

# Rational Numbers

## Exercise 4A

Q1

**Answer :**

The numbers that are in the form of  $\frac{p}{q}$ , where p and q are integers and q  $\neq$  0, are called rational numbers.

For example:

Five positive rational numbers:

$$\frac{5}{7}, \frac{-3}{-4}, \frac{7}{8}, \frac{-14}{-15}, \frac{5}{9}$$

Five negative rational numbers:

$$\frac{-3}{7}, \frac{-3}{8}, \frac{8}{-9}, \frac{-19}{25}, \frac{8}{-25}$$

Yes, there is a rational number that is neither positive nor negative, i.e. zero (0).

Q3

**Answer :**

(i)  $\frac{8}{19}$

Numerator = 8

Denominator = 19

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

Numerator = 5

Denominator = -8

(iii)  $\frac{-13}{5}$

Numerator = -13

Denominator = 15

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

Numerator = -8  
Denominator = -11

(v) 9

i.e.  $\frac{9}{1}$

Numerator = 9  
Denominator = 1

Q4

**Answer :**

(i) 5

The rational number will be  $\frac{5}{1}$ .

Numerator = 5  
Denominator = 1

(ii) -3

The rational number will be  $\frac{-3}{1}$ .

Numerator = -3  
Denominator = 1

(iii) 1

The rational number will be  $\frac{1}{1}$ .

Numerator = 1  
Denominator = 1

(iv) 0

The rational number will be  $\frac{0}{1}$ .

Numerator = 0  
Denominator = 1

(v) -23

The rational number will be  $\frac{-23}{1}$ .

Numerator = -23  
Denominator = 1

Q5

**Answer :**

Positive rational numbers:

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

(iv)  $\frac{37}{53}$

(vi) 8 because 8 can be written as  $\frac{8}{1}$ , where  $1 \neq 0$ .

0 is neither positive nor negative.

Q6

**Answer :**

Negative rational numbers:

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

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

(v) -6

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

Q7

**Answer :**

(i) Following are the four rational numbers that are equivalent to  $\frac{6}{11}$ .

$$\frac{6 \times 2}{11 \times 2}, \frac{6 \times 3}{11 \times 3}, \frac{6 \times 4}{11 \times 4} \text{ and } \frac{6 \times 5}{11 \times 5}$$

i.e.  $\frac{12}{22}, \frac{18}{33}, \frac{24}{44}$  and  $\frac{30}{55}$

(ii) Following are the four rational numbers that are equivalent to  $\frac{-3}{8}$ .

$$\frac{-3 \times 2}{8 \times 2}, \frac{-3 \times 3}{8 \times 3}, \frac{-3 \times 4}{8 \times 4} \text{ and } \frac{-3 \times 5}{8 \times 5}$$

$$\text{i.e. } \frac{-6}{16}, \frac{-9}{24}, \frac{-12}{32} \text{ and } \frac{-15}{40}$$

(iii) Following are the four rational numbers that are equivalent to  $\frac{7}{-15}$ .

$$\frac{7 \times 2}{-15 \times 2}, \frac{7 \times 3}{-15 \times 3}, \frac{7 \times 4}{-15 \times 4} \text{ and } \frac{7 \times 5}{-15 \times 5}$$

(iv) Following are the four rational numbers that are equivalent to 8, i.e.  $\frac{8}{1}$ .

$$\frac{8 \times 2}{1 \times 2}, \frac{8 \times 3}{1 \times 3}, \frac{8 \times 4}{1 \times 4} \text{ and } \frac{8 \times 5}{1 \times 5}$$

$$\text{i.e. } \frac{16}{2}, \frac{24}{3}, \frac{32}{4} \text{ and } \frac{40}{5}$$

(v) Following are the four rational numbers that are equivalent to -1, i.e.  $\frac{1}{1}$ .

$$\frac{1 \times 2}{1 \times 2}, \frac{1 \times 3}{1 \times 3}, \frac{1 \times 4}{1 \times 4} \text{ and } \frac{1 \times 5}{1 \times 5}$$

$$\text{i.e. } \frac{2}{2}, \frac{3}{3}, \frac{4}{4} \text{ and } \frac{5}{5}$$

(vi) Following are the four rational numbers that are equivalent to -1, i.e.  $\frac{-1}{1}$ .

$$\frac{-1 \times 2}{1 \times 2}, \frac{-1 \times 3}{1 \times 3}, \frac{-1 \times 4}{1 \times 4} \text{ and } \frac{-1 \times 5}{1 \times 5}$$

$$\text{i.e. } \frac{-2}{2}, \frac{-3}{3}, \frac{-4}{4} \text{ and } \frac{-5}{5}$$

Q8

**Answer :**

$$(i) \frac{12 \times (-1)}{(-17) \times (-1)} = \frac{-12}{17}$$

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

$$(iii) \frac{-8}{-19} = \frac{-8 \times (-1)}{(-19) \times (-1)} = \frac{8}{19}$$

$$(iv) \frac{11 \times (-1)}{-6 \times (-1)} = \frac{-11}{6}$$

Q9

**Answer :**

(i) Numerator of  $\frac{5}{8}$  is 5.

5 should be multiplied by 3 to get 15.

Multiplying both the numerator and the denominator by 3:

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

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

(ii) Numerator of  $\frac{5}{8}$  is 5.

5 should be multiplied by -2 to get -10.

Multiplying both the numerator and the denominator by -2:

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

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

Q10

**Answer :**

(i) Denominator of  $\frac{4}{7}$  is 7.

7 should be multiplied by 3 to get 21.

Multiplying both the numerator and the denominator by 3:

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

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

(ii)

Denominator of  $\frac{4}{7}$  is 7.

7 should be multiplied by -5 to get -35.

Multiplying both the numerator and the denominator by -5:

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

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

Q11

**Answer :**

(i) Numerator of  $\frac{-12}{13}$  is -12.

-12 should be multiplied by 4 to get 48.

Multiplying both the numerator and the denominator by 4:

$$\frac{-12 \times 4}{13 \times 4} = \frac{-48}{52}$$

$$\frac{-12}{13} = \frac{-48}{52}$$

(ii) Numerator of  $\frac{-12}{13}$  is -12.

-12 should be multiplied by -5 to get 60

Multiplying its numerator and denominator by -5:

$$\frac{-12 \times (-5)}{13 \times (-5)} = \frac{60}{-65}$$

$$\frac{-12}{13} = \frac{60}{-65}$$

Q12

**Answer :**

(i) Denominator of  $\frac{-8}{11}$  is 11.

Clearly,  $11 \times 2 = 22$

Multiplying both the numerator and the denominator by 2:

$$\frac{-8 \times 2}{11 \times 2} = \frac{-16}{22}$$

$$\frac{-8}{11} = \frac{-16}{22}$$

(ii) Denominator of  $\frac{-8}{11}$  is 11.

Clearly,  $11 \times 5 = 55$

Multiplying both the numerator and the denominator by 5:

$$\frac{-8 \times 5}{11 \times 5} = \frac{-40}{55}$$

$$\frac{-8}{11} = \frac{-40}{55}$$

Q13

**Answer :**

(i) Numerator of  $\frac{14}{-5}$  is 14.

Clearly,  $14 \times 4 = 56$

Multiplying both the numerator and the denominator by 4:

$$\frac{14 \times 4}{-5 \times 4} = \frac{56}{-20}$$

$$\frac{14}{-5} = \frac{56}{-20}$$

(ii) -70

Numerator of  $\frac{14}{-5}$  is 14.

Clearly,  $14 \times (-5) = -70$

Multiplying both the numerator and the denominator by -5:

$$\frac{14 \times (-5)}{(-5) \times (-5)} = \frac{-70}{25}$$

$$\frac{14}{-5} = \frac{-70}{25}$$

Q14

**Answer :**

(i) Denominator of  $\frac{13}{-8}$  is -8.

Clearly,  $(-8) \times 5 = -40$

Multiplying both the numerator and the denominator by 5:

$$\frac{13 \times 5}{-8 \times 5} = \frac{65}{-40}$$

$$\frac{13}{-8} = \frac{65}{-40}$$

(ii) Denominator of  $\frac{13}{-8}$  is -8.

Clearly,  $(-8) \times (-4) = 32$

Multiplying both the numerator and the denominator by -4:

$$\frac{13 \times (-4)}{-8 \times (-4)} = \frac{-52}{32}$$

$$\frac{13}{-8} = \frac{-52}{32}$$

Q15

**Answer :**

(i) Numerator of  $\frac{-36}{24}$  is -36.

Clearly,  $(-36) \div 4 = (-9)$

Dividing both the numerator and the denominator by 4:

$$\frac{-36 \div 4}{24 \div 4} = \frac{-9}{6}$$

(ii) Numerator of  $\frac{-36}{24}$  is -36.

Clearly,  $(-36) \div (-6) = 6$

Dividing both the numerator and the denominator by -6:

$$\frac{-36 \div (-6)}{24 \div (-6)} = \frac{6}{-4}$$

$$\frac{-36}{24} = \frac{6}{-4}$$

Q16

**Answer :**

(i) Denominator of  $\frac{84}{-147}$  is  $-147$ .

$$\therefore -147 \div (-21) = 7$$

Dividing both the numerator and the denominator by  $-21$ :

$$\frac{84 \div (-21)}{-147 \div (-21)} = \frac{-4}{7}$$

$$\frac{84}{-147} = \frac{-4}{7}$$

(ii) Denominator of  $\frac{84}{-147}$  is  $-147$ .

$$-147 \div 3 = -49$$

Dividing both the numerator and the denominator by  $3$ :

$$\frac{84 \div 3}{-147 \div 3} = \frac{28}{-49}$$

$$\frac{84}{-147} = \frac{28}{-49}$$

Q17

**Answer :**

(i)  $\frac{35}{49}$

H.C.F. of  $35$  and  $49$  is  $7$ .

$$\begin{array}{r} 35 \overline{) 49} (1 \\ \underline{-35} \phantom{0} \\ 14 \overline{) 35} (2 \\ \underline{-28} \phantom{0} \\ 7 \overline{) 14} (2 \\ \underline{-14} \\ \times \end{array}$$

Dividing the numerator and the denominator by  $7$ :

$$\frac{35 \div 7}{49 \div 7} = \frac{5}{7}$$

So,  $\frac{35}{49}$  is equal to  $\frac{5}{7}$  in the standard form.

(ii)  $\frac{8}{-36}$

Denominator is  $-36$ , which is negative.

Multiplying both the numerator and the denominator by  $-1$ :

$$\frac{8 \times (-1)}{-36 \times (-1)} = \frac{-8}{36}$$

$$\begin{array}{r} 8 \overline{) 36} (4 \\ \underline{-32} \phantom{0} \\ 4 \overline{) 8} (2 \\ \underline{-8} \\ \times \end{array}$$

H.C.F. of  $8$  and  $36$  is  $4$ .

Dividing its numerator and denominator by  $4$ :

$$\frac{-8 \div 4}{36 \div 4} = \frac{-2}{9}$$

So,  $\frac{8}{-36}$  is equal to  $\frac{-2}{9}$  in the standard form.

$$(iii) \frac{-27}{45}$$

$$\begin{array}{r} 27 \overline{)45} 1 \\ \underline{-27} \phantom{0} \\ 18 \overline{)27} 1 \\ \underline{-18} \phantom{0} \\ 9 \overline{)18} 2 \\ \underline{-18} \phantom{0} \\ \times \end{array}$$

H.C.F. of 27 and 45 is 9.

Dividing its numerator and denominator by 9:

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

Hence,  $\frac{-27}{45}$  is equal to  $\frac{-3}{5}$  in the standard form.

$$(iv) \frac{-14}{-49}$$

The denominator is negative.

Multiplying its numerator and denominator by  $-1$ :

$$\frac{-14 \times (-1)}{-49 \times (-1)} = \frac{14}{49}$$

$$\begin{array}{r} 14 \overline{)49} 3 \\ \underline{-42} \phantom{0} \\ 7 \overline{)14} 2 \\ \underline{-14} \phantom{0} \\ \times \end{array}$$

H.C.F. of 14 and 49 is 7.

Dividing both the numerator and the denominator by 7.

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

Hence,  $\frac{-14}{-49}$  is equal to  $\frac{2}{7}$  in the standard form.

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

The denominator is negative.

Multiplying its denominator and denominator by  $-1$ :

$$\frac{91 \times (-1)}{-78 \times (-1)} = \frac{-91}{78}$$

$$\begin{array}{r} 78 \overline{)91} 1 \\ \underline{-78} \phantom{0} \\ 13 \overline{)78} 6 \\ \underline{-78} \phantom{0} \\ \times \end{array}$$

H.C.F. of 91 and 78 is 13.

Dividing both the numerator and the denominator by 13:

$$\frac{-91 \div 13}{78 \div 13} = \frac{-7}{6}$$

Hence,  $\frac{91}{-78}$  is equal to  $\frac{-7}{6}$  in the standard form.

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

$$\begin{array}{r} 68 \overline{)119} 1 \\ \underline{-68} \phantom{0} \\ 51 \overline{)68} 1 \\ \underline{-51} \phantom{0} \\ 17 \overline{)51} 3 \\ \underline{-51} \phantom{0} \\ \times \end{array}$$

H.C.F. of 68 and 119 is 17.

Dividing both the numerator and the denominator by 17:

$$\frac{-68 \div 17}{119 \div 17} = \frac{-4}{7}$$

Hence,  $\frac{-68}{119}$  is equal to  $\frac{-4}{7}$  in the standard form.

$$(vii) \frac{-87}{116}$$

$$\begin{array}{r} 87 \overline{)116} (1 \\ \underline{-87} \phantom{0} \\ 29 \overline{)87} (3 \\ \underline{-87} \\ \times \end{array}$$

H.C.F. of 87 and 116 is 29.

Dividing both the numerator and the denominator by 29:

$$\frac{-87 \div 29}{116 \div 29} = \frac{-3}{4}$$

Hence,  $\frac{-87}{116}$  is equal to  $\frac{-3}{4}$  in the standard form.

1

$$(viii) \frac{299}{-161}$$

The denominator is negative.

Multiplying both the numerator and denominator by -1:

$$\frac{299 \times (-1)}{-161 \times (-1)} = \frac{-299}{161}$$

$$\begin{array}{r} 161 \overline{)299} (1 \\ \underline{-161} \phantom{0} \\ 138 \overline{)161} (1 \\ \underline{-138} \phantom{0} \\ 23 \overline{)138} (6 \\ \underline{-138} \\ \times \end{array}$$

H.C.F. of 299 and 161 is 23.

Dividing both the numerator and the denominator by 23:

$$\frac{-299 \div 23}{161 \div 23} = \frac{-13}{7}$$

Hence,  $\frac{299}{-161}$  is equal to  $\frac{-13}{7}$  in the standard form.

Q18

**Answer :**

(i)

$$\begin{aligned} \frac{-9 \times 4}{5 \times 4} &= \frac{-36}{20} \\ \frac{-9 \times (-3)}{5 \times (-3)} &= \frac{27}{-15} \\ \frac{-9 \times 5}{5 \times 5} &= \frac{-45}{25} \\ \therefore \frac{-9}{5} &= \frac{-36}{20} = \frac{27}{-15} = \frac{-45}{25} \end{aligned}$$

(ii)

$$\begin{aligned} \frac{-6 \times 3}{11 \times 3} &= \frac{-18}{33} \\ \frac{-6 \times 4}{11 \times 4} &= \frac{-24}{44} \\ \therefore \frac{-6}{11} &= \frac{-18}{33} = \frac{-24}{44} \end{aligned}$$

Q19



**Answer :**

(i)  $\frac{-13}{7}, \frac{39}{-21}$

We have:

$$(-13) \times (-21) = 273$$

$$\text{And } 7 \times 39 = 273$$

$$(-13) \times (-21) = 7 \times 39$$

$$\text{or } \frac{-13}{7} = \frac{39}{-21}$$

Hence,  $\frac{-13}{7}$  and  $\frac{39}{21}$  are equivalent rational numbers.

(ii)  $\frac{3}{-8}, \frac{-6}{16}$

We have:

$$3 \times 16 = 48$$

$$\text{And } (-8) \times (-6) = 48$$

$$\therefore 3 \times 16 = (-8) \times (-6)$$

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

(iii)  $\frac{9}{4}, \frac{-36}{-16}$

We have:

$$9 \times (-16) = -144$$

$$\text{And } 4 \times (-36) = -144$$

$$9 \times (-16) = 4 \times (-36)$$

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

Therefore, they are equivalent rational numbers.

(iv)  $\frac{7}{15}, \frac{-28}{60}$

We have:

$$7 \times 60 = 420$$

$$\text{And } 15 \times (-28) = -420$$

$$\therefore 7 \times 60 \neq 15 \times (-28)$$

Therefore, the rational numbers are not equivalent.

$$(v) \frac{3}{12}, \frac{-1}{4}$$

We have:

$$3 \times 4 = 12$$

$$\text{And } 12 \times (-1) = -12$$

$$12 \neq -12$$

Therefore, the rational numbers are not equivalent.

$$(vi) \frac{2}{3}, \frac{3}{2}$$

We have:

$$2 \times 2 = 4$$

$$\text{And } 3 \times 3 = 9$$

$$2 \times 2 \neq 3 \times 3$$

Therefore, the rational numbers are not equivalent.

Q20

**Answer :**

$$(i) \frac{-1}{5} = \frac{8}{x}$$

$$\Rightarrow -x = 5 \times 8$$

$$\Rightarrow x = -40$$

$$(ii) \frac{7}{-3} = \frac{x}{6}$$

$$\Rightarrow (-3)x = 7 \times 6$$

$$\Rightarrow x = \frac{(7 \times 6)}{(-3)}$$

$$\Rightarrow x = -14$$

$$(iii) \frac{3}{5} = \frac{x}{-25}$$

$$\Rightarrow 5x = 3 \times (-25)$$

$$\Rightarrow x = \frac{3 \times (-25)}{5}$$

$$\Rightarrow x = (-15)$$

$$(iv) \frac{13}{6} = \frac{-65}{x}$$

$$\Rightarrow 13x = 6 \times (-65)$$

$$\Rightarrow x = \frac{6 \times (-65)}{13}$$

$$\Rightarrow x = 6 \times (-5)$$

$$\Rightarrow x = -30$$

$$(v) \frac{16}{x} = -4$$

$$\Rightarrow x = \frac{16}{(-4)}$$

$$\Rightarrow x = (-4)$$

$$vi) \frac{-48}{x} = 2$$

$$\Rightarrow \frac{-48}{2} = \frac{x}{1}$$

$$\Rightarrow 2x = (-48) \times 1$$

$$\Rightarrow x = \frac{-48}{2}$$

$$x = (-24)$$

Q21

**Answer :**

(i)  $\frac{8}{-12}$  and  $\frac{-10}{15}$

$$8 \times 15 = 120$$

$$\text{And } (-10) \times (-12) = 120$$

$$8 \times 15 = (-10) \times (-12)$$

$$\therefore \frac{8}{-12} = \frac{-10}{15}$$

Therefore, the rational numbers are equal.

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

$$(-3) \times (-21) = 63$$

$$\text{And } 7 \times 9 = 63$$

$$\therefore (-3) \times (-21) = 7 \times 9$$

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

Therefore, the rational numbers are equal.

(iii)  $\frac{-8}{-14}$ ,  $\frac{15}{21}$

$$(-8) \times 21 = -168$$

$$\text{And } 15 \times (-14) = -210$$

$$(-8) \times 21 \neq 15 \times 14$$

Therefore, the rational numbers are not equal.

Q22

**Answer :**

(i) False

For example,  $-1$  is smaller than zero and is a rational number.

(ii) True

All integers can be written with the denominator 1.

(iii) False

Though 0 is an integer, when the denominator is 0, it is not a rational number.

For example,  $\frac{1}{0}$  is not a rational number.

(iv) True

(v) False

$-1$  is a rational number but not a fraction.

# Rational Numbers

## Exercise 4B

Q2

Answer :

- (i)  $\frac{5}{6}$ . This is because 0 can be written as  $\frac{0}{6}$  and  $\frac{0}{6} < \frac{5}{6}$ .
- (ii)  $\frac{-3}{5} < 0$ . This is because 0 can be written as  $\frac{0}{5}$  and  $-3 < 0$ .
- (iii)  $\frac{5}{8} > \frac{3}{8}$ . This is because  $5 > 3$ .
- (iv)  $\frac{7}{9} > \frac{5}{9}$ . This is because  $7 > 5$ .
- (v)  $\frac{-6}{11} < \frac{-5}{11}$ . This is because  $-6 < -5$ .
- (vi)  $\frac{-15}{4} > \frac{-17}{4}, -15 > -17$

Q3

Answer :

- (i)  $\frac{5}{9}, \frac{-3}{-8}$
- $$\frac{(-3) \times (-1)}{(-8) \times (-1)} = \frac{3}{8}$$
- L. C. M. of 9 and 8 is 72.
- $$\frac{5 \times 8}{9 \times 8} = \frac{40}{72}$$
- $$\frac{3 \times 9}{8 \times 9} = \frac{27}{72}$$
- $27 < 40$
- $$\frac{-3}{-8} < \frac{5}{9}$$
- So,  $\frac{5}{9}$  is greater.

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

$$(ii) \quad \frac{4}{-3}, \frac{-8}{7}$$

We will convert each negative denominator into positive.

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

L. C. M. of 3 and 7 is 21.

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

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

$$(-24) > (-28)$$

$$\frac{-8}{7} > \frac{4}{(-3)}$$

So,  $\frac{-8}{7}$  is greater.

(iii)

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

L. C. M. of 5 and 1 is 5.

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

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

$$-12 > -15$$

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

$\frac{-12}{5}$  is greater.

(iv)

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

L. C. M. of 9 and 8 is 72.

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

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

$$-56 < -45$$

$$\frac{-7}{9} < \frac{-5}{8}$$

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

$$(v) \quad \frac{4}{-5}, \frac{-7}{8}$$

We will convert each negative denominator into positive.

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

L. C. M. of 5 and 8 is 40.

$$\frac{-4 \times 8}{5 \times 8} = \frac{-32}{40}$$

$$\frac{-7 \times 5}{8 \times 5} = \frac{-35}{40}$$

$$-32 > -35$$

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

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

$$(vi) \quad \frac{9}{-13}, \frac{7}{-12}$$

We will convert each negative denominator into positive.

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

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

L. C. M. of 13 and 12 is 156.

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

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

$$-108 < -91$$

$$\frac{9}{-13} < \frac{7}{-12}$$

Answer :

$$(i) \frac{-3}{7} > \frac{-6}{13}$$

L. C. M. of 7 and 13 is 91.

$$\frac{-3 \times 13}{7 \times 13} = \frac{-39}{91}$$

$$\frac{-6 \times 7}{13 \times 7} = \frac{-42}{91}$$

$$\frac{-39}{91} > \frac{-42}{91}$$

$$(ii) \frac{5}{-13} = \frac{-35}{91}$$

L. C. M. of 13 and 91 is 91.

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

$$(iii) -2 > \frac{-13}{5}$$

L. C. M of 1 and 5 is 5.

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

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

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

$$(iv) \frac{-2}{3} < \frac{-5}{8}$$

L. C. M. of 8 and 3 is 24.

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

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

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

$$(v) 0 < \frac{3}{5}$$

L. C. M. of 1 and 5 is 5.

$$\frac{0 \times 1}{1 \times 5} = \frac{0}{5}$$

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

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

$$(vi) \frac{-8}{9} > \frac{-9}{10}$$

L. C. M. of 9 and 10 is 90.

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

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

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

Q5

Answer :

$$(i) \frac{2}{5}, \frac{7}{10}, \frac{8}{15}, \frac{13}{30}$$

L. C. M. of 5, 10, 15 and 30 is 30

$$\begin{array}{r|l} 5 & 5, 10, 15, 30 \\ 2 & 1, 2, 3, 6 \\ 3 & 1, 1, 3, 3 \\ & 1, 1, 1, 1 \end{array}$$

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

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

$$\frac{8 \times 2}{15 \times 2} = \frac{16}{30}$$

$$\frac{13 \times 1}{30 \times 1} = \frac{13}{30}$$

Required order:  $\frac{2}{5} < \frac{13}{30} < \frac{8}{15} < \frac{7}{10}$

$$\begin{array}{r|l} 13 & 13, 91 \\ 7 & 1, 7 \\ & 1, 1 \end{array}$$

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

$$\begin{array}{r|l} 3 & 9, 10 \\ 3 & 3, 10 \\ 5 & 1, 10 \\ 2 & 1, 2 \\ & 1, 1 \end{array}$$

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

First, we need to convert each negative denominator into positive.

$$\frac{-3}{4}, \frac{5 \times -1}{-12 \times -1}, \frac{-7}{16}, \frac{9 \times -1}{-24 \times -1}$$

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

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

L. C. M. of 4, 12, 16 and 24 is 48.

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

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

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

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

$$\text{Required order: } \frac{-3}{4} < \frac{-7}{16} < \frac{-5}{12} < \frac{-9}{24}$$

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

First, we need to convert the negative denominators to make them positive.

$$\frac{-3}{10}, \frac{7 \times -1}{-15 \times -1}, \frac{-11}{20}, \frac{17 \times -1}{-30 \times -1}$$

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

$$\begin{array}{r|l} 5 & 10, 15, 20, 30 \\ \hline 2 & 2, 3, 4, 6 \\ \hline 3 & 1, 3, 2, 3 \\ \hline 3 & 1, 3, 1, 3 \\ \hline & 1, 1, 1, 1 \end{array}$$

L. C. M of 10, 15, 20, 30 = 60

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

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

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

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

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

$$\text{i.e. } \frac{-17}{30} < \frac{-11}{20} < \frac{-7}{15} < \frac{-3}{10}$$

$$(iv) \frac{2}{3}, \frac{3}{4}, \frac{5}{-6}, \frac{-7}{12}$$

First, we need to convert the negative denominators to positive ones.

$$\frac{2}{3}, \frac{3}{4}, \frac{5 \times -1}{-6 \times -1}, \frac{-7}{12}$$

$$\frac{2}{3}, \frac{3}{4}, \frac{-5}{6}, \frac{-7}{12}$$

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

L. C. M of 3, 4, 6, 12 = 12

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

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

$$\frac{-5 \times 2}{6 \times 2} = \frac{-10}{12}$$

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

$$\text{Therefore, the correct order is } \frac{-5}{6} < \frac{-7}{12} < \frac{2}{3} < \frac{3}{4}.$$

Answer :

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

First, we need to convert each negative denominator into positive.

$$\frac{-2}{5}, \frac{7 \times -1}{-10 \times -1}, \frac{-11}{15}, \frac{19 \times -1}{-30 \times -1}$$
$$\frac{-2}{5}, \frac{-7}{10}, \frac{-11}{15}, \frac{-19}{30}$$

$$\begin{array}{r|l} 5 & 5, 10, 15, 30 \\ \hline 2 & 1, 2, 3, 6 \\ \hline 3 & 1, 1, 3, 3 \\ \hline & 1, 1, 1, 1 \end{array}$$

L. C. M. of 5, 10, 15 and 30 is 30.

$$\frac{-2 \times 6}{5 \times 6} = \frac{-12}{30},$$
$$\frac{-7 \times 3}{10 \times 3} = \frac{-21}{30},$$
$$\frac{-11 \times 2}{15 \times 2} = \frac{-22}{30},$$
$$\frac{-19 \times 1}{30 \times 1} = \frac{-19}{30},$$

$$\text{Correct order: } \frac{-2}{5} > \frac{19}{-30} > \frac{7}{-10} > \frac{-11}{15}$$

$$(ii) -2, \frac{-13}{6}, \frac{8}{-3}, \frac{1}{3}$$

First, we need to convert each negative denominator into positive.

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

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

L. C. M. of 6, 3 and 3 is 6.

$$\frac{-2 \times 6}{1 \times 6} = \frac{-12}{6},$$
$$\frac{-13 \times 1}{6 \times 1} = \frac{-13}{6},$$
$$\frac{-8 \times 2}{3 \times 2} = \frac{-16}{6},$$
$$\frac{1 \times 2}{3 \times 2} = \frac{2}{6},$$

$$\text{Correct order: } \frac{1}{3} > -2 > \frac{-13}{6} > \frac{-8}{3}$$

$$(iii) \frac{-4}{9}, \frac{5}{-12}, \frac{-7}{18}, \frac{2}{-3}$$

First, we need to convert each negative denominator into positive.

$$\frac{-4}{9}, \frac{5 \times -1}{-12 \times -1}, \frac{-7}{18}, \frac{2 \times -1}{-3 \times -1}$$
$$\frac{-4}{9}, \frac{-5}{12}, \frac{-7}{18}, \frac{-2}{3}$$

$$\begin{array}{r|l} 3 & 9, 12, 18, 3 \\ \hline 3 & 3, 4, 6, 1 \\ \hline 2 & 1, 4, 2, 1 \\ \hline 2 & 1, 2, 1, 1 \\ \hline & 1, 1, 1, 1 \end{array}$$

L. C. M. of 9, 12, 18 and 3 is 36.

$$\frac{-4 \times 4}{9 \times 4} = \frac{-16}{36},$$
$$\frac{-5 \times 3}{12 \times 3} = \frac{-15}{36},$$
$$\frac{-7 \times 2}{18 \times 2} = \frac{-14}{36},$$
$$\frac{-2 \times 12}{3 \times 12} = \frac{-24}{36}$$

$$\text{Correct order: } \frac{-7}{18} > \frac{-5}{12} > \frac{-4}{9} > \frac{-2}{3}$$



$$(iv) \frac{17}{-30}, \frac{11}{-15}, \frac{-7}{10}, \frac{3}{5}$$

First, we need to convert each negative denominator into positive.

$$\frac{17 \times -1}{-30 \times -1}, \frac{11 \times -1}{-15 \times -1}, \frac{-7}{10}, \frac{3}{5}$$

$$\frac{17}{30}, \frac{-11}{15}, \frac{-7}{10}, \frac{3}{5}$$

$$\begin{array}{c|c} 5 & 5, 10, 15, 30 \\ \hline 2 & 1, 2, 3, 6 \\ \hline 3 & 1, 1, 3, 3 \\ \hline & 1, 1, 1, 1 \end{array}$$

L. C. M. of 30, 15, 10 and 5 is 30.

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

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

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

$$\frac{3 \times 6}{5 \times 6} = \frac{18}{30},$$

Correct order:  $\frac{3}{5} > \frac{17}{-30} > \frac{-7}{10} > \frac{11}{-15}$

Q8

**Answer :**

L. C. M. of 2 and 3 is 6.

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

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

Therefore,  $\frac{-17}{6}, \frac{-16}{6}, \frac{-15}{6}, \frac{-14}{6}$  and  $\frac{-13}{6}$  are the five rational number between  $-3$  and  $-2$ .

Q9.

**Answer :**

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

$$\frac{-5}{5} \text{ and } \frac{5}{5}$$

Hence, the five rational numbers between  $-1$  and  $1$  are  $\frac{-4}{5}, \frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5}$  and  $\frac{1}{5}$ .

Q10

**Answer :**

$$\frac{-3}{5} \text{ and } \frac{-1}{2}$$

L.C.M. of 5 and 2 is 10.

$$\frac{-3 \times 2}{5 \times 2} = \frac{-6 \times 4}{10 \times 4} = \frac{-24 \times 2}{40 \times 2} = \frac{-48}{80},$$

$$\frac{-1 \times 5}{2 \times 5} = \frac{-5 \times 4}{10 \times 4} = \frac{-20 \times 2}{40 \times 2} = \frac{-40}{80},$$

Hence, the five rational numbers between  $\frac{-3}{5}$  and  $\frac{-1}{2}$  are  $\frac{-45}{80}, \frac{-44}{80}, \frac{-43}{80}, \frac{-42}{80}$  and  $\frac{-41}{80}$ .

# Rational Numbers

## Exercise 4C

Q1

**Answer :**

$$(i) \quad \frac{12}{7} + \frac{3}{7} = \frac{12+3}{7} = \frac{15}{7}$$

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

(iii)

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

$$\frac{-3}{8} + \frac{1}{8} = \frac{-3+1}{8} = \frac{-2}{8}$$

(iv)

$$\frac{7}{-11} \times \frac{-1}{-1} = \frac{-7}{11}$$

$$\frac{-5}{11} + \frac{-7}{11} = \frac{-5+(-7)}{11} = \frac{-5-7}{11} = \frac{-12}{11}$$

(v)

$$\frac{-11}{-13} \times \frac{-1}{-1} = \frac{11}{13}$$

$$= \frac{-9}{13} + \frac{11}{13} = \frac{-9+11}{13} = \frac{2}{13}$$

(vi)

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

(vii)

$$\frac{(-17)}{9} + \frac{(-11)}{9} = \frac{-17-11}{9} = \frac{-28}{9}$$

(viii)

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

$$\frac{-3}{7} + \frac{(-5)}{7} = \frac{-3-5}{7} = \frac{-8}{7}$$

Q2

**Answer :**

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

The denominators of the given rational numbers are 5 and 4.

*L.C.M.* of 5 and 4 is 20.

$$\frac{-2}{5} = \frac{(-2) \times 4}{5 \times 4} = \frac{-8}{20}$$

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

$$\text{Now, } \frac{(-8)}{20} + \frac{15}{20} = \frac{-8+15}{20} = \frac{7}{20}$$

$$(ii) \frac{-5}{9} + \frac{2}{3}$$

The denominators of the given rational numbers are 9 and 3.

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

L.C.M. of 9 and 3 is 9.

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

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

$$\begin{aligned} \text{Now, } & \frac{(-5)}{9} + \frac{6}{9} \\ &= \frac{-5+6}{9} \\ &= \frac{1}{9} \end{aligned}$$

$$(iii) -4 + \frac{1}{2}$$

The denominators of the given rational numbers are 1 and 2.

L.C.M. of 1 and 2 is 2.

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

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

$$\begin{aligned} \text{Now, } & \frac{(-8)}{2} + \frac{1}{2} \\ &= \frac{-8+1}{2} \\ &= \frac{-7}{2} \end{aligned}$$

$$(iv) \quad \frac{-7}{27} + \frac{5}{18}$$

The denominators of the given rational numbers are 27 and 18.

$$\begin{array}{r|l} 3 & 27, 18 \\ \hline 3 & 9, 6 \\ \hline 3 & 3, 2 \\ \hline 2 & 1, 2 \\ \hline & 1, 1 \end{array}$$

L.C.M. of 27 and 18 is 54.

$$\frac{-7}{27} = \frac{(-7) \times 2}{27 \times 2} = \frac{-14}{54}$$

$$\frac{5}{18} = \frac{5 \times 3}{18 \times 3} = \frac{15}{54}$$

$$\text{Now, } \frac{(-14)}{54} + \frac{15}{54} = \frac{-14+15}{54}$$

$$= \frac{1}{54}$$

$$(v) \quad \frac{-5}{36} + \left( \frac{-7}{12} \right)$$

$$\begin{array}{r|l} 3 & 36, 12 \\ \hline 2 & 12, 4 \\ \hline 2 & 6, 2 \\ \hline 3 & 3, 1 \\ \hline & 1, 1 \end{array}$$

The denominators of the given rational numbers are 36 and 12.

L.C.M. of 36 and 12 is 36.

$$\frac{-5}{36} = \frac{(-5) \times 1}{36 \times 1} = \frac{-5}{36}$$

$$\frac{-7}{12} = \frac{-7 \times 3}{12 \times 3} = \frac{-21}{36}$$

$$\text{Now, } \frac{(-5)}{36} + \frac{(-21)}{36} = \frac{-5-21}{36}$$

$$\frac{-26}{36} = \frac{-13}{18} \quad \left( 26 \text{ and } 36 \text{ are divided by } 2 \right)$$

$$(vi) \quad \frac{1}{-9} + \left( \frac{4}{-27} \right)$$

We need a positive denominator.

$$\frac{1}{-9} \times \frac{-1}{-1} = \frac{-1}{9} \quad \text{and} \quad \frac{4}{-27} \times \frac{-1}{-1} = \frac{-4}{27}$$

The denominators of the given rational numbers are 9 and 27

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

L.C.M. of 9 and 27 is 27

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

$$\frac{-4}{27} = \frac{-4 \times 1}{27 \times 1} = \frac{-4}{27}$$

$$\frac{(-3)}{27} + \frac{(-4)}{27} = \frac{-3-4}{27}$$

$$= \frac{-7}{27}$$

(vii)

$$\frac{-9}{24} + \left(\frac{-1}{18}\right)$$

The denominators of the given numbers are 24 and 18

$$\begin{array}{r|l} 3 & 24, 18 \\ \hline 2 & 8, 6 \\ \hline 2 & 4, 3 \\ \hline 2 & 2, 3 \\ \hline 3 & 1, 3 \\ \hline & 1, 1 \end{array}$$

L.C.M. of 24 and 18 is 72.

$$\therefore \frac{-9}{24} = \frac{-9 \times 3}{24 \times 3} = \frac{-27}{72}$$

$$\frac{-1}{18} = \frac{-1 \times 4}{18 \times 4} = \frac{-4}{72}$$

$$\text{Now, } \frac{-27}{72} + \left(\frac{-4}{72}\right)$$

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

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

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

$$\text{(viii)} \frac{27}{-4} + \left(\frac{-15}{8}\right)$$

We need a positive denominator.

$$\frac{27}{-4} \times \frac{-1}{-1} = \frac{-27}{4}$$

The denominators of the given rational numbers are 4 and 8.

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

L.C.M. of 4 and 8 is 8.

$$\frac{-27}{4} = \frac{-27 \times 2}{4 \times 2} = \frac{-54}{8}$$

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

$$\text{Now, } \frac{-54}{8} + \frac{(-15)}{8}$$

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

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

Q3

**Answer :**

(i)

$$\frac{-3}{5} + \frac{7}{5} + \frac{-1}{5}$$

L.C.M. of the given rational number is 5.

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

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

$$= \frac{-4 + 7}{5}$$

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

(ii)

$$\frac{-12}{7} + \frac{3}{7} + \frac{-2}{7}$$

$$= \frac{(-12)}{7} + \frac{3}{7} + \frac{(-2)}{7}$$

$$= \frac{-12 + 3 - 2}{7}$$

$$= \frac{-14 + 3}{7}$$

$$= \frac{-11}{7}$$

$$(iii) \quad \frac{11}{-12} + \frac{3}{-8} + \frac{1}{4}$$

We need a positive denominator.

$$\frac{11}{-12} \times \frac{-1}{-1} = \frac{-11}{12} \text{ and } \frac{3}{-8} \times \frac{-1}{-1} = \frac{-3}{8}$$

L.C.M. of the denominators 12, 8 and 4 is 24.

$$\therefore \frac{-11 \times 2}{12 \times 2} = \frac{-22}{24}$$

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

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

$$\begin{aligned} \text{Now, } & \frac{(-22)}{24} + \frac{(-9)}{24} + \frac{6}{24} \\ &= \frac{-22-9+6}{24} \\ &= \frac{-31+6}{24} \\ &= \frac{-25}{24} \end{aligned}$$

$$(iv) \quad \frac{-16}{9} + \frac{-5}{12} + \frac{7}{18}$$

L.C.M. of the denominators 9, 12 and 18 is 36.

$$\frac{-16 \times 4}{9 \times 4} = \frac{-64}{36}$$

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

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

$$\begin{aligned} \text{Now, } & \frac{(-64)}{36} + \frac{(-15)}{36} + \frac{14}{36} \\ &= \frac{-64-15+14}{36} \\ &= \frac{-79+14}{36} \\ &= \frac{-65}{36} \end{aligned}$$

$$(v) \quad -3 + \frac{1}{8} = \frac{-2}{5}$$

L.C.M. of the denominators 1, 8 and 5 is 40.

$$\frac{-3 \times 40}{1 \times 40} = \frac{-120}{40}$$

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

$$\frac{-2 \times 8}{5 \times 8} = \frac{-16}{40}$$

$$\begin{aligned} \text{Now, } & \frac{(-120)}{40} + \frac{5}{40} + \frac{(-16)}{40} \\ &= \frac{-120+5-16}{40} \\ &= \frac{-136+5}{40} = \frac{-131}{40} \end{aligned}$$

$$(vi) \quad \frac{-13}{8} + \frac{5}{16} + \frac{-1}{4}$$

L.C.M. of the denominator 8, 16 and 4 is 16.

$$\frac{-13 \times 2}{8 \times 2} = \frac{-26}{16}$$

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

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

$$\begin{aligned} \text{Now, } & \frac{(-26)}{16} + \frac{5}{16} + \frac{(-4)}{16} \\ &= \frac{-26+5-4}{16} \end{aligned}$$

$$\text{Now, } \frac{-30+5}{16} = \frac{-25}{16}$$

2	12,8,4
2	6,4,2
2	3,2,1
3	3,1,1
	1,1,1

3	9,12,18
3	3,4,6
2	1,4,2
2	1,2,1
	1,1,1

2	8,16,4
2	4,8,2
2	2,4,1
2	1,2,1
	1,1,1

Q4.

**Answer :**

(i)

$$\frac{-8}{15} + \frac{2}{-3}$$

We need a positive denominator.

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

Now, L.C.M. of 15 and 3 is 15.

$$\frac{-8}{15} = \frac{-8 \times 1}{15 \times 1} = \frac{-8}{15}$$

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

$$\begin{aligned} \text{Now, } & \frac{-8}{15} + \frac{-10}{15} \\ &= \frac{-8-10}{15} \end{aligned}$$

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

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

(ii)

$$\frac{-7}{10} + \frac{13}{-15} + \frac{27}{20}$$

We need a positive denominator.

$$\frac{13}{-15} \times \frac{-1}{-1} = \frac{-13}{15}$$

Now, L.C.M. of 10, 15 and 20 is 60.

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

$$\frac{-13}{15} = \frac{-13 \times 4}{15 \times 4} = \frac{-52}{60}$$

$$\frac{27}{20} = \frac{27 \times 3}{20 \times 3} = \frac{81}{60}$$

$$\begin{aligned} \text{Now, } & \frac{-42}{60} + \frac{-52}{60} + \frac{81}{60} \\ &= \frac{(-42)+(-52)+(81)}{60} \\ &= \frac{-94+81}{60} \\ &= \frac{-13}{60} \end{aligned}$$

(iii)

$$-1 + \frac{7}{-9} + \frac{11}{12}$$

We need a positive denominator.

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

Now, L.C.M. of 1, 9 and 12 is 36.

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

$$\frac{-7}{9} = \frac{-7 \times 4}{9 \times 4} = \frac{-28}{36}$$

$$\frac{11}{12} = \frac{11 \times 3}{12 \times 3} = \frac{33}{36}$$

$$\begin{aligned} & \frac{-36}{36} + \frac{-28}{36} + \frac{33}{36} \\ &= \frac{-36-28+33}{36} \\ &= \frac{-64+33}{36} \\ &= \frac{-31}{36} \\ &= \frac{-5}{4} \end{aligned}$$

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

$$\begin{array}{r|l} 5 & 10,15,20 \\ \hline 2 & 2,3,4 \\ \hline 2 & 1,3,2 \\ \hline 3 & 1,3,1 \\ \hline & 1,1,1 \end{array}$$

$$\begin{array}{r|l} 3 & 9,12 \\ \hline 3 & 3,4 \\ \hline 2 & 1,4 \\ \hline 2 & 1,2 \\ \hline & 1,1 \end{array}$$

(iv)

$$\frac{-11}{39} + \frac{5}{26} + \frac{2}{1}$$

L.C.M. of 39, 26 and 1 is 78.

$$\frac{-11}{39} = \frac{-11 \times 2}{39 \times 2} = \frac{-22}{78}$$

$$\frac{5}{26} = \frac{5 \times 3}{26 \times 3} = \frac{15}{78}$$

$$\frac{2}{1} = \frac{2 \times 78}{1 \times 78} = \frac{156}{78}$$

$$\text{Now, } \frac{-22}{78} + \frac{15}{78} + \frac{156}{78}$$

$$= \frac{-22+171}{78}$$

$$= \frac{149}{78}$$

(v)

$$2 + \frac{-1}{2} + \frac{-3}{4}$$

L.C.M. of 2 and 4 is 4.

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

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

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

$$\frac{8}{4} + \frac{(-2)}{4} + \frac{(-3)}{4}$$

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

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

$$(vi) \frac{-9}{11} + \frac{2}{3} + \frac{-3}{4}$$

L.C.M. of 11, 3 and 4 is 132.

$$\frac{-9}{11} = \frac{-9 \times 12}{11 \times 12} = \frac{-108}{132}$$

$$\frac{2}{3} = \frac{2 \times 44}{3 \times 44} = \frac{88}{132}$$

$$\frac{-3}{4} = \frac{-3 \times 33}{4 \times 33} = \frac{-99}{132}$$

$$\frac{-108}{132} + \frac{88}{132} + \frac{(-99)}{132}$$

$$= \frac{-108+88-99}{132}$$

$$= \frac{-207+88}{132} = \frac{-119}{132}$$

13	39,26
3	3,2
2	1,2
	1,1

2	2,4
2	1,2
	1,1

2	11,3,4
2	11,3,2
11	11,3,1
3	1,3,1
	1,1,1

Q5.

Answer :

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

$$(ii) \frac{-11}{7} = \left(-\frac{11}{7}\right) = \left(-1 \frac{4}{7}\right) = -1 + \left(\frac{-4}{7}\right)$$

$$(iii) \frac{-25}{9} = \left(-\frac{25}{9}\right) = -\left(2 \frac{7}{9}\right) = -2 + \left(\frac{-7}{9}\right)$$

$$(iv) \frac{-103}{20} = -\left(\frac{103}{20}\right) = -\left(5 \frac{3}{20}\right) = -5 + \left(\frac{-3}{20}\right)$$



# Rational Numbers

## Exercise 4D

Q1

**Answer :**

(i) Additive inverse of 5 is  $-5$ .

(ii) Additive inverse of  $-9$  is  $9$ .

(iii) Additive inverse of  $\frac{3}{14}$  *is*  $-\frac{3}{14}$ .

(iv) Additive inverse of  $-\frac{11}{15}$  *is*  $\frac{11}{15}$ .

$$\begin{aligned}\text{(v) Additive inverse of } \frac{15}{-4} &= \frac{15 \times (-1)}{(-4) \times (-1)} \\ &= \frac{-15}{4} \\ &= \frac{15}{4}\end{aligned}$$

$$\begin{aligned}\text{(vi) Additive inverse of } \frac{-18}{-13} &= \frac{-18 \times (-1)}{(-13) \times (-1)} \\ &= \frac{18}{13} \\ &= \frac{-18}{13}\end{aligned}$$

(vii) Additive inverse of  $0$  is  $0$ .

$$\begin{aligned}\text{(viii) Additive inverse of } \frac{1}{-6} &= \frac{1 \times (-1)}{(-6) \times (-1)} \\ &= \frac{-1}{6} \\ &= \frac{1}{6}\end{aligned}$$

Q2

**Answer :**

(i)

$$\frac{1}{3} - \frac{3}{4} = \frac{1}{3} + \left( \text{additive inverse of } \frac{3}{4} \right)$$

L.C.M. of 3 and 4 is 12.

$$\frac{1}{3} + \left( -\frac{3}{4} \right) = \frac{4+(-9)}{12} = \frac{-5}{12}$$

(ii)

$$\frac{1}{3} - \frac{(-5)}{6} = \frac{1}{3} + \left( \text{additive inverse of } \frac{-5}{6} \right)$$

$$= \frac{1}{3} + \frac{5}{6}$$

L.C.M. of 3 and 6 is 6.

$$= \frac{2+5}{6}$$

$$= \frac{7}{6}$$

(iii)

$$\frac{(-3)}{5} - \left( \frac{-8}{9} \right) = \frac{(-3)}{5} + \left( \text{additive inverse of } \frac{-8}{9} \right)$$

$$= \frac{(-3)}{5} + \frac{8}{9}$$

L.C.M. of 5 and 9 is 45.

$$= \frac{-27+40}{45}$$

$$= \frac{13}{45}$$

(iv)

$$\frac{(-1)}{1} - \frac{(-9)}{7} = \frac{(-1)}{1} + \left( \text{additive inverse of } \frac{-9}{7} \right)$$

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

L.C.M. of 7 and 1 is 7.

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

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

(v)

$$\frac{1}{1} - \frac{(-18)}{11} = \frac{1}{1} + \left( \text{additive inverse of } \frac{-18}{11} \right)$$

$$= \frac{(1)}{1} + \frac{18}{11}$$

$$= \frac{11+18}{11}$$

$$= \frac{29}{11}$$

(vi)

$$0 - \left( \frac{-13}{9} \right) = 0 + \left( \text{additive inverse of } \frac{-13}{9} \right)$$

$$= 0 + \frac{13}{9}$$

$$= \frac{13}{9}$$

(vii)

$$\frac{(-6)}{5} - \frac{(-32)}{13} = \frac{(-6)}{5} + \left( \text{additive inverse of } \frac{-32}{13} \right)$$

$$= \frac{-6}{5} + \frac{32}{13}$$

L.C.M. of 5 and 13 is 65

$$= \frac{-78+160}{65}$$

$$= \frac{82}{65}$$

(viii)

$$\begin{aligned}\frac{-4}{7} - \frac{(-7)}{1} &= \frac{-4}{7} + \left(\text{additive inverse of } \frac{-7}{1}\right) \\ &= \frac{(-4)}{7} + \frac{7}{1} \\ \text{L.C.M. of 7 and 1 is 7.} \\ &= \frac{-4+49}{7} \\ &= \frac{45}{7}\end{aligned}$$

(ix)

$$\begin{aligned}\frac{-2}{3} - \frac{5}{9} &= \frac{-2}{3} + \left(\text{additive inverse of } \frac{5}{9}\right) \\ &= \frac{-2}{3} - \frac{5}{9} \\ \text{L.C.M. of 3 and 9 is 9.} \\ &= \frac{-6-5}{9} \\ &= \frac{-11}{9}\end{aligned}$$

(x)

$$\begin{aligned}\frac{-3}{5} - \frac{5}{1} &= \frac{-3}{5} + \left(\text{additive inverse of } \frac{5}{1}\right) \\ &= \frac{-3}{5} - \frac{5}{1} \\ \text{L.C.M. of 5 and 1 is 5.} \\ &= \frac{-3-25}{5} \\ &= \frac{-28}{5}\end{aligned}$$

Q3

**Answer :**

( i )

$$\begin{aligned}\frac{3}{4} - \frac{4}{5} \\ &= \frac{3}{4} - \frac{4}{5} = \frac{3}{4} + \left(\text{additive inverse of } \frac{4}{5}\right) \\ \text{L. C. M. 4 and 5 is 20.} \\ &= \frac{15-16}{20} \\ &= \frac{-1}{20}\end{aligned}$$

(ii)

$$\begin{aligned}\frac{-3}{1} - \frac{4}{7} &= \frac{-3}{1} + \left(\text{additive inverse of } \frac{4}{7}\right) \\ &= \frac{-3}{1} - \frac{4}{7} \\ &= \frac{-21-4}{7} \\ &= \frac{-25}{7}\end{aligned}$$

(iii)

$$\begin{aligned}\frac{7}{24} - \frac{19}{36} &= \frac{7}{24} + \left(\text{additive inverse of } \frac{19}{36}\right) \\&= \frac{7}{24} - \frac{19}{36} \\ \text{L.C.M. of 24 and 36 is 72.} \\&= \frac{21-38}{72} \\&= \frac{-17}{72}\end{aligned}$$

(iv)

$$\begin{aligned}\frac{14}{15} - \frac{13}{20} &= \frac{14}{15} + \left(\text{additive inverse of } \frac{13}{20}\right) \\&= \frac{14}{15} - \frac{13}{20} \\ \text{L.C.M. of 15 and 20 is 60.} \\&= \frac{56-39}{60} \\&= \frac{17}{60}\end{aligned}$$

(v)

$$\begin{aligned}\frac{4}{9} - \frac{2}{(-3)} \\ \text{We need a positive denominator.} \\ \frac{2}{-3} \times \frac{(-1)}{(-1)} &= \frac{-2}{3} \\ \frac{4}{9} - \frac{(-2)}{3} &= \frac{4}{9} + \left(\text{additive inverse of } \frac{-2}{3}\right) \\ \text{L.C.M. of 3 and 9 is 9.} \\&= \frac{4+6}{9} \\&= \frac{10}{9}\end{aligned}$$

(vi)

$$\begin{aligned}\frac{7}{11} - \frac{(-4)}{(-11)} \\ \text{We need a positive denominator.} \\ \frac{-4}{-11} \times \frac{(-1)}{(-1)} &= \frac{4}{11} \\ \frac{7}{11} - \frac{4}{11} &= \frac{7}{11} + \left(\text{additive inverse of } \frac{4}{11}\right) \\&= \frac{7-4}{11} \\&= \frac{3}{11}\end{aligned}$$

$$(vii) \quad \frac{-5}{14} - \frac{-2}{7} = \frac{-5}{14} + \left( \text{additive inverse of } \frac{-2}{7} \right)$$

$$\frac{-5}{14} + \frac{2}{7}$$

L.C.M. of 14 and 7 is 14.

$$\frac{-5+4}{14}$$

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

(viii)

$$\left( \frac{-5}{-8} \right) - \left( \frac{-3}{4} \right)$$

We need a positive denominator.

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

[L.C.M. of 8 and 4 is 8.]

$$\frac{5}{8} - \left( \frac{-3}{4} \right) = \frac{5}{8} + \left( \text{additive inverse of } \frac{-3}{4} \right)$$

L.C.M. of 8 and 4 is 8.

$$= \frac{5+6}{8}$$

$$= \frac{11}{8}$$

Q4

**Answer :**

First we will find the sum of  $\frac{-36}{11}$  and  $\frac{49}{22}$ .

$$\frac{-36}{11} + \frac{49}{22}$$

L.C.M. of 11 and 22 is 22.

$$= \frac{-72+49}{22}$$

$$= \frac{-23}{22}$$

Now, we have to find the sum of  $\frac{33}{8}$  and  $\frac{-19}{4}$ .

$$\frac{33}{8} + \frac{(-19)}{4}$$

L.C.M. of 8 and 4 is 8.

$$= \frac{33-38}{8}$$

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

$$\text{Now, } \frac{(-5)}{8} - \frac{(-23)}{22}$$

$$= \frac{-5}{8} + \frac{23}{22}$$

L.C.M. of 8 and 22 is 88.

$$= \frac{-55+92}{88}$$

$$= \frac{37}{88}$$

Q5

**Answer :**

Let the other number that be  $x$ .

$$\frac{5}{7} + x = \frac{4}{21}$$

$$\Rightarrow x = \frac{4}{21} - \frac{5}{7}$$

L.C.M. of 21 and 7 is 21.

$$\Rightarrow x = \frac{4-15}{21}$$

$$\Rightarrow x = \frac{-11}{21}$$

Hence, the required number is  $\frac{-11}{21}$ .

Q6

**Answer :**

Let the other number be  $x$ .

$$\frac{3}{16} + x = \frac{-3}{8}$$

$$\Rightarrow x = \frac{-3}{8} - \frac{3}{16}$$

L.C.M. of 8 and 16 is 16.

$$\Rightarrow x = \frac{-6-3}{16}$$

$$\Rightarrow x = \frac{-9}{16}$$

Q7

**Answer :**

Let the other number be  $x$ .

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

$$\Rightarrow x = -3 - \frac{(-15)}{7}$$

$$\Rightarrow x = \frac{-21+15}{7}$$

$$\Rightarrow x = \frac{-6}{7}$$

Hence, the required number is  $\frac{-6}{7}$ .

Q8

**Answer :**

Let the required number be  $x$ .

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

$$\Rightarrow x = \frac{-4}{3} + 5$$

$$\Rightarrow x = \frac{-4+15}{3}$$

$$\Rightarrow x = \frac{11}{3}$$

Hence, the required number is  $\frac{11}{3}$ .

Q9

**Answer :**

Let the required number be  $x$ .

$$\frac{-3}{8} + x = \frac{5}{12}$$

$$\Rightarrow x = \frac{5}{12} - \frac{(-3)}{8}$$

$$\Rightarrow x = \frac{10+9}{24}$$

$$\Rightarrow x = \frac{19}{24}$$

Hence, the required number is  $\frac{19}{24}$ .

Q10

**Answer :**

Let the number that is to be added be  $x$ .

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

$$\Rightarrow x = 3 - \frac{(-12)}{5}$$

$$\Rightarrow x = \frac{15+12}{5}$$

$$\Rightarrow x = \frac{27}{5}$$

Hence, the required number is  $\frac{27}{5}$ .

Q11

**Answer :**

Let the number that is to be added be  $x$ .

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

$$\Rightarrow x = \frac{-2}{3} - \frac{(-5)}{7}$$

L. C. M. of 3 and 7 is 21.

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

$$\Rightarrow x = \frac{1}{21}$$

Hence, the required number is  $\frac{1}{21}$ .

Q12

**Answer :**

Let the number that is to be added be  $x$ .

$$\frac{2}{9} + x = -1$$

$$\Rightarrow x = -1 - \frac{2}{9}$$

$$\Rightarrow x = \frac{-9-2}{9}$$

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

Hence, the required number is  $\frac{-11}{9}$ .

Q13

**Answer :**

Let the required number that is to be added be  $x$ .

$$\left(\frac{-13}{4} + \frac{-3}{8}\right) + x = 1$$

$$\Rightarrow x = 1 - \left(\frac{-13}{4} + \frac{(-3)}{8}\right)$$

L. C. M. of 4 and 8 is 8.

$$= 1 - \left(\frac{-26-3}{8}\right)$$

$$= 1 - \left(\frac{-29}{8}\right)$$

$$= 1 + \frac{29}{8}$$

$$= \frac{8+29}{8}$$

$$= \frac{37}{8}$$

Hence, the required number is  $\frac{37}{8}$ .

Q14

**Answer :**

Let the required number that is to be subtracted be  $x$ .

$$\frac{-3}{4} - x = \frac{5}{6}$$

$$\Rightarrow -x = \frac{5}{6} - \frac{(-3)}{4}$$

L. C. M. of 6 and 4 is 12.

$$\Rightarrow -x = \frac{10+9}{12}$$

$$\Rightarrow -x = \frac{19}{12}$$

$$\Rightarrow -x \times (-1) = \frac{19}{12} \times (-1)$$

$$\Rightarrow x = -\frac{19}{12}$$

Hence, the required number is  $\frac{-19}{12}$ .

Q15

**Answer :**

Let the required number that is to be subtracted be  $x$ .

$$\frac{-2}{3} - x = \frac{-5}{6}$$

$$\Rightarrow -x = \frac{-5}{6} - \frac{(-2)}{3}$$

L.C.M. of 6 and 3 is 6.

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

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

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

Q16

**Answer :**

Let the required number that is to be subtracted be  $x$ .

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

$$\Rightarrow -x = 1 - \frac{(-3)}{4}$$

$$\Rightarrow -x = \frac{4+3}{4}$$

$$\Rightarrow -x = \frac{7}{4}$$

$$\Rightarrow x = -\frac{7}{4}$$



# Rational Numbers

## Exercise 4E

Q1

Answer :

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

$$(ii) \frac{\cancel{8}^3}{\cancel{8}_1} \times \frac{\cancel{3}^{-2}^4}{\cancel{3}_1} = \frac{(3 \times 4)}{(1 \times 1)} = 12$$

$$(iii) \frac{7}{\cancel{7}_1} \times \frac{\cancel{2}^{-4}^4}{1} = 7 \times 4 = 28$$

$$(iv) \frac{-2}{\cancel{2}_1} \times \frac{\cancel{6}^2}{7} = \frac{(-2 \times 2)}{7} = \frac{-4}{7}$$

(v) We need a positive denominator.

$$\therefore \frac{10}{-3} \times \frac{-1}{-1} = \frac{-10}{3}$$

$$= \frac{-\cancel{1}^{-2}^4}{\cancel{3}_1} \times \frac{-\cancel{1}^{-2}^2}{\cancel{3}_1}$$

$$= (-4) \times (-2)$$

$$= 8$$

$$(vi) \frac{\cancel{2}^{-5}^5}{\cancel{3}_3} \times \frac{\cancel{3}^1}{-\cancel{1}^{-1}^1} = \frac{5}{3} \times \frac{1}{2} = \frac{5}{6}$$

$$(vii) \frac{-\cancel{7}^1}{\cancel{1}^{-1}^1} \times \frac{-\cancel{4}^{-4}^4}{\cancel{2}^{-2}^2} = \frac{4}{3}$$

$$(viii) \frac{-\cancel{3}^{-6}^{12}}{\cancel{5}_5} \times \frac{\cancel{2}^{-4}^4}{\cancel{3}_3} = 12 \times 4 = 48$$

$$(ix) \frac{-\cancel{1}^{-3}^1}{\cancel{1}^{-1}^1} \times \frac{-\cancel{2}^{-5}^5}{\cancel{2}^{-2}^2} = \frac{-1}{3} \times \frac{-5}{2} = \frac{5}{6}$$

Q2

**Answer :**

(i)

$$\begin{aligned} & \frac{3}{-2-5} \times \frac{-1}{5} \\ &= \frac{3 \times 1}{5 \times 5} \\ &= \frac{3}{25} \end{aligned}$$

(ii)

$$\begin{aligned} & \frac{-7}{-3-6} \times \frac{-5}{-1-2} \\ &= \frac{-1 \times 1}{6 \times 2} \\ &= \frac{-1}{12} \end{aligned}$$

(iii)

$$\begin{aligned} & \frac{-5}{-1-2} \times \frac{-9}{-2-4} \\ &= \frac{1 \times (-1)}{-2 \times 4} \\ &= \frac{-1}{-8} = \frac{1}{8} \end{aligned}$$

(iv)

$$\begin{aligned} & \frac{-9}{-3} \times \frac{-1-6^2}{-3} \\ &= (-3) \times (-2) \\ &= 6 \end{aligned}$$

(v)

$$\begin{aligned} & \frac{-32}{1} \times \frac{-7}{36} \\ &= \frac{-3 \cdot 2^5 \times (-7)}{1 \times 3 \cdot 6^2} \\ &= \frac{-8 \times (-7)}{9} \\ &= \frac{56}{9} \end{aligned}$$

(vi)

We need a positive denominator.

$$\therefore \frac{16}{-21} \times \frac{-1}{-1} = \frac{-16}{21}$$

$$\text{Now, } \frac{-16}{-2-3} \times \frac{-1-4^2}{5}$$

$$\begin{aligned} &= \frac{(-16) \times (-2)}{3 \times 5} \\ &= \frac{32}{15} \end{aligned}$$

Q3

**Answer :**

(i)

$$\begin{aligned} & \frac{7}{-2-1} \times (-4-8^2) \\ &= 7 \times (-2) \\ &= -14 \end{aligned}$$

(ii)

$$\begin{aligned} & \frac{-19}{-3-6} \times -1-6^4 \\ &= \frac{-19}{9} \times 4 \\ &= \frac{-76}{9} \end{aligned}$$

(iii)

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

(iv)

$$\begin{aligned}
& -13 \times \frac{17}{26} \\
&= \frac{-1 \times 13^1 \times 17}{-2 \times 13^2} \\
&= \frac{-17}{2}
\end{aligned}$$

(v)

$$\begin{aligned}
& \frac{-13}{-5_1} \times \left( -1 \times 10^2 \right) \\
&= 26
\end{aligned}$$

(vi)

$$\begin{aligned}
& \frac{(-9^1)}{-1 \times 9_1} \times \frac{(-6 \times 4^4)}{-2 \times 3_3} \\
&= \frac{4}{3}
\end{aligned}$$

Q4

**Answer :**

(i)

$$\begin{aligned}
& \left( \frac{+3^1}{-8_2} \times \frac{+2^3}{+3_1} \right) + \left( \frac{-4^2}{-9_3} \times \frac{-3^1}{-2_1} \right) \\
&= \frac{3}{2} + \frac{2}{3}
\end{aligned}$$

L. C. M. of 2 and 3 is 6.

$$\begin{aligned}
&= \frac{9+4}{6} \\
&= \frac{13}{6}
\end{aligned}$$

(ii)

$$\begin{aligned}
& \left( \frac{16}{15} \times \frac{-25}{8} \right) + \left( \frac{-14}{27} \times \frac{6}{7} \right) \\
&= \left( \frac{+16^2}{+15_3} \times \frac{-25^5}{-8_1} \right) + \left( \frac{-14^2}{-27} \times \frac{6}{-7_1} \right) \\
&= \left[ \frac{2}{3} \times \frac{(-5)}{1} \right] + \left[ \frac{(-2)}{27} \times \frac{6}{1} \right] \\
&= \frac{(-10)}{3} + \frac{(-1 \times 2^4)}{-2 \times 7^9} \\
&= \frac{-10}{3} + \frac{-4}{9}
\end{aligned}$$

L. C. M. of 3 and 9 is 9.

$$\begin{aligned}
&= \frac{-30-4}{9} \\
&= \frac{-34}{9}
\end{aligned}$$

(iii)

$$\begin{aligned} & \left( \frac{6}{55} \times \frac{-22}{9} \right) - \left( \frac{26}{125} \times \frac{-10}{39} \right) \\ &= \left( \frac{-6^2}{5 \cdot 5_5} \times \frac{-2 \cdot 2^2}{9_3} \right) - \left( \frac{-2 \cdot 6^2}{1 \cdot 2 \cdot 5_{25}} \times \frac{-1 \cdot 6^2}{3 \cdot 9_3} \right) \\ &= \left[ \frac{(-4)}{15} - \frac{(-4)}{75} \right] \\ &= \frac{-4}{15} + \frac{4}{75} \end{aligned}$$

L. C. M. of 15 and 75 is 75.

$$\begin{aligned} &= \frac{-20+4}{75} \\ &= \frac{-16}{75} \end{aligned}$$

(iv)

$$\begin{aligned} & \left( \frac{-1 \cdot 2^4}{7_1} \times \frac{-1 \cdot 4^2}{2 \cdot 7_9} \right) - \left( \frac{-8^1}{4 \cdot 5_5} \times \frac{9^1}{16_2} \right) \\ &= \left[ \frac{(-4)}{1} \times \frac{(-2)}{9} \right] - \left[ \frac{-1}{5} \times \frac{1}{2} \right] \\ &= \frac{8}{9} + \frac{1}{10} \end{aligned}$$

L. C. M. of 9 and 10 is 90.

$$\begin{aligned} &= \frac{80+9}{90} \\ &= \frac{89}{90} \end{aligned}$$

Q5

**Answer :**

$$\text{Cost of 1 meter cloth} = \text{Rs } 40 \frac{1}{2}$$

$$\begin{aligned} \text{Cost of } 3 \frac{1}{2} \text{ meter cloth} &= \text{Rs } \left( 40 \frac{1}{2} \times 3 \frac{1}{2} \right) \\ &= \text{Rs } \left( \frac{81}{2} \times \frac{7}{2} \right) \\ &= \text{Rs } \frac{567}{4} \\ &= \text{Rs } 141.75 \end{aligned}$$

Q6

**Answer :**

$$\text{Distance covered in 1 hour} = 46 \frac{2}{3} \text{ km}$$

$$\text{Distance covered in } 2 \frac{2}{5} \text{ hours} = \left( 46 \frac{2}{3} \times 2 \frac{2}{5} \right)$$

$$= \left( \frac{1 \cdot 4 \cdot 28}{3} \times \frac{1 \cdot 2^4}{5^1} \right)$$

$$= (28 \times 4)$$

$$= 112 \text{ km}$$

Hence, the required distance is 112 km.

# Rational Numbers

## Exercise 4F

Q1

**Answer :**

(i) Multiplicative inverse of 18 =  $\frac{1}{18}$

ii) Multiplicative inverse of  $-16 = \frac{-1}{16}$

iii) Multiplicative inverse of  $\frac{13}{25} = \frac{25}{13}$

iv) Multiplicative inverse of  $\frac{-17}{12} = \frac{12}{-17}$

v) Multiplicative inverse of  $\frac{-6}{19} = \frac{19}{-6}$

vi) Multiplicative inverse of  $\frac{-3}{-5} = \frac{-5}{-3} = \frac{5}{3}$

vii) Multiplicative inverse of  $-1 = \frac{1}{-1} = -1$

viii) Multiplicative inverse of 0 =  $\frac{1}{0} = \text{infinity}$

Hence, it does not exist.

Q2

**Answer :**

(i)  $\frac{4}{9} \div \left(\frac{-5}{12}\right)$

$$= \frac{4}{9} \times \frac{12}{-5}$$

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

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

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

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

$$= \frac{128}{5}$$

(iii)  $\frac{-12}{7} \div (-18)$

$$= \frac{-12}{7} \times \left(\frac{-1}{18}\right)$$

$$= \frac{2}{21}$$

(iv)  $\frac{-1}{10} \div \left(\frac{-8}{5}\right)$

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

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

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

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

(v)  $\frac{-16}{35} \div \left(\frac{-15}{14}\right)$

$$= \frac{-16}{35} \times \frac{14}{(-15)}$$

$$= \frac{-32}{-75}$$

$$= \frac{32}{75}$$

(vi)  $\left(\frac{-65}{14}\right) \div \left(\frac{13}{-7}\right)$

$$= \left(\frac{-65}{14}\right) \times \left(\frac{-7}{13}\right)$$

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

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

Q3

Answer :

$$\begin{aligned}
 \text{(i)} \quad & (\dots?) \div \frac{-7}{5} = \frac{10}{19} \\
 & (\dots?) = \frac{10}{19} \times \frac{-7}{5} \\
 & (\dots?) = \frac{-14}{19} \\
 \text{(ii)} \quad & (\dots?) \div (-3) = \frac{-4}{15} \\
 & (\dots?) = \frac{-4}{15} \times (-3) \\
 & (\dots?) = \frac{4}{5} \\
 \text{(iii)} \quad & \frac{9}{8} \div (\dots?) = \frac{-3}{2} \\
 & \frac{9}{8} \div (\dots?) = \frac{(-3)}{2} \\
 & (\dots?) = \frac{9}{8} \times \frac{2}{(-3)} \\
 & (\dots?) = \frac{-3}{4} \\
 \text{(iv)} \quad & (-12) \div (\dots?) = \frac{-6}{5} \\
 & (\dots?) = (-12) \times \left(\frac{5}{-6}\right) \\
 & (\dots?) = 10
 \end{aligned}$$

Answer :

$$\begin{aligned}
 \text{Sum} &= \frac{65}{12} + \frac{8}{3} = \frac{65+32}{12} = \frac{97}{12} \\
 \text{Difference} &= \frac{65}{12} - \frac{8}{3} = \frac{65-32}{12} = \frac{33}{12} \\
 &= \frac{97}{12} \div \frac{33}{12} \\
 &= \frac{97}{12} \times \frac{12}{33} \\
 &= \frac{97}{33}
 \end{aligned}$$

Q5

Answer :

Let the required number be  $x$ .

$$\begin{aligned}
 \frac{-44}{9} \div x &= \frac{-11}{3} \\
 \Rightarrow x &= \frac{-44}{9} \times \frac{3}{-11} \\
 \Rightarrow x &= \frac{4}{3}
 \end{aligned}$$

Q6

Answer :

Let the required number be  $x$ .

$$\begin{aligned}
 x \times \left(\frac{-8}{15}\right) &= 24 \\
 x &= 24 \div \frac{-8}{15} \\
 &= 24 \times \left(\frac{15}{-8}\right) \\
 &= \frac{45 \times (-1)}{-1 \times (-1)} \\
 &= -45
 \end{aligned}$$

Q7

Answer :

Let the other number be  $x$ .

$$\begin{aligned}
 x \times -8 &= 10 \\
 \Rightarrow x &= 10 \div (-8) \\
 &= 10 \times \frac{1}{-8} \\
 &= -\frac{5}{4}
 \end{aligned}$$

∴ Other number =  $-\frac{5}{4}$

Q8

**Answer :**

Let the other number be  $x$ .

$$x \times (-12) = -9$$

$$\Rightarrow x = -9 \div (-12)$$

$$= -9 \times \left( \frac{1}{-12} \right)$$

$$= -9 \times \left( \frac{-1}{12} \right)$$

$$= \frac{-9^3}{+2_4}$$

Hence, the other number is  $\frac{3}{4}$ .

Q9

**Answer :**

Let the other number be  $x$ .

$$x \times \left( \frac{-4}{3} \right) = \frac{-16}{9}$$

$$\Rightarrow x = \frac{-16}{9} \div \left( \frac{-4}{3} \right)$$

$$= \frac{-16^4}{\cancel{4}_3} \times \left( \frac{\cancel{3}^1}{-4_1} \right)$$

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

Hence, the other number is  $\frac{4}{3}$ .

Q10

**Answer :**

Let the required number be  $x$ .

$$x \times \left( \frac{-8}{39} \right) = \frac{5}{26}$$

$$\Rightarrow x = \frac{5}{26} \div \left( \frac{-8}{39} \right)$$

$$= \frac{5}{\cancel{26}_2} \times \left( \frac{\cancel{39}^3}{-8} \right)$$

$$= \frac{15 \times -1}{-16 \times -1} = \frac{-15}{16}$$

Hence, the required number is  $\frac{-15}{16}$ .

Q11

**Answer :**

Length of the cloth required to prepare 24 trousers = 54 m

Length of the cloth required for each pair of trousers =  $54 \div 24$

$$\begin{aligned} &= \frac{\cancel{54}_9}{\cancel{24}_4} \\ &= \frac{9}{4} = 2\frac{1}{4} \text{ m} \end{aligned}$$

Hence,  $2\frac{1}{4}$  m length of cloth is required for each pair of trousers.

Q12

**Answer :**

Length of a rope = 30 m

Number of pieces =  $30 \div 3\frac{3}{4} = 30 \div \frac{15}{4}$

$$= \frac{2 \cancel{30}_6}{\cancel{15}_5} \times \frac{4}{+5}$$

$$= 8$$

Hence, the number of pieces would be 8.

Q13

**Answer :**

Cost of  $2\frac{1}{2}$  m cloth = Rs  $78\frac{3}{4}$

Cost of cloth per meter =  $78\frac{3}{4} \div 2\frac{1}{2}$

$$= \frac{315}{4} \div \frac{5}{2}$$

$$= \frac{\cancel{315}^{63}}{\cancel{4}_2} \times \frac{\cancel{2}^1}{5_1}$$

$$= \text{Rs } \frac{63}{2} = \text{Rs } 31\frac{1}{2}$$

$\therefore$  Cost of the cloth (per metre) = Rs  $31\frac{1}{2}$

# Rational Numbers

## Exercise 4G

Q1

**Answer :**

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

$$\begin{array}{r} 33 \overline{) 55} (1 \\ \underline{-33} \\ 22 \overline{) 33} (1 \\ \underline{-22} \\ 11 \overline{) 22} (2 \\ \underline{-22} \\ \times \end{array}$$

**H. C. F. of 33 and 55 is 11**

$$\frac{-33 \div 11}{55 \div 11} = \frac{-3}{5}$$

Q2

**Answer :**

(b)  $\frac{-6}{7}$

$$\begin{array}{r} 102 \overline{) 119} (1 \\ \underline{-102} \\ 17 \overline{) 102} (6 \\ \underline{-102} \\ \times \end{array}$$

**H. C. F. of 102 and 119 is 17**

$$\frac{-102 \div 17}{119 \div 17} = \frac{-6}{7}$$

The standard form of  $\frac{-102}{119}$  is  $\frac{-6}{7}$

Q3



**Answer :**

The correct option is (a).

The value of  $x$  is  $-14$ .

$$\left[ x = \frac{7 \times 6}{-3} = \frac{-42}{-3} = -14 \right]$$

Q4

**Answer :**

The correct option is (c).

$\frac{14}{9}$  should be added to  $-\frac{5}{9}$  to get 1.

Let the required number be  $x$ .

$$x + \left( -\frac{5}{9} \right) = 1$$

$$x = 1 - \frac{(-5)}{9} = \frac{9+5}{9} = \frac{14}{9}$$

Q5

**Answer :**

The correct option is (b).

Let the number that is to be subtracted be  $x$ .

$$\frac{-3}{4} - x = \frac{5}{6}$$

$$\Rightarrow -x = \frac{5}{6} - \left( \frac{-3}{4} \right)$$

$$\Rightarrow -x = \frac{5}{6} + \frac{3}{4}$$

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

$$\Rightarrow x = -\frac{19}{12}$$

Hence,  $-\frac{19}{12}$  should be subtracted from  $-\frac{3}{4}$  to get  $\frac{5}{6}$ .

Q6

**Answer :**

The correct option is (a).

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

L.C.M. of 6 and 12 is 12.

$$\therefore \frac{-5 \times 2}{6 \times 2} = \frac{-10}{12} \text{ and } \frac{-7 \times 1}{12 \times 1} = \frac{-7}{12}$$

Hence,  $\frac{-5}{6}$  is smaller than  $\frac{-7}{12}$ .

Q7

**Answer :**

The correct option is (a).

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

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

$$\therefore \frac{-2 \times 5}{3 \times 5} = \frac{-10}{15} \text{ and } \frac{-4 \times 3}{5 \times 3} = \frac{-12}{15}$$

Thus,  $\frac{-2}{3}$  is greater than  $\frac{-4}{5}$ .

Q8

**Answer :**

The correct option is (c).

Reciprocal of  $-6$  is  $-\frac{1}{6}$ .

Q9

**Answer :**

The correct option is (b).

Multiplicative inverse of  $-\frac{2}{3}$  is  $-\frac{3}{2}$ .

Q10

**Answer :**

The correct option is (a).

$$\begin{aligned} & -2\frac{1}{9} - 6 \\ &= \frac{-19}{9} - 6 = \frac{-19-54}{9} \\ &= \frac{-73}{9} = -8\frac{1}{9} \end{aligned}$$

Q11

**Answer :**

The correct option is (c).

$$\begin{aligned} & \frac{-6}{13} - \frac{[-7]}{15} \\ \text{L.C.M. of 13 and 15 is 195.} \\ &= \frac{-6}{13} - \frac{[-7]}{15} \\ &= \frac{-90+91}{195} \\ &= \frac{1}{195} \end{aligned}$$

Q12

**Answer :**

The correct option is (b).

$$\begin{aligned} & -2\frac{1}{3} + 4\frac{3}{5} \\ &= \frac{-7}{3} + \frac{23}{5} \\ \text{L.C.M. of 5 and 5 is 15.} \\ &= \frac{-35+69}{15} \\ &= \frac{34}{15} \\ &= 2\frac{4}{15} \end{aligned}$$

Q13

**Answer :**

The correct option is (b).

$$\begin{aligned} & \frac{2}{3} - 1\frac{5}{7} \\ &= \frac{2}{3} - \frac{12}{7} \\ \text{L.C.M. of 3 and 7 is 21.} \\ &= \frac{14-36}{21} \\ &= \frac{-22}{21} \\ &= -1\frac{1}{21} \end{aligned}$$

Q14

**Answer :**

The correct option is (b).

$$\begin{aligned} & \frac{-5}{12} \text{ is greater than } \frac{-4}{9}. \\ \text{L.C.M. of 9 and 12 is 36.} \\ & \frac{-5 \times 3}{12 \times 3} = \frac{-15}{36} \\ & \frac{-4 \times 4}{12 \times 4} = \frac{-16}{36} \\ & (-15) > (-16) \\ & \frac{-5}{12} > \frac{-4}{9} \end{aligned}$$

Q15

**Answer :**

The correct option is (b).

$$\frac{-9}{14} + ? = -1$$

$$\therefore ? = -1 - \frac{(-9)}{14}$$

$$? = \frac{-14+9}{14}$$

$$? = \frac{-5}{14}$$

Q16

**Answer :**

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

$$\frac{5}{4} - \frac{7}{6} - \frac{(-2)}{3}$$

L.C.M. of 4, 6 and 3 is 12.

$$= \frac{15 - 14 + 8}{12}$$

$$= \frac{23 - 14}{12}$$

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

Q17

**Answer :**

$$(b) 2$$

$$1 \div \frac{1}{2}$$

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

$$= 2$$

Q18

**Answer :**

$$(a) \frac{-35}{18}$$

$$? = \frac{5}{12} \div \frac{(-3)}{14}$$

$$= \frac{5}{12} \times \frac{14}{(-3)}$$

$$= \frac{70}{-36}$$

$$= \frac{35 \times -1}{18 \times -1}$$

$$? = \frac{-35}{18}$$

Q19

**Answer :**

$$(c) 0$$

$$0 \div \frac{-7}{5} = 0$$

Q20

**Answer :**

$$(d) \text{ Not defined}$$

This is because  $\frac{-3}{8} \div 0$  is not defined.