

EXERCISE 4.1

1. $\frac{0}{3}$; numerator = 0
denominator = 3

$\frac{-1}{3}$; numerator = -1
denominator = 3

$\frac{-5}{17}$; numerator = -5
denominator = 17

$\frac{-4}{-3}$; numerator = -4
denominator = -3

$\frac{7}{-8}$; numerator = 7
denominator = -8

2. $\frac{4}{0}$ is not a rational number.

Since, denominator = 0.

3. (i) Numerator = 3, Denominator = -7

$\therefore$ Rational number = $\frac{3}{-7}$

(ii) Denominator = -4, Numerator = -3.

$\therefore$ Rational number = $\frac{-3}{-4}$.

(iii) Numerator = $15 - 7 = 8$
Denominator = $13 - 6 = 7$

$\therefore$ Rational number = $\frac{8}{7}$

(iv) Numerator = $7 + 6 = 13$
Denominator = $17 \times (-2) = -34$

$\therefore$ Rational number = $\frac{13}{-34}$

4. (i) $\frac{-4}{-7} = \frac{-4 \times 4}{-7 \times 4} = \frac{-16}{-28}$

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

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

5. (i) $\frac{6}{-11} = \frac{6 \times (-1)}{-11 \times (-1)} = \frac{-6}{11}$

(ii) $\frac{6}{-11} = \frac{6 \times 5}{-11 \times 5} = \frac{30}{-55}$

(iii) $\frac{6}{-11} = \frac{6 \times (-4)}{-11 \times (-4)} = \frac{-24}{44}$

6. $\frac{-25}{60} = \frac{-25 \div (-5)}{60 \div (-5)} = \frac{5}{-12}$

7. (i) $\frac{7}{-13} = \frac{7 \times (-3)}{-13 \times (-3)} = \frac{-21}{39}$

(ii) $\frac{7}{-13} = \frac{7 \times 2}{-13 \times 2} = \frac{14}{-26}$

8. $\frac{6}{-7} = \frac{6 \times (-1)}{-7 \times (-1)} = \frac{-6}{7}$

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

$\frac{-11}{-5} = \frac{-11 \times (-1)}{-5 \times (-1)} = \frac{11}{5}$

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

9. (i) $\frac{-7 \times 2}{8 \times 2} = \frac{-14}{16}$; $\frac{-7 \times 3}{8 \times 3} = \frac{-21}{24}$; $\frac{-7 \times 4}{8 \times 4} = \frac{-28}{32}$

$\therefore$ Three equivalent rational numbers of $\frac{-7}{8}$ are $\frac{-14}{16}$, $\frac{-21}{24}$ and $\frac{-28}{32}$.

(ii) $\frac{11 \times 2}{-6 \times 2} = \frac{22}{-12}$; $\frac{11 \times 3}{-6 \times 3} = \frac{33}{-18}$; $\frac{11 \times 4}{-6 \times 4} = \frac{44}{-24}$

$\therefore$ Three equivalent rational numbers of $\frac{11}{-6}$ are $\frac{22}{-12}$, $\frac{33}{-18}$ and $\frac{44}{-24}$.

(iii) $\frac{18 \div 2}{12 \div 2} = \frac{9}{6}$; $\frac{18 \div 3}{12 \div 3} = \frac{6}{4}$; $\frac{18 \div 6}{12 \div 6} = \frac{3}{2}$

∴ Three equivalent rational numbers

of $\frac{18}{12}$ are $\frac{3}{2}$, $\frac{6}{4}$ and $\frac{9}{6}$.

10. (i) $\frac{3}{8}, \frac{5}{7}$

L.C.M. of 8 and 7 is 56.

$$\frac{3}{8} = \frac{3 \times 7}{8 \times 7} = \frac{21}{56} \text{ and } \frac{5}{7} = \frac{5 \times 8}{7 \times 8} = \frac{40}{56}$$

Hence, $\frac{21}{56}$ and $\frac{40}{56}$ are the equivalent forms of $\frac{3}{8}$ and $\frac{5}{7}$ respectively, having a common denominator.

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

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

$$\frac{3}{4} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8}, \frac{-7}{8}$$

Hence, $\frac{6}{8}$ and $\frac{-7}{8}$ are the equivalent forms of $\frac{3}{4}$ and $\frac{-7}{8}$ respectively, having a common denominator.

(iii) $\frac{7}{-6}, \frac{3}{4}$

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

$$\frac{7}{-6} = \frac{7 \times (-2)}{-6 \times (-2)} = \frac{-14}{12}$$

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

Hence, $\frac{-14}{12}$ and $\frac{9}{12}$ are the equivalent forms of $\frac{7}{-6}$ and $\frac{3}{4}$ respectively, having a common denominator.

True/ False (Pg : 66)

1. True 2. False 3. True 4. True

EXERCISE 4.2

1. (i) $\frac{-30}{-45}$ $\begin{array}{r} 30 \overline{) 45} 1 \\ -30 \\ \hline 15 \end{array} \begin{array}{r} 30 \overline{) 2} \\ -30 \\ \hline 0 \end{array}$
H.C.F. of 30 and 45 is 15.

$$\therefore \frac{-30}{-45} = \frac{(-30) \div 15}{(-45) \div 15} = \frac{-2}{-3} = \frac{-2 \times (-1)}{(-3) \times (-1)} = \frac{2}{3}$$

(ii) $\frac{24}{-42}$ $\begin{array}{r} 24 \overline{) 42} 1 \\ -24 \\ \hline 18 \end{array} \begin{array}{r} 24 \overline{) 1} \\ -18 \\ \hline 6 \end{array}$
H.C.F. of 24 and 42 is 6.

$$\therefore \frac{24}{-42} = \frac{24 \div 6}{(-42) \div 6} = \frac{4}{-7} = \frac{4 \times (-1)}{(-7) \times (-1)} = \frac{-4}{7}$$

(iii) $\frac{-35}{49}$

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

$$\therefore \frac{-35}{49} = \frac{(-35) \div 7}{49 \div 7} = \frac{-5}{7}$$

(iv) $\frac{39}{-24}$

H.C.F. of 39 and 24 is 3.

$$\frac{39}{-24} = \frac{39 \div 3}{(-24) \div 3} = \frac{13}{-8} = \frac{13 \times (-1)}{(-8) \times (-1)} = \frac{-13}{8}$$

(v) $\frac{-72}{-99}$

H.C.F. of 72 and 99 is 9.

$$\therefore \frac{-72}{-99} = \frac{(-72) \div 9}{(-99) \div 9} = \frac{-8}{-11} = \frac{(-8) \times (-1)}{(-11) \times (-1)} = \frac{8}{11}$$

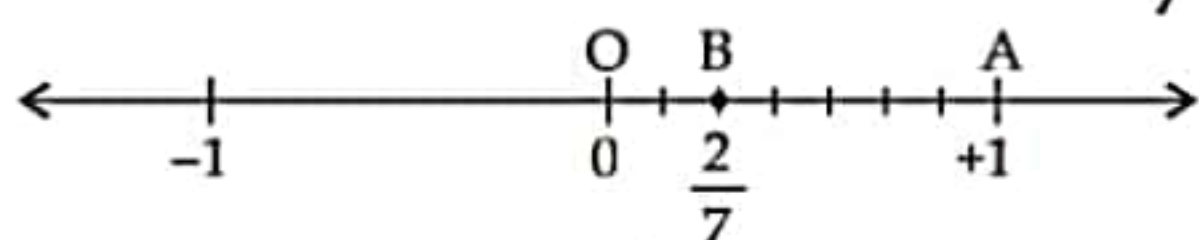
(vi) $\frac{-216}{144}$ $\begin{array}{r} 144 \overline{) 216} 1 \\ -144 \\ \hline 72 \end{array} \begin{array}{r} 144 \overline{) 2} \\ -144 \\ \hline 0 \end{array}$
H.C.F. of 216 and 144 is 72.

$$\therefore \frac{-216}{144} = \frac{-216 \div 72}{144 \div 72} = \frac{-3}{2}$$

(vii) $\frac{-195}{520}$ $\begin{array}{r} 195 \overline{) 520} 2 \\ -390 \\ \hline 130 \end{array} \begin{array}{r} 195 \overline{) 1} \\ -130 \\ \hline 65 \end{array}$
H.C.F. of 195 and 520 is 65.

$$\therefore \frac{-195}{520} = \frac{-195 \div 65}{520 \div 65} = \frac{-3}{8}$$

2. (i) $\frac{2}{7}$; Draw a line and take a point O on it to represent zero. Take a point A such that OA = +1 unit. Divide OA into seven equal parts, each part represents $\frac{1}{7}$.



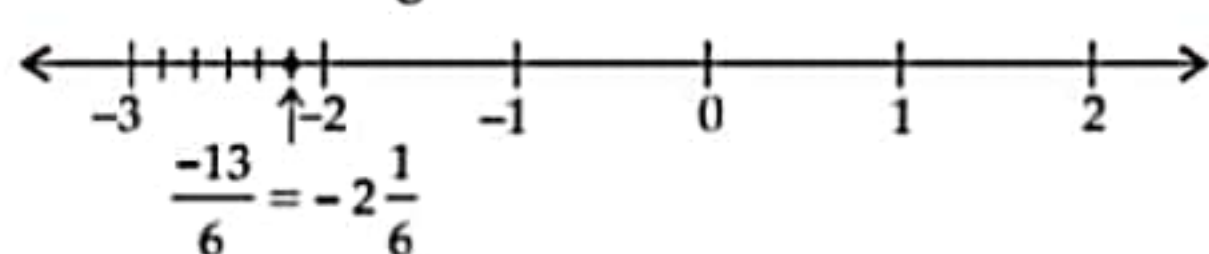
Point B represents $\frac{2}{7}$ on the number line.

(ii) $\frac{-13}{6} = -2\frac{1}{6}$

$\frac{-13}{6} = -2\frac{1}{6}$ lies between -2 and -3.

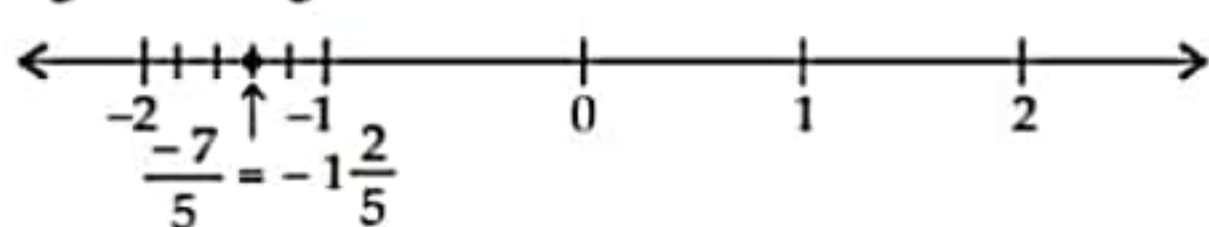
Divide the unit length between -2 and -3 into six equal parts. Each part

represents $\frac{-1}{6}$.



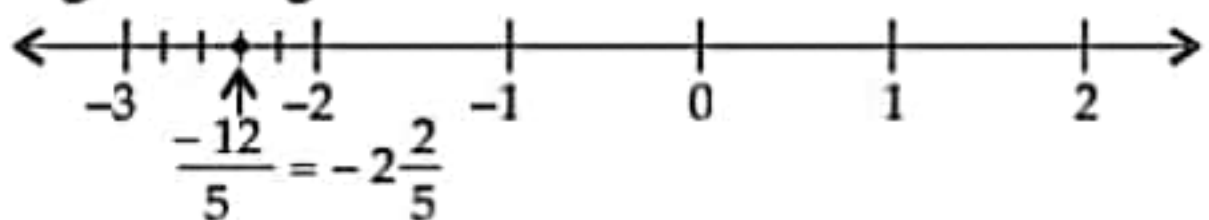
(iii) $\frac{-7}{5} = -1\frac{2}{5}$

$\frac{-7}{5} = -1\frac{2}{5}$ lies between -1 and -2.



(iv) $\frac{12}{-5} = \frac{12 \times (-1)}{-5 \times (-1)} = \frac{-12}{5} = -2\frac{2}{5}$

$\frac{12}{-5} = -2\frac{2}{5}$ lies between -2 and -3.



3. (i) L.C.M. of 6 and 8 is 24.

$$\frac{5}{6} = \frac{5 \times 4}{6 \times 4} = \frac{20}{24}$$

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

Since, denominators are same and $21 > 20$.

$$\therefore \frac{21}{24} > \frac{20}{24} \Rightarrow \frac{7}{8} > \frac{5}{6}$$

(ii) $\frac{4}{-5} = -\frac{4}{5}$ (standard form)

Every positive rational number is greater than every negative rational number.

$$\therefore \frac{11}{20} > -\frac{4}{5}$$

- (iii) L.C.M. of 16 and 9 is 144.

$$\frac{-3}{16} = \frac{-3 \times 9}{16 \times 9} = \frac{-27}{144}$$

$$\frac{5}{-9} = \frac{5 \times (-16)}{-9 \times (-16)} = \frac{-80}{144}$$

$\therefore$ Denominators are same and $-27 > -80$,

$$\therefore \frac{-27}{144} > \frac{-80}{144} \Rightarrow \frac{-3}{16} > \frac{5}{-9}$$

4. (i) $\frac{-35}{-20} = \frac{-35 \div (-5)}{-20 \div (-5)} = \frac{7}{4}$

Hence, $\frac{7}{4}$ and $\frac{-35}{-20}$ represent the same rational number.

(ii) $\frac{-24}{42} = \frac{-24 \div (-6)}{42 \div (-6)} = \frac{4}{-7}$

Hence, $\frac{-24}{42}$ and $\frac{4}{-7}$ represent the same rational number.

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

$$\therefore -10 \neq -15$$

Hence, $\frac{5}{-8}$ and $\frac{-15}{16}$ do not represent the same rational number.

5. (i) $\frac{-7}{4}, \frac{5}{-12}, \frac{-3}{16}, \frac{3}{-8}$

L.C.M. of 4, 12, 16 and 8 is 48.

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

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

$$\frac{-3}{16} = \frac{-3 \times 3}{16 \times 3} = \frac{-9}{48}$$

$$\frac{3}{-8} = \frac{3 \times (-6)}{-8 \times (-6)} = \frac{-18}{48}$$

$\therefore \frac{-84}{48}, \frac{-20}{48}, \frac{-18}{48}, \frac{-9}{48}$ are in ascending order.

$\Rightarrow \frac{-7}{4}, \frac{5}{-12}, \frac{3}{-8}, \frac{-3}{16}$ are in ascending order.

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

L.C.M. of 15, 10, 20 and 30 is 60.

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

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

$$\frac{-3}{20} = \frac{-3 \times 3}{20 \times 3} = \frac{-9}{60}$$

$$\frac{7}{-30} = \frac{7 \times (-2)}{-30 \times (-2)} = \frac{-14}{60}$$

$\therefore \frac{-44}{60}, \frac{-42}{60}, \frac{-14}{60}, \frac{-9}{60}$ are in ascending order.

$\Rightarrow \frac{11}{-15}, \frac{-7}{10}, \frac{7}{-30}, \frac{-3}{20}$ are in ascending order.

$$(iii) \frac{3}{5}, \frac{-2}{-3}, 0, \frac{1}{2}, \frac{-7}{6}$$

L.C.M. of 5, 3, 2, and 6 is 30.

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

$$\frac{-2}{-3} = \frac{-2 \times (-10)}{-3 \times (-10)} = \frac{20}{30}$$

$$0 = \frac{0 \times 30}{1 \times 30} = \frac{0}{30}, \frac{1}{2} = \frac{1 \times 15}{2 \times 15} = \frac{15}{30}$$

$$\frac{-7}{6} = \frac{-7 \times 5}{6 \times 5} = \frac{-35}{30}$$

$\therefore \frac{-35}{30}, \frac{0}{30}, \frac{15}{30}, \frac{18}{30}, \frac{20}{30}$ are in ascending order.

$\Rightarrow \frac{-7}{6}, 0, \frac{1}{2}, \frac{3}{5}, \frac{-2}{-3}$ are in ascending order.

$$6. (i) \frac{2}{-9}, \frac{-4}{3}, \frac{7}{-12}, \frac{-5}{18}$$

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

$$\frac{2}{-9} = \frac{2 \times (-4)}{-9 \times (-4)} = \frac{-8}{36}$$

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

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

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

$\frac{-8}{36}, \frac{-10}{36}, \frac{-21}{36}, \frac{-48}{36}$ are in descending order.

$\Rightarrow \frac{2}{-9}, \frac{-5}{18}, \frac{7}{-12}, \frac{-4}{3}$ are in descending order.

$$(ii) -3, \frac{-3}{5}, \frac{8}{-3}, \frac{1}{3}$$

L.C.M. of 1, 5, 3 and 3 is 15.

$$-3 = \frac{-3}{1} = \frac{-3 \times 15}{1 \times 15} = \frac{-45}{15}$$

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

$$\frac{8}{-3} = \frac{8 \times (-5)}{-3 \times (-5)} = \frac{-40}{15}$$

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

$\frac{5}{15}, \frac{-9}{15}, \frac{-40}{15}, \frac{-45}{15}$ are in descending order.

$\Rightarrow \frac{1}{3}, \frac{-3}{5}, \frac{8}{-3}, -3$ are in descending order.

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

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

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

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

$$\frac{4}{-18} = \frac{4 \times (-2)}{-18 \times (-2)} = \frac{-8}{36}$$

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

$\frac{24}{36}, \frac{-8}{36}, \frac{-20}{36}, \frac{-21}{36}$ are in descending order.

$\Rightarrow \frac{-2}{-3}, \frac{4}{-18}, \frac{-5}{9}, \frac{7}{-12}$ are in descending order.

7. (i) $\frac{-3}{13}$ and $\frac{5}{13}$

$$\frac{-3}{13} < \frac{-2}{13} < \frac{-1}{13} < 0 < \frac{5}{13}$$

Hence, three rational numbers between

$\frac{-3}{13}$ and $\frac{5}{13}$ are $\frac{-2}{13}, \frac{-1}{13}$ and 0.

(ii) $\frac{3}{9}$ and $\frac{3}{7}$

L.C.M. of 9 and 7 is 63.

$$\frac{3}{9} = \frac{3 \times 7}{9 \times 7} = \frac{21}{63}, \quad \frac{3}{7} = \frac{3 \times 9}{7 \times 9} = \frac{27}{63}$$

$$\text{Now, } \frac{21}{63} < \frac{22}{63} < \frac{23}{63} < \frac{24}{63} < \frac{27}{63}$$

Hence, three rational numbers between

$\frac{3}{9}$ and $\frac{3}{7}$ are $\frac{22}{63}, \frac{23}{63}$ and $\frac{24}{63}$.

8. The L.C.M. of 7 and 5 is 35.

$$\frac{-2}{7} = \frac{-2 \times 5}{7 \times 5} = \frac{-10}{35}, \quad \frac{3}{-5} = \frac{3 \times (-7)}{-5 \times (-7)} = \frac{-21}{35}$$

$$\text{Now, } \frac{-21}{35} < \frac{-13}{35} < \frac{-12}{35} < \frac{-11}{35} < \frac{-10}{35}$$

Hence, three required rational numbers are

$\frac{-11}{35}, \frac{-12}{35}$ and $\frac{-13}{35}$.

9. (i) $\frac{-7}{11} \leq 0$ ($\because -7 < 0$)

(ii) $\frac{-16}{-24} = \frac{-16 \div (-8)}{-24 \div (-8)} = \frac{2}{3}$

$$\text{Hence, } \frac{-16}{-24} \leq \frac{2}{3}$$

(iii) $\frac{7}{1} = \frac{7 \times (-12)}{1 \times (-12)} = \frac{-84}{-12}$

$$\text{Hence, } 7 \leq \frac{-84}{-12}$$

(iv) $\frac{-5}{21} = \frac{-5 \times 2}{21 \times 2} = \frac{-10}{42}$

$$\frac{-10}{42} < \frac{-7}{42} \quad (\because -10 < -7)$$

$$\text{Hence, } \frac{-5}{21} < \frac{-7}{42}$$

(v) $\frac{-16}{-7} = \frac{-16 \times (-1)}{-7 \times (-1)} = \frac{16}{7}$

$$\frac{-13}{7} < \frac{16}{7} \quad (\because -13 < 16)$$

$$\text{Hence, } \frac{-13}{7} < \frac{16}{7}$$

(vi) $\frac{5}{1} = \frac{5 \times 4}{1 \times 4} = \frac{20}{4}$

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

$$\frac{20}{4} > \frac{-15}{4} \quad (\because 20 > -15)$$

$$\text{Hence, } 5 > \frac{15}{-4}$$

10. (i) L.C.M. of 15 and 10 is 30.

$$\frac{4}{-15} = \frac{4 \times (-2)}{-15 \times (-2)} = \frac{-8}{30}$$

$$\frac{-1}{10} = \frac{-1 \times 3}{10 \times 3} = \frac{-3}{30}$$

$$\therefore \frac{-8}{30} < \frac{-3}{30} \Rightarrow \frac{4}{-15} < \frac{-1}{10}$$

Hence, $\frac{4}{-15}$ is smaller.

(ii) L.C.M. of 2 and 4 is 4.

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

$$\therefore \frac{-14}{4} < \frac{-1}{4} \Rightarrow \frac{-7}{2} < \frac{-1}{4}$$

Hence, $\frac{-7}{2}$ is smaller.

(iii) L.C.M. of 36 and 9 is 36.

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

$$\therefore \frac{-20}{36} < \frac{-13}{36} \Rightarrow \frac{5}{-9} < \frac{-13}{36}$$

Hence, $\frac{5}{-9}$ is smaller.

EXERCISE 4.3

1. (i) $\frac{3}{7} + \left(\frac{-6}{7}\right) = \frac{3+(-6)}{7} = \frac{-3}{7}$

(ii) $\frac{-13}{4} + \frac{7}{4} = \frac{-13+7}{4} = \frac{-6}{4} = \frac{-3}{2}$

(iii) $\frac{-8}{13} + \left(\frac{-4}{13}\right) = \frac{(-8)+(-4)}{13} = \frac{-8-4}{13} = \frac{-12}{13}$

(iv) $\frac{-5}{11} + \left(\frac{-6}{11}\right) = \frac{(-5)+(-6)}{11} = \frac{-5-6}{11} = \frac{-11}{11} = -1$

2. (i) $1 + \left(\frac{5}{-12}\right) = 1 + \frac{5 \times (-1)}{-12 \times (-1)} = \frac{1}{1} + \left(\frac{-5}{12}\right)$
 $= \frac{12 \times 1 + (-5)}{12} = \frac{12-5}{12} = \frac{7}{12}$

(ii) $\frac{-2}{9} + \frac{8}{27} = \frac{(-2) \times 3 + 8 \times 1}{27} = \frac{-6+8}{27} = \frac{2}{27}$

(iii) $\frac{-5}{12} + \frac{5}{8} = \frac{-5 \times 2}{12 \times 2} + \frac{5 \times 3}{8 \times 3} = \frac{-10}{24} + \frac{15}{24}$
 $= \frac{-10+15}{24} = \frac{5}{24}$

(iv) $\frac{-3}{4} + \left(\frac{-5}{6}\right) = \frac{-3 \times 3}{4 \times 3} + \frac{(-5) \times 2}{6 \times 2}$
 $= \frac{-9}{12} + \left(\frac{-10}{12}\right) = \frac{-9-10}{12} = \frac{-19}{12}$

3. (i) $\frac{-9}{24} + \left(\frac{-1}{18}\right) = \frac{-9 \times 3}{24 \times 3} + \frac{(-1) \times 4}{18 \times 4}$
 $(\because \text{L.C.M. of 24 and 18 is 72.})$

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

$$= \frac{-27-4}{72} = \frac{-31}{72}$$

(ii) $\frac{-6}{27} + \frac{5}{18} = \frac{-6 \times 2}{27 \times 2} + \frac{5 \times 3}{18 \times 3}$
 $(\because \text{L.C.M. of 27 and 18 is 54.})$

$$= \frac{-12}{54} + \frac{15}{54} = \frac{-12+15}{54} = \frac{3}{54} = \frac{1}{18}$$

(iii) $\frac{-7}{36} + \left(\frac{-5}{12}\right) = \frac{(-7) \times 1 + (-5) \times 3}{36}$
 $= \frac{-7-15}{36} = \frac{-22}{36} = \frac{-11}{18}$

(iv) $\frac{3}{-7} + \left(\frac{-4}{-21}\right) = \frac{3 \times (-1)}{(-7) \times (-1)} + \frac{(-4) \times (-1)}{(-21) \times (-1)}$
 $(\text{Making denominator positive})$
 $= \frac{-3}{7} + \frac{4}{21} = \frac{(-3) \times 3 + 4 \times 1}{21} = \frac{-9+4}{21} = \frac{-5}{21}$

(v) $-4 + \frac{1}{3} = \frac{-4}{1} + \frac{1}{3} = \frac{(-4) \times 3 + 1}{3} = \frac{-12+1}{3}$
 $= \frac{-11}{3}$

(vi) $\frac{4}{-15} + \frac{1}{12} = \frac{4 \times (-1)}{-15 \times (-1)} + \frac{1}{12} = \frac{-4}{15} + \frac{1}{12}$
 $(\text{Making denominator positive})$
 $= \frac{(-4) \times 4 + 1 \times 5}{60}$
 $(\because \text{L.C.M. of 15 and 12 is 60.})$
 $= \frac{-16+5}{60} = \frac{-11}{60}$

(vii) $\frac{-11}{8} + \frac{7}{36} = \frac{-11 \times 9}{8 \times 9} + \frac{7 \times 2}{36 \times 2}$
 $(\because \text{L.C.M. of 8 and 36 is 72.})$
 $= \frac{-99}{72} + \frac{14}{72} = \frac{-99+14}{72} = \frac{-85}{72}$

(viii) $\frac{5}{-26} + \frac{8}{39} = \frac{5 \times (-1)}{-26 \times (-1)} + \frac{8}{39} = \frac{-5}{26} + \frac{8}{39}$
 $(\text{Making denominator positive})$

$$= \frac{(-5) \times 3 + 8 \times 2}{78}$$

($\because$ L.C.M. of 26 and 39 is 78.)

$$= \frac{-15 + 16}{78} = \frac{1}{78}$$

4. (i) $\frac{8}{-5} + \left(\frac{4}{-3}\right) + \frac{1}{3} = \frac{-8}{5} + \left(\frac{-4}{3}\right) + \frac{1}{3}$
(Making denominator positive)

$$= \frac{-8 \times 3}{5 \times 3} + \frac{(-4) \times 5}{3 \times 5} + \frac{1 \times 5}{3 \times 5}$$

$$= \frac{-24}{15} + \left(\frac{-20}{15}\right) + \frac{5}{15}$$

($\because$ L.C.M. of 5, 3 and 3 is 15.)

$$= \frac{-24 - 20 + 5}{15} = \frac{-39}{15} = \frac{-13}{5}$$

(ii) $\frac{9}{-26} + \frac{14}{39} + \left(\frac{-5}{-13}\right) = \frac{-9}{26} + \frac{14}{39} + \frac{5}{13}$

(Making denominator positive)

$$= \frac{-9 \times 3 + 14 \times 2 + 5 \times 6}{78} = \frac{-27 + 28 + 30}{78} = \frac{31}{78}$$

(iii) $\frac{24}{5} + \left(\frac{-1}{10}\right) + 2 = \frac{24 \times 2 + (-1) + 2 \times 10}{10}$

$$= \frac{48 - 1 + 20}{10} = \frac{67}{10}$$

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

(Making denominator positive)

$$= \frac{3 \times 27}{1 \times 27} + \frac{(-5) \times 3}{9 \times 3} + \frac{5 \times 9}{3 \times 9}$$

$$= \frac{81}{27} + \left(\frac{-15}{27}\right) + \frac{45}{27}$$

($\because$ L.C.M. of 9 and 3 is 27.)

$$= \frac{81 - 15 + 45}{27} = \frac{111}{27} = \frac{37}{9}$$

EXERCISE 4.4

1. (i) $\frac{4}{11} - \left(\frac{-6}{11}\right) = \frac{4 - (-6)}{11} = \frac{4 + 6}{11} = \frac{10}{11}$

(ii) $\frac{-8}{13} - \left(\frac{-7}{13}\right) = \frac{(-8) - (-7)}{13} = \frac{-8 + 7}{13} = \frac{-1}{13}$

(iii) $\frac{4}{17} - \left(\frac{-9}{17}\right) = \frac{4 - (-9)}{17} = \frac{4 + 9}{17} = \frac{13}{17}$

(iv) $\frac{-6}{8} - \left(\frac{-4}{9}\right) = \frac{(-6) \times 9 - (-4) \times 8}{72}$
 $= \frac{-54 + 32}{72} = \frac{-22}{72} = \frac{-11}{36}$

(v) $\left(\frac{-4}{39}\right) - \left(\frac{-6}{13}\right) = \frac{(-4) \times 1 - (-6) \times 3}{39}$
 $= \frac{-4 + 18}{39} = \frac{14}{39}$

(vi) $\frac{4}{21} - \left(\frac{-3}{7}\right) = \frac{4 \times 1 - (-3) \times 3}{21} = \frac{4 + 9}{21} = \frac{13}{21}$

(vii) $\frac{8}{19} - \left(\frac{-6}{19}\right) = \frac{8 - (-6)}{19} = \frac{8 + 6}{19} = \frac{14}{19}$

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

2. (i) $\frac{5}{7} - \frac{3}{8} = \frac{5 \times 8 - 3 \times 7}{56}$
($\because$ L.C.M. of 7 and 8 is 56.)
 $= \frac{40 - 21}{56} = \frac{19}{56}$

(ii) $\frac{7}{8} - \frac{5}{9} = \frac{7 \times 9 - 5 \times 8}{72}$
($\because$ L.C.M. of 8 and 9 is 72.)
 $= \frac{63 - 40}{72} = \frac{23}{72}$

(iii) $\frac{2}{7} - \left(\frac{-5}{6}\right) = \frac{2 \times 6 - (-5) \times 7}{42}$
($\because$ L.C.M. of 7 and 6 is 42.)
 $= \frac{12 + 35}{42} = \frac{47}{42}$

(iv) $\frac{5}{3} - \frac{14}{5} = \frac{5 \times 5 - 14 \times 3}{15}$
($\because$ L.C.M. of 3 and 5 is 15.)
 $= \frac{25 - 42}{15} = \frac{-17}{15}$

(v) $-\frac{11}{5} - 6 = -\frac{11}{5} - \frac{6}{1} = \frac{-11 \times 1 - 6 \times 5}{5}$

$$= \frac{-11-30}{5} = \frac{-41}{5}$$

$$(vi) \quad \frac{5}{63} - \left(\frac{-6}{21} \right) = \frac{5 \times 1 - (-6) \times 3}{63} = \frac{5+18}{63}$$

($\because$ L.C.M. of 63 and 21 is 63.)

$$= \frac{23}{63}$$

$$(vii) \quad \frac{2}{3} - \left(\frac{7}{-9} \right) = \frac{2}{3} - \frac{7 \times (-1)}{(-9) \times (-1)}$$

$$= \frac{2}{3} - \left(\frac{-7}{9} \right) = \frac{2 \times 3 - (-7) \times 1}{9} = \frac{6+7}{9} = \frac{13}{9}$$

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

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

($\because$ L.C.M. of 4 and 5 is 20.)

3. Let the number to be subtracted be x .
Then,

$$\frac{-3}{2} - x = \frac{-31}{14}$$

$$\Rightarrow \frac{-3}{2} - x + \frac{31}{14} = \frac{-31}{14} + \frac{31}{14}$$

(Adding $\frac{31}{14}$ on both sides)

$$\Rightarrow \frac{-3}{2} + \frac{31}{14} = x$$

$$\Rightarrow x = \frac{(-3) \times 7 + 31 \times 1}{14}$$

(L.C.M. of 2 and 14 is 14.)

$$\Rightarrow x = \frac{-21+31}{14} = \frac{10}{14} = \frac{5}{7}$$

Hence, $\frac{5}{7}$ should be subtracted from $\frac{-3}{2}$
to get $\frac{-31}{14}$.

4. Let the number to be added be x . Then,

$$\frac{5}{6} + x = \frac{41}{24}$$

$$\Rightarrow \frac{5}{6} + x - \frac{41}{24} = \frac{41}{24} - \frac{41}{24}$$

(Subtracting $\frac{41}{24}$ from both sides)

$$\Rightarrow x = \frac{41}{24} - \frac{5}{6}$$

$$\Rightarrow x = \frac{41-5 \times 4}{24} = \frac{41-20}{24}$$

$$= \frac{21}{24} = \frac{7}{8}$$

Hence, $\frac{7}{8}$ should be added to $\frac{5}{6}$ to get $\frac{41}{24}$.

5. The sum of $\frac{-2}{7}$ and $\frac{3}{14} = \frac{-2}{7} + \frac{3}{14}$

$$= \frac{(-2) \times 2 + 3 \times 1}{14} = \frac{-4+3}{14} = \frac{-1}{14}$$

And, the sum of $\frac{11}{14}$ and $\frac{15}{42} = \frac{11}{14} + \frac{15}{42}$

$$= \frac{11 \times 3 + 15 \times 1}{42} = \frac{33+15}{42} = \frac{48}{42} = \frac{16}{14}$$

Now, $\frac{16}{14} - \left(\frac{-1}{14} \right) = \frac{16 - (-1)}{14} = \frac{17}{14}$

6. Other number = $\frac{-7}{13} - \left(\frac{-5}{39} \right)$

$$= \frac{(-7) \times 3 - (-5) \times 1}{39} = \frac{-21+5}{39} = \frac{-16}{39}$$

Hence, other rational number is $\frac{-16}{39}$.

7. Let the number to be added be x . Then,

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

$$x = 1 - \left(\frac{(-3) \times 3 + (-5) \times 5}{15} \right)$$

($\because$ L.C.M. of 5 and 3 is 15.)

$$x = 1 - \left(\frac{-9-25}{15} \right) = \frac{1}{1} - \left(\frac{-34}{15} \right)$$

$$x = \frac{1 \times 15 - (-34) \times 1}{15} = \frac{15+34}{15} = \frac{49}{15}$$

Hence, the required number is $\frac{49}{15}$.

8. Let the number to be subtracted be x .
Then,

$$\frac{-2}{5} - x = \frac{11}{35}$$

$$\begin{aligned}\Rightarrow x &= \frac{-2}{5} - \frac{11}{35} \\ &= \frac{(-2) \times 7 - 11 \times 1}{35} = \frac{-14 - 11}{35} \\ &= \frac{-25}{35} = \frac{-5}{7}\end{aligned}$$

Hence, the required number is $\frac{-5}{7}$.

9. Let the number to be subtracted be x .
Then,

$$\left(\frac{-5}{18} + \frac{5}{12}\right) - x = \frac{-11}{72}$$

$$\Rightarrow \left(\frac{-5 \times 2 + 5 \times 3}{36}\right) - x = \frac{-11}{72}$$

$$\Rightarrow \frac{-10 + 15}{36} - x = \frac{-11}{72}$$

$$\Rightarrow \frac{5}{36} - x = \frac{-11}{72}$$

$$\begin{aligned}\Rightarrow x &= \frac{5}{36} + \frac{11}{72} \\ &= \frac{5 \times 2 + 11 \times 1}{72} \\ &= \frac{10 + 11}{72} \\ &= \frac{21}{72} = \frac{7}{24}\end{aligned}$$

Hence, the required number is $\frac{7}{24}$.

10. Other rational number = $\frac{3}{2} - \frac{9}{10}$

$$= \frac{3 \times 5 - 9 \times 1}{10} = \frac{15 - 9}{10} = \frac{6}{10} = \frac{3}{5}$$

Hence, the other number is $\frac{3}{5}$.

EXERCISE 4.5

- $\frac{-3}{\cancel{8}_1} \times \frac{\cancel{8}^1}{7} = \frac{-3}{7}$
 - $\frac{-2}{7} \times \left(\frac{-3}{1}\right) = \frac{(-2) \times (-3)}{7} = \frac{6}{7}$
 - $(-2) \times \frac{3}{11} = \frac{-2 \times 3}{11} = \frac{-6}{11}$
 - $\left(\frac{-\cancel{3}^1}{\cancel{7}_1}\right) \times \left(\frac{\cancel{21}^3}{\cancel{24}_8}\right) = \frac{(-1) \times (-3)}{1 \times 8} = \frac{3}{8}$
 - $\frac{-2}{9} \times (-5) = \frac{(-2) \times (-5)}{9} = \frac{10}{9}$
 - $\frac{-3}{\cancel{2}_1} \times \frac{\cancel{4}^2}{7} = \frac{(-3) \times 2}{1 \times 7} = \frac{-6}{7}$
 - $\frac{-\cancel{8}^4}{\cancel{15}_3 \times \cancel{10}_{\cancel{2}_1}} \times \frac{\cancel{25}^{\cancel{5}^1}}{\cancel{10}_{\cancel{2}_1}} = \frac{(-4) \times 1}{3 \times 1} = \frac{-4}{3}$
 - $\frac{-5}{8} \times \left(\frac{-7}{3}\right) = \frac{(-5) \times (-7)}{8 \times 3} = \frac{35}{24}$
- $\frac{3}{7} \times \left(\frac{-3}{5}\right) = \frac{3 \times (-3)}{7 \times 5} = \frac{-9}{35}$
 - $-8 \times \left(\frac{-21}{4}\right) = \left(\frac{-\cancel{8}^2}{1}\right) \times \left(\frac{-21}{\cancel{4}_1}\right)$

$$= \frac{(-2) \times (-21)}{1 \times 1} = 42$$
 - $\frac{-2}{3} \times \frac{7}{8} = \frac{-\cancel{2}^1}{3} \times \frac{7}{\cancel{8}_4} = \frac{(-1) \times 7}{3 \times 4} = \frac{-7}{12}$
 - $\frac{-6}{11} \times \frac{9}{5} = \frac{(-6) \times 9}{11 \times 5} = \frac{-54}{55}$
 - $\frac{-7}{12} \times \left(-2\frac{6}{7}\right) = \frac{-\cancel{7}^1}{\cancel{12}_3} \times \left(\frac{-\cancel{20}^5}{\cancel{7}_1}\right)$

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

$$(vi) \quad -1\frac{2}{9} \times \left(\frac{21}{-44}\right) = -\frac{11^1}{9_3} \times \left(\frac{21^7}{-44_4}\right)$$

$$= \frac{(-1) \times 7}{3 \times (-4)} = \frac{-7}{-12} = \frac{7}{12}$$

$$(vii) \quad -15 \times 1\frac{2}{5} = \frac{-15^3}{1} \times \frac{7}{5_1} = \frac{-3 \times 7}{1 \times 1} = -21$$

$$(viii) \quad -1\frac{1}{9} \times \left(-5\frac{8}{11}\right) = -\frac{10}{9_1} \times \left(\frac{-63^7}{11}\right)$$

$$= \frac{(-10) \times (-7)}{1 \times 11} = \frac{70}{11} = 6\frac{4}{11}$$

$$3. \quad x = \frac{-3}{2}, y = \frac{4}{3} \text{ and } z = -1$$

$$\text{L.H.S.} = x \times (y + z)$$

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

$$= \frac{-3}{2} \times \left(\frac{4-3}{3}\right) = \frac{-3^1}{2} \times \frac{1}{3_1} = \frac{-1}{2}$$

$$\text{R.H.S.} = (x \times y) + (x \times z)$$

$$= \left(\frac{-3^1}{2_1} \times \frac{4^2}{3_1}\right) + \left(\frac{-3}{2} \times (-1)\right)$$

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

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

$$\text{Hence, L.H.S.} = \text{R.H.S.}$$

$$4. (i) \quad \frac{-5}{3} \times \left[\frac{-1}{2} + \left(\frac{-3}{5}\right)\right]$$

$$= \frac{-5}{3} \times \left[\frac{(-1) \times 5 + (-3) \times 2}{10}\right] = \frac{-5}{3} \times \left[\frac{-5-6}{10}\right]$$

$$= \frac{-5^1}{3} \times \left(\frac{-11}{10_2}\right) = \frac{(-1) \times (-11)}{3 \times 2} = \frac{11}{6}$$

$$(ii) \quad \frac{-2}{9} \times \left(\frac{3}{7} + \frac{4}{5}\right) = \frac{-2}{9} \times \left(\frac{3 \times 5 + 4 \times 7}{35}\right)$$

$$= \frac{-2}{9} \times \left(\frac{15+28}{35}\right) = \frac{-2}{9} \times \frac{43}{35}$$

$$= \frac{(-2) \times 43}{9 \times 35} = \frac{-86}{315}$$

$$5. (i) \quad \left(2 \times \frac{3}{4}\right) + \left[\frac{4}{5} + \left(\frac{3}{-2}\right)\right]$$

$$= \left(2^1 \times \frac{3}{4_2}\right) + \left[\frac{4}{5} + \left(\frac{-3}{2}\right)\right]$$

(Making denominator positive)

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

$$= \frac{3}{2} + \left(\frac{8-15}{10}\right) = \frac{3}{2} + \left(\frac{-7}{10}\right)$$

$$= \frac{3 \times 5 + (-7) \times 1}{10} = \frac{15-7}{10}$$

$$= \frac{8^4}{10^5} = \frac{4}{5}$$

$$(ii) \quad \left[\frac{20}{8} \times \left(\frac{-24}{15}\right)\right] - \left[8 \times \left(\frac{1}{-2}\right)\right]$$

$$= \left[\frac{20^4}{8_1} \times \left(\frac{-24^7}{15_{3_1}}\right)\right] - \left[8^4 \times \left(\frac{-1}{2_1}\right)\right]$$

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

$$= -4 - (-4) = -4 + 4 = 0$$

$$6. (i) \quad \frac{-3}{5} \times \boxed{-1} = \frac{3}{5}$$

$$(ii) \quad \frac{-5}{7} \times \boxed{\frac{7}{5}} = -1$$

$$(iii) \quad \boxed{0} \times \frac{-9}{11} = 0$$

$$(iv) \quad \frac{6}{27} \times \boxed{\frac{27}{6}} = 1$$

$$(v) \quad \frac{-9}{13} \times \boxed{\frac{-3}{3}} = \frac{27}{39}$$

$$(vi) \quad \frac{-36}{7} \times \boxed{\frac{7}{2}} = -18$$

7. The cost of 1 m of cloth = ₹ $42\frac{2}{3}$

∴ The cost of $5\frac{3}{4}$ m of cloth

$$= ₹ \left(42\frac{2}{3} \times 5\frac{3}{4} \right) = ₹ \left(\frac{128^{\cancel{32}}}{3} \times \frac{23}{\cancel{4}_1} \right)$$

$$= ₹ \left(\frac{32 \times 23}{3 \times 1} \right) = ₹ \frac{736}{3} = ₹ 245\frac{1}{3}$$

Hence, the cost of $5\frac{3}{4}$ m of cloth is ₹ $245\frac{1}{3}$.

8. Length = $13\frac{1}{2}$ m, breadth = $11\frac{2}{3}$ m

Area of rectangular park
= length × breadth

$$= \left(13\frac{1}{2} \times 11\frac{2}{3} \right) \text{ sq. m}$$

$$= \left(\frac{\cancel{27}^9}{2} \times \frac{35}{\cancel{3}_1} \right) \text{ sq. m} = \left(\frac{9 \times 35}{2} \right) \text{ sq. m}$$

$$= \frac{315}{2} \text{ sq. m} = 157\frac{1}{2} \text{ sq. m}$$

Hence, area of rectangular park is $157\frac{1}{2}$ sq. m.

EXERCISE 4.6

1. (i) $\frac{2}{5} \times \frac{3}{7} = \frac{2 \times 3}{5 \times 7} = \frac{6}{35}$

Reciprocal of $\frac{6}{35} = \frac{1}{6/35} = \frac{35}{6}$

(ii) Reciprocal of $\frac{-7}{25} = \frac{1}{-7/25} = \frac{-25}{7}$

(iii) Reciprocal of $\frac{-1}{13} = \frac{1}{-1/13} = \frac{13}{-1} = -13$

(iv) $\frac{-7^1}{\cancel{9}_3} \times \frac{\cancel{3}^1}{14_2} = \frac{(-1) \times 1}{3 \times 2} = \frac{-1}{6}$

Reciprocal of $\left(\frac{-7}{9} \times \frac{3}{14} \right)$ or $\frac{-1}{6} = \frac{1}{-1/6}$

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

2. (i) $\frac{25}{11} \div \frac{5}{22} = \frac{\cancel{25}^5}{\cancel{11}_1} \times \frac{\cancel{22}^2}{\cancel{5}_1}$

(Reciprocal of $\frac{5}{22}$ is $\frac{22}{5}$)

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

(ii) $\frac{13}{7} \div \frac{26}{21} = \frac{\cancel{13}^1}{\cancel{7}_1} \times \frac{\cancel{21}^3}{\cancel{26}_2}$

(Reciprocal of $\frac{26}{21}$ is $\frac{21}{26}$)

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

(iii) $(-6) \div \frac{3}{11} = (-\cancel{6}^2) \times \frac{11}{\cancel{3}_1}$

(Reciprocal of $\frac{3}{11}$ is $\frac{11}{3}$)

$$= \frac{(-2) \times 11}{1} = -22$$

(iv) $\frac{-3}{8} \div \frac{5}{8} = \frac{-3}{\cancel{8}_1} \times \frac{\cancel{8}^1}{5} = \frac{(-3) \times 1}{1 \times 5} = \frac{-3}{5}$

(Reciprocal of $\frac{5}{8}$ is $\frac{8}{5}$)

3. (i) $\frac{4}{5} \div \frac{9}{7} = \frac{4}{5} \times \frac{7}{9}$ (Reciprocal of $\frac{9}{7}$ is $\frac{7}{9}$)
 $= \frac{28}{45}$

(ii) $\frac{6}{13} \div \left(\frac{-2}{65} \right) = \frac{\cancel{6}^3}{\cancel{13}_1} \times \left(\frac{-\cancel{65}^5}{\cancel{2}_1} \right)$

(Reciprocal of $\frac{-2}{65}$ is $\frac{-65}{2}$)

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

$$(iii) \frac{-6}{21} \div \frac{4}{63} = \frac{-\cancel{6}^3}{\cancel{21}_1} \times \frac{\cancel{63}^3}{\cancel{4}_2}$$

(Reciprocal of $\frac{4}{63}$ is $\frac{63}{4}$)

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

$$(iv) \frac{-5}{7} \div \left(\frac{-15}{28} \right) = \frac{-\cancel{5}^1}{\cancel{7}_1} \times \left(\frac{-\cancel{28}^4}{\cancel{15}_3} \right)$$

(Reciprocal of $\frac{-15}{28}$ is $\frac{-28}{15}$)

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

$$4. \text{ Other number } = \frac{-13}{9} \div \left(\frac{-26}{7} \right)$$

$$= \frac{-\cancel{13}^1}{9} \times \left(\frac{-7}{\cancel{26}_2} \right)$$

(Reciprocal of $\frac{-26}{7}$ is $\frac{-7}{26}$)

$$= \frac{(-1) \times (-7)}{9 \times 2} = \frac{7}{18}$$

Hence, the other number is $\frac{7}{18}$.

$$5. \text{ The required number } = \frac{-3}{10} \div \left(\frac{-2}{3} \right)$$

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

(Reciprocal of $\frac{-2}{3}$ is $\frac{-3}{2}$)

$$= \frac{(-3) \times (-3)}{20} = \frac{9}{20}$$

Hence, the required rational number is $\frac{9}{20}$.

$$6. \text{ Sum of } \frac{65}{9} \text{ and } \frac{-11}{-3} = \frac{65}{9} + \frac{11}{3}$$

(Making denominator positive)

$$= \frac{65 \times 1 + 11 \times 3}{9} = \frac{65 + 33}{9} = \frac{98}{9}$$

$$\text{And, product of } \frac{7}{6} \text{ and } \frac{5}{-3} = \frac{7}{6} \times \left(\frac{5}{-3} \right) = \frac{35}{-18}$$

$$\text{Now, } \frac{98}{9} \div \left(\frac{35}{-18} \right) = \frac{\cancel{98}^{14}}{\cancel{9}_1} \times \left(\frac{-\cancel{18}^2}{\cancel{35}_5} \right) = \frac{-28}{5}$$

(Reciprocal of $\frac{35}{-18}$ is $\frac{-18}{35}$)

$$7. \text{ The required number } = \frac{-9}{20} \div \left(\frac{-3}{2} \right)$$

$$= \frac{-\cancel{9}^3}{\cancel{20}_{10}} \times \left(\frac{-\cancel{2}^1}{\cancel{3}_1} \right) = \frac{-3 \times (-1)}{10 \times 1} = \frac{3}{10}$$

Hence, the required rational number is $\frac{3}{10}$.

8. Distance covered by car in one hour

$$= \left(189 \frac{1}{3} \div 4 \frac{4}{9} \right) \text{ km}$$

$$= \left(\frac{568}{3} \div \frac{40}{9} \right) \text{ km}$$

$$= \left(\frac{\cancel{568}^{71}}{\cancel{3}_1} \times \frac{\cancel{9}^3}{\cancel{40}_5} \right) \text{ km}$$

$$= \left(\frac{71 \times 3}{1 \times 5} \right) \text{ km} = \frac{213}{5} \text{ km} = 42 \frac{3}{5} \text{ km}$$

Hence, the car covers a distance of $42 \frac{3}{5}$ km in 1 hour.

MULTIPLE CHOICE QUESTIONS

1. 0 is neither positive nor negative.

Hence, option (a) is correct.

$$2. \frac{27}{-81} = \frac{27 \div (-27)}{-81 \div (-27)} = \frac{-1}{3}$$

Hence, option (b) is correct.

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

$$\Rightarrow \frac{x}{6} = \frac{4 \times (-2)}{-3 \times (-2)}$$

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

$$\Rightarrow x = -8$$

Hence, option (b) is correct.

$$4. \left| \frac{-3}{2} \right| = \frac{3}{2}$$

Hence, option (c) is correct.

$$5. \text{The reciprocal of } \frac{19}{7} = \frac{1}{19/7} = \frac{7}{19}$$

Hence, option (c) is correct.

$$6. \frac{-4}{9} + x = 1$$

$$\begin{aligned} \Rightarrow x &= 1 - \left(\frac{-4}{9} \right) \\ &= \frac{1 \times 9 - (-4) \times 1}{9} = \frac{9+4}{9} = \frac{13}{9} \end{aligned}$$

Hence, option (b) is correct.

$$7. \text{Other number} = -6 \div \left(\frac{-3}{2} \right)$$

$$= -6^2 \times \left(\frac{-2}{3} \right) = \frac{(-2) \times (-2)}{1} = 4$$

Hence, option (b) is correct.

$$\begin{aligned} 8. -4 + \left(\frac{-3}{5} \right) &= \frac{-4}{1} + \left(\frac{-3}{5} \right) \\ &= \frac{(-4) \times 5 + (-3) \times 1}{5} = \frac{-20-3}{5} = \frac{-23}{5} \end{aligned}$$

Hence, option (a) is correct.

$$\begin{aligned} 9. \frac{-3}{7} - x &= \frac{-2}{7} \Rightarrow x = \frac{-3}{7} - \left(\frac{-2}{7} \right) \\ &= \frac{(-3) - (-2)}{7} = \frac{-3+2}{7} = \frac{-1}{7} \end{aligned}$$

Hence, option (b) is correct.

$$10. 5\frac{2}{3} \div \text{Rational number} = 3\frac{2}{5}$$

$$\Rightarrow \frac{17}{3} \div \text{Rational number} = \frac{17}{5}$$

$$\Rightarrow \text{Rational number} = \frac{17}{3} \div \frac{17}{5}$$

$$= \frac{\cancel{17}^1}{3} \times \frac{5}{\cancel{17}_1} = \frac{1 \times 5}{3 \times 1} = \frac{5}{3}$$

Hence, option (a) is correct.

MENTAL MATHS CORNER

$$1. \frac{-2}{7} + x = -1$$

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

$$\text{Hence, } \frac{-2}{7} + \left(\frac{-5}{7} \right) = -1.$$

$$\begin{aligned} 2. \frac{-2}{9} - \frac{4}{18} &= \frac{(-2) \times 2 - 4 \times 1}{18} = \frac{-4-4}{18} \\ &= \frac{-8}{18} = \frac{-4}{9} \end{aligned}$$

$$\text{Hence, } \frac{-2}{9} - \frac{4}{18} = \frac{-4}{9}.$$

$$3. -1 \times \left(\frac{-7}{11} \right) = \frac{7}{11}.$$

$$4. \frac{4}{7} \div x = -1$$

$$\Rightarrow x = \frac{4}{7} \div (-1) \Rightarrow x = -\frac{4}{7}$$

$$\text{Hence, } \frac{4}{7} \div \left(-\frac{4}{7} \right) = -1.$$

$$5. 1 \div \left(\frac{3}{-5} \right) = 1 \times \left(\frac{-5}{3} \right) = \frac{-5}{3}$$

$$\text{Hence, } 1 \div \left(\frac{3}{-5} \right) = \frac{-5}{3}$$

$$6. \left| \frac{5}{7} \right| - \left| \frac{-5}{7} \right| + \frac{5}{7} = \frac{5}{7} - \frac{5}{7} + \frac{5}{7} = \frac{5-5+5}{7} = \frac{5}{7}$$

Hence, $\left| \frac{5}{7} \right| - \left| \frac{-5}{7} \right| + \frac{5}{7} = \frac{5}{7}$.

REVIEW EXERCISE

1. (i) $\frac{-3}{-15} = \frac{-3 \div (-3)}{(-15) \div (-3)} = \frac{1}{5}$

(ii) $\frac{24}{-36} = \frac{24 \div (-12)}{-36 \div (-12)} = \frac{-2}{3}$

(iii) $\frac{35}{-75} = \frac{35 \div (-5)}{-75 \div (-5)} = \frac{-7}{15}$

(iv) $\frac{-21}{49} = \frac{-21 \div 7}{49 \div 7} = \frac{-3}{7}$

2. (i) $\frac{4}{-5} = \frac{4 \times (-6)}{-5 \times (-6)} = \frac{-24}{30}$

$\frac{-2}{3} = \frac{-2 \times 10}{3 \times 10} = \frac{-20}{30}$

Therefore,

$$\frac{-24}{30} < \frac{-23}{30} < \frac{-22}{30} < \frac{-21}{30} < \frac{-20}{30}$$

$$\Rightarrow \frac{4}{-5} < \frac{-23}{30} < \frac{-11}{15} < \frac{-7}{10} < \frac{-2}{3}$$

Hence, three rational numbers between

$\frac{4}{-5}$ and $\frac{-2}{3}$ are $\frac{-23}{30}$, $\frac{-11}{15}$ and $\frac{-7}{10}$.

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

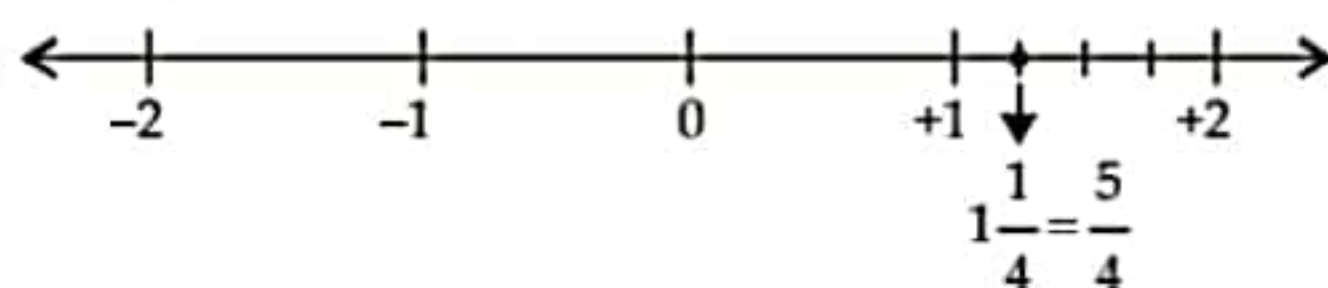
$$\frac{3}{9} > \frac{2}{9} > \frac{1}{9} > 0 > \frac{-1}{9}$$

or $\frac{-1}{9} < 0 < \frac{1}{9} < \frac{2}{9} < \frac{3}{9}$

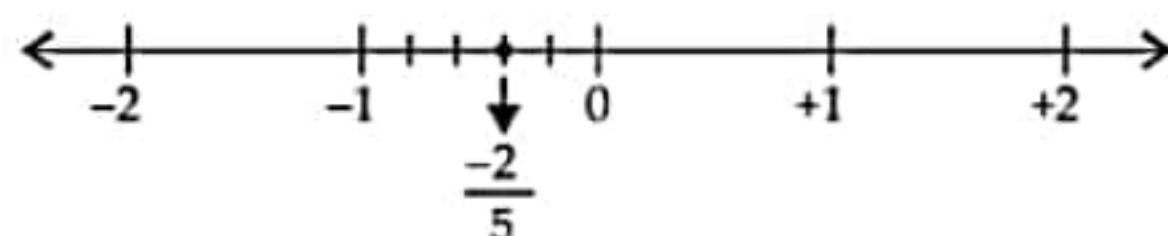
Hence, three rational numbers between

$\frac{1}{3}$ and $\frac{1}{-9}$ are 0 , $\frac{1}{9}$ and $\frac{2}{9}$.

3. (i) $\frac{5}{4}$



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



4. L.C.M. of 7, 35 and 21 is 105.

$$\frac{-2}{7} = \frac{-2 \times 15}{7 \times 15} = \frac{-30}{105}$$

$$\frac{5}{7} = \frac{5 \times 15}{7 \times 15} = \frac{75}{105}$$

$$\frac{24}{35} = \frac{24 \times 3}{35 \times 3} = \frac{72}{105}$$

$$\frac{11}{-21} = \frac{11 \times (-5)}{-21 \times (-5)} = \frac{-55}{105}$$

$\therefore \frac{75}{105} > \frac{72}{105} > \frac{-30}{105} > \frac{-55}{105}$ are in descending order.

$\Rightarrow \frac{5}{7}, \frac{24}{35}, \frac{-2}{7}, \frac{11}{-21}$ are in descending order.

5. $\therefore \frac{-3}{7}$ and $\frac{p}{-28}$ are equivalent rational numbers.

$$\therefore \frac{-3}{7} = \frac{p}{-28}$$

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

$$\Rightarrow \frac{12}{-28} = \frac{p}{-28}$$

$$\Rightarrow \boxed{p = 12}$$

6. (i) $\frac{-7}{16} + \frac{8}{24} = \frac{-7 \times 3 + 8 \times 2}{48} = \frac{-21 + 16}{48} = \frac{-5}{48}$

(ii) $\frac{-3}{10} - \left(\frac{-4}{7} \right) = \frac{-3 \times 7 - (-4) \times 10}{70} = \frac{-21 + 40}{70} = \frac{19}{70}$

(iii) $\frac{-7}{6} \times \left(\frac{24}{-42} \right) = \frac{-7^1 \times 24^{\cancel{1}^2}}{\cancel{6}_1 \times -\cancel{42}_{\cancel{2}_3}} = \frac{2}{3}$

$$(iv) -7 \div \left(\frac{1}{-9}\right) = -7 \times (-9) = 63$$

$$7. \text{ The required number} = 8 \div \left(\frac{-16}{5}\right)$$

$$= 8^1 \times \left(\frac{-5}{16_2}\right) = \frac{1 \times (-5)}{2} = \frac{-5}{2}$$

Hence, the required rational number is $\frac{-5}{2}$.

$$8. \text{ The required number} = \frac{-8}{13} \div \frac{16}{3}$$

$$= \frac{-8^1}{13} \times \frac{3}{16_2}$$

$$= \frac{(-1) \times 3}{13 \times 2} = \frac{-3}{26}$$

Hence, the required rational number is $\frac{-3}{26}$.

BRAIN TEASER

1. Let the two numbers be x and y . Therefore,
 $x + y = 10$ and $xy = 20$ (Given)

Now, $x + y = 10$

$$\Rightarrow \frac{x}{xy} + \frac{y}{xy} = \frac{10}{xy}$$

$$\Rightarrow \frac{x}{xy} + \frac{y}{xy} = \frac{10}{20}$$

$$\Rightarrow \frac{1}{y} + \frac{1}{x} = \frac{1}{2}$$

Here, $\frac{1}{x}$ and $\frac{1}{y}$ are the reciprocals of numbers x and y respectively.

We see that, the sum of the reciprocals of two numbers is $\frac{1}{2}$.

$$2. \quad a = \frac{2}{5}, b = \frac{3}{2} \quad (\text{Given})$$

$$a + b = \frac{2}{5} + \frac{3}{2} = \frac{2 \times 2 + 3 \times 5}{10} = \frac{4 + 15}{10} = \frac{19}{10}$$

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

$$\text{and } a - b = \frac{2}{5} - \frac{3}{2} = \frac{2 \times 2 - 3 \times 5}{10} = \frac{4 - 15}{10} = \frac{-11}{10}$$

$$\text{Now, } (a + b) \div (a - b) = \frac{19}{10} \div \left(\frac{-11}{10}\right)$$

$$= \frac{19}{10_1} \times \left(\frac{10^1}{11}\right)$$

(Reciprocal of $\frac{-11}{10}$ is $\frac{-10}{11}$)

$$= \frac{19 \times (-1)}{1 \times 11} = \frac{-19}{11}$$