7 \times -1}{-18 \times -1} = \frac{-7}{18}$$

Since, the denominators of all the numbers are different therefore we will take LCM of the denominators.

LCM of 9, 12, 18 and 3 = 36

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

$$\frac{-5}{12} = \frac{-5 \times 3}{12 \times 3} = \frac{-15}{36}$$

$$\frac{-7}{18} = \frac{-7 \times 2}{18 \times 2} = \frac{-14}{36}$$

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

Clearly,

$$-24 < -16 < -15 < -14$$

Therefore,

$$\frac{-24}{36} < \frac{-16}{36} < \frac{-15}{36} < \frac{-14}{36}$$

Hence,

$$\frac{-2}{3} < \frac{4}{-9} < \frac{-5}{12} < \frac{7}{-18}$$

(ii)

$$\frac{5}{-12} = \frac{5 \times -1}{-12 \times -1} = \frac{-5}{12}$$

And,

$$\frac{9}{-24} = \frac{9 \times -1}{-24 \times -1} = \frac{-9}{24}$$

Since, the denominators of all the numbers are different therefore we will take LCM of the denominators.

LCM of 4, 12, 16 and 24 = 48

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

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

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

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

Clearly,

$$-36 < -21 < -20 < -18$$

Therefore,

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

Hence,

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

(iii)

$$\frac{3}{-5} = \frac{3 \times -1}{-5 \times -1} = \frac{-3}{5}$$

Since, the denominators of all the numbers are different therefore we will take LCM of the denominators.

LCM of 5, 10, 15 and 20 = 60

$$\frac{-3}{5} = \frac{-3 \times 12}{5 \times 12} = \frac{-36}{60}$$

$$\frac{-7}{10} = \frac{-7 \times 6}{10 \times 6} = \frac{-42}{60}$$

$$\frac{-11}{15} = \frac{-11 \times 4}{15 \times 4} = \frac{-44}{60}$$

$$\frac{-13}{20} = \frac{-13 \times 3}{20 \times 3} = \frac{-39}{60}$$

Clearly,

$$-44 < -42 < -39 < -36$$

Therefore,

$$\frac{-44}{60} < \frac{-42}{60} < \frac{-39}{60} < \frac{-36}{60}$$

Hence,

$$\frac{-11}{15} < \frac{-7}{10} < \frac{-13}{20} < \frac{3}{-5}$$

(iv)

$$\frac{13}{-28} = \frac{13 \times -1}{-28 \times -1} = \frac{-13}{28}$$

Since, the denominators of all the numbers are different therefore we will take LCM of the denominators.

LCM of 7, 14, 28 and 42 = 84

$$\frac{-4}{7} = \frac{-4 \times 12}{7 \times 12} = \frac{-48}{84}$$

$$\frac{-9}{14} = \frac{-9 \times 6}{14 \times 6} = \frac{-54}{84}$$

$$\frac{-13}{28} = \frac{-13 \times 3}{28 \times 3} = \frac{-39}{84}$$

$$\frac{-23}{42} = \frac{-23 \times 2}{42 \times 2} = \frac{-46}{84}$$

Clearly,

$$-54 < -48 < -46 < -39$$

Therefore,

$$\frac{-54}{84} < \frac{-48}{84} < \frac{-46}{84} < \frac{-39}{84}$$

Hence,

$$\frac{-9}{14} < \frac{-4}{7} < \frac{-23}{42} < \frac{13}{-28}$$

## 9. Question

Arrange the following rational numbers in descending order:

$$(i) -2, \frac{-13}{6}, \frac{8}{-3}, \frac{1}{3} \quad (ii) \frac{-3}{10}, \frac{7}{-15}, \frac{-11}{20}, \frac{17}{-30}$$

$$(iii) \frac{-5}{6}, \frac{-7}{12}, \frac{-13}{18}, \frac{23}{-24} \quad (iv) \frac{-10}{11}, \frac{-19}{22}, \frac{-23}{33}, \frac{-39}{44}$$

**Answer**

(i)

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

And,

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

Since, the denominators of all the numbers are different therefore we will take LCM of the denominators.

LCM of 1, 6 and 3 = 6

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

$$\frac{-13}{6} = \frac{-13 \times 1}{6 \times 1} = \frac{-13}{6}$$

$$\frac{-8}{3} = \frac{-8 \times 2}{3 \times 2} = \frac{-16}{6}$$

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

Clearly,

$$2 > -12 > -13 > -16$$

Therefore,

$$\frac{2}{6} > \frac{-12}{6} > \frac{-13}{6} > \frac{-16}{6}$$

Hence,

$$\frac{1}{3} > \frac{-2}{1} > \frac{-13}{6} > \frac{-8}{3}$$

(ii)

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

And,

$$\frac{17}{-30} = \frac{17 \times -1}{-30 \times -1} = \frac{-17}{30}$$

Since, the denominators of all the numbers are different therefore we will take LCM of the denominators.

LCM of 10, 15, 20 and 30 = 60

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

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

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

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

Clearly,

$$-18 > -28 > -33 > -34$$

Therefore,

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

Hence,

$$\frac{-3}{10} > \frac{-7}{15} > \frac{-11}{20} > \frac{-17}{30}$$

(iii)

$$\frac{23}{-24} = \frac{23 \times -1}{-24 \times -1} = \frac{-23}{24}$$

Since, the denominators of all the numbers are different therefore we will take LCM of the denominators.

LCM of 6, 12, 18 and 24 = 72

$$\frac{-5}{6} = \frac{-5 \times 12}{6 \times 12} = \frac{-60}{72}$$

$$\frac{-7}{12} = \frac{-7 \times 6}{12 \times 6} = \frac{-42}{72}$$

$$\frac{-13}{18} = \frac{-13 \times 4}{18 \times 4} = \frac{-52}{72}$$

$$\frac{-23}{24} = \frac{-23 \times 3}{24 \times 3} = \frac{-69}{72}$$

Clearly,

$$-42 > -52 > -60 > -69$$

Therefore,

$$\frac{-42}{72} > \frac{-52}{72} > \frac{-60}{72} > \frac{-69}{72}$$

Hence,

$$\frac{-7}{12} > \frac{-13}{18} > \frac{-5}{6} > \frac{-23}{24}$$

(iv)

Since, the denominators of all the numbers are different therefore we will take LCM of the denominators.

LCM of 11, 22, 33 and 44 = 132

$$\frac{-10}{11} = \frac{-10 \times 12}{11 \times 12} = \frac{-120}{132}$$

$$\frac{-19}{22} = \frac{-19 \times 6}{22 \times 6} = \frac{-114}{132}$$

$$\frac{-23}{33} = \frac{-23 \times 4}{33 \times 4} = \frac{-92}{132}$$

$$\frac{-39}{44} = \frac{-39 \times 3}{44 \times 3} = \frac{-117}{132}$$

Clearly,

$$-92 > -114 > -117 > -120$$

Therefore,

$$\frac{-92}{132} > \frac{-114}{132} > \frac{-117}{132} > \frac{-120}{132}$$

Hence,

$$\frac{-23}{33} > \frac{-19}{22} > \frac{-39}{44} > \frac{-10}{11}$$

### 10. Question

Which of the following statements are true and which are false?

- (i) Every whole number is a rational number.
- (ii) Every integer is a rational number.
- (iii) 0 is a whole number but it is not a rational number.

### Answer

(i) Every whole number  $a$  can be represented as  $\frac{a}{1}$

Therefore, every whole number is a rational number.

(ii) Every integer  $a$  can be represented as  $\frac{a}{1}$

Therefore, every integer is a rational number.

(iii) 0 can be represented as  $\frac{0}{1}$

Therefore, 0 is a whole number and a rational number.

### Exercise 1B

#### 1. Question

Represent each of the following numbers on the number line:

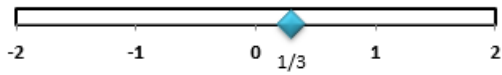
(i)  $\frac{1}{3}$  (ii)  $\frac{2}{7}$  (iii)  $1\frac{3}{4}$  (iv)  $2\frac{2}{5}$

(v)  $3\frac{1}{2}$  (vi)  $5\frac{5}{7}$  (vii)  $4\frac{2}{3}$  (viii) 8

### Answer

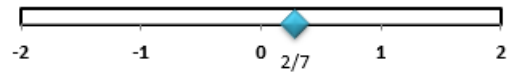
(i)  $\frac{1}{3}$  is greater than 0 and less than 1.

Therefore, it lies between 0 and 1



(ii)  $\frac{2}{7}$  is greater than 0 and less than 1.

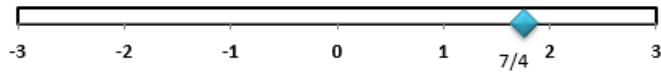
Therefore, it lies between 0 and 1



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

$\frac{7}{4}$  is greater than 1 and less than 2.

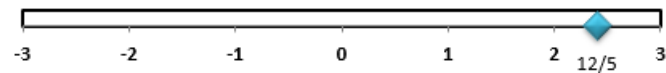
Therefore, it lies between 1 and 2



$$(iv) 2\frac{2}{5} = \frac{(5 \times 2) + 2}{5} = \frac{10 + 2}{5} = \frac{12}{5}$$

$\frac{12}{5}$  is greater than 2 and less than 3.

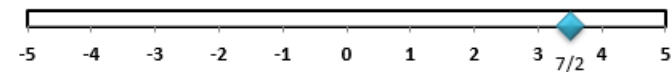
Therefore, it lies between 2 and 3.



$$(v) 3\frac{1}{2} = \frac{(2 \times 3) + 1}{2} = \frac{6 + 1}{2} = \frac{7}{2}$$

$\frac{7}{2}$  is greater than 3 and less than 4.

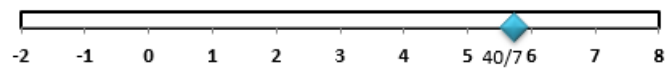
Therefore, it lies between 3 and 4.



$$(vi) 5\frac{5}{7} = \frac{(7 \times 5) + 5}{7} = \frac{35 + 5}{7} = \frac{40}{7}$$

$\frac{40}{7}$  is greater than 5 and less than 6.

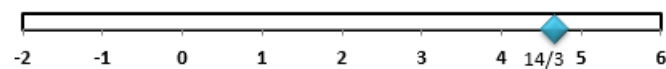
Therefore, it lies between 5 and 6.



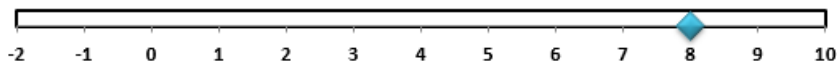
$$(vii) 4\frac{2}{3} = \frac{(3 \times 4) + 2}{3} = \frac{12 + 2}{3} = \frac{14}{3}$$

$\frac{14}{3}$  is greater than 4 and less than 5.

Therefore, it lies between 4 and 5.



(viii) The number line representation of 8 is



## 2. Question

Represent each of the following numbers on the number line:

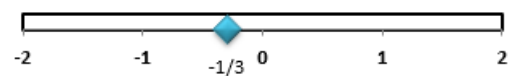
(i)  $-\frac{1}{3}$  (ii)  $-\frac{3}{4}$  (iii)  $-1\frac{2}{3}$  (iv)  $-3\frac{1}{7}$

(v)  $-4\frac{3}{5}$  (vi)  $-2\frac{5}{6}$  (vii)  $-3$  (viii)  $-2\frac{7}{8}$

## Answer

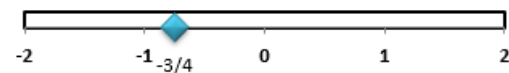
(i)  $-\frac{1}{3}$  is greater than -1 and less than 0.

Therefore, it lies between -1 and 0



(ii)  $-\frac{3}{4}$  is greater than -1 and less than 0.

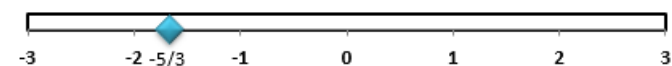
Therefore, it lies between -1 and 0



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

$-\frac{5}{3}$  is greater than -2 and less than -1.

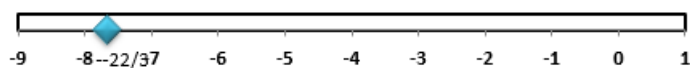
Therefore, it lies between -2 and -1



(iv)  $-3\frac{1}{7} = -\frac{(7 \times 3) + 1}{7} = -\frac{21+1}{7} = -\frac{22}{7}$

$-\frac{22}{7}$  is greater than -8 and less than -7.

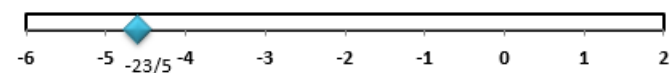
Therefore, it lies between -8 and -7



(v)  $-4\frac{3}{5} = -\frac{(5 \times 4) + 3}{5} = -\frac{20+3}{5} = -\frac{23}{5}$

$-\frac{23}{5}$  is greater than -5 and less than -4.

Therefore, it lies between -5 and -4

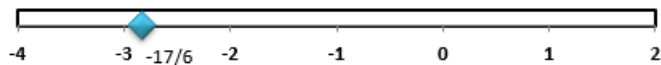


(vi)  $-2\frac{5}{6} = -\frac{(6 \times 2) + 5}{6} = -\frac{12+5}{6} = -\frac{17}{6}$

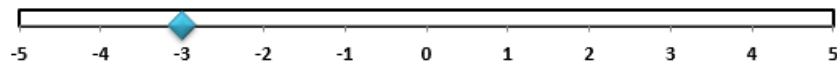


$-\frac{17}{6}$  is greater than -3 and less than -2.

Therefore, it lies between -3 and -2



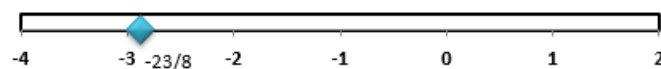
(vii) The number line representation of -3 is



$$(viii) -2\frac{7}{8} = -\frac{(8 \times 2) + 7}{8} = -\frac{16 + 7}{8} = -\frac{23}{8}$$

$-\frac{23}{8}$  is greater than -3 and less than -2.

Therefore, it lies between -3 and -2



### 3. Question

Which of the following statements are true and which are false?

(i)  $-\frac{3}{5}$  lies to the left of 0 on the number line.

(ii)  $-\frac{12}{7}$  lies to the right of 0 on the number line.

(iii) The rational numbers  $\frac{1}{3}$  and  $-\frac{5}{2}$  are on opposite sides of 0 on the number line.

(iv) The rational number  $-\frac{18}{-13}$  lies to the left of 0 on the number line.

### Answer

(i) True

$-\frac{3}{5}$  is a negative number.

All negative numbers are less than 0 and therefore, lie to the left of 0 on the number line.

Hence,  $-\frac{3}{5}$  lies to the left of 0 on the number line.

(iii) False

$-\frac{12}{7}$  is a negative number.

All negative numbers are less than 0 and therefore, lie to the left of 0 on the number line.

Hence,  $-\frac{12}{7}$  lies to the left of 0 on the number line.

(iii) True

$\frac{1}{3}$  is a positive number.

All positive numbers are greater than 0 and therefore, lie to the right of 0 on the number line.

Hence,  $\frac{1}{3}$  lies to the right of 0 on the number line.

$\frac{-5}{2}$  is a negative number.

All negative numbers are less than 0 and therefore, lie to the left of 0 on the number line.

Hence,  $\frac{-5}{2}$  lies to the left of 0 on the number line.

Therefore, the rational numbers,  $\frac{1}{3}$  and  $\frac{-5}{2}$  are on opposite sides of 0 on the number line.

(iv) False

$$\frac{-18}{-13} = \frac{-18 \times -1}{-13 \times -1} = \frac{18}{13}$$

$\frac{18}{13}$  is a positive number.

All positive numbers are greater than 0 and therefore, lie to the right of 0 on the number line.

Hence,  $\frac{18}{13}$  lies to the right of 0 on the number line.

## Exercise 1C

### 1. Question

Add the following rational numbers:

(i)  $\frac{-2}{5}$  and  $\frac{4}{5}$  (ii)  $\frac{-6}{11}$  and  $\frac{-4}{11}$  (iii)  $\frac{-11}{8}$  and  $\frac{5}{8}$

(iv)  $\frac{-7}{3}$  and  $\frac{1}{3}$  (v)  $\frac{5}{6}$  and  $\frac{-1}{6}$  (vi)  $\frac{-17}{15}$  and  $\frac{-1}{15}$

### Answer

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

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

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

(ii)  $\frac{-6}{11} + \frac{-4}{11}$

$$= \frac{-6 + (-4)}{11}$$

$$= \frac{-6 - 4}{11}$$

$$= \frac{-10}{11}$$

(iii)  $\frac{-11}{8} + \frac{5}{8}$

$$= \frac{-11 + 5}{8}$$

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

To convert it into lowest terms, divide both numerator and denominator by common divisor of both 6 and 8 that is, 2

$$= \frac{-6 \div 2}{8 \div 2}$$

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

$$\text{(iv)} \frac{-7}{3} + \frac{1}{3}$$

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

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

To convert it into lowest terms, divide both numerator and denominator by common divisor of both 6 and 3 that is, 3.

$$= \frac{-6 \div 3}{3 \div 3}$$

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

$$= 2$$

$$\text{(v)} \frac{5}{6} + \frac{-1}{6}$$

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

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

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

To convert it into lowest terms, divide both numerator and denominator by common divisor of both 4 and 6 that is, 2.

$$= \frac{4 \div 2}{6 \div 2}$$

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

$$\text{(vi)} \frac{-17}{15} + \frac{-1}{15}$$

$$= \frac{-17 + (-1)}{15}$$

$$= \frac{-18}{15}$$

To convert it into lowest terms, divide both numerator and denominator by common divisor of both 18 and 15 that is, 3.

$$= \frac{-18 \div 3}{15 \div 3}$$

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

## 2. Question

Add the following rational numbers:

$$(i) \frac{3}{4} \text{ and } \frac{-3}{5} \quad (ii) \frac{5}{8} \text{ and } \frac{-7}{12} \quad (iii) \frac{-8}{9} \text{ and } \frac{11}{6}$$

$$(iv) \frac{-5}{16} \text{ and } \frac{7}{24} \quad (v) \frac{7}{-18} \text{ and } \frac{8}{27}$$

$$(vi) \frac{1}{-12} \text{ and } \frac{2}{-15} \quad (vii) -1 \text{ and } \frac{3}{4}$$

$$(viii) 2 \text{ and } \frac{-5}{4} \quad (ix) 0 \text{ and } \frac{-2}{5}$$

## Answer

(i) Since, the denominators of given rational numbers are different therefore, we take their LCM.

LCM of 4 and 5 = 20

$$\frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{20}$$

And

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

Now,

$$\begin{aligned} \frac{3}{4} + \frac{-3}{5} &= \frac{15}{20} + \frac{-12}{20} \\ &= \frac{15 + (-12)}{20} \\ &= \frac{15 - 12}{20} \\ &= \frac{3}{20} \end{aligned}$$

(ii) Since, the denominators of given rational numbers are different therefore, we take their LCM.

LCM of 8 and 12 = 24

$$\frac{5}{8} = \frac{5 \times 3}{8 \times 3} = \frac{15}{24}$$

And

$$\frac{-7}{12} = \frac{-7 \times 2}{12 \times 2} = \frac{-14}{24}$$

Now,

$$\begin{aligned}
& \frac{5}{8} + \frac{-7}{12} \\
&= \frac{15}{24} + \frac{-14}{24} \\
&= \frac{15 + (-14)}{24} \\
&= \frac{15 - 14}{24} \\
&= \frac{1}{24}
\end{aligned}$$

(iii) Since, the denominators of given rational numbers are different therefore, we take their LCM.

LCM of 9 and 6 = 18

$$\frac{-8}{9} = \frac{-8 \times 2}{9 \times 2} = \frac{-16}{18}$$

And

$$\frac{11}{6} = \frac{11 \times 3}{6 \times 3} = \frac{33}{18}$$

Now,

$$\begin{aligned}
& \frac{-8}{9} + \frac{11}{6} \\
&= \frac{-16}{18} + \frac{33}{18} \\
&= \frac{-16 + 33}{18} \\
&= \frac{17}{18}
\end{aligned}$$

(iv) Since, the denominators of given rational numbers are different therefore, we take their LCM.

LCM of 16 and 24 = 48

$$\frac{-5}{16} = \frac{-5 \times 3}{16 \times 3} = \frac{-15}{48}$$

And

$$\frac{7}{24} = \frac{7 \times 2}{24 \times 2} = \frac{14}{48}$$

Now,

$$\begin{aligned}
& \frac{-5}{16} + \frac{7}{24} \\
&= \frac{-15}{48} + \frac{14}{48} \\
&= \frac{-15 + 14}{48} \\
&= \frac{-1}{48}
\end{aligned}$$

(v) Since, the denominators of given rational numbers are negative therefore, we will make them positive.

$$\frac{7}{-18} = \frac{7 \times -1}{-18 \times -1} = \frac{-7}{18}$$

Now, since, the denominators of given rational numbers are different therefore, we take their LCM.

LCM of 18 and 27 = 54

$$\frac{-7}{18} = \frac{-7 \times 3}{18 \times 3} = \frac{-21}{54}$$

And

$$\frac{8}{27} = \frac{8 \times 2}{27 \times 2} = \frac{16}{54}$$

Now,

$$\begin{aligned} \frac{-7}{18} + \frac{8}{27} \\ &= \frac{-21}{54} + \frac{16}{54} \\ &= \frac{-21 + 16}{54} \\ &= \frac{-5}{54} \end{aligned}$$

(vi) Since, the denominators of given rational numbers are negative therefore, we will make them positive.

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

And,

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

Now, since, the denominators of given rational numbers are different therefore, we take their LCM.

LCM of 12 and 15 = 60

$$\frac{-1}{12} = \frac{-1 \times 5}{12 \times 5} = \frac{-5}{60}$$

And

$$\frac{-2}{15} = \frac{-2 \times 4}{15 \times 4} = \frac{-8}{60}$$

Now,

$$\begin{aligned} \frac{-5}{60} + \frac{-8}{60} \\ &= \frac{-5 + (-8)}{60} \\ &= \frac{-5 - 8}{60} \\ &= \frac{-13}{60} \end{aligned}$$

(vii) We can write -1 as  $\frac{-1}{1}$ .

Now, since, the denominators of given rational numbers are different therefore, we take their LCM.

LCM of 1 and 4 = 4

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

And

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

Now,

$$\begin{aligned} & -1 + \frac{3}{4} \\ &= \frac{-4 + 3}{4} \\ &= \frac{-1}{4} \end{aligned}$$

(viii) We can write 2 as  $\frac{2}{1}$ .

Now, since, the denominators of given rational numbers are different therefore, we take their LCM.

LCM of 1 and 4 = 4

$$\frac{2}{1} = \frac{2 \times 4}{1 \times 4} = \frac{8}{4}$$

And

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

Now,

$$\begin{aligned} & 2 + \frac{-5}{4} \\ &= \frac{8 + (-5)}{4} \\ &= \frac{8 - 5}{4} \\ &= \frac{3}{4} \end{aligned}$$

(ix)  $0 + \frac{-2}{5}$

On adding, any number to 0 we get the same number.

Therefore,

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

### 3. Question

Verify the following:

$$(i) \frac{-12}{5} + \frac{2}{7} = \frac{2}{7} + \frac{-12}{5} \quad (ii) \frac{-5}{8} + \frac{-9}{13} = \frac{-9}{13} + \frac{-5}{8}$$

$$(iii) 3 + \frac{-7}{12} = \frac{-7}{12} + 3 \quad (iv) \frac{2}{-7} + \frac{12}{-35} = \frac{12}{-35} + \frac{2}{-7}$$

### Answer

(i) LCM of 5 and 7 = 35

$$\frac{-12}{5} = \frac{-12 \times 7}{5 \times 7} = \frac{-84}{35}$$

And,

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

$$\text{LHS} = \frac{-12}{5} + \frac{2}{7} = \frac{-84}{35} + \frac{10}{35} = \frac{-84 + 10}{35} = \frac{-74}{35}$$

Similarly,

LCM of 7 and 5 = 35

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

And,

$$\frac{-12}{5} = \frac{-12 \times 7}{5 \times 7} = \frac{-84}{35}$$

$$\text{RHS} = \frac{2}{7} + \frac{-12}{5} = \frac{10}{35} + \frac{-84}{35} = \frac{10 + (-84)}{35} = \frac{10 - 84}{35} = \frac{-74}{35}$$

i.e., LHS = RHS

Hence,

$$\frac{-12}{5} + \frac{2}{7} = \frac{2}{7} + \frac{-12}{5}$$

Verified

(ii) LCM of 13 and 8 = 104

$$\frac{-5}{8} = \frac{-5 \times 13}{8 \times 13} = \frac{-65}{104}$$

And,

$$\frac{-9}{13} = \frac{-9 \times 8}{13 \times 8} = \frac{-72}{104}$$

$$\text{LHS} = \frac{-5}{8} + \frac{-9}{13} = \frac{-65}{104} + \frac{-72}{104} = \frac{-65 + (-72)}{104} = \frac{-65 - 72}{104} = \frac{-137}{104}$$

Similarly,

LCM of 8 and 13 = 104

$$\frac{-9}{13} = \frac{-9 \times 8}{13 \times 8} = \frac{-72}{104}$$

And,



$$\frac{-5}{8} = \frac{-5 \times 13}{8 \times 13} = \frac{-65}{104}$$

$$\text{RHS} = \frac{-9}{13} + \frac{-5}{8} = \frac{-72}{104} + \frac{-65}{104} = \frac{-72 + (-65)}{104} = \frac{-72 - 65}{104} = \frac{-137}{104}$$

i.e., LHS = RHS

Hence,

$$\frac{-5}{8} + \frac{-9}{13} = \frac{-9}{13} + \frac{-5}{8}$$

Verified

(iii) 3 can be written as  $\frac{3}{1}$

LCM of 1 and 12 = 12

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

And,

$$\frac{-7}{12} = \frac{-7 \times 1}{12 \times 1} = \frac{-7}{12}$$

$$\text{LHS} = \frac{3}{1} + \frac{-7}{12} = \frac{36}{12} + \frac{-7}{12} = \frac{36 + (-7)}{12} = \frac{36 - 7}{12} = \frac{29}{12}$$

Similarly,

LCM of 1 and 12 = 12

$$\frac{-7}{12} = \frac{-7 \times 1}{12 \times 1} = \frac{-7}{12}$$

And,

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

$$\text{RHS} = \frac{-7}{12} + \frac{3}{1} = \frac{-7}{12} + \frac{36}{12} = \frac{-7 + 36}{12} = \frac{29}{12}$$

i.e., LHS = RHS

Hence,

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

Verified

(iv) Since, the denominators are negative we will make them positive.

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

And,

$$\frac{12}{-35} = \frac{12 \times -1}{35 \times -1} = \frac{-12}{35}$$

LCM of 7 and 35 = 35

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

And,

$$\frac{-12}{35} = \frac{-12 \times 1}{35 \times 1} = \frac{-12}{35}$$

$$\text{LHS} = \frac{-2}{7} + \frac{-12}{35} = \frac{-10}{35} + \frac{-12}{35} = \frac{-10 + (-12)}{35} = \frac{-10 - 12}{35} = \frac{-22}{35}$$

Similarly,

LCM of 7 and 5 = 35

$$\frac{-12}{35} = \frac{-12 \times 1}{35 \times 1} = \frac{-12}{35}$$

And,

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

$$\text{RHS} = \frac{-12}{35} + \frac{-2}{7} = \frac{-12}{35} + \frac{-10}{35} = \frac{-12 + (-10)}{35} = \frac{-12 - 10}{35} = \frac{-22}{35}$$

i.e., LHS = RHS

Hence,

$$\frac{-2}{7} + \frac{-12}{35} = \frac{-12}{35} + \frac{-2}{7}$$

Verified

#### 4. Question

Verify the following:

$$(i) \left( \frac{3}{4} + \frac{-2}{5} \right) + \frac{-7}{10} = \frac{3}{4} + \left( \frac{-2}{5} + \frac{-7}{10} \right)$$

$$(ii) \left( \frac{-7}{11} + \frac{2}{-5} \right) + \frac{-13}{22} = \frac{-7}{11} + \left( \frac{2}{-5} + \frac{-13}{22} \right)$$

$$(iii) -1 + \left( \frac{-2}{3} + \frac{-3}{4} \right) = \left( -1 + \frac{-2}{3} \right) + \frac{-3}{4}$$

#### Answer

(i)

$$\left( \frac{3}{4} + \frac{-2}{5} \right) + \frac{-7}{10} = \frac{3}{4} + \left( \frac{-2}{5} + \frac{-7}{10} \right)$$

$$\text{LHS} = \left( \frac{3}{4} + \frac{-2}{5} \right) + \frac{-7}{10}$$

$$= \left( \frac{3 \times 5 + (-2) \times 4}{20} \right) + \frac{-7}{10}$$

$$= \left( \frac{15 - 8}{20} \right) + \frac{-7}{10}$$

$$= \frac{7}{20} + \frac{-7}{10}$$

$$= \frac{7 \times 1 + (-7) \times 2}{20}$$

$$= \frac{7 \times 1 + (-7) \times 2}{20}$$

$$= \frac{7 - 14}{20}$$

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

$$\text{RHS} = \frac{3}{4} + \left( \frac{-2}{5} + \frac{-7}{10} \right)$$

$$= \frac{3}{4} + \left( \frac{(-2) \times 2 + (-7) \times 1}{10} \right)$$

$$= \frac{3}{4} + \left( \frac{-4 - 7}{10} \right)$$

$$= \frac{3}{4} + \frac{-11}{10}$$

$$= \frac{3 \times 5 + (-11) \times 2}{20}$$

$$= \frac{15 - 22}{20}$$

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

$$\text{RHS} = \text{LHS}$$

Verified

(ii)

$$\left( \frac{-7}{11} + \frac{2}{-5} \right) + \frac{-13}{22} = \frac{-7}{11} + \left( \frac{2}{-5} + \frac{-13}{22} \right)$$

$$\text{LHS} = \left( \frac{-7}{11} + \frac{2}{-5} \right) + \frac{-13}{22}$$

$$= \left( \frac{-7}{11} + \frac{-2}{5} \right) + \frac{-13}{22}$$

$$= \left( \frac{-7 \times 5 + (-2) \times 11}{55} \right) + \frac{-13}{22}$$

$$= \left( \frac{-35 - 22}{55} \right) + \frac{-13}{22}$$

$$= \frac{-57}{55} + \frac{-13}{22}$$

$$= \frac{-57 \times 2 + (-13) \times 5}{110}$$

$$= \frac{-114 - 65}{110}$$

$$= \frac{-179}{110}$$

$$\begin{aligned}
\text{RHS} &= \frac{-7}{11} + \left( \frac{2}{-5} + \frac{-13}{22} \right) \\
&= \frac{-7}{11} + \left( \frac{-2}{5} + \frac{-13}{22} \right) \\
&= \frac{-7}{11} + \left( \frac{(-2) \times 22 + (-13) \times 5}{-110} \right) \\
&= \frac{-7}{11} + \left( \frac{-44 - 65}{-110} \right) \\
&= \frac{-7}{11} + \frac{-109}{110} \\
&= \frac{-7 \times 10 + (-109) \times 1}{110} \\
&= \frac{-70 - 109}{110} \\
&= \frac{-179}{110}
\end{aligned}$$

RHS = LHS

Verified

(iii)

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

$$\begin{aligned}
\text{LHS} &= -1 + \left( \frac{-2}{3} + \frac{-3}{4} \right) \\
&= \frac{-1}{1} + \left( \frac{-2}{3} + \frac{-3}{4} \right) \\
&= \frac{-1}{1} + \left( \frac{-2 \times 4 + (-3) \times 3}{12} \right) \\
&= \frac{-1}{1} + \left( \frac{-8 - 9}{12} \right) \\
&= \frac{-1}{1} + \frac{-17}{12} \\
&= \frac{-1 \times 12 + (-17) \times 1}{12} \\
&= \frac{-12 - 17}{12} \\
&= \frac{-29}{12}
\end{aligned}$$

$$\begin{aligned}
\text{RHS} &= \left( -1 + \frac{-2}{3} \right) + \frac{-3}{4} \\
&= \left( \frac{-1}{1} + \frac{-2}{3} \right) + \frac{-3}{4} \\
&= \left( \frac{-1 \times 3 + (-2) \times 1}{3} \right) + \frac{-3}{4}
\end{aligned}$$

$$\begin{aligned}
&= \left( \frac{-3-2}{3} \right) + \frac{-3}{4} \\
&= \frac{-5}{3} + \frac{-3}{4} \\
&= \frac{-5 \times 4 + (-3) \times 3}{12} \\
&= \frac{-20 - 9}{12} \\
&= \frac{-29}{12}
\end{aligned}$$

RHS = LHS

Verified

### 5. Question

Fill in the blanks:

$$(i) \left( \frac{-3}{17} \right) + \left( \frac{-12}{5} \right) = \left( \frac{-12}{5} \right) + (....)$$

$$(ii) -9 + \frac{-21}{8} = (....) + (-9)$$

$$(iii) \left( \frac{-8}{13} + \frac{3}{7} \right) + \left( \frac{-13}{4} \right) = (....) + \left[ \frac{3}{7} + \left( \frac{-13}{4} \right) \right]$$

$$(iv) -12 + \left( \frac{7}{12} + \frac{-9}{11} \right) = \left( -12 + \frac{7}{12} \right) + (....)$$

$$(v) \frac{19}{-5} + \left( \frac{-3}{11} + \frac{-7}{8} \right) = \left\{ \frac{19}{-5} + (....) \right\} + \frac{-7}{8}$$

$$(vi) \frac{-16}{7} + ..... = ..... + \frac{-16}{7} = \frac{-16}{7}$$

### Answer

$$(i) \frac{-3}{17}$$

By Commutative property, i.e.,  $a+b=b+a$

Therefore,

$$\frac{-3}{17} + \frac{-12}{5} = \frac{-12}{5} + \frac{-3}{17}$$

$$(ii) \frac{-21}{8}$$

By Commutative property, i.e.,  $a+b=b+a$

Therefore,

$$-9 + \frac{-21}{8} = \frac{-21}{8} + (-9)$$

$$(iii) \frac{-8}{13}$$

By Associative property, i.e.,  $(a+b)+c=a+(b+c)$

Therefore,

$$\left(\frac{-8}{13} + \frac{3}{7}\right) + \left(\frac{-13}{4}\right) = \left(\frac{-8}{13}\right) + \left[\frac{3}{7} + \left(\frac{-13}{4}\right)\right]$$

$$(iv) \frac{-9}{11}$$

By Associative property, i.e.,  $(a+b)+c=a+(b+c)$

Therefore,

$$-12 + \left(\frac{7}{12} + \frac{-9}{11}\right) = \left(-12 + \frac{7}{12}\right) + \left(\frac{-9}{11}\right)$$

$$(v) \frac{-3}{11}$$

By Associative property, i.e.,  $(a+b)+c=a+(b+c)$

Therefore,

$$\frac{19}{-5} + \left(\frac{-3}{11} + \frac{-7}{8}\right) = \left(\frac{19}{-5} + \frac{-3}{11}\right) + \left(\frac{-7}{8}\right)$$

$$(vi) 0, 0$$

0 is the additive identity that is, if we add 0 to any number the result will be the number itself.

$$a+0=0+a$$

Also, By Commutative property, i.e.,  $a+b=b+a$

We get,

$$\frac{-16}{7} + 0 = 0 + \frac{-16}{7} = \frac{-16}{7}$$

## 6. Question

Find the additive inverse of each of the following:

$$(i) \frac{1}{3} \quad (ii) \frac{23}{9} \quad (iii) -18 \quad (iv) \frac{-17}{8} \quad (v) \frac{15}{-4}$$

$$(vi) \frac{-16}{-5} \quad (vii) \frac{-3}{11} \quad (viii) 0 \quad (ix) \frac{19}{-6} \quad (x) \frac{-8}{-7}$$

## Answer

Additive inverse of a number  $\frac{a}{b}$  is the number  $-\frac{a}{b}$  such that,  $\frac{a}{b} + \left(\frac{-a}{b}\right) = 0$

Therefore,

(i) Additive inverse of  $\frac{1}{3}$  is  $-\frac{1}{3}$

(ii) Additive inverse of  $\frac{23}{9}$  is  $-\frac{23}{9}$

(iii) Additive inverse of -18 is 18

(iv) Additive inverse of  $-\frac{17}{8}$  is  $\frac{17}{8}$

(v)

$$\frac{15}{-4} = \frac{15 \times -1}{-4 \times -1} = \frac{-15}{4}$$

Therefore, Additive inverse of  $\frac{-15}{4}$  is  $\frac{15}{4}$

(vi)

$$\frac{-16}{-5} = \frac{-16 \times -1}{-5 \times -1} = \frac{16}{5}$$

Additive inverse of  $\frac{16}{5}$  is  $-\frac{16}{5}$

(vii) Additive inverse of  $\frac{-3}{11}$  is  $\frac{3}{11}$

(viii) Additive inverse of 0 is 0

(ix)

$$\frac{19}{-6} = \frac{19 \times -1}{-6 \times -1} = \frac{-19}{6}$$

Therefore, Additive inverse of  $\frac{-19}{6}$  is  $\frac{19}{6}$

(x)

$$\frac{-8}{-7} = \frac{-8 \times -1}{-7 \times -1} = \frac{8}{7}$$

Additive inverse of  $\frac{8}{7}$  is  $-\frac{8}{7}$

## 7. Question

Subtract:

(i)  $\frac{3}{4}$  from  $\frac{1}{3}$  (ii)  $\frac{-5}{6}$  from  $\frac{1}{3}$

(iii)  $\frac{-8}{9}$  from  $\frac{-3}{5}$  (iv)  $\frac{-9}{7}$  from -1

(v)  $\frac{-18}{11}$  from 1 (vi)  $\frac{-13}{9}$  from 0

(vii)  $\frac{-32}{13}$  from  $\frac{-6}{5}$  (viii) -7 from  $\frac{-4}{7}$

## Answer

(i)

Since the denominators of both the numbers are different therefore, we will take their LCM

LCM Of 3 and 4 = 12

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

And,

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

Therefore,

$$\begin{aligned} \frac{1}{3} - \frac{3}{4} \\ &= \frac{4}{12} - \frac{9}{12} \\ &= \frac{4 - 9}{12} \\ &= \frac{-5}{12} \end{aligned}$$

(ii)

Since the denominators of both the numbers are different therefore, we will take their LCM

LCM Of 6 and 3 = 6

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

And,

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

Therefore,

$$\begin{aligned} \frac{1}{3} - \left( \frac{-5}{6} \right) \\ &= \frac{2}{6} - \left( \frac{-5}{6} \right) \\ &= \frac{2 - (-5)}{6} \\ &= \frac{2 + 5}{6} \\ &= \frac{7}{6} \end{aligned}$$

(iii)

Since the denominators of both the numbers are different therefore, we will take their LCM

LCM Of 9 and 5 = 45

$$\frac{-8}{9} = \frac{-8 \times 5}{9 \times 5} = \frac{-40}{45}$$

And,



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

Therefore,

$$\begin{aligned} & \frac{-3}{5} - \left( \frac{-8}{9} \right) \\ &= \frac{-27}{45} - \left( \frac{-40}{45} \right) \\ &= \frac{-27 - (-40)}{45} \\ &= \frac{-27 + 40}{45} \\ &= \frac{13}{45} \end{aligned}$$

(iv)

We can write,  $-1 = \frac{-1}{1}$

Since the denominators of both the numbers are different therefore, we will take their LCM

LCM Of 1 and 7 = 7

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

And,

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

Therefore,

$$\begin{aligned} & -1 - \left( \frac{-9}{7} \right) \\ &= \frac{-7}{7} - \left( \frac{-9}{7} \right) \\ &= \frac{-7 - (-9)}{7} \\ &= \frac{-7 + 9}{7} \\ &= \frac{2}{7} \end{aligned}$$

(v)

We can write,  $1 = \frac{1}{1}$

Since the denominators of both the numbers are different therefore, we will take their LCM

LCM Of 1 and 11 = 11

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

And,

$$\frac{-18}{11} = \frac{-18 \times 1}{11 \times 1} = \frac{-18}{11}$$

Therefore,

$$\begin{aligned} & 1 - \left( \frac{-18}{11} \right) \\ &= \frac{11}{11} - \left( \frac{-18}{11} \right) \\ &= \frac{11 - (-18)}{11} \\ &= \frac{11 + 18}{11} \\ &= \frac{29}{11} \end{aligned}$$

(vi)

$$\begin{aligned} & 0 - \left( \frac{-13}{9} \right) \\ &= 0 + \frac{13}{9} \\ &= \frac{13}{9} \end{aligned}$$

(vii)

Since the denominators of both the numbers are different therefore, we will take their LCM

LCM Of 13 and 5 = 65

$$\frac{-6}{5} = \frac{-6 \times 13}{5 \times 13} = \frac{-78}{65}$$

And,

$$\frac{-32}{13} = \frac{-32 \times 5}{13 \times 5} = \frac{-160}{65}$$

Therefore,

$$\begin{aligned} & \frac{-6}{5} - \left( \frac{-32}{13} \right) \\ &= \frac{-78}{65} - \left( \frac{-160}{65} \right) \\ &= \frac{-78 - (-160)}{65} \\ &= \frac{-78 + 160}{65} \\ &= \frac{82}{65} \end{aligned}$$

(viii)

We can write,  $-7 = \frac{-7}{1}$

Since the denominators of both the numbers are different therefore, we will take their LCM

LCM Of 1 and 7 = 7

$$\frac{-7}{1} = \frac{-7 \times 7}{1 \times 7} = \frac{-49}{7}$$

And,

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

Therefore,

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

$$= \frac{-4}{7} - \left( \frac{-49}{7} \right)$$

$$= \frac{-4 - (-49)}{7}$$

$$= \frac{-4 + 49}{7}$$

$$= \frac{45}{7}$$

### 8. Question

Using the rearrangement property find the sum:

$$(i) \frac{4}{3} + \frac{3}{5} + \frac{-2}{3} + \frac{-11}{5}$$

$$(ii) \frac{-8}{3} + \frac{-1}{4} + \frac{-11}{6} + \frac{3}{8}$$

$$(iii) \frac{-13}{20} + \frac{11}{14} + \frac{-5}{7} + \frac{3}{10}$$

$$(iv) \frac{-6}{7} + \frac{-5}{6} + \frac{-4}{9} + \frac{-15}{7}$$

### Answer

Rearrangement property says that, the numbers in an addition expression may be arranged and grouped in any order.

Therefore,

$$(i) \frac{4}{3} + \frac{3}{5} + \frac{-2}{3} + \frac{-11}{5}$$

We arrange the numbers with same denominators together,

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

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

$$= \left( \frac{2}{3} \right) + \left( \frac{-8}{5} \right)$$

Now, we take LCM of 3 and 5=15

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

And,

$$\frac{-8}{5} = \frac{-8 \times 3}{5 \times 3} = \frac{-24}{15}$$

Therefore,

$$\begin{aligned} & \left( \frac{2}{3} \right) + \left( \frac{-8}{5} \right) \\ &= \left( \frac{10}{15} \right) + \left( \frac{-24}{15} \right) \\ &= \frac{10 + (-24)}{15} \\ &= \frac{10 - 24}{15} \\ &= \frac{-14}{15} \end{aligned}$$

(ii)

$$\frac{-8}{3} + \frac{-1}{4} + \frac{-11}{6} + \frac{3}{8}$$

We arrange the numbers,

$$= \left( \frac{-8}{3} + \frac{-11}{6} \right) + \left( \frac{-1}{4} + \frac{3}{8} \right)$$

LCM of 3 and 6 =6

$$\frac{-8}{3} = \frac{-8 \times 2}{3 \times 2} = \frac{-16}{6}$$

And,

$$\frac{-11}{6} = \frac{-11 \times 1}{6 \times 1} = \frac{-11}{6}$$

LCM of 4 and 8 =8

$$\frac{-1}{4} = \frac{-1 \times 2}{4 \times 2} = \frac{-2}{8}$$

And,

$$\frac{3}{8} = \frac{3 \times 1}{8 \times 1} = \frac{3}{8}$$

Now,

$$\begin{aligned} & \left( \frac{-16}{6} + \frac{-11}{6} \right) + \left( \frac{-2}{8} + \frac{3}{8} \right) \\ &= \left( \frac{-16 + (-11)}{6} \right) + \left( \frac{-2 + 3}{8} \right) \\ &= \left( \frac{-27}{6} \right) + \left( \frac{1}{8} \right) \end{aligned}$$

Now, we take LCM of 6 and 8=24

$$\frac{-27}{6} = \frac{-27 \times 4}{6 \times 4} = \frac{-108}{24}$$

And,

$$\frac{1}{8} = \frac{1 \times 3}{8 \times 3} = \frac{3}{24}$$

Therefore,

$$\begin{aligned} & \left( \frac{-27}{6} \right) + \left( \frac{1}{8} \right) \\ &= \left( \frac{-108}{24} \right) + \left( \frac{3}{24} \right) \\ &= \frac{-108 + 3}{24} \\ &= \frac{-105}{24} \end{aligned}$$

In lowest terms,

$$\frac{-105}{24} = \frac{-105 \div 3}{24 \div 3} = \frac{-35}{8}$$

(iii)

$$\frac{-13}{20} + \frac{11}{14} + \frac{-5}{7} + \frac{7}{10}$$

We arrange the numbers,

$$= \left( \frac{-13}{20} + \frac{7}{10} \right) + \left( \frac{11}{14} + \frac{-5}{7} \right)$$

LCM of 20 and 10 =20

$$\frac{-13}{20} = \frac{-13 \times 1}{20 \times 1} = \frac{-13}{20}$$

And,

$$\frac{7}{10} = \frac{7 \times 2}{10 \times 2} = \frac{14}{20}$$

LCM of 14 and 7 =14

$$\frac{11}{14} = \frac{11 \times 1}{14 \times 1} = \frac{11}{14}$$

And,

$$\frac{-5}{7} = \frac{-5 \times 2}{7 \times 2} = \frac{-10}{14}$$

Now,

$$\begin{aligned} & \left( \frac{-13}{20} + \frac{14}{20} \right) + \left( \frac{11}{14} + \frac{-10}{14} \right) \\ &= \left( \frac{-13 + 14}{20} \right) + \left( \frac{11 + (-10)}{14} \right) \end{aligned}$$

$$= \left(\frac{1}{20}\right) + \left(\frac{1}{14}\right)$$

Now, we take LCM of 20 and 14=140

$$\frac{1}{20} = \frac{1 \times 7}{20 \times 7} = \frac{7}{140}$$

And,

$$\frac{1}{14} = \frac{1 \times 10}{14 \times 10} = \frac{10}{140}$$

Therefore,

$$\begin{aligned} & \left(\frac{1}{20}\right) + \left(\frac{1}{14}\right) \\ &= \left(\frac{7}{140}\right) + \left(\frac{10}{140}\right) \\ &= \frac{7+10}{140} \\ &= \frac{17}{140} \end{aligned}$$

(iv)

$$\frac{-6}{7} + \frac{-5}{6} + \frac{-4}{9} + \frac{-15}{7}$$

We arrange the numbers,

$$= \left(\frac{-6}{7} + \frac{-15}{7}\right) + \left(\frac{-5}{6} + \frac{-4}{9}\right)$$

LCM of 4 and 9 =18

$$\frac{-4}{9} = \frac{-4 \times 2}{9 \times 2} = \frac{-8}{18}$$

And,

$$\frac{-5}{6} = \frac{-5 \times 3}{6 \times 3} = \frac{-15}{18}$$

Now,

$$\begin{aligned} & \left(\frac{-6}{7} + \frac{-15}{7}\right) + \left(\frac{-8}{18} + \frac{-15}{18}\right) \\ &= \left(\frac{-6+(-15)}{7}\right) + \left(\frac{-8+(-15)}{18}\right) \\ &= \left(\frac{-6-15}{7}\right) + \left(\frac{-8-15}{18}\right) \\ &= \left(\frac{-21}{7}\right) + \left(\frac{-23}{18}\right) \end{aligned}$$

In lowest terms,

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

Now, we take LCM of 1 and 18=18

$$\frac{-3}{1} = \frac{-3 \times 18}{1 \times 18} = \frac{-54}{18}$$

And,

$$\frac{-23}{18} = \frac{-23 \times 1}{18 \times 1} = \frac{-23}{18}$$

Therefore,

$$\begin{aligned} &= \left( \frac{-3}{1} \right) + \left( \frac{-23}{18} \right) \\ &= \left( \frac{-54}{18} \right) + \left( \frac{-23}{18} \right) \\ &= \frac{-54 + (-23)}{18} \\ &= \frac{-54 - 23}{18} \\ &= \frac{-77}{18} \end{aligned}$$

### 9. Question

The sum of two rational numbers is  $-2$ . If one of the numbers is  $\frac{-14}{5}$ , find the other.

### Answer

Sum of two rational numbers =  $-2$

One number =  $\frac{-14}{5}$

Let the other rational number =  $x$

Now,

According to question,

$$\frac{-14}{5} + x = -2$$

$$\Rightarrow x = -2 - \frac{-14}{5}$$

$$\Rightarrow x = \frac{-10 - (-14)}{5}$$

$$\Rightarrow x = \frac{-10 + 14}{5}$$

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

Therefore, the other rational number is  $\frac{4}{5}$

### 10. Question

The sum of two rational numbers is  $\frac{-1}{2}$ . If one of the numbers is  $\frac{5}{6}$ , find the other.

**Answer**

Sum of two rational numbers =  $\frac{-1}{2}$

One number =  $\frac{5}{6}$

Let the other rational number = x

Now,

According to question,

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

$$\Rightarrow x = \frac{-1}{2} - \frac{5}{6}$$

$$\Rightarrow x = \frac{-3 - 5}{6}$$

$$\Rightarrow x = \frac{-8}{6}$$

In lowest terms,

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

Therefore, the other rational number is  $\frac{-4}{3}$

**11. Question**

What number should be added to  $\frac{-5}{8}$  so as to get  $\frac{-3}{2}$  ?

**Answer**

Let the number = x

Now,

According to question,

$$\frac{-5}{8} + x = \frac{-3}{2}$$

$$\Rightarrow x = \frac{-3}{2} - \frac{-5}{8}$$

$$\Rightarrow x = \frac{-12 - (-5)}{8}$$

$$\Rightarrow x = \frac{-12 + 5}{8}$$

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

Therefore,  $\frac{-7}{8}$  should be added to  $\frac{-5}{8}$  so as to get  $\frac{-3}{2}$

**12. Question**



What number should be added to  $-1$  so as to get  $\frac{5}{7}$ ?

**Answer**

Let the number =  $x$

Now,

According to question,

$$-1 + x = \frac{5}{7}$$

$$\Rightarrow x = \frac{5}{7} - (-1)$$

$$\Rightarrow x = \frac{5 - (-7)}{7}$$

$$\Rightarrow x = \frac{5 + 7}{7}$$

$$\Rightarrow x = \frac{12}{7}$$

Therefore,  $\frac{12}{7}$  should be added to  $-1$  so as to get  $\frac{5}{7}$

**13. Question**

What number should be subtracted from  $\frac{-2}{3}$  to get  $\frac{-1}{6}$ ?

**Answer**

Let the number =  $x$

Now,

According to question,

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

$$\Rightarrow x = \frac{-2}{3} - \left(\frac{-1}{6}\right)$$

$$\Rightarrow x = \frac{-4 - (-1)}{6}$$

$$\Rightarrow x = \frac{-4 + 1}{6}$$

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

In lowest terms,

$$x = \frac{-3 \div 3}{6 \div 3} = \frac{-1}{2}$$

Therefore,  $\frac{-1}{2}$  should be subtracted from  $\frac{-2}{3}$  so as to get  $\frac{-1}{6}$

**14. Question**

- (i) Which rational number is its own additive inverse?
- (ii) Is the difference of two rational numbers a rational number?
- (iii) Is addition commutative on rational numbers?
- (iv) Is addition associative on rational numbers?
- (v) Is subtraction commutative on rational numbers?
- (vi) Is subtraction associative on rational numbers?
- (vii) What is the negative of a negative rational number?

**Answer**

(i) A Additive inverse of a number  $\frac{a}{b}$  is the number  $-\frac{a}{b}$  such that,  $\frac{a}{b} + \left(-\frac{a}{b}\right) = 0$

0 is the rational number that is its own additive inverse

(ii) Let there be 2 rational numbers,  $\frac{a}{b}$  and  $\frac{c}{d}$  where,  $b \neq 0$  and  $d \neq 0$

$$\frac{a}{b} - \frac{c}{d}$$

LCM of b and d = bd

$$= \frac{ad - bc}{bd}$$

Where,  $bd \neq 0$

Therefore,  $\frac{ad-bc}{bd}$  is a rational number

Hence,

Yes, the difference of two rational numbers a rational number

(iii) Yes, addition is commutative on rational numbers

Let there be 2 rational numbers,  $\frac{a}{b}$  and  $\frac{c}{d}$  where,  $b \neq 0$  and  $d \neq 0$

Then,

$$\frac{a}{b} + \frac{c}{d} = \frac{c}{d} + \frac{a}{b}$$

(iv) Yes, addition is associative on rational numbers

Let there be 3 rational numbers,  $\frac{a}{b}$ ,  $\frac{c}{d}$  and  $\frac{e}{f}$  where,  $b \neq 0$ ,  $d \neq 0$  and  $f \neq 0$

Then,

$$\frac{a}{b} + \left(\frac{c}{d} + \frac{e}{f}\right) = \left(\frac{a}{b} + \frac{c}{d}\right) + \frac{e}{f}$$

(v) No, subtraction is not commutative on rational numbers

Let there be 2 rational numbers,  $\frac{a}{b}$  and  $\frac{c}{d}$  where,  $b \neq 0$  and  $d \neq 0$

Then,

$$\frac{a}{b} + \frac{c}{d} \neq \frac{c}{d} + \frac{a}{b}$$

(vi) No, addition is not associative on rational numbers

Let there be 3 rational numbers,  $\frac{a}{b}$ ,  $\frac{c}{d}$  and  $\frac{e}{f}$  where,  $b \neq 0$ ,  $d \neq 0$  and  $f \neq 0$

Then,

$$\frac{a}{b} + \left( \frac{c}{d} + \frac{e}{f} \right) \neq \left( \frac{a}{b} + \frac{c}{d} \right) + \frac{e}{f}$$

(vii) Negative of a negative rational number is the number itself without the negative sign.

## Exercise 1D

### 1. Question

Find each of the following products:

$$(i) \frac{3}{5} \times \frac{-7}{8} \quad (ii) \frac{-9}{2} \times \frac{5}{4} \quad (iii) \frac{-6}{11} \times \frac{-5}{3}$$

$$(iv) \frac{-2}{3} \times \frac{6}{7} \quad (v) \frac{-12}{5} \times \frac{10}{-3} \quad (vi) \frac{25}{-9} \times \frac{3}{-10}$$

$$(vii) \frac{5}{-18} \times \frac{-9}{20} \quad (viii) \frac{-13}{15} \times \frac{-25}{26} \quad (ix) \frac{16}{-21} \times \frac{14}{5}$$

$$(x) \frac{-7}{6} \times 24 \quad (xi) \frac{7}{24} \times (-48)$$

$$(xii) \frac{-13}{5} \times (-10)$$

### Answer

(i)

$$\begin{aligned} \frac{3}{5} \times \frac{-7}{8} \\ &= \frac{3 \times -7}{5 \times 8} \\ &= \frac{-21}{40} \end{aligned}$$

(ii)

$$\begin{aligned} \frac{-9}{2} \times \frac{5}{4} \\ &= \frac{-9 \times 5}{2 \times 4} \\ &= \frac{-45}{8} \end{aligned}$$

(iii)

$$\begin{aligned} \frac{-6}{11} \times \frac{-5}{3} \\ &= \frac{-6 \times -5}{11 \times 3} \end{aligned}$$

$$= \frac{30}{33}$$

In lowest terms,

$$\frac{30}{33} = \frac{30 \div 3}{33 \div 3} = \frac{10}{11}$$

(iv)

$$\begin{aligned} \frac{-2}{3} \times \frac{6}{7} \\ = \frac{-2 \times 6}{3 \times 7} \\ = \frac{-12}{21} \end{aligned}$$

In lowest terms,

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

(v)

$$\begin{aligned} \frac{-12}{5} \times \frac{10}{-3} \\ = \frac{-12 \times 10}{5 \times -3} \\ = \frac{-120}{-15} = \frac{-120 \times -1}{-15 \times -1} = \frac{120}{15} \end{aligned}$$

In lowest terms,

$$\frac{120}{15} = \frac{120 \div 3}{15 \div 3} = \frac{40}{5}$$

Further,

$$\frac{40}{5} = \frac{40 \div 5}{5 \div 5} = \frac{8}{1} = 8$$

(vi)

$$\begin{aligned} \frac{25}{-9} \times \frac{3}{-10} \\ = \frac{25 \times 3}{-9 \times -10} \\ = \frac{75}{90} \end{aligned}$$

In lowest terms,

$$\frac{75}{90} = \frac{75 \div 15}{90 \div 15} = \frac{5}{6}$$

(vii)

$$\frac{5}{-18} \times \frac{-9}{20}$$

$$= \frac{5 \times -9}{-18 \times 20}$$

$$= \frac{-45}{-360} = \frac{-45 \times -1}{-360 \times -1} = \frac{45}{360}$$

In lowest terms,

$$\frac{45}{360} = \frac{45 \div 45}{360 \div 45} = \frac{1}{8}$$

(viii)

$$\frac{-13}{15} \times \frac{-25}{26}$$

$$= \frac{-13 \times -25}{15 \times 26}$$

$$= \frac{325}{390}$$

In lowest terms,

$$\frac{325}{390} = \frac{325 \div 5}{390 \div 5} = \frac{65}{78}$$

Further,

$$\frac{65}{78} = \frac{65 \div 13}{78 \div 13} = \frac{5}{6}$$

(ix)

$$\frac{16}{-21} \times \frac{14}{5}$$

$$= \frac{16 \times 14}{-21 \times 5}$$

$$= \frac{224}{-105} = \frac{224 \times -1}{-105 \times -1} = \frac{-224}{105}$$

In lowest terms,

$$\frac{-224}{105} = \frac{-224 \div 7}{105 \div 7} = \frac{-32}{15}$$

(x)

$$\frac{-7}{6} \times 24$$

$$= \frac{-7}{6} \times \frac{24}{1}$$

$$= \frac{-7 \times 24}{6 \times 1}$$

$$= \frac{-168}{6}$$

In lowest terms,

$$\frac{-168}{6} = \frac{-168 \div 2}{6 \div 2} = \frac{-84}{3}$$

Further,

$$\frac{-84}{3} = \frac{-84 \div 3}{3 \div 3} = \frac{-28}{1} = -28$$

(xi)

$$\begin{aligned}\frac{7}{24} \times -48 \\&= \frac{7}{24} \times \frac{-48}{1} \\&= \frac{7 \times -48}{24 \times 1} \\&= \frac{-336}{24}\end{aligned}$$

In lowest terms,

$$\frac{-336}{24} = \frac{-336 \div 4}{24 \div 4} = \frac{-84}{6}$$

Further,

$$\frac{-84}{6} = \frac{-84 \div 6}{6 \div 6} = \frac{-14}{1} = -14$$

(xii)

$$\begin{aligned}\frac{-13}{5} \times -10 \\&= \frac{-13}{5} \times \frac{-10}{1} \\&= \frac{-13 \times -10}{5 \times 1} \\&= \frac{130}{5}\end{aligned}$$

In lowest terms,

$$\frac{130}{5} = \frac{130 \div 5}{5 \div 5} = \frac{26}{1} = 26$$

## 2. Question

Verify each of the following:

$$(i) \frac{3}{5} \times \frac{-5}{9} = \frac{-5}{9} \times \frac{3}{7} \quad (ii) \frac{-8}{7} \times \frac{13}{9} = \frac{13}{9} \times \frac{-8}{7}$$

$$(iii) \frac{-12}{5} \times \frac{7}{-36} = \frac{7}{-36} \times \frac{-12}{5}$$

$$(iv) -8 \times \frac{-13}{12} = \frac{-13}{12} \times (-8)$$

**Answer**

(i)

$$\text{LHS} = \frac{3}{7} \times \frac{-5}{9}$$

$$= \frac{3 \times -5}{7 \times 9}$$

$$= \frac{-15}{63}$$

In lowest terms,

$$\frac{-15}{63} = \frac{-15 \div 3}{63 \div 3} = \frac{-5}{21}$$

$$\text{RHS} = \frac{-5}{9} \times \frac{3}{7}$$

$$= \frac{-5 \times 3}{9 \times 7}$$

$$= \frac{-15}{63}$$

In lowest terms,

$$\frac{-15}{63} = \frac{-15 \div 3}{63 \div 3} = \frac{-5}{21}$$

LHS=RHS

Verified

(ii)

$$\text{LHS} = \frac{-8}{7} \times \frac{13}{9}$$

$$= \frac{-8 \times 13}{7 \times 9}$$

$$= \frac{-104}{63}$$

$$\text{RHS} = \frac{13}{9} \times \frac{-8}{7}$$

$$= \frac{13 \times -8}{9 \times 7}$$

$$= \frac{-104}{63}$$

LHS=RHS

Verified

(iii)

$$\text{LHS} = \frac{-12}{5} \times \frac{7}{-36}$$

$$= \frac{-12 \times 7}{5 \times -36}$$

$$= \frac{-84}{-180} = \frac{-84 \times -1}{-180 \times -1} = \frac{84}{180}$$

In lowest terms,

$$\frac{84}{180} = \frac{84 \div 12}{180 \div 12} = \frac{7}{15}$$

$$\text{RHS} = \frac{7}{-36} \times \frac{-12}{5}$$

$$= \frac{7 \times -12}{-36 \times 5}$$

$$= \frac{-84}{-180} = \frac{-84 \times -1}{-180 \times -1} = \frac{84}{180}$$

In lowest terms,

$$\frac{84}{180} = \frac{84 \div 12}{180 \div 12} = \frac{7}{15}$$

LHS=RHS

Verified

(iv)

$$\text{LHS} = -8 \times \frac{-13}{12}$$

$$= \frac{-8 \times -13}{12}$$

$$= \frac{104}{12}$$

In lowest terms,

$$\frac{104}{12} = \frac{104 \div 4}{12 \div 4} = \frac{26}{3}$$

$$\text{RHS} = \frac{-13}{12} \times -8$$

$$= \frac{-13 \times -8}{12}$$

$$= \frac{104}{12}$$

In lowest terms,

$$\frac{104}{12} = \frac{104 \div 4}{12 \div 4} = \frac{26}{3}$$

LHS=RHS

Verified

### 3. Question

Verify each of the following:

$$(i) \left( \frac{5}{7} \times \frac{12}{13} \right) \times \frac{7}{18} = \frac{5}{7} \times \left( \frac{12}{13} \times \frac{7}{18} \right)$$



$$(ii) \diamond \frac{-13}{24} \times \left( \frac{-12}{5} \times \frac{35}{36} \right) = \left( \frac{-13}{24} \times \frac{-12}{5} \right) \times \frac{35}{36}$$

$$(iii) \left( \frac{-9}{5} \times \frac{-10}{3} \right) \times \frac{21}{-4} = \frac{-9}{5} \times \left( \frac{-10}{3} \times \frac{21}{-4} \right)$$

**Answer**

(i)

$$\left( \frac{5}{7} \times \frac{12}{13} \right) \times \frac{7}{18} = \frac{5}{7} \times \left( \frac{12}{13} \times \frac{7}{18} \right)$$

$$\text{LHS} = \left( \frac{5}{7} \times \frac{12}{13} \right) \times \frac{7}{18}$$

$$= \frac{5 \times 12}{7 \times 13} \times \frac{7}{18}$$

$$= \frac{60}{91} \times \frac{7}{18}$$

$$= \frac{60 \times 7}{91 \times 18}$$

$$= \frac{420}{1638}$$

In lowest terms,

$$\frac{420}{1638} = \frac{420 \div 42}{1638 \div 42} = \frac{10}{13}$$

$$\text{RHS} = \frac{5}{7} \times \left( \frac{12}{13} \times \frac{7}{18} \right)$$

$$= \frac{5}{7} \times \frac{12 \times 7}{13 \times 18}$$

$$= \frac{5}{7} \times \frac{84}{234}$$

$$= \frac{420}{1638}$$

In lowest terms,

$$\frac{420}{1638} = \frac{420 \div 42}{1638 \div 42} = \frac{10}{13}$$

LHS=RHS

Verified

(ii)

$$\frac{-13}{24} \times \left( \frac{-12}{5} \times \frac{35}{36} \right) = \left( \frac{-13}{24} \times \frac{-12}{5} \right) \times \frac{35}{36}$$

$$\text{LHS} = \frac{-13}{24} \times \left( \frac{-12}{5} \times \frac{35}{36} \right)$$

$$= \frac{-13}{24} \times \frac{-12 \times 35}{5 \times 36}$$

$$= \frac{-13}{24} \times \frac{-420}{180}$$

$$= \frac{60 \times 7}{24 \times 180}$$

$$= \frac{5460}{4320}$$

In lowest terms,

$$\frac{5460}{4320} = \frac{5460 \div 10}{4320 \div 10} = \frac{546}{432}$$

Further,

$$\frac{546}{432} = \frac{546 \div 6}{432 \div 6} = \frac{91}{72}$$

$$\text{RHS} = \left( \frac{-13}{24} \times \frac{-12}{5} \right) \times \frac{35}{36}$$

$$= \frac{-13 \times -12}{24 \times 5} \times \frac{35}{36}$$

$$= \frac{156}{120} \times \frac{35}{36}$$

$$= \frac{156 \times 35}{120 \times 36}$$

$$= \frac{5460}{4320}$$

In lowest terms,

$$\frac{5460}{4320} = \frac{5460 \div 10}{4320 \div 10} = \frac{546}{432}$$

Further,

$$\frac{546}{432} = \frac{546 \div 6}{432 \div 6} = \frac{91}{72}$$

LHS=RHS

Verified

(iii)

$$\left( \frac{-9}{5} \times \frac{-10}{3} \right) \times \frac{21}{-4} = \frac{-9}{5} \times \left( \frac{-10}{3} \times \frac{21}{-4} \right)$$

$$\text{LHS} = \left( \frac{-9}{5} \times \frac{-10}{3} \right) \times \frac{21}{-4}$$

$$= \frac{-9 \times -10}{5 \times 3} \times \frac{21}{-4}$$

$$= \frac{90}{15} \times \frac{21}{-4}$$

$$= \frac{90 \times 21}{15 \times -4}$$

$$= \frac{1890}{-60} = \frac{1890 \times -1}{-60 \times -1} = \frac{-1890}{60}$$

In lowest terms,

$$\frac{-1890}{60} = \frac{-1890 \div 10}{60 \div 10} = \frac{-189}{6}$$

Further,

$$\frac{-189}{6} = \frac{-189 \div 3}{6 \div 3} = \frac{-63}{2}$$

$$\text{RHS} = \frac{-9}{5} \times \left( \frac{-10}{3} \times \frac{21}{-4} \right)$$

$$= \frac{-9}{5} \times \frac{-10 \times 21}{3 \times -4}$$

$$= \frac{-9}{5} \times \frac{-210}{-12}$$

$$= \frac{-9 \times -210}{5 \times -12}$$

$$= \frac{1890}{-60} = \frac{1890 \times -1}{-60 \times -1} = \frac{-1890}{60}$$

In lowest terms,

$$\frac{-1890}{60} = \frac{-1890 \div 10}{60 \div 10} = \frac{-189}{6}$$

Further,

$$\frac{-189}{6} = \frac{-189 \div 3}{6 \div 3} = \frac{-63}{2}$$

LHS=RHS

Verified

#### 4. Question

Fill in the blanks:

$$(i) \frac{-23}{17} \times \frac{18}{35} = \frac{18}{35} \times (....)$$

$$(ii) -38 \times \frac{-7}{19} = \frac{-7}{19} \times (....)$$

$$(iii) \left( \frac{15}{7} \times \frac{-21}{10} \right) \times \frac{-5}{6} = (....) \times \left( \frac{-21}{10} \times \frac{-5}{6} \right)$$

$$(iv) \frac{-12}{5} \times \left( \frac{4}{15} \times \frac{25}{-16} \right) = \left( \frac{-12}{5} \times \frac{4}{15} \right) \times (....)$$

#### Answer

(i)

By Commutative Property, i.e,  $a \times b = b \times a$

$$\frac{-23}{17} \times \frac{18}{35} = \frac{18}{35} \times \frac{-23}{17}$$

(ii)

By Commutative Property, i.e,  $a \times b = b \times a$

$$-38 \times \frac{-7}{19} = \frac{-7}{19} \times -38$$

(iii)

By Associative Property, i.e,  $(a \times b) \times c = a \times (b \times c)$

$$\left(\frac{15}{7} \times \frac{-21}{10}\right) \times \frac{-5}{6} = \frac{15}{7} \times \left(\frac{-21}{10} \times \frac{-5}{6}\right)$$

(iv)

By Associative Property, i.e,  $(a \times b) \times c = a \times (b \times c)$

$$\frac{-12}{5} \times \left(\frac{4}{15} \times \frac{25}{-16}\right) = \left(\frac{-12}{5} \times \frac{4}{15}\right) \times \frac{25}{-16}$$

### 5. Question

Find the multiplicative inverse (i.e., reciprocal) of:

(i)  $\frac{13}{25}$  (ii)  $\frac{-17}{12}$  (iii)  $\frac{-7}{24}$  (iv) 18 (v) -6

(vi)  $\frac{-3}{-5}$  (vii) -1 (viii)  $\frac{0}{2}$  (ix)  $\frac{2}{-5}$  (x)  $\frac{-1}{8}$

### Answer

A multiplicative inverse for a number  $x$ , is a number which when multiplied by  $x$  yields the multiplicative identity, 1

The multiplicative inverse of a rational number  $\frac{a}{b}$  is  $\frac{b}{a}$ .

Therefore,

(i) The multiplicative inverse of  $\frac{13}{25} = \frac{25}{13}$ .

(ii) The multiplicative inverse of  $\frac{-17}{12} = \frac{12}{-17}$ .

In standard form,

$$\frac{12}{-17} = \frac{12 \times -1}{-17 \times -1} = \frac{-12}{17}$$

(iii) The multiplicative inverse of  $\frac{-7}{24} = \frac{24}{-7}$ .

In standard form,

$$\frac{24}{-7} = \frac{24 \times -1}{-7 \times -1} = \frac{-24}{7}$$

(iv) The multiplicative inverse of 18 =  $\frac{1}{18}$ .

(v) The multiplicative inverse of -6 =  $\frac{1}{-6}$ .

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

(vi) The multiplicative inverse of  $\frac{-3}{-5} = \frac{-5}{-3}$ .

In standard form,

$$\frac{-5}{-3} = \frac{-5 \times -1}{-3 \times -1} = \frac{5}{3}$$

(vii) The multiplicative inverse of  $-1 = -1$ .

(viii) The multiplicative inverse of  $\frac{0}{2}$  is undefined.

Since,  $\frac{2}{0}$  is undefined.

(ix) The multiplicative inverse of  $\frac{2}{-5} = \frac{-5}{2}$ .

(x) The multiplicative inverse of  $\frac{-1}{8} = \frac{8}{-1}$ .

In standard form,

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

## 6. Question

Find the value of:

$$(i) \left(\frac{5}{8}\right)^{-1} \quad (ii) \left(\frac{-4}{9}\right)^{-1} \quad (iii) (-7)^{-1} \quad (iv) \left(\frac{1}{-3}\right)^{-1}$$

## Answer

Let there be a rational number  $\frac{a}{b}$  then  $\left(\frac{a}{b}\right)^{-1} = \frac{b}{a}$

Therefore,

(i)

$$\left(\frac{5}{8}\right)^{-1} = \frac{8}{5}$$

(ii)

$$\left(\frac{-4}{9}\right)^{-1} = \frac{9}{-4} = \frac{9 \times -1}{-4 \times -1} = \frac{-9}{4}$$

(iii)

$$(-7)^{-1} = \left(\frac{-7}{1}\right)^{-1} = \frac{1}{-7} = \frac{1 \times -1}{-7 \times -1} = \frac{-1}{7}$$

(iv)

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

## 7. Question

Verify the following:

$$(i) \frac{3}{7} \times \left( \frac{5}{6} + \frac{12}{13} \right) = \left( \frac{3}{7} \times \frac{5}{6} \right) + \left( \frac{3}{7} \times \frac{12}{13} \right)$$

$$(ii) \frac{-15}{4} \times \left( \frac{3}{7} + \frac{-12}{5} \right) = \left( \frac{-15}{4} \times \frac{3}{7} \right) + \left( \frac{-15}{4} \times \frac{-12}{5} \right)$$

$$(iii) \left( \frac{-8}{3} + \frac{-13}{12} \right) \times \frac{5}{6} = \left( \frac{-8}{3} \times \frac{5}{6} \right) + \left( \frac{-13}{12} \times \frac{5}{6} \right)$$

$$(iv) \frac{-16}{7} \times \left( \frac{-8}{9} + \frac{-7}{6} \right) = \left( \frac{-16}{7} \times \frac{-8}{9} \right) + \left( \frac{-16}{7} \times \frac{-7}{6} \right)$$

**Answer**

(i)

$$\frac{3}{7} \times \left( \frac{5}{6} + \frac{12}{13} \right) = \left( \frac{3}{7} \times \frac{5}{6} \right) + \left( \frac{3}{7} \times \frac{12}{13} \right)$$

$$\text{LHS} = \frac{3}{7} \times \left( \frac{5}{6} + \frac{12}{13} \right)$$

$$= \frac{3}{7} \times \left( \frac{5 \times 13 + 12 \times 6}{78} \right)$$

$$= \frac{3}{7} \times \left( \frac{65 + 72}{78} \right)$$

$$= \frac{3}{7} \times \left( \frac{137}{78} \right)$$

$$= \frac{3 \times 137}{7 \times 78}$$

$$= \frac{411}{546}$$

In lowest terms,

$$\frac{411}{546} = \frac{411 \div 3}{546 \div 3} = \frac{137}{182}$$

$$\text{RHS} = \left( \frac{3}{7} \times \frac{5}{6} \right) + \left( \frac{3}{7} \times \frac{12}{13} \right)$$

$$= \left( \frac{3 \times 5}{7 \times 6} \right) + \left( \frac{3 \times 12}{7 \times 13} \right)$$

$$= \frac{15}{42} + \left( \frac{36}{91} \right)$$

$$= \frac{15 \times 13 + 36 \times 6}{546}$$

$$= \frac{195 + 216}{546}$$

$$= \frac{411}{546}$$

In lowest terms,

$$\frac{411}{546} = \frac{411 \div 3}{546 \div 3} = \frac{137}{182}$$

LHS=RHS

Verified

(ii)

$$\frac{-15}{4} \times \left( \frac{3}{7} + \frac{-12}{5} \right) = \left( \frac{-15}{4} \times \frac{3}{7} \right) + \left( \frac{-15}{4} \times \frac{-12}{5} \right)$$

$$\text{LHS} = \frac{-15}{4} \times \left( \frac{3}{7} + \frac{-12}{5} \right)$$

$$= \frac{-15}{4} \times \left( \frac{3 \times 5 + (-12) \times 7}{35} \right)$$

$$= \frac{-15}{4} \times \left( \frac{15 - 84}{35} \right)$$

$$= \frac{-15}{4} \times \left( \frac{-69}{35} \right)$$

$$= \frac{-15 \times -69}{4 \times 35}$$

$$= \frac{1035}{140}$$

In lowest terms,

$$\frac{1035}{140} = \frac{1035 \div 5}{140 \div 5} = \frac{207}{28}$$

$$\text{RHS} = \left( \frac{-15}{4} \times \frac{3}{7} \right) + \left( \frac{-15}{4} \times \frac{-12}{5} \right)$$

$$= \left( \frac{-15 \times 3}{4 \times 7} \right) + \left( \frac{-15 \times -12}{4 \times 5} \right)$$

$$= \frac{-45}{28} + \left( \frac{180}{20} \right)$$

$$= \frac{-45 \times 5 + 180 \times 7}{140}$$

$$= \frac{-225 + 1260}{140}$$

$$= \frac{1035}{140}$$

In lowest terms,

$$\frac{1035}{140} = \frac{1035 \div 5}{140 \div 5} = \frac{207}{28}$$

LHS=RHS

Verified

(iii)

$$\left( \frac{-8}{3} + \frac{-13}{12} \right) \times \frac{5}{6} = \left( \frac{-8}{3} \times \frac{5}{6} \right) + \left( \frac{-13}{12} \times \frac{5}{6} \right)$$

$$\begin{aligned}
\text{LHS} &= \left( \frac{-8}{3} + \frac{-13}{12} \right) \times \frac{5}{6} \\
&= \left( \frac{-8 \times 4 + (-13) \times 1}{12} \right) \times \left( \frac{5}{6} \right) \\
&= \left( \frac{-32 - 13}{12} \right) \times \left( \frac{5}{6} \right) \\
&= \frac{-45}{12} \times \frac{5}{6} \\
&= \frac{-45 \times 5}{12 \times 6} \\
&= \frac{-225}{72}
\end{aligned}$$

In lowest terms,

$$\frac{-225}{72} = \frac{-225 \div 9}{72 \div 9} = \frac{-25}{8}$$

$$\begin{aligned}
\text{RHS} &= \left( \frac{-8}{3} \times \frac{5}{6} \right) + \left( \frac{-13}{12} \times \frac{5}{6} \right) \\
&= \left( \frac{-8 \times 5}{3 \times 6} \right) + \left( \frac{-13 \times 5}{12 \times 6} \right) \\
&= \frac{-40}{18} + \left( \frac{-65}{72} \right) \\
&= \frac{-40 \times 4 + (-65) \times 1}{72} \\
&= \frac{-160 - 65}{72} \\
&= \frac{-225}{72}
\end{aligned}$$

In lowest terms,

$$\frac{-225}{72} = \frac{-225 \div 9}{72 \div 9} = \frac{-25}{8}$$

LHS=RHS

Verified

(iv)

$$\begin{aligned}
\frac{-16}{7} \times \left( \frac{-8}{9} + \frac{-7}{6} \right) &= \left( \frac{-16}{7} \times \frac{-8}{9} \right) + \left( \frac{-16}{7} \times \frac{-7}{6} \right) \\
\text{LHS} &= \frac{-16}{7} \times \left( \frac{-8}{9} + \frac{-7}{6} \right) \\
&= \frac{-16}{7} \times \left( \frac{-8 \times 2 + (-7) \times 3}{18} \right) \\
&= \frac{-16}{7} \times \left( \frac{-16 - 21}{18} \right) \\
&= \frac{-16}{7} \times \left( \frac{-37}{18} \right)
\end{aligned}$$



$$= \frac{-16 \times -37}{7 \times 18}$$

$$= \frac{592}{126}$$

In lowest terms,

$$\frac{592}{126} = \frac{592 \div 2}{126 \div 2} = \frac{296}{63}$$

$$\text{RHS} = \left( \frac{-16}{7} \times \frac{-8}{9} \right) + \left( \frac{-16}{7} \times \frac{-7}{6} \right)$$

$$= \left( \frac{-16 \times -8}{7 \times 9} \right) + \left( \frac{-16 \times -7}{7 \times 6} \right)$$

$$= \frac{128}{63} + \left( \frac{112}{42} \right)$$

$$= \frac{128 \times 2 + 112 \times 3}{126}$$

$$= \frac{256 + 336}{126}$$

$$= \frac{592}{126}$$

In lowest terms,

$$\frac{592}{126} = \frac{592 \div 2}{126 \div 2} = \frac{296}{63}$$

LHS=RHS

Verified

### 8. Question

Name the property of multiplication illustrated by each of the following statements:

$$(i) \frac{-15}{8} \times \frac{-12}{7} = \frac{-12}{7} \times \frac{-15}{8}$$

$$(ii) \left( \frac{-2}{3} \times \frac{7}{9} \right) \times \frac{-9}{5} = \frac{-2}{3} \times \left( \frac{7}{9} \times \frac{-9}{5} \right)$$

$$(iii) \frac{-3}{4} \times \left( \frac{-5}{6} + \frac{7}{8} \right) = \left( \frac{-3}{4} \times \frac{-5}{6} \right) + \left( \frac{-3}{4} \times \frac{7}{8} \right)$$

$$(iv) \frac{-16}{9} \times 1 = 1 \times \frac{-16}{9} = \frac{-16}{9}$$

$$(v) \frac{-11}{15} \times \frac{15}{-11} = \frac{15}{-11} \times \frac{-11}{15} = 1$$

$$(vi) \frac{-7}{5} \times 0 = 0$$

## Answer

- (i) Commutative law i.e.,  $a \times b = b \times a$
- (ii) Associative law i.e.,  $a(bc) = (ab)c$
- (iii) Distributive law i.e.,  $a(b + c) = ab + ac$
- (iv) Property of multiplicative identity i.e.,  $a \times 1 = 1 \times a$
- (v) Property of multiplicative inverse i.e.,  $\frac{a}{b} \times \frac{b}{a} = 1$
- (vi) Multiplicative property of 0 i.e.,  $a \times 0 = 0$

## 9. Question

Fill in the blanks:

- (i) The product of a rational number and its reciprocal is.....
- (ii) Zero has.....reciprocal.
- (iii) The numbers..... and.....are their own reciprocals.
- (iv) Zero is.....the reciprocal of any number.
- (v) The reciprocal of  $a$ , where  $a \neq 0$ , is.....
- (vi) The reciprocal of  $\frac{1}{a}$ , where  $a \neq 0$ , is.....
- (vii) The reciprocal of a positive rational number is.....
- (viii) The reciprocal of a negative rational number is.....

## Answer

- (i) 1
- (ii) No
- (iii) 1 and -1
- (iv) Not
- (v)  $\frac{1}{a}$
- (vi)  $a$
- (vii) Positive
- (viii) Negative

## Exercise 1E

### 1. Question

Simplify:

(i)  $\frac{4}{9} \div \frac{-5}{12}$  (ii)  $-8 \div \frac{-7}{16}$  (iii)  $\frac{-12}{7} \div (-18)$  (iv)  $\frac{-1}{10} \div \frac{-8}{5}$  (v)  $\frac{-16}{35} \div \frac{-15}{14}$  (vi)  $\frac{-65}{14} \div \frac{13}{7}$

## Answer

(i)  $\frac{4}{9} \div \frac{-5}{12}$

$$= \frac{4}{9} \times \frac{12}{-5}$$

$$= \frac{4 \times 12}{9 \times -5}$$

$$= \frac{48}{-45} = \frac{48 \times -1}{-45 \times -1} = \frac{-48}{45}$$

In lowest terms,

$$\frac{-48}{45} = \frac{-48 \div 3}{45 \div 3} = \frac{-16}{15}$$

(ii)

$$-8 \div \frac{-7}{16}$$

$$= \frac{-8}{1} \div \frac{-7}{16}$$

$$= \frac{-8}{1} \times \frac{16}{-7}$$

$$= \frac{-8 \times 16}{1 \times -7}$$

$$= \frac{-128}{-7} = \frac{-128 \times -1}{-7 \times -1} = \frac{128}{7}$$

(iii)

$$\frac{-12}{7} \div -18$$

$$= \frac{-12}{7} \div \frac{-18}{1}$$

$$= \frac{-12}{7} \times \frac{1}{-18}$$

$$= \frac{-12 \times 1}{7 \times -18}$$

$$= \frac{-12}{-126} = \frac{-12 \times -1}{-126 \times -1} = \frac{12}{126}$$

In lowest terms,

$$\frac{12}{126} = \frac{12 \div 6}{126 \div 6} = \frac{2}{21}$$

(iv)

$$\frac{-1}{10} \div \frac{-8}{5}$$

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

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

$$= \frac{-5}{-80} = \frac{-5 \times -1}{-80 \times -1} = \frac{5}{80}$$

In lowest terms,

$$\frac{5}{80} = \frac{5 \div 5}{80 \div 5} = \frac{1}{16}$$

(v)

$$\frac{-16}{35} \div \frac{-15}{14}$$

$$= \frac{-16}{35} \times \frac{14}{-15}$$

$$= \frac{-16 \times 14}{35 \times -15}$$

$$= \frac{-224}{-525} = \frac{-224 \times -1}{-525 \times -1} = \frac{224}{525}$$

In lowest terms,

$$\frac{224}{525} = \frac{224 \div 7}{525 \div 7} = \frac{32}{75}$$

(vi)

$$\frac{-65}{14} \div \frac{13}{7}$$

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

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

$$= \frac{-455}{182} = \frac{-455 \times -1}{182 \times -1} = \frac{-455}{182}$$

In lowest terms,

$$\frac{-455}{182} = \frac{-455 \div 7}{182 \div 7} = \frac{-65}{26}$$

Further,

$$\frac{-65}{26} = \frac{-65 \div 13}{26 \div 13} = \frac{-5}{2}$$

## 2. Question

Verify whether the given statement is true or false:

$$(i) \frac{13}{5} \div \frac{26}{10} = \frac{26}{10} \div \frac{13}{5}$$

$$(ii) -9 \div \frac{3}{4} = \frac{3}{4} \div (-9)$$

$$(iii) \frac{-8}{9} \div \frac{-4}{3} = \frac{-4}{3} \div \frac{-8}{9}$$

$$(iv) \frac{-7}{24} \div \frac{3}{-16} = \frac{3}{-16} \div \frac{-7}{24}$$

## Answer

(i)

$$\frac{13}{5} \div \frac{26}{10} = \frac{26}{10} \div \frac{13}{5}$$

$$\text{LHS} = \frac{13}{5} \div \frac{26}{10}$$

$$= \frac{13}{5} \times \frac{10}{26}$$

$$= \frac{13 \times 10}{5 \times 26}$$

$$= \frac{130}{130} = 1$$

$$\text{RHS} = \frac{26}{10} \div \frac{13}{5}$$

$$= \frac{26}{10} \times \frac{5}{13}$$

$$= \frac{26 \times 5}{10 \times 13}$$

$$= \frac{130}{130} = 1$$

Since,  $\text{RHS} = \text{LHS}$

Therefore, True

(ii)

$$-9 \div \frac{3}{4} = \frac{3}{4} \div (-9)$$

$$\text{LHS} = -9 \div \frac{3}{4}$$

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

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

$$= \frac{-36}{3} = -12$$

$$\text{RHS} = \frac{3}{4} \div (-9)$$

$$= \frac{3}{4} \times \frac{1}{-9}$$

$$= \frac{3 \times 1}{4 \times -9}$$

$$= \frac{3}{-36} = \frac{-1}{12}$$

Since,  $\text{RHS} \neq \text{LHS}$

Therefore, False

(iii)

$$\frac{-8}{9} \div \frac{-4}{3} = \frac{-4}{3} \div \frac{-8}{9}$$

$$\text{LHS} = \frac{-8}{9} \div \frac{-4}{3}$$

$$= \frac{-8}{9} \times \frac{3}{-4}$$

$$= \frac{-8 \times 3}{9 \times -4}$$

$$= \frac{-24}{-36} = \frac{2}{3}$$

$$\text{RHS} = \frac{-4}{3} \div \frac{-8}{9}$$

$$= \frac{-4}{3} \times \frac{9}{-8}$$

$$= \frac{-4 \times 9}{3 \times -8}$$

$$= \frac{-36}{-24} = \frac{3}{2}$$

Since,  $\text{RHS} \neq \text{LHS}$

Therefore, False

(iv)

$$\frac{-7}{24} \div \frac{3}{-16} = \frac{3}{-16} \div \frac{-7}{24}$$

$$\text{LHS} = \frac{-7}{24} \div \frac{3}{-16}$$

$$= \frac{-7}{24} \times \frac{-16}{3}$$

$$= \frac{-7 \times -16}{24 \times 3}$$

$$= \frac{112}{72} = \frac{14}{9}$$

$$\text{RHS} = \frac{3}{-16} \div \frac{-7}{24}$$

$$= \frac{3}{-16} \times \frac{24}{-7}$$

$$= \frac{3 \times 24}{-16 \times -7}$$

$$= \frac{72}{112} = \frac{9}{14}$$

Since,  $\text{RHS} \neq \text{LHS}$

Therefore, False

### 3. Question

Verify whether the given statement is true or false:

$$(i) \left( \frac{5}{9} \div \frac{1}{3} \right) \div \frac{5}{2} = \frac{5}{9} \div \left( \frac{1}{3} \div \frac{5}{2} \right)$$

$$(ii) \left\{ (-16) \div \frac{6}{5} \right\} \div \frac{-9}{10} = (-16) \div \left\{ \frac{6}{5} \div \frac{-9}{10} \right\}$$

$$(iii) \left( \frac{-3}{5} \div \frac{-12}{35} \right) \div \frac{1}{14} = \frac{-3}{5} \div \left( \frac{-12}{35} \div \frac{1}{14} \right)$$

### Answer

(i)

$$\left( \frac{5}{9} \div \frac{1}{3} \right) \div \frac{5}{2} = \frac{5}{9} \div \left( \frac{1}{3} \div \frac{5}{2} \right)$$

$$\text{LHS} = \left( \frac{5}{9} \div \frac{1}{3} \right) \div \frac{5}{2}$$

$$= \left( \frac{5}{9} \times \frac{3}{1} \right) \div \frac{5}{2}$$

$$= \left( \frac{5 \times 3}{9 \times 1} \right) \div \frac{5}{2}$$

$$= \frac{15}{9} \div \frac{5}{2}$$

$$= \frac{15}{9} \times \frac{2}{5}$$

$$= \frac{15 \times 2}{9 \times 5}$$

$$= \frac{30}{45} = \frac{30 \div 15}{45 \div 15} = \frac{2}{3}$$

$$\text{RHS} = \frac{5}{9} \div \left( \frac{1}{3} \div \frac{5}{2} \right)$$

$$= \frac{5}{9} \div \left( \frac{1}{3} \times \frac{2}{5} \right)$$

$$= \frac{5}{9} \div \frac{2}{15}$$

$$= \frac{5}{9} \times \frac{15}{2}$$

$$= \frac{5 \times 15}{9 \times 2}$$

$$= \frac{75}{18} = \frac{75 \div 3}{18 \div 3} = \frac{25}{6}$$

$\text{RHS} \neq \text{LHS}$

Hence, False

(ii)

$$\left(-16 \div \frac{6}{5}\right) \div \frac{-9}{10} = -16 \div \left(\frac{6}{5} \div \frac{-9}{10}\right)$$

$$\text{LHS} = \left(-16 \div \frac{6}{5}\right) \div \frac{-9}{10}$$

$$= \left(\frac{-16}{1} \div \frac{6}{5}\right) \div \frac{-9}{10}$$

$$= \left(\frac{-16}{1} \times \frac{5}{6}\right) \div \frac{-9}{10}$$

$$= \left(\frac{-16 \times 5}{1 \times 6}\right) \div \frac{-9}{10}$$

$$= \frac{-80}{6} \div \frac{-9}{10}$$

$$= \frac{-80}{6} \times \frac{10}{-9}$$

$$= \frac{-80 \times 10}{6 \times -9}$$

$$= \frac{-800}{-54} = \frac{800}{54} = \frac{800 \div 2}{54 \div 2} = \frac{400}{27}$$

$$\text{RHS} = -16 \div \left(\frac{6}{5} \div \frac{-9}{10}\right)$$

$$= \frac{-16}{1} \div \left(\frac{6}{5} \div \frac{-9}{10}\right)$$

$$= \frac{-16}{1} \div \left(\frac{6}{5} \times \frac{10}{-9}\right)$$

$$= \frac{-16}{1} \div \frac{60}{-45}$$

$$= \frac{-16}{1} \times \frac{-45}{60}$$

$$= \frac{-16 \times -45}{1 \times 60}$$

$$= \frac{720}{60} = \frac{720 \div 60}{60 \div 60} = 12$$

$\text{RHS} \neq \text{LHS}$

Hence, False

(iii)

$$\left(\frac{-3}{5} \div \frac{-12}{35}\right) \div \frac{1}{14} = \frac{-3}{5} \div \left(\frac{-12}{35} \div \frac{1}{14}\right)$$

$$\text{LHS} = \left(\frac{-3}{5} \div \frac{-12}{35}\right) \div \frac{1}{14}$$

$$= \left(\frac{-3}{5} \times \frac{35}{-12}\right) \div \frac{1}{14}$$



$$\begin{aligned}
&= \left( \frac{-3 \times 35}{5 \times -12} \right) \div \frac{1}{14} \\
&= \frac{-105}{-60} \div \frac{1}{14} \\
&= \frac{-105}{-60} \times \frac{14}{1} \\
&= \frac{-105 \times 14}{-60 \times 1} \\
&= \frac{-1470}{-60} = \frac{-1470}{-60} = \frac{1470 \div 30}{60 \div 30} = \frac{49}{2}
\end{aligned}$$

$$\begin{aligned}
\text{RHS} &= \frac{-3}{5} \div \left( \frac{-12}{35} \div \frac{1}{14} \right) \\
&= \frac{-3}{5} \div \left( \frac{-12}{35} \times \frac{14}{1} \right) \\
&= \frac{-3}{5} \div \left( \frac{-12 \times 1 + 14 \times 35}{35} \right) \\
&= \frac{-3}{5} \div \frac{-12 + 490}{35} \\
&= \frac{-3}{5} \div \frac{478}{35} \\
&= \frac{-3}{5} \times \frac{35}{478} \\
&= \frac{-3 \times 35}{5 \times 478} \\
&= \frac{-105}{2390} = \frac{-105 \div 5}{2390 \div 5} = \frac{-21}{478}
\end{aligned}$$

RHS  $\neq$  LHS

Hence, False

#### 4. Question

The product of two rational numbers is -9. If one of the numbers is -12, find the other.

#### Answer

Product of two rational numbers = -9

One rational number = -12

Let the other rational number = x

Now,

According to the question,

$$-12 \times x = -9$$

$$\Rightarrow x = \frac{-9}{-12}$$

$$\Rightarrow x = \frac{-9}{-12} = \frac{-9 \times -1}{-12 \times -1} = \frac{9}{12}$$

$$\Rightarrow x = \frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$$

Hence, the other rational number is  $\frac{3}{4}$

### 5. Question

The product of two rational numbers is  $\frac{-16}{9}$ . If one of the numbers is  $\frac{-4}{3}$ , find the other.

### Answer

Product of two rational numbers =  $\frac{-16}{9}$

One rational number =  $\frac{-4}{3}$

Let the other rational number = x

Now,

According to the question,

$$\frac{-4}{3} \times x = \frac{-16}{9}$$

$$\Rightarrow x = \frac{-16}{9} \div \frac{-4}{3}$$

$$\Rightarrow x = \frac{-16}{9} \times \frac{3}{-4}$$

$$\Rightarrow x = \frac{-16 \times 3}{9 \times -4}$$

$$\Rightarrow x = \frac{-48}{-36} = \frac{-48 \times -1}{-36 \times -1} = \frac{48}{36}$$

$$\Rightarrow x = \frac{48}{36} = \frac{48 \div 12}{36 \div 12} = \frac{4}{3}$$

Hence, the other rational number is  $\frac{4}{3}$

### 6. Question

By what rational number should we multiply  $\frac{-15}{56}$  to get  $\frac{-5}{7}$ ?

### Answer

Let x be multiplied by  $\frac{-15}{56}$  to get  $\frac{-5}{7}$

It can be written as,

$$\frac{-15}{56} \times x = \frac{-5}{7}$$

$$\Rightarrow x = \frac{-5}{7} \div \frac{-15}{56}$$

$$\Rightarrow x = \frac{-5}{7} \times \frac{56}{-15}$$

$$\Rightarrow x = \frac{-5 \times 56}{7 \times -15}$$

$$\Rightarrow x = \frac{-280}{-105} = \frac{-280 \times -1}{-105 \times -1} = \frac{280}{105}$$

$$\Rightarrow x = \frac{280}{105} = \frac{280 \times 35}{105 \times 35} = \frac{8}{3}$$

Hence, it should be multiplied by is  $\frac{8}{3}$

### 7. Question

By what rational number should  $\frac{-8}{39}$  be multiplied to obtain  $\frac{1}{26}$  ?

### Answer

Let x be multiplied by  $\frac{-8}{39}$  to get  $\frac{1}{26}$

It can be written as,

$$\frac{-8}{39} \times x = \frac{1}{26}$$

$$\Rightarrow x = \frac{1}{26} \div \frac{-8}{39}$$

$$\Rightarrow x = \frac{1}{26} \times \frac{39}{-8}$$

$$\Rightarrow x = \frac{1 \times 39}{26 \times -8}$$

$$\Rightarrow x = \frac{39}{-208} = \frac{39 \times -1}{-208 \times -1} = \frac{-39}{208}$$

$$\Rightarrow x = \frac{-39}{208} = \frac{-39 \div 13}{208 \div 13} = \frac{-3}{16}$$

Hence, it should be multiplied by is  $\frac{-3}{16}$

### 8. Question

By what number should  $\frac{-33}{8}$  be divided to get  $\frac{-11}{2}$  ?

### Answer

Let  $\frac{-33}{8}$  be divided by x to get  $\frac{-11}{2}$

It can be written as,

$$\frac{-33}{8} \div x = \frac{-11}{2}$$

$$\Rightarrow x = \frac{-33}{8} \div \frac{-11}{2}$$

$$\Rightarrow x = \frac{-33}{8} \times \frac{2}{-11}$$

$$\Rightarrow x = \frac{-33 \times 2}{8 \times -11}$$

$$\Rightarrow x = \frac{-66}{-88} = \frac{-66 \times -1}{-88 \times -1} = \frac{66}{88}$$

$$\Rightarrow x = \frac{66}{88} = \frac{66 \div 22}{88 \div 22} = \frac{3}{4}$$

Hence, it should be multiplied by is  $\frac{3}{4}$

### 9. Question

Divide the sum of  $\frac{13}{5}$  and  $\frac{-12}{7}$  by the product of  $\frac{-31}{7}$  and  $\frac{1}{-2}$ .

### Answer

Sum of  $\frac{13}{5}$  and  $\frac{-12}{7}$  -

$$\begin{aligned} & \frac{13}{5} + \frac{-12}{7} \\ &= \frac{13 \times 7 + (-12) \times 5}{35} \\ &= \frac{91 - 60}{35} \\ &= \frac{31}{35} \end{aligned}$$

Product of  $\frac{-31}{7}$  and  $\frac{1}{-2}$  -

$$\begin{aligned} & \frac{-31}{7} \times \frac{1}{-2} \\ &= \frac{-31 \times 1}{7 \times -2} \\ &= \frac{-31}{-14} \\ &= \frac{31}{14} \end{aligned}$$

Now,

According to the question,

$$\begin{aligned} & \frac{31}{35} \div \frac{31}{14} \\ &= \frac{31}{35} \times \frac{14}{31} \\ &= \frac{2}{5} \end{aligned}$$

### 10. Question

Divide the sum of  $\frac{65}{12}$  and  $\frac{8}{3}$  by their difference.

**Answer**

According to the question,

$$\begin{aligned}
 & \left( \frac{65}{12} + \frac{8}{3} \right) \div \left( \frac{65}{12} - \frac{8}{3} \right) \\
 &= \left( \frac{65 \times 1 + 8 \times 4}{12} \right) \div \left( \frac{65 \times 1 - 8 \times 4}{12} \right) \\
 &= \left( \frac{65 + 32}{12} \right) \div \left( \frac{65 - 32}{12} \right) \\
 &= \left( \frac{97}{12} \right) \div \left( \frac{33}{12} \right) \\
 &= \frac{97}{12} \times \frac{12}{33} \\
 &= \frac{97}{33}
 \end{aligned}$$

**11. Question**

Fill in the blanks:

$$(i) \frac{9}{8} \div (\dots) = \frac{-3}{2} \quad (ii) (\dots) \div \left( \frac{-7}{5} \right) = \frac{10}{19}$$

$$(iii) (\dots) \div (-3) = \frac{-4}{15} \quad (iv) (-12) \div (\dots) = \frac{-6}{5}$$

**Answer**

(i)

$$\frac{9}{8} \div x(\text{let}) = \frac{-3}{2}$$

$$\Rightarrow x = \frac{9}{8} \div \frac{-3}{2}$$

$$\Rightarrow x = \frac{9}{8} \times \frac{2}{-3}$$

$$\Rightarrow x = \frac{9 \times 2}{8 \times -3}$$

$$\Rightarrow x = \frac{18}{-24} = \frac{18 \times -1}{-24 \times -1} = \frac{-18}{24}$$

$$\Rightarrow x = \frac{-18}{24} = \frac{-18 \div 6}{24 \div 6} = \frac{-3}{4}$$

Therefore,

$$\frac{9}{8} \div \frac{-3}{4} = \frac{-3}{4}$$

(ii)

$$x(\text{let}) \div \frac{-7}{5} = \frac{10}{19}$$

$$\Rightarrow x = \frac{10}{19} \times \frac{-7}{5}$$

$$\Rightarrow x = \frac{10 \times -7}{19 \times 5}$$

$$\Rightarrow x = \frac{-70}{95} = \frac{-70 \div 5}{95 \div 5} = \frac{-14}{19}$$

Therefore,

$$\frac{-14}{19} \div \frac{-7}{5} = \frac{10}{19}$$

(iii)

$$x(\text{let}) \div (-3) = \frac{-4}{15}$$

$$\Rightarrow x = \frac{-4}{15} \times (-3)$$

$$\Rightarrow x = \frac{-4 \times -3}{15 \times 1}$$

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

Therefore,

$$\frac{4}{5} \div (-3) = \frac{-4}{15}$$

(iv)

$$-12 \div x(\text{let}) = \frac{-6}{5}$$

$$\Rightarrow x = -12 \div \frac{-6}{5}$$

$$\Rightarrow x = -12 \times \frac{5}{-6}$$

$$\Rightarrow x = \frac{-12 \times 5}{1 \times -6}$$

$$\Rightarrow x = \frac{-60}{-6} = \frac{-60 \times -1}{-6 \times -1} = \frac{60}{6}$$

$$\Rightarrow x = \frac{60}{6} = \frac{60 \div 6}{6 \div 6} = 10$$

Therefore,

$$-12 \div 10 = \frac{-6}{5}$$

## 12. Question

- (i) Are rational numbers always closed under division?
- (ii) Are rational numbers always commutative under division?
- (iii) Are rational numbers always associative under division?
- (iv) Can we divide 1 by 0?

## Answer

(i) No rational numbers are not always closed under division,

Since,  $\frac{a}{0} = \infty$  which is not a rational number

(ii) No rational numbers are not always commutative under division,

Let  $\frac{a}{b}$  and  $\frac{c}{d}$  be two rational numbers.

$$\frac{a}{b} \div \frac{c}{d} = \frac{ad}{bc}$$

And

$$\frac{c}{d} \div \frac{a}{b} = \frac{bc}{ad}$$

Therefore,

$$\frac{a}{b} \div \frac{c}{d} \neq \frac{c}{d} \div \frac{a}{b}$$

Hence, rational numbers are not always commutative under division

(iii) No rational numbers are not always associative under division,

Let  $\frac{a}{b}$ ,  $\frac{c}{d}$  and  $\frac{e}{f}$  be two rational numbers.

$$\frac{a}{b} \div \left( \frac{c}{d} \div \frac{e}{f} \right) = \frac{ade}{bcf}$$

And

$$\left( \frac{a}{b} \div \frac{c}{d} \right) \div \frac{e}{f} = \frac{adf}{bce}$$

Therefore,

$$\frac{a}{b} \div \left( \frac{c}{d} \div \frac{e}{f} \right) \neq \left( \frac{a}{b} \div \frac{c}{d} \right) \div \frac{e}{f}$$

Hence, rational numbers are not always associative under division.

(iv) No we cannot divide 1 by 0.

Since,  $\frac{a}{0} = \infty$  which is not defined.

## Exercise 1F

### 1. Question

Find a rational number between  $\frac{1}{4}$  and  $\frac{1}{3}$ .

## Answer

To find a rational number x between two rational numbers  $\frac{a}{b}$  and  $\frac{c}{d}$ , we use

$$x = \frac{1}{2} \left( \frac{a}{b} + \frac{c}{d} \right)$$

Therefore, to find rational number x (let) between  $\frac{1}{4}$  and  $\frac{1}{3}$

$$x = \frac{1}{2} \left( \frac{1}{4} + \frac{1}{3} \right)$$

$$\Rightarrow x = \frac{1}{2} \left( \frac{1 \times 3 + 1 \times 4}{12} \right)$$

$$\Rightarrow x = \frac{1}{2} \left( \frac{3 + 4}{12} \right)$$

$$\Rightarrow x = \frac{1}{2} \times \frac{7}{12}$$

$$\Rightarrow x = \frac{7}{24}$$

## 2. Question

Find a rational number between 2 and 3 .

### Answer

To find a rational number  $x$  between two rational numbers  $\frac{a}{b}$  and  $\frac{c}{d}$ , we use

$$x = \frac{1}{2} \left( \frac{a}{b} + \frac{c}{d} \right)$$

Therefore, to find rational number  $x$  (let) between 2 and 3

$$x = \frac{1}{2} (2 + 3)$$

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

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

## 3. Question

Find a rational number between  $\frac{-1}{3}$  and  $\frac{1}{2}$ .

### Answer

To find a rational number  $x$  between two rational numbers  $\frac{a}{b}$  and  $\frac{c}{d}$ , we use

$$x = \frac{1}{2} \left( \frac{a}{b} + \frac{c}{d} \right)$$

Therefore, to find rational number  $x$  (let) between  $\frac{-1}{3}$  and  $\frac{1}{2}$

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

$$\Rightarrow x = \frac{1}{2} \left( \frac{-1 \times 2 + 1 \times 3}{6} \right)$$

$$\Rightarrow x = \frac{1}{2} \left( \frac{-2 + 3}{6} \right)$$

$$\Rightarrow x = \frac{1}{2} \times \frac{1}{6}$$



$$\Rightarrow x = \frac{1}{12}$$

#### 4. Question

Find two rational numbers between  $-3$  and  $-2$ .

#### Answer

To find a rational number  $x$  between two rational numbers  $\frac{a}{b}$  and  $\frac{c}{d}$ , we use

$$x = \frac{1}{2} \left( \frac{a}{b} + \frac{c}{d} \right)$$

Therefore, to find rational number  $x$  (let) between  $-3$  and  $-2$

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

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

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

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

Now if we find a rational number between  $\frac{-5}{2}$  and  $-2$  it will also be between  $-3$  and  $-2$  since  $\frac{-5}{2}$  lies between  $-3$  and  $-2$

Therefore, to find rational number  $y$  (let) between  $\frac{-5}{2}$  and  $-2$

$$y = \frac{1}{2} \left( \frac{-5}{2} + (-2) \right)$$

$$\Rightarrow y = \frac{1}{2} \left( \frac{-5}{2} - 2 \right)$$

$$\Rightarrow y = \frac{1}{2} \left( \frac{-5 - 4}{2} \right)$$

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

#### 5. Question

Find three rational numbers between  $4$  and  $5$ .

#### Answer

To find a rational number  $x$  between two rational numbers  $\frac{a}{b}$  and  $\frac{c}{d}$ , we use

$$x = \frac{1}{2} \left( \frac{a}{b} + \frac{c}{d} \right)$$

Therefore, to find rational number  $x$  (let) between  $4$  and  $5$

$$x = \frac{1}{2} (4 + 5)$$

$$\Rightarrow x = \frac{1}{2} \times 9$$

$$\Rightarrow x = \frac{9}{2}$$

Now if we find a rational number between 4 and  $\frac{9}{2}$  it will also be between 4 and 5 since  $\frac{9}{2}$  lies between 4 and 5

Therefore, to find rational number y (let) between 4 and  $\frac{9}{2}$

$$y = \frac{1}{2} \left( 4 + \frac{9}{2} \right)$$

$$\Rightarrow y = \frac{1}{2} \left( \frac{8+9}{2} \right)$$

$$\Rightarrow y = \frac{1}{2} \times \frac{17}{2}$$

$$\Rightarrow y = \frac{17}{4}$$

Now if we find a rational number between  $\frac{9}{2}$  and 5 it will also be between 4 and 5 since  $\frac{9}{2}$  lies between 4 and 5

Therefore, to find rational number z (let) between  $\frac{9}{2}$  and 5

$$z = \frac{1}{2} \left( \frac{9}{2} + 5 \right)$$

$$\Rightarrow z = \frac{1}{2} \left( \frac{9+10}{2} \right)$$

$$\Rightarrow z = \frac{1}{2} \times \frac{19}{2}$$

$$\Rightarrow z = \frac{19}{4}$$

## 6. Question

Find three rational numbers between  $\frac{2}{3}$  and  $\frac{3}{4}$ .

## Answer

To find a rational number x between two rational numbers  $\frac{a}{b}$  and  $\frac{c}{d}$ , we use

$$x = \frac{1}{2} \left( \frac{a}{b} + \frac{c}{d} \right)$$

Therefore, to find rational number x (let) between  $\frac{2}{3}$  and  $\frac{3}{4}$

$$x = \frac{1}{2} \left( \frac{2}{3} + \frac{3}{4} \right)$$

$$\Rightarrow x = \frac{1}{2} \left( \frac{8+9}{12} \right)$$

$$\Rightarrow x = \frac{1}{2} \times \frac{17}{12}$$

$$\Rightarrow x = \frac{17}{24}$$

Now if we find a rational number between  $\frac{2}{3}$  and  $\frac{17}{24}$  it will also be between  $\frac{2}{3}$  and  $\frac{3}{4}$  since  $\frac{17}{24}$  lies between  $\frac{2}{3}$  and  $\frac{3}{4}$

Therefore, to find rational number y (let) between  $\frac{2}{3}$  and  $\frac{17}{24}$

$$y = \frac{1}{2} \left( \frac{2}{3} + \frac{17}{24} \right)$$

$$\Rightarrow y = \frac{1}{2} \left( \frac{16 + 17}{24} \right)$$

$$\Rightarrow y = \frac{1}{2} \times \frac{33}{24}$$

$$\Rightarrow y = \frac{33}{48}$$

Now if we find a rational number between  $\frac{17}{24}$  and  $\frac{3}{4}$  it will also be between  $\frac{2}{3}$  and  $\frac{3}{4}$  since  $\frac{17}{24}$  lies between  $\frac{2}{3}$  and  $\frac{3}{4}$

Therefore, to find rational number z (let) between  $\frac{17}{24}$  and  $\frac{3}{4}$

$$z = \frac{1}{2} \left( \frac{17}{24} + \frac{3}{4} \right)$$

$$\Rightarrow z = \frac{1}{2} \left( \frac{17 + 18}{24} \right)$$

$$\Rightarrow z = \frac{1}{2} \times \frac{35}{24}$$

$$\Rightarrow z = \frac{35}{48}$$

## 7. Question

Find 10 rational numbers between  $-\frac{3}{4}$  and  $\frac{5}{6}$ .

### Answer

We can write  $-\frac{3}{4}$  as  $-\frac{9}{12}$  (Since,  $-\frac{3}{4} = \frac{-3 \times 3}{4 \times 3} = -\frac{9}{12}$ )

And,

We can write  $\frac{5}{6}$  as  $\frac{10}{12}$  (Since,  $\frac{5}{6} = \frac{5 \times 2}{6 \times 2} = \frac{10}{12}$ )

Now clearly, rational numbers between them are,

$-\frac{8}{12}, -\frac{7}{12}, -\frac{6}{12}, -\frac{5}{12}, -\frac{4}{12}, -\frac{3}{12}, -\frac{2}{12}, -\frac{1}{12}, 0, \frac{1}{12}, \frac{2}{12}, \frac{3}{12}, \frac{4}{12}, \frac{5}{12}, \frac{6}{12}, \frac{7}{12}, \frac{8}{12}$  and  $\frac{9}{12}$

Any 10 rational numbers are,

$-\frac{8}{12}, -\frac{7}{12}, -\frac{6}{12}, -\frac{5}{12}, -\frac{4}{12}, -\frac{3}{12}, -\frac{2}{12}, -\frac{1}{12}, 0$ , and  $\frac{1}{12}$

## 8. Question

Find 12 rational numbers between -1 and 2.

### Answer

We can write  $-1$  as  $-\frac{10}{10}$  (Since,  $-\frac{1}{1} = \frac{-1 \times 10}{1 \times 10} = -\frac{10}{10}$ )

And,

We can write 2 as  $\frac{20}{10}$  (Since,  $2 = \frac{2 \times 10}{1 \times 10} = \frac{20}{10}$ )

Now clearly any 12 rational numbers between -1 and 2 are,

$$\frac{-9}{10}, \frac{-8}{10}, \frac{-7}{10}, \frac{-6}{10}, \frac{-5}{10}, \frac{-4}{10}, \frac{-3}{10}, \frac{-2}{10}, \frac{-1}{10}, 0, \frac{1}{10} \text{ and } \frac{2}{10}$$

## Exercise 1G

### 1. Question

From a rope 11 m long. two pieces of lengths  $2\frac{3}{5}$  m and  $3\frac{3}{10}$  m are cut off. What is the length of remaining rope?

### Answer

Length of rope = 11 m

Length of first piece cut =  $2\frac{3}{5}$  m

Length of second piece cut =  $3\frac{3}{10}$  m

Total length cut = Length of first piece cut + Length of second piece cut

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

$$= \frac{13}{5} \text{ m} + \frac{33}{10} \text{ m}$$

$$= \frac{26 + 33}{10} \text{ m}$$

$$= \frac{59}{10} \text{ m}$$

Length of remaining rope = Length of rope - Total length cut

$$= 11 \text{ m} - \frac{59}{10} \text{ m}$$

$$= \frac{110 - 59}{10} \text{ m}$$

$$= \frac{51}{10} \text{ m}$$

$$= 5\frac{1}{10} \text{ m}$$

Hence, Length of remaining rope =  $5\frac{1}{10}$  m

### 2. Question

A drum full of rice weight  $40\frac{1}{6}$  kg. If the empty drum weight  $13\frac{3}{4}$  kg. Find the weight of rice in the drum.

### Answer

Weight of drum full of rice =  $40\frac{1}{6}$  kg

Weight of empty drum =  $13\frac{3}{4}$  kg

Weight of rice Weight of drum full of rice - Weight of empty drum

$$= 40\frac{1}{6} \text{ kg} - 13\frac{3}{4} \text{ kg}$$

$$= \frac{241}{6} \text{ kg} - \frac{55}{4} \text{ kg}$$

$$= \frac{482 - 165}{12} \text{ kg}$$

$$= \frac{317}{12} \text{ kg}$$

$$= 26\frac{5}{12} \text{ kg}$$

Hence, Weight of rice =  $26\frac{5}{12}$  kg

### 3. Question

A basket contains three types of fruits weight  $19\frac{1}{3}$  kg in all. If  $8\frac{1}{9}$  kg of these be apples,  $3\frac{1}{6}$  kg be oranges and the rest pears, what is the weight of the pears in the basket?

### Answer

Weight of basket with three types of fruits =  $19\frac{1}{3}$  kg

Weight of apples =  $8\frac{1}{9}$  kg

Weight of oranges =  $3\frac{1}{6}$  kg

Weight of pears = Weight of basket with three types of fruits - (Weight of apples + Weight of oranges )

$$= 19\frac{1}{3} \text{ kg} - (8\frac{1}{9} \text{ kg} + 3\frac{1}{6} \text{ kg})$$

$$= \frac{58}{3} \text{ kg} - (\frac{73}{9} \text{ kg} + \frac{19}{6} \text{ kg})$$

$$= \frac{58}{3} \text{ kg} - (\frac{146 + 57}{18} \text{ kg})$$

$$= \frac{58}{3} \text{ kg} - \frac{203}{18} \text{ kg}$$

$$= \frac{348 - 203}{18} \text{ kg}$$

$$= \frac{145}{18} \text{ kg}$$

$$= 8\frac{1}{18} \text{ kg}$$

Hence, Weight of pears =  $8\frac{1}{18}$  kg

### 4. Question

On one day a rickshaw puller earned Rs. 160. Out of his earnings he spent  $26\frac{3}{5}$  on tea and snacks, Rs.  $50\frac{1}{2}$  on food and Rs.  $16\frac{2}{5}$  on repairs of the rickshaw. How much did he save on that day?

**Answer**

Total Earnings = Rs 160

Spend on tea and snacks = Rs  $26\frac{3}{5}$

Spend on food = Rs  $50\frac{1}{2}$

Spend on repairs = Rs  $16\frac{2}{5}$

Total Expenditure = Spend on tea and snacks + Spend on food + Spend on repairs

$$= \text{Rs } 26\frac{3}{5} + \text{Rs } 50\frac{1}{2} + \text{Rs } 16\frac{2}{5}$$

$$= \text{Rs } \frac{133}{5} + \text{Rs } \frac{101}{2} + \text{Rs } \frac{82}{5}$$

$$= \text{Rs } \frac{266 + 505 + 164}{10}$$

$$= \text{Rs } \frac{935}{10}$$

Savings = Total Earnings - Total Expenditure

$$= \text{Rs } 160 - \text{Rs } \frac{935}{10}$$

$$= \text{Rs } \frac{1600 - 935}{10}$$

$$= \text{Rs } \frac{665}{10}$$

$$= \text{Rs } 66\frac{1}{2}$$

Hence, Savings = Rs  $66\frac{1}{2}$

**5. Question**

Find the cost of  $3\frac{2}{5}$  meters of cloth at Rs.  $63\frac{3}{4}$  per meter.

**Answer**

Cost of cloth per meter = Rs  $63\frac{3}{4}$

Total meters =  $3\frac{2}{5}$  m

Cost of total cloth = Cost of cloth per meter × Total meters

$$= \text{Rs } 63\frac{3}{4} \times 3\frac{2}{5} \text{ m}$$

$$= \text{Rs } \frac{255}{4} \times \frac{17}{5}$$

$$= \text{Rs } \frac{4335}{20} = \frac{4335 \div 5}{20 \div 5} = \frac{867}{4}$$

$$= \text{Rs } 216\frac{3}{4}$$

Therefore, total cost = **Rs 216 $\frac{3}{4}$**

## 6. Question

A car is moving at an average speed of  $60\frac{2}{5}$  km/hr. How much distance will it cover in  $6\frac{1}{4}$  hours?

## Answer

Speed of car =  $60\frac{2}{5}$  km/hr

Total hours =  $6\frac{1}{4}$  hrs

Total Distance = Speed of car  $\times$  Total hours

$$= 60\frac{2}{5} \text{ km/hr} \times 6\frac{1}{4} \text{ hrs}$$

$$= \frac{302}{5} \text{ km/hr} \times \frac{25}{4} \text{ hrs}$$

$$= \frac{7550}{20} \text{ km}$$

$$= \frac{755}{2} \text{ km}$$

$$= 377\frac{1}{2} \text{ km}$$

Therefore, Total Distance =  $377\frac{1}{2}$  km

## 7. Question

Find the area of a rectangular park which is  $36\frac{3}{5}$  m long and  $16\frac{2}{3}$  m board.

## Answer

Length of park =  $36\frac{3}{5}$  m

Breadth of park =  $16\frac{2}{3}$  m

Area of park = Length of park  $\times$  Breadth of park

$$= 36\frac{3}{5} \text{ m} \times 16\frac{2}{3} \text{ m}$$

$$= \frac{183}{5} \text{ m} \times \frac{50}{3} \text{ m}$$

$$= \frac{183 \times 50}{5 \times 3} \text{ m}$$

$$= \frac{9150}{15} \text{ m}^2$$

$$= 610 \text{ m}^2$$

Hence, Area of park =  $610 \text{ m}^2$

### 8. Question

Find the area of square plot of land whose each side measure  $8\frac{1}{2}$  meters.

### Answer

$$\text{Side of plot} = 8\frac{1}{2} \text{ m}$$

Area of plot = Side of plot  $\times$  Side of plot

$$= 8\frac{1}{2} \text{ m} \times 8\frac{1}{2} \text{ m}$$

$$= \frac{17}{2} \text{ m} \times \frac{17}{2} \text{ m}$$

$$= \frac{17 \times 17}{2 \times 2} \text{ m}$$

$$= \frac{289}{4} \text{ m}^2$$

$$= 72\frac{1}{4} \text{ m}^2$$

Hence, Area of plot =  $72\frac{1}{4} \text{ m}^2$

### 9. Question

One liters of petrol costs Rs.  $63\frac{3}{4}$ . What is the cost of 34 liters of petrol?

### Answer

$$\text{Cost of one litre petrol} = \text{Rs } 63\frac{3}{4} = \text{Rs } \frac{255}{4}$$

Cost of 34 litre petrol = 34  $\times$  Cost of one litre petrol

$$= 34 \times \text{Rs } \frac{255}{4}$$

$$= \text{Rs } \frac{34 \times 255}{4}$$

$$= \text{Rs } \frac{8670}{4}$$

$$= \text{Rs } \frac{4335}{2}$$

$$= \text{Rs } 2167\frac{1}{2}$$

Cost of 34 litre petrol =  $\text{Rs } 2167\frac{1}{2}$



### 10. Question

An aeroplane covers 1020 km in an hour. How much distance will it cover in  $4\frac{1}{6}$  hours?

### Answer

Distance covered in one hour = 1020 km

Distance covered in  $4\frac{1}{6}$  hours =  $4\frac{1}{6} \times$  Distance covered in one hour

$$= 4\frac{1}{6} \times 1020 \text{ km}$$

$$= \frac{25}{6} \times 1020 \text{ km}$$

$$= \frac{25 \times 1020}{6} \text{ km}$$

$$= \frac{25500}{6} \text{ km}$$

$$= 4250 \text{ km}$$

Distance covered in  $4\frac{1}{6}$  hours = 4250 km

### 11. Question

The cost of  $3\frac{1}{2}$  meters of cloth is Rs.  $166\frac{1}{4}$ . What is the cost of one metre of cloth?

### Answer

Cost of  $3\frac{1}{2}$  m of cloth = Rs  $166\frac{1}{4}$

Cost of 1 m of cloth = Cost of  $3\frac{1}{2}$  m of cloth  $\div 3\frac{1}{2}$

$$= \text{Rs } 166\frac{1}{4} \div 3\frac{1}{2}$$

$$= \text{Rs } \frac{665}{4} \div \frac{7}{2}$$

$$= \text{Rs } \frac{665}{4} \times \frac{2}{7}$$

$$= \text{Rs } \frac{1330}{28}$$

$$= \text{Rs } 47\frac{1}{2}$$

Cost of 1 m of cloth = Rs  $47\frac{1}{2}$

### 12. Question

A cord of length  $71\frac{1}{2}$  m has been cut into 26 pieces of equal length. What is the length of each piece?

### Answer

$$\text{Length of cord} = 71\frac{1}{2}\text{m}$$

$$\text{No of pieces} = 26$$

$$\text{Length of each piece} = \text{Length of cord} \div \text{No of pieces}$$

$$= 71\frac{1}{2}\text{m} \div 26$$

$$= \frac{143}{2}\text{m} \div 26$$

$$= \frac{143}{2}\text{m} \times \frac{1}{26}$$

$$= \frac{143}{2}\text{m} \times \frac{1}{26}$$

$$= \frac{143}{2 \times 26}\text{m}$$

$$= \frac{143}{52}\text{m}$$

$$= \frac{11}{4}\text{m}$$

$$= 2\frac{3}{4}\text{m}$$

$$\text{Length of each piece} = 2\frac{3}{4}\text{m}$$

### 13. Question

The area of a room is  $65\frac{1}{4}m^2$ . If its breadth is  $5\frac{7}{16}$  meters, what is its length?

### Answer

$$\text{Area of room} = 65\frac{1}{4}m^2$$

$$\text{Breadth of room} = 5\frac{7}{16}\text{m}$$

$$\text{Length of room} = \text{Area of room} \div \text{Breadth of room}$$

$$= 65\frac{1}{4}m^2 \div 5\frac{7}{16}\text{m}$$

$$= \frac{261}{4}m^2 \div \frac{87}{16}\text{m}$$

$$= \frac{261}{4}m^2 \times \frac{16}{87}\text{m}$$

$$= \frac{4176}{348}\text{m}$$

$$= 12\text{m}$$

$$\text{Length of room} = 12\text{m}$$

### 14. Question

The product of two fractions is  $9\frac{3}{5}$ . If one of the fractions is  $9\frac{3}{7}$ , find the other.

**Answer**

$$\text{Product of two fractions} = 9\frac{3}{5}$$

$$\text{First fraction} = 9\frac{3}{7}$$

$$\text{Second fraction} = \text{Product of two fractions} \div \text{First fraction}$$

$$= 9\frac{3}{5} \div 9\frac{3}{7}$$

$$= \frac{48}{5} \div \frac{66}{7}$$

$$= \frac{48}{5} \times \frac{7}{66}$$

$$= \frac{336}{330}$$

$$= \frac{56}{55}$$

$$= 1\frac{1}{55}$$

$$\text{Second fraction} = 1\frac{1}{55}$$

**15. Question**

In a school,  $\frac{5}{8}$  of the students are boys. If there are 240 girls, find the number of boys in the school.

**Answer**

$$\text{Fraction of boys} = \frac{5}{8}$$

$$\text{Fraction of girls} = 1 - \frac{5}{8} = \frac{3}{8}$$

$$\text{Number of girls} = 240$$

$$\text{Number of girls} = \text{Total students} \times \frac{3}{8}$$

$$\Rightarrow 240 = \text{Total students} \times \frac{3}{8}$$

$$\Rightarrow \text{Total students} = 240 \div \frac{3}{8}$$

$$= 240 \times \frac{8}{3}$$

$$= \frac{240 \times 8}{3}$$

$$= \frac{1920}{3} = 640$$

$$\text{Total students} = 640$$

Number of boys = Total students - Number of girls

$$= 640 - 240 = 400$$

Number of boys = 400

### 16. Question

After reading  $\frac{7}{9}$  of a book, 40 pages are left. How many pages are there in the book?

### Answer

$$\text{Fraction read} = \frac{7}{9}$$

$$\text{Fraction left} = 1 - \frac{7}{9} = \frac{2}{9}$$

$$\text{Pages left} = 40$$

$$\text{Pages left} = \frac{2}{9} \times \text{Total pages}$$

$$40 = \frac{2}{9} \times \text{Total pages}$$

$$\Rightarrow \text{Total pages} = 40 \div \frac{2}{9}$$

$$= 40 \times \frac{9}{2}$$

$$= 180$$

$$\text{Total pages} = 180$$

### 17. Question

Rita had Rs. 300. She spent  $\frac{1}{3}$  of her money on notebooks and  $\frac{1}{4}$  of the remainder on stationary items. How much money is left with her?

### Answer

$$\text{Total money} = \text{Rs } 300$$

$$\text{Fraction spent on notebooks} = \frac{1}{3}$$

$$\text{Amount spent on notebooks} = \frac{1}{3} \times 300 = \text{Rs } 100$$

$$\text{Amount left} = \text{Rs } 300 - \text{Rs } 100 = \text{Rs } 200$$

$$\text{Fraction spent on stationary} = \frac{1}{4}$$

$$\text{Amount spent on stationary} = \frac{1}{4} \times 200 = \text{Rs } 50$$

$$\text{Money left} = \text{Rs } 300 - \text{Rs } 150 = \text{Rs } 150$$

### 18. Question

Amit earns Rs. 32000 per month. He spends  $\frac{1}{4}$  of his income on food;  $\frac{3}{10}$  of the remainder on house rent and

$\frac{5}{21}$  of the remainder on the education of children. How much money is still left with him?

**Answer**

Total earnings = Rs 32000

Amount spend on food =  $\frac{1}{4} \times \text{Rs } 32000 = \text{Rs } 8000$

Amount left = Rs 32000 - Rs 8000 = Rs 24000

Amount spend on house rent =  $\frac{3}{10} \times \text{Rs } 24000 = \text{Rs } 7200$

Amount left = Rs 24000 - Rs 7200 = Rs 16800

Amount spend on education =  $\frac{5}{21} \times \text{Rs } 16800 = \text{Rs } 4000$

Amount left = Rs 16800 - Rs 4000 = Rs 12800

Money left = Rs 12800

**19. Question**

If  $\frac{3}{5}$  of a number exceeds its  $\frac{2}{7}$  by 44, find the number.

**Answer**

Let the number be x

$$\frac{3}{5} \text{ of } x = \frac{3}{5}x$$

$$\frac{2}{7} \text{ of } x = \frac{2}{7}x$$

According to the question,

$$\frac{3}{5}x - \frac{2}{7}x = 44$$

$$\Rightarrow \frac{3x \times 7 - 2x \times 5}{35} = 44$$

$$\Rightarrow \frac{21x - 10x}{35} = 44$$

$$\Rightarrow \frac{11}{35} \times x = 44$$

$$\Rightarrow x = 44 \div \frac{11}{35}$$

$$\Rightarrow x = 44 \times \frac{35}{11}$$

$$\Rightarrow x = \frac{1540}{11}$$

$$\Rightarrow x = 140$$

The number is 140

**20. Question**

At a cricket test match  $\frac{2}{7}$  of the spectators were in a covered place while 15000 were in open. Find the total number of spectators.

**Answer**

$$\text{Fraction of spectators covered} = \frac{2}{7}$$

$$\text{Fraction left} = 1 - \frac{2}{7} = \frac{7-2}{7} = \frac{5}{7}$$

$$\text{Number of spectators in open} = 15000$$

According to the question,

$$\text{Number of spectators in open} = \text{Total number of spectators} \times \frac{5}{7}$$

$$\Rightarrow 15000 = \frac{5}{7} \times \text{Total number of spectators}$$

$$\Rightarrow \text{Total number of spectators} = 15000 \div \frac{5}{7}$$

$$\Rightarrow \text{Total number of spectators} = 15000 \times \frac{7}{5}$$

$$\Rightarrow \text{Total number of spectators} = 21000$$

**Exercise 1H****1. Question**

$$\left( \frac{-5}{16} + \frac{7}{12} \right) = ?$$

Options A.  $-\frac{7}{48}$

B.  $\frac{1}{24}$

C.  $\frac{13}{48}$

D.  $\frac{1}{3}$

**Answer**

$$\frac{-5}{16} + \frac{7}{12}$$

$$\text{LCM of 12 and 16} = 48$$

$$= \frac{-5 \times 3 + 7 \times 4}{48}$$

$$= \frac{-15 + 28}{48}$$

$$= \frac{13}{48}$$

**2. Question**

$$\left( \frac{8}{-15} + \frac{4}{-3} \right) = ?$$

Options A.  $\frac{28}{15}$

B.  $\frac{-28}{15}$

C.  $\frac{-4}{5}$

D.  $\frac{-4}{15}$

**Answer**

$$\frac{8}{-15} = \frac{8 \times -1}{-15 \times -1} = \frac{-8}{15}$$

And,

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

$$\Rightarrow \frac{8}{-15} + \frac{4}{-3} = \frac{-8}{15} + \frac{-4}{3}$$

$$= \frac{-8 \times 3 + (-4) \times 15}{45}$$

$$= \frac{-24 - 60}{45}$$

$$= \frac{-84}{45} = \frac{-84 \div 3}{45 \div 3} = \frac{-28}{15}$$

**3. Question**

$$\left( \frac{7}{-26} + \frac{16}{39} \right) = ?$$

Options A.  $\frac{11}{78}$

B.  $\frac{-11}{78}$

C.  $\frac{11}{39}$

D.  $\frac{-11}{39}$

**Answer**

$$\frac{7}{-26} = \frac{7 \times -1}{-26 \times -1} = \frac{-7}{26}$$

$$\Rightarrow \frac{7}{-26} + \frac{16}{39} = \frac{-7}{26} + \frac{16}{39}$$

$$= \frac{-7 \times 3 + 16 \times 2}{78}$$

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

$$= \frac{11}{78}$$

#### 4. Question

$$\left( 3 + \frac{5}{-7} \right) = ?$$

Options A.  $\frac{-16}{7}$

B.  $\frac{16}{7}$

C.  $\frac{-26}{7}$

D.  $\frac{-8}{7}$

#### Answer

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

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

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

$$= \frac{3 \times 7 + (-5) \times 1}{7}$$

$$= \frac{21 - 5}{7}$$

$$= \frac{16}{7}$$

#### 5. Question

$$\left( \frac{31}{-4} + \frac{-5}{8} \right) = ?$$

Options A.  $\frac{67}{8}$



B.  $\frac{57}{8}$

C.  $\frac{-57}{8}$

D.  $\frac{-67}{8}$

**Answer**

$$\frac{31}{-4} = \frac{31 \times -1}{-4 \times -1} = \frac{-31}{4}$$

$$\Rightarrow \frac{31}{-4} + \frac{-5}{8} = \frac{-31}{4} + \frac{-5}{8}$$

$$= \frac{-31 \times 2 + (-5) \times 1}{8}$$

$$= \frac{-62 - 5}{8}$$

$$= \frac{-67}{8}$$

**6. Question**

What should be added to  $\frac{7}{12}$  to get  $\frac{-4}{15}$ ?

Options A.  $\frac{17}{20}$

B.  $\frac{-17}{20}$

C.  $\frac{7}{20}$

D.  $\frac{-7}{20}$

**Answer**

Let the number added be x.

Then,

$$\frac{7}{12} + x = \frac{-4}{15}$$

$$\Rightarrow x = \frac{-4}{15} - \frac{7}{12}$$

$$= \frac{-4 \times 4 - 7 \times 5}{60}$$

$$= \frac{-16 - 35}{8}$$

$$= \frac{-51}{60} = \frac{-51 \div 3}{60 \div 3} = \frac{-17}{20}$$

### 7. Question

$$\left( \frac{2}{3} + \frac{-4}{5} + \frac{7}{15} + \frac{-11}{20} \right) = ?$$

Options A.  $\frac{-1}{5}$

B.  $\frac{-4}{15}$

C.  $\frac{-13}{60}$

D.  $\frac{-7}{30}$

### Answer

$$\frac{2}{3} + \frac{-4}{5} + \frac{7}{15} + \frac{-11}{20}$$

LCM of 3, 5, 15, 20

$$= \frac{2 \times 20 + (-4) \times 12 + 7 \times 4 + (-11) \times 3}{60}$$

$$= \frac{40 - 48 + 28 - 33}{60}$$

$$= \frac{68 - 81}{60}$$

$$= \frac{-31}{60}$$

### 8. Question

The sum of two numbers is  $\frac{-4}{7}$  to get  $\frac{5}{6}$ ?

Options A.  $\frac{5}{2}$

B.  $\frac{3}{2}$

C.  $\frac{5}{4}$

D.  $\frac{-5}{2}$

**Answer**

Let the number added be x.

Then,

$$\frac{5}{6} + x = \frac{-4}{7}$$

$$\Rightarrow x = \frac{-4}{7} - \frac{5}{6}$$

$$= \frac{-4 \times 6 - 5 \times 7}{42}$$

$$= \frac{-24 - 35}{42}$$

$$= \frac{-59}{42}$$

**9. Question**

What should be added to  $\frac{-5}{7}$  to get  $\frac{-2}{3}$  ?

Options A.  $\frac{-29}{21}$

B.  $\frac{29}{21}$

C.  $\frac{1}{21}$

D.  $\frac{-1}{21}$

**Answer**

Let the number added be x.

Then,

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

$$\Rightarrow x = \frac{-2}{3} - \frac{-5}{7}$$

$$= \frac{-2 \times 7 - (-5) \times 3}{21}$$

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

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

**10. Question**

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

Options A.  $\frac{5}{2}$

B.  $\frac{3}{2}$

C.  $\frac{5}{4}$

D.  $\frac{-5}{2}$

**Answer**

Let the number subtracted be x.

Then,

$$\frac{-5}{3} - x = \frac{5}{6}$$

$$\Rightarrow x = \frac{-5}{3} - \frac{5}{6}$$

$$= \frac{-5 \times 2 - 5 \times 1}{6}$$

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

$$= \frac{-15}{6} = \frac{-15 \div 3}{6 \div 3} = \frac{-5}{2}$$

**11. Question**

$$\left(\frac{-3}{7}\right)^{-1} = ?$$

Options A.  $\frac{7}{3}$

B.  $\frac{-7}{3}$

C.  $\frac{3}{7}$

D. none of these

**Answer**

We know, For any real number  $a \neq 0$ ,  $a^{-1} = \frac{1}{a}$  So,  $\left(\frac{-3}{7}\right)^{-1} = \frac{7}{-3} = \frac{7 \times -1}{-3 \times -1} = \frac{-7}{3}$

**12. Question**

The product of two rational numbers is  $\frac{-28}{81}$ . If one of the numbers is  $\frac{14}{27}$  then the other one is

Options A.  $\frac{-2}{3}$

B.  $\frac{2}{3}$

C.  $\frac{3}{2}$

D.  $\frac{-3}{2}$

**Answer**

Let the other number be x.

Then,

$$\frac{14}{27} \times x = \frac{-28}{81}$$

$$\Rightarrow x = \frac{-28}{81} \div \frac{14}{27}$$

$$\Rightarrow x = \frac{-28}{81} \times \frac{27}{14}$$

$$\Rightarrow x = \frac{-756}{1134} = \frac{-756 \div 378}{1134 \div 378} = \frac{-2}{3}$$

**13. Question**

The product of two numbers is  $\frac{-16}{35}$ . If one of the numbers is  $\frac{-15}{14}$ , the other is

Options A.  $\frac{-2}{5}$

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

C.  $\frac{32}{75}$

D.  $\frac{-8}{3}$

**Answer**

Let the other number be x.

Then,

$$\frac{-15}{14} \times x = \frac{-16}{35}$$

$$\Rightarrow x = \frac{-16}{35} \div \frac{-15}{14}$$

$$\Rightarrow x = \frac{-16}{35} \times \frac{14}{-15}$$

$$\Rightarrow x = \frac{-224}{-525} = \frac{-224 \times -1}{-525 \times -1} = \frac{224}{525}$$

$$\Rightarrow x = \frac{224}{525} = \frac{224 \div 7}{525 \div 7} = \frac{32}{75}$$

#### 14. Question

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

Options A.  $\frac{-7}{5}$

B.  $\frac{-13}{5}$

C.  $\frac{13}{5}$

D.  $\frac{7}{5}$

#### Answer

Let the number subtracted be x.

Then,

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

$$\Rightarrow x = \frac{-3}{5} - \frac{-2}{1}$$

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

$$\Rightarrow x = \frac{-3 + 10}{5}$$

$$\Rightarrow x = \frac{7}{5}$$

#### 15. Question

The sum of two rational numbers is  $-3$ . If one of them is  $\frac{-10}{3}$  then the other one is

Options A.  $\frac{-13}{3}$

B.  $\frac{-19}{3}$

C.  $\frac{1}{3}$

D.  $\frac{13}{3}$

**Answer**

Let the other number be x.

Then,

$$\frac{-10}{3} + x = \frac{-3}{1}$$

$$\Rightarrow x = \frac{-3}{1} - \frac{-10}{3}$$

$$\Rightarrow x = \frac{-3 \times 3 - (-10) \times 1}{3}$$

$$\Rightarrow x = \frac{-9 + 10}{3}$$

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

**16. Question**

Which of the following numbers is in standard form?

Options A.  $\frac{-12}{26}$

B.  $\frac{-49}{71}$

C.  $\frac{-9}{16}$

D.  $\frac{28}{-105}$

**Answer**

$\frac{-12}{26}$  is not in standard form since 12 and 26 have a common divisor 2.

$\frac{28}{-105}$  is not in standard form since its denominator is negative.

Therefore, only  $\frac{-49}{71}$  and  $\frac{-9}{16}$  are in standard forms as their numerator and denominator have no common divisor and their denominators are positive.

**17. Question**

$$\left(\frac{-9}{16} \times \frac{8}{15}\right) = ?$$

Options A.  $\frac{-3}{10}$

B.  $\frac{-4}{15}$

C.  $\frac{-9}{25}$

D.  $\frac{-2}{5}$

**Answer**

$$\frac{-9}{16} \times \frac{8}{15}$$

$$= \frac{-9 \times 8}{16 \times 15}$$

$$= \frac{-72}{240} = \frac{-72 \div 24}{240 \div 24} = \frac{-3}{10}$$

**18. Question**

$$\left(\frac{-5}{9} \div \frac{2}{3}\right) = ?$$

Options A.  $\frac{-5}{2}$

B.  $\frac{-5}{6}$

C.  $\frac{-10}{27}$

D.  $\frac{-6}{5}$

**Answer**

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

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

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

$$= \frac{-15}{18} = \frac{-15 \div 3}{18 \div 3} = \frac{-5}{6}$$



**19. Question**

$$\frac{4}{9} \div ? = \frac{-18}{15}$$

Options A.  $\frac{-32}{45}$

B.  $\frac{-8}{5}$

C.  $\frac{-9}{10}$

D.  $\frac{-5}{6}$

**Answer**

$$\frac{4}{9} \div x = \frac{-8}{15}$$

$$\Rightarrow x = \frac{4}{9} \div \frac{-8}{15}$$

$$\Rightarrow x = \frac{4}{9} \times \frac{15}{-8}$$

$$\Rightarrow x = \frac{4 \times 15}{9 \times -8}$$

$$\Rightarrow x = \frac{60}{-72} = \frac{60 \times -1}{-72 \times -1} = \frac{-60}{72}$$

$$\Rightarrow x = \frac{-60}{72} = \frac{-60 \div 6}{72 \div 6} = \frac{-5}{6}$$

**20. Question**

Additive inverse of  $\frac{-5}{9}$  is

Options A.  $\frac{-9}{5}$

B. 0

C.  $\frac{5}{9}$

D.  $\frac{9}{5}$

**Answer**

Additive inverse of a number  $\frac{a}{b}$  is the number  $-\frac{a}{b}$  such that,  $\frac{a}{b} + \left(\frac{-a}{b}\right) = 0$

Therefore,

Additive inverse of  $\frac{-5}{9}$  is  $\frac{5}{9}$

### 21. Question

Reciprocal of  $\frac{-3}{4}$  is

Options A.  $\frac{4}{3}$

B.  $\frac{3}{4}$

C.  $\frac{-4}{3}$

D. 0

### Answer

Reciprocal of  $\frac{-3}{4} = \frac{4}{-3}$

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

### 22. Question

A rational number between  $\frac{-2}{3}$  and  $\frac{1}{4}$  is

Options A.  $\frac{5}{2}$

B.  $\frac{-5}{12}$

C.  $\frac{5}{24}$

D.  $\frac{-5}{24}$

### Answer

Rational number between  $\frac{-2}{3}$  and  $\frac{1}{4}$

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

$$= \frac{1}{2} \left( \frac{-2 \times 4 + 1 \times 3}{12} \right)$$

$$= \frac{1}{2} \left( \frac{-8 + 3}{12} \right)$$

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

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

### 23. Question

The reciprocal of a negative rational number

Options A. is a positive rational number

B. is a negative rational number

C. can be either a positive or a negative rational number

D. does not exist

### Answer

Let  $\frac{-a}{b}$  be a negative rational number

Then, its reciprocal will be  $\frac{-b}{a}$  which is also a negative rational number.

Hence, the reciprocal of a negative rational number is a negative rational number

## CCE Test Paper-1

### 1. Question

Find the additive inverse of (i)  $\frac{7}{-10}$  (ii)  $\frac{8}{5}$ .

### Answer

Additive inverse of a number  $\frac{a}{b}$  is the number  $-\frac{a}{b}$  such that,  $\frac{a}{b} + \left(-\frac{a}{b}\right) = 0$

Therefore,

$$(i) \frac{7}{-10} = \frac{7 \times -1}{-10 \times -1} = \frac{-7}{10}$$

Additive inverse of  $\frac{-7}{10}$  is  $\frac{7}{10}$

$$(ii) \text{ Additive inverse of } \frac{8}{5} \text{ is } \frac{-8}{5}$$

### 2. Question

The sum of two rational numbers is  $-4$ . If one of them is  $\frac{-11}{5}$ , find the other.

### Answer

Sum of two rational numbers =  $-4$

$$\text{First number} = \frac{-11}{5}$$

Second number = Sum of two rational numbers - First number

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

$$= \frac{-20 - (-11)}{5}$$

$$= \frac{-20 + 11}{5}$$

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

$$\text{Second number} = \frac{-9}{5}$$

### 3. Question

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

#### Answer

Let the number added be x

Then,

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

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

$$\Rightarrow x = \frac{2 \times 5 - (-3) \times 3}{15}$$

$$\Rightarrow x = \frac{10 + 9}{15}$$

$$\Rightarrow x = \frac{19}{15}$$

### 4. Question

What number should be subtracted from  $\frac{-3}{4}$  to get  $\frac{-1}{2}$ ?

#### Answer

Let the number subtracted be x

Then,

$$\frac{-3}{4} - x = \frac{-1}{2}$$

$$\Rightarrow x = \frac{-3}{4} - \frac{-1}{2}$$

$$\Rightarrow x = \frac{-3 \times 1 - (-1) \times 2}{4}$$

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

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

### 5. Question

Find the multiplicative inverse of (i)  $\frac{-3}{4}$  (ii)  $\frac{11}{4}$ .

**Answer**

Multiplicative inverse of a rational number  $\frac{a}{b} = \frac{b}{a}$

Therefore,

(i) Negative inverse of  $\frac{-3}{4} = \frac{4}{-3}$

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

(ii) Negative inverse of  $\frac{11}{4} = \frac{4}{11}$

**6. Question**

The product of two numbers is  $-8$ . If one of them is  $-12$ , find the other.

**Answer**

Let the other number be  $x$

Then,

$$-12 \times x = -8$$

$$\Rightarrow x = -8 \div -12$$

$$\Rightarrow x = \frac{-8}{-12} = \frac{-8 \times -1}{-12 \times -1} = \frac{8}{12}$$

$$\Rightarrow x = \frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

**7. Question**

Evaluate:

$$(i) \frac{-3}{5} \times \frac{10}{7} \quad (ii) \left(\frac{-5}{8}\right)^{-1} \quad (iii) (-6)^{-1}$$

**Answer**

(i)

$$\frac{-3}{5} \times \frac{10}{7}$$

$$= \frac{-3 \times 10}{5 \times 7}$$

$$= \frac{-30}{35} = \frac{-30 \div 5}{35 \div 5} = \frac{-6}{7}$$

(ii)

$$\left(\frac{-5}{8}\right)^{-1}$$

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

(iii)

$$(-6)^{-1}$$

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

### 8. Question

Name the property of multiplication shown by each of the following statements:

$$(i) \frac{-12}{5} \times \frac{3}{4} = \frac{3}{4} \times \frac{-12}{5} \quad (ii) \frac{-8}{15} \times 1 = \frac{-8}{15}$$

$$(iii) \left( \frac{-2}{3} \times \frac{7}{8} \right) \times \frac{-5}{7} = \frac{-2}{3} \times \left( \frac{7}{8} \times \frac{-5}{7} \right)$$

$$(iv) \frac{-2}{3} \times 0 = 0$$

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

### Answer

(i) Commutative law of multiplication i.e.,  $a \times b = b \times a$

(ii) 1 as multiplicative identity i.e.,  $a \times 1 = a$

(iii) Associative law of multiplication i.e.,  $a(bc) = (ab)c$

(iv) Multiplicative property of 0 i.e.,  $a \times 0 = 0$

(v) Distributive law of multiplication over addition i.e.,  $a(b + c) = ab + ac$

### 9. Question

Find two rational numbers lying between  $\frac{-1}{3}$  and  $\frac{1}{2}$ .

### Answer

Rational number between  $\frac{-1}{3}$  and  $\frac{1}{2}$

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

$$= \frac{1}{2} \left( \frac{-1 \times 2 + 1 \times 3}{6} \right)$$

$$= \frac{1}{2} \left( \frac{-2 + 3}{6} \right)$$

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

$$= \frac{1}{12}$$

Now,

Rational number between  $\frac{1}{12}$  and  $\frac{1}{2}$

$$= \frac{1}{2} \left( \frac{1}{12} + \frac{1}{2} \right)$$

$$= \frac{1}{2} \left( \frac{1 \times 1 + 1 \times 6}{12} \right)$$

$$= \frac{1}{2} \left( \frac{1 + 6}{12} \right)$$

$$= \frac{1}{2} \times \frac{7}{12}$$

$$= \frac{7}{24}$$

#### 10. Question

What should be added to  $\frac{-3}{5}$  to get  $\frac{-1}{3}$ ?

Options A.  $\frac{4}{5}$

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

C.  $\frac{4}{15}$

D.  $\frac{2}{5}$

#### Answer

Let the number added be x

Then,

$$\frac{-3}{5} + x = \frac{-1}{3}$$

$$\Rightarrow x = \frac{1}{3} - \frac{-3}{5}$$

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

$$\Rightarrow x = \frac{-5 + 9}{15}$$

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

#### 11. Question

What should be added to  $\frac{-2}{3}$  to get  $\frac{3}{4}$ ?

Options A.  $\frac{-11}{12}$

B.  $\frac{-13}{12}$

C.  $\frac{-5}{4}$

D.  $\frac{17}{12}$

**Answer**

Let the number added be x

Then,

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

$$\Rightarrow x = \frac{3}{4} - \frac{-2}{3}$$

$$\Rightarrow x = \frac{3 \times 3 - (-2) \times 4}{12}$$

$$\Rightarrow x = \frac{9 + 8}{12}$$

$$\Rightarrow x = \frac{17}{12}$$

**12. Question**

$$\left(\frac{-5}{4}\right)^{-1} = ?$$

Options A.  $\frac{4}{5}$

B.  $\frac{-4}{5}$

C.  $\frac{5}{4}$

D.  $\frac{3}{5}$

**Answer**

$$\left(\frac{-5}{4}\right)^{-1} = \frac{4}{-5}$$

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

**13. Question**

The product of two numbers is  $\frac{-1}{4}$ . If one of them is  $\frac{-3}{10}$ , then the other is



Options A.  $\frac{5}{6}$

B.  $\frac{-5}{6}$

C.  $\frac{4}{3}$

D.  $\frac{-8}{5}$

**Answer**

Let the other number be x

Then,

$$\frac{-3}{10} \times x = \frac{-1}{4}$$

$$\Rightarrow x = \frac{-1}{4} \div \frac{-3}{10}$$

$$\Rightarrow x = \frac{-1}{4} \times \frac{10}{-3}$$

$$\Rightarrow x = \frac{-1 \times 10}{4 \times -3}$$

$$\Rightarrow x = \frac{-10}{-12} = \frac{-10 \times -1}{-12 \times -1} = \frac{10}{12}$$

$$\Rightarrow x = \frac{10}{12} = \frac{10 \div 2}{12 \div 2} = \frac{5}{6}$$

**14. Question**

$$\left( \frac{-5}{6} \div \frac{-2}{3} \right) = ?$$

Options A.  $\frac{-5}{4}$

B.  $\frac{5}{4}$

C.  $\frac{-4}{5}$

D.  $\frac{4}{5}$

**Answer**

$$\frac{-5}{6} \div \frac{-2}{3}$$

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

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

$$= \frac{-15}{-12} = \frac{-15 \times -1}{-12 \times -1} = \frac{15}{12}$$

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

### 15. Question

$$\frac{4}{3} \div ? = \frac{-5}{2}$$

Options A.  $\frac{-8}{5}$

B.  $\frac{8}{5}$

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

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

### Answer

$$\frac{4}{3} \div x = \frac{-5}{2}$$

$$\Rightarrow x = \frac{4}{3} \div \frac{-5}{2}$$

$$\Rightarrow x = \frac{4}{3} \times \frac{2}{-5}$$

$$\Rightarrow x = \frac{4 \times 2}{3 \times -5}$$

$$\Rightarrow x = \frac{8}{-15} = \frac{8 \times -1}{-15 \times -1} = \frac{-8}{15}$$

### 16. Question

Reciprocal of  $\frac{-7}{9}$  is

Options A.  $\frac{9}{7}$

B.  $\frac{-9}{7}$

C.  $\frac{7}{9}$

D. none of these

**Answer**

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

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

**17. Question**

A rational number between  $\frac{-2}{3}$  and  $\frac{1}{2}$  is

Options A.  $\frac{-1}{6}$

B.  $\frac{-1}{12}$

C.  $\frac{-5}{6}$

D.  $\frac{5}{6}$

**Answer**

Rational number between  $\frac{-1}{3}$  and  $\frac{1}{2}$

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

$$= \frac{1}{2} \left( \frac{-2 \times 2 + 1 \times 3}{6} \right)$$

$$= \frac{1}{2} \left( \frac{-4 + 3}{6} \right)$$

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

$$= \frac{-1}{12}$$

**18. Question**

Fill in the blanks.

(i)  $\frac{25}{8} \div (\dots) = -10.$

(ii)  $\frac{-8}{9} \times (\dots) = \frac{-2}{3}.$

$$(iii) (-1) + (\dots) = \frac{-2}{9}.$$

$$(iv) \frac{2}{3} - (\dots) = \frac{1}{15}.$$

### Answer

(i)

$$\frac{25}{8} \div x = -10$$

$$\Rightarrow x = \frac{25}{8} \div -10$$

$$\Rightarrow x = \frac{25}{8} \times \frac{1}{-10}$$

$$\Rightarrow x = \frac{25 \times 1}{8 \times -10}$$

$$\Rightarrow x = \frac{25}{-80} = \frac{25 \times -1}{-80 \times -1} = \frac{-25}{80}$$

$$\Rightarrow x = \frac{-25}{80} = \frac{-25 \div 5}{80 \div 5} = \frac{-5}{16}$$

(ii)

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

$$\Rightarrow x = \frac{-2}{3} \div \frac{-8}{9}$$

$$\Rightarrow x = \frac{-2}{3} \times \frac{9}{-8}$$

$$\Rightarrow x = \frac{-2 \times 9}{3 \times -8}$$

$$\Rightarrow x = \frac{-18}{-24} = \frac{-18 \times -1}{-24 \times -1} = \frac{18}{24}$$

$$\Rightarrow x = \frac{18}{24} = \frac{18 \div 6}{24 \div 6} = \frac{3}{4}$$

(iii)

$$-1 + x = \frac{-2}{9}$$

$$\Rightarrow x = \frac{-2}{9} - (-1)$$

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

$$\Rightarrow x = \frac{-2 + 9}{9}$$

$$\Rightarrow x = \frac{7}{9}$$

(iv)

$$\frac{2}{3} - x = \frac{1}{15}$$

$$\Rightarrow x = \frac{2}{3} - \frac{1}{15}$$

$$\Rightarrow x = \frac{2 \times 5 - 1 \times 1}{15}$$

$$\Rightarrow x = \frac{10 - 1}{15}$$

$$\Rightarrow x = \frac{9}{15} = \frac{9 \div 3}{15 \div 3} = \frac{3}{5}$$

### 19. Question

Write 'T' for true and 'F' for false for each of the following:

(i) Rational numbers are always closed under subtraction.

(ii) Rational numbers are always closed under division.

(iii)  $1 \div 0 = 0$ .

(iv) Subtraction is commutative on rational numbers.

$$(v) -\left(\frac{-7}{8}\right) = \frac{7}{8}.$$

### Answer

(i) true

Let there be two rational numbers  $\frac{a}{b}$  and  $\frac{c}{d}$

Then,

$$\frac{a}{b} - \frac{c}{d} = \frac{ad - bc}{bd}$$

which is also a rational number

Hence, Rational numbers are always closed under subtraction.

(ii) false

$$\frac{a}{0} = \infty$$

Hence, Rational numbers are not always closed under division.

(iii) false

$$\frac{1}{0} = \infty$$

Hence,  $\frac{1}{0} \neq 0$

(iv) false

Let there be two rational numbers  $\frac{a}{b}$  and  $\frac{c}{d}$

Then,

$$\frac{a}{b} - \frac{c}{d} = \frac{ad - bc}{bd}$$

And

$$\frac{c}{d} - \frac{a}{b} = \frac{bc - ad}{bd}$$

Therefore,

$$\frac{a}{b} - \frac{c}{d} \neq \frac{c}{d} - \frac{a}{b}$$

Hence, Subtraction is not commutative on rational numbers.

(v) true

$$-\left(\frac{-7}{8}\right) = -1 \times \frac{-7}{8} = \frac{7}{8}$$