

Exercise 9.1

Question 1:

List five rational numbers between:

(i) -1 and 0

(ii) -2 and -1

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

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

Answer 1:

(i) -1 and 0

Let us write -1 and 0 as rational numbers with denominator 6.

$$\Rightarrow -1 = \frac{-6}{6} \text{ and } 0 = \frac{0}{6}$$

$$\therefore \frac{-6}{6} < \frac{-5}{6} < \frac{-4}{6} < \frac{-3}{6} < \frac{-2}{6} < \frac{-1}{6} < 0$$

$$\Rightarrow -1 < \frac{-5}{6} < \frac{-2}{3} < \frac{-1}{2} < \frac{-1}{3} < \frac{-1}{6} < 0$$

Therefore, five rational numbers between -1 and 0 would be

$$\frac{-5}{6}, \frac{-2}{3}, \frac{-1}{2}, \frac{-1}{3}, \frac{-1}{6}$$

(ii) -2 and -1

Let us write -2 and -1 as rational numbers with denominator 6.

$$\Rightarrow -2 = \frac{-12}{6} \text{ and } -1 = \frac{-6}{6}$$

$$\therefore \frac{-12}{6} < \frac{-11}{6} < \frac{-10}{6} < \frac{-9}{6} < \frac{-8}{6} < \frac{-7}{6} < \frac{-6}{6}$$

$$\Rightarrow -2 < \frac{-11}{6} < \frac{-5}{3} < \frac{-3}{2} < \frac{-4}{3} < \frac{-7}{6} < -1$$

Therefore, five rational numbers between -2 and -1 would be

$$\frac{-11}{6}, \frac{-5}{3}, \frac{-3}{2}, \frac{-4}{3}, \frac{-7}{6}$$

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

Let us write $\frac{-4}{5}$ and $\frac{-2}{3}$ as rational numbers with the same denominators.

$$\Rightarrow \frac{-4}{5} = \frac{-36}{45} \text{ and } \frac{-2}{3} = \frac{-30}{45}$$

$$\therefore \frac{-36}{45} < \frac{-35}{45} < \frac{-34}{45} < \frac{-33}{45} < \frac{-32}{45} < \frac{-31}{45} < \frac{-30}{45}$$

$$\Rightarrow \frac{-4}{5} < \frac{-7}{9} < \frac{-34}{45} < \frac{-11}{15} < \frac{-32}{45} < \frac{-31}{45} < \frac{-2}{3}$$

Therefore, five rational numbers between $\frac{-4}{5}$ and $\frac{-2}{3}$ would be

$$\frac{-7}{9}, \frac{-34}{45}, \frac{-11}{15}, \frac{-32}{45}, \frac{-31}{45}, \frac{-2}{3}$$

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

Let us write $\frac{-1}{2}$ and $\frac{2}{3}$ as rational numbers with the same denominators.

$$\Rightarrow \frac{-1}{2} = \frac{-3}{6} \text{ and } \frac{2}{3} = \frac{4}{6}$$

$$\therefore \frac{-3}{6} < \frac{-2}{6} < \frac{-1}{6} < 0 < \frac{1}{6} < \frac{2}{6} < \frac{3}{6} < \frac{4}{6}$$

$$\Rightarrow \frac{-1}{2} < \frac{-1}{3} < \frac{-1}{6} < 0 < \frac{1}{6} < \frac{1}{3} < \frac{1}{2} < \frac{2}{3}$$

Therefore, five rational numbers between $\frac{-1}{2}$ and $\frac{2}{3}$ would be

$$\frac{-1}{3}, \frac{-1}{6}, 0, \frac{1}{6}, \frac{1}{3}.$$

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Question 2:

Write four more rational numbers in each of the following patterns:

(i) $\frac{-3}{5}, \frac{-6}{10}, \frac{-9}{15}, \frac{-12}{20}, \dots$

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

(iii) $\frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24}, \dots$

(iv) $\frac{-2}{3}, \frac{2}{-3}, \frac{4}{-6}, \frac{6}{-9}, \dots$

Answer 2:

(i) $\frac{-3}{5}, \frac{-6}{10}, \frac{-9}{15}, \frac{-12}{20}, \dots$

$\Rightarrow \frac{-3 \times 1}{5 \times 1}, \frac{-3 \times 2}{5 \times 2}, \frac{-3 \times 3}{5 \times 3}, \frac{-3 \times 4}{5 \times 4}, \dots$

Therefore, the next four rational numbers of this pattern would be

$$\frac{-3 \times 5}{5 \times 5}, \frac{-3 \times 6}{5 \times 6}, \frac{-3 \times 7}{5 \times 7}, \frac{-3 \times 8}{5 \times 8} = \frac{-15}{25}, \frac{-18}{30}, \frac{-21}{35}, \frac{-24}{40}$$

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

$\Rightarrow \frac{-1 \times 1}{4 \times 1}, \frac{-1 \times 2}{4 \times 2}, \frac{-1 \times 3}{4 \times 3}, \dots$

Therefore, the next four rational numbers of this pattern would be

$$\frac{-1 \times 4}{4 \times 4}, \frac{-1 \times 5}{4 \times 5}, \frac{-1 \times 6}{4 \times 6}, \frac{-1 \times 7}{4 \times 7} = \frac{-4}{16}, \frac{-5}{20}, \frac{-6}{24}, \frac{-7}{28}$$

(iii) $\frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24}, \dots$

$\Rightarrow \frac{-1 \times 1}{6 \times 1}, \frac{1 \times 2}{-6 \times 2}, \frac{1 \times 3}{-6 \times 3}, \frac{1 \times 4}{-6 \times 4}, \dots$

Therefore, the next four rational numbers of this pattern would be

$$\frac{1 \times 5}{-6 \times 5}, \frac{1 \times 6}{-6 \times 6}, \frac{1 \times 7}{-6 \times 7}, \frac{1 \times 8}{-6 \times 8} = \frac{5}{-30}, \frac{6}{-36}, \frac{7}{-42}, \frac{8}{-48}$$

$$(iv) \quad \frac{-2}{3}, \frac{2}{-3}, \frac{4}{-6}, \frac{6}{-9}, \dots$$

$$\Rightarrow \frac{-2 \times 1}{3 \times 1}, \frac{2 \times 1}{-3 \times 1}, \frac{2 \times 2}{-3 \times 2}, \frac{2 \times 3}{-3 \times 3}, \dots$$

Therefore, the next four rational numbers of this pattern would be

$$\frac{2 \times 4}{-3 \times 4}, \frac{2 \times 5}{-3 \times 5}, \frac{2 \times 6}{-3 \times 6}, \frac{2 \times 7}{-3 \times 7} = \frac{8}{-12}, \frac{10}{-15}, \frac{12}{-18}, \frac{14}{-21}$$

Question 3:

Give four rational numbers equivalent to:

$$(i) \quad \frac{-2}{7}$$

$$(ii) \quad \frac{5}{-3}$$

$$(iii) \quad \frac{4}{9}$$

Answer 3:

$$(i) \quad \frac{-2}{7}$$

$$\frac{-2 \times 2}{7 \times 2} = \frac{-4}{14}, \quad \frac{-2 \times 3}{7 \times 3} = \frac{-6}{21}, \quad \frac{-2 \times 4}{7 \times 4} = \frac{-8}{28}, \quad \frac{-2 \times 5}{7 \times 5} = \frac{-10}{35}$$

Therefore, four equivalent rational numbers are $\frac{-4}{14}, \frac{-6}{21}, \frac{-8}{28}, \frac{-10}{35}$.

$$(ii) \quad \frac{5}{-3}$$

$$\frac{5 \times 2}{-3 \times 2} = \frac{10}{-6}, \quad \frac{5 \times 3}{-3 \times 3} = \frac{15}{-9}, \quad \frac{5 \times 4}{-3 \times 4} = \frac{20}{-12}, \quad \frac{5 \times 5}{-3 \times 5} = \frac{25}{-15}$$

Therefore, four equivalent rational numbers are $\frac{10}{-6}, \frac{15}{-9}, \frac{20}{-12}, \frac{25}{-15}$.

$$(iii) \quad \frac{4}{9}$$

$$\frac{4 \times 2}{9 \times 2} = \frac{8}{18}, \quad \frac{4 \times 3}{9 \times 3} = \frac{12}{27}, \quad \frac{4 \times 4}{9 \times 4} = \frac{16}{36}, \quad \frac{4 \times 5}{9 \times 5} = \frac{20}{45}$$

Therefore, four equivalent rational numbers are $\frac{8}{18}, \frac{12}{27}, \frac{16}{36}, \frac{20}{45}$.

Question 4:

Draw the number line and represent the following rational numbers on it:

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

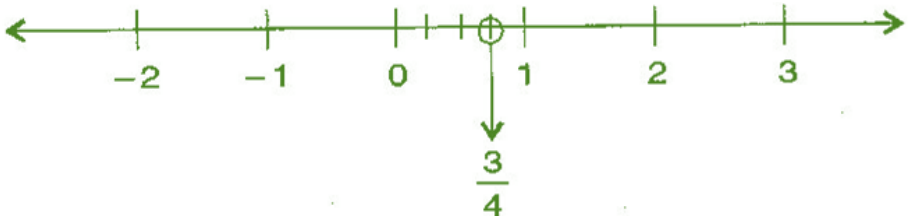
(ii) $-\frac{5}{8}$

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

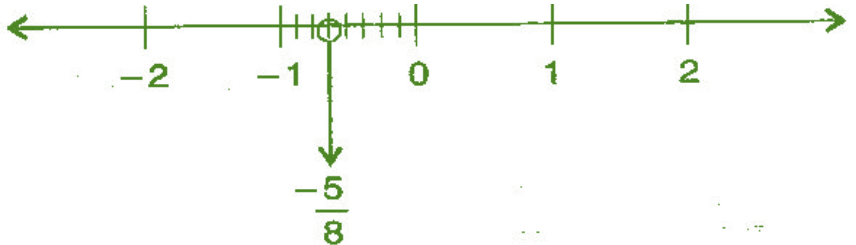
(iv) $\frac{7}{8}$

Answer 4:

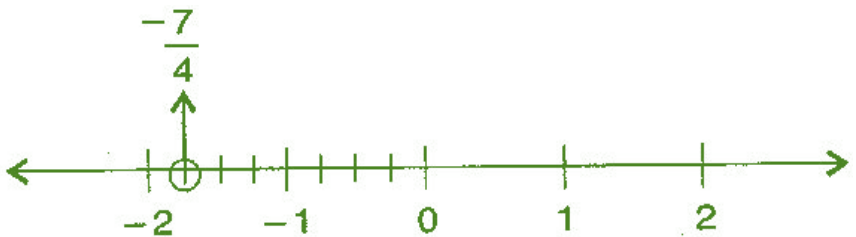
(i) $\frac{3}{4}$



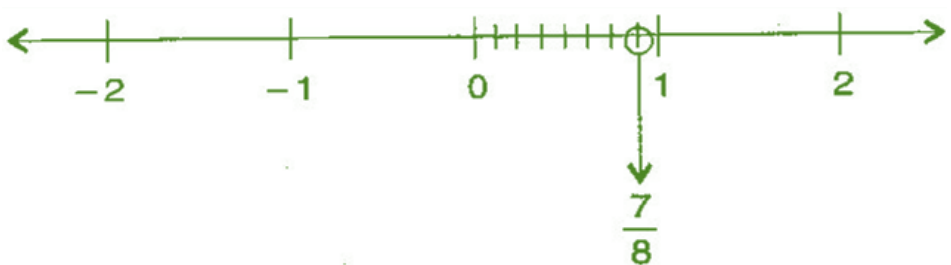
(ii) $-\frac{5}{8}$



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



(iv) $\frac{7}{8}$



Question 5:

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



Answer 5:

Each part which is between the two numbers is divided into 3 parts.

Therefore, $A = \frac{6}{3}$, $P = \frac{7}{3}$, $Q = \frac{8}{3}$ and $B = \frac{9}{3}$

Similarly $T = \frac{-3}{3}$, $R = \frac{-4}{3}$, $S = \frac{-5}{3}$ and $U = \frac{-6}{3}$

Thus, the rational numbers represented P, Q, R and S are $\frac{7}{3}$, $\frac{8}{3}$, $\frac{-4}{3}$ and $\frac{-5}{3}$ respectively.

Question 6:

Which of the following pairs represent the same rational numbers:

- (i) $\frac{-7}{21}$ and $\frac{3}{9}$
- (ii) $\frac{-16}{20}$ and $\frac{20}{-25}$
- (iii) $\frac{-2}{-3}$ and $\frac{2}{3}$
- (iv) $\frac{-3}{5}$ and $\frac{-12}{20}$
- (v) $\frac{8}{-5}$ and $\frac{-24}{15}$
- (vi) $\frac{1}{3}$ and $\frac{-1}{9}$
- (vii) $\frac{-5}{-9}$ and $\frac{5}{-9}$

Answer 6:

$$\begin{aligned} \text{(i)} \quad & \frac{-7}{21} \text{ and } \frac{3}{9} \\ \Rightarrow & \frac{-7}{21} = \frac{-1}{3} \text{ and } \frac{3}{9} = \frac{1}{3} \end{aligned} \quad \text{[Converting into lowest term]}$$

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

$$\therefore \frac{-7}{21} \neq \frac{3}{9}$$

$$\begin{aligned} \text{(ii)} \quad & \frac{-16}{20} \text{ and } \frac{20}{-25} \\ \Rightarrow & \frac{-16}{20} = \frac{-4}{5} \text{ and } \frac{20}{-25} = \frac{4}{-5} = \frac{-4}{5} \end{aligned} \quad \text{[Converting into lowest term]}$$

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

$$\therefore \frac{-16}{20} = \frac{20}{-25}$$

$$\begin{aligned} \text{(iii)} \quad & \frac{-2}{-3} \text{ and } \frac{2}{3} \\ \Rightarrow & \frac{-2}{-3} = \frac{2}{3} \text{ and } \frac{2}{3} = \frac{2}{3} \end{aligned} \quad \text{[Converting into lowest term]}$$

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

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

$$\begin{aligned} \text{(iv)} \quad & \frac{-3}{5} \text{ and } \frac{-12}{20} \\ \Rightarrow & \frac{-3}{5} = \frac{-3}{5} \text{ and } \frac{-12}{20} = \frac{-3}{5} \end{aligned} \quad \text{[Converting into lowest term]}$$

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

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

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(v) $\frac{8}{-5}$ and $\frac{-24}{15}$

$\Rightarrow \frac{8}{-5} = \frac{-8}{5}$ and $\frac{-24}{15} = \frac{-8}{5}$ [Converting into lowest term]

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

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

(vi) $\frac{1}{3}$ and $\frac{-1}{9}$

$\Rightarrow \frac{1}{3} = \frac{1}{3}$ and $\frac{-1}{9} = \frac{-1}{9}$ [Converting into lowest term]

$\therefore \frac{1}{3} \neq \frac{-1}{9}$

$\therefore \frac{1}{3} \neq \frac{-1}{9}$

(vii) $\frac{-5}{-9}$ and $\frac{5}{-9}$

$\Rightarrow \frac{-5}{-9} = \frac{5}{9}$ and $\frac{5}{-9} = \frac{5}{9}$ [Converting into lowest term]

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

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

Question 7:

Rewrite the following rational numbers in the simplest form:

(i) $\frac{-8}{6}$

(ii) $\frac{25}{45}$

(iii) $\frac{-44}{72}$

(iv) $\frac{-8}{10}$

Answer 7:

(i) $\frac{-8}{6} = \frac{-8 \div 2}{6 \div 2} = \frac{-4}{3}$

[H.C.F. of 8 and 6 is 2]

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$$(ii) \quad \frac{25}{45} = \frac{25 \div 5}{45 \div 5} = \frac{5}{9} \quad [\text{H.C.F. of 25 and 45 is 5}]$$

$$(iii) \quad \frac{-44}{72} = \frac{-44 \div 4}{72 \div 4} = \frac{-11}{18} \quad [\text{H.C.F. of 44 and 72 is 4}]$$

$$(iv) \quad \frac{-8}{10} = \frac{-8 \div 2}{10 \div 2} = \frac{-4}{5} \quad [\text{H.C.F. of 8 and 10 is 2}]$$

Question 8:

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

$$(i) \quad \frac{-5}{7} \square \frac{2}{3} \quad (ii) \quad \frac{-4}{5} \square \frac{-5}{7} \quad (iii) \quad \frac{-7}{8} \square \frac{14}{-16} \quad (iv) \quad \frac{-8}{5} \square \frac{-7}{4}$$

$$(v) \quad \frac{1}{-3} \square \frac{-1}{4} \quad (vi) \quad \frac{5}{-11} \square \frac{-5}{11} \quad (vii) \quad 0 \square \frac{-7}{6}$$

Answer 8:

$$(i) \quad \frac{-5}{7} \square \frac{2}{3} \quad \text{Since, the positive number is greater than negative number.}$$

$$(ii) \quad \frac{-4 \times 7}{5 \times 7} \square \frac{-5 \times 5}{7 \times 5} \Rightarrow \frac{-28}{35} \square \frac{-25}{35} \Rightarrow \frac{-4}{5} \square \frac{-5}{7}$$

$$(iii) \quad \frac{-7 \times 2}{8 \times 2} \square \frac{14 \times (-1)}{-16 \times (-1)} \Rightarrow \frac{-14}{16} \square \frac{-14}{16} \Rightarrow \frac{-7}{8} \square \frac{14}{-16}$$

$$(iv) \quad \frac{-8 \times 4}{5 \times 4} \square \frac{-7 \times 5}{4 \times 5} \Rightarrow \frac{-32}{20} \square \frac{-35}{20} \Rightarrow \frac{-8}{5} \square \frac{-7}{4}$$

$$(v) \quad \frac{1}{-3} \square \frac{-1}{4} \Rightarrow \frac{1}{-3} \square \frac{-1}{4}$$

$$(vi) \quad \frac{5}{-11} \square \frac{-5}{11} \Rightarrow \frac{5}{-11} \square \frac{-5}{11}$$

$$(vii) \quad 0 \square \frac{-7}{6} \quad \text{Since, 0 is greater than every negative number.}$$

Question 9:

Which is greater in each of the following:

- (i) $\frac{2}{3}, \frac{5}{2}$ (ii) $\frac{-5}{6}, \frac{-4}{3}$ (iii) $\frac{-3}{4}, \frac{2}{-3}$ (iv) $\frac{-1}{4}, \frac{1}{4}$
- (v) $-3\frac{2}{7}, -3\frac{4}{5}$

Answer 9:

(i) $\frac{2 \times 2}{3 \times 2} = \frac{4}{6}$ and $\frac{5 \times 3}{2 \times 3} = \frac{15}{6}$

Since $\frac{4}{6} < \frac{15}{6}$ Therefore $\frac{2}{3} < \frac{5}{2}$

(ii) $\frac{-5 \times 1}{6 \times 1} = \frac{-5}{6}$ and $\frac{-4 \times 2}{3 \times 2} = \frac{-8}{6}$

Since $\frac{-5}{6} > \frac{-8}{6}$ Therefore $\frac{-5}{6} > \frac{-4}{3}$

(iii) $\frac{-3 \times 3}{4 \times 3} = \frac{-9}{12}$ and $\frac{2 \times (-4)}{-3 \times (-4)} = \frac{-8}{12}$

Since $\frac{-9}{12} < \frac{-8}{12}$ Therefore $\frac{-3}{4} < \frac{2}{-3}$

(iv) $\frac{-1}{4} < \frac{1}{4}$ Since positive number is always greater than negative number.

(v) $-3\frac{2}{7} = \frac{-23}{7} = \frac{-23 \times 5}{7 \times 5} = \frac{-115}{35}$ and $-3\frac{4}{5} = \frac{-19}{5} = \frac{-19 \times 7}{5 \times 7} = \frac{-133}{35}$

Since $\frac{-115}{35} > \frac{-133}{35}$ Therefore $-3\frac{2}{7} > -3\frac{4}{5}$

Question 10:

Write the following rational numbers in ascending order:

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

(ii) $\frac{1}{3}, \frac{-2}{9}, \frac{-4}{3}$

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

Answer 10:

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

$$\Rightarrow \quad \frac{-3}{5} < \frac{-2}{5} < \frac{-1}{5}$$

$$(ii) \quad \frac{1}{3}, \frac{-2}{9}, \frac{-4}{3} \quad \Rightarrow \quad \frac{3}{9}, \frac{-2}{9}, \frac{-12}{9} \quad [\text{Converting into same denominator}]$$

$$\text{Now} \quad \frac{-12}{9} < \frac{-2}{9} < \frac{3}{9} \quad \Rightarrow \quad \frac{-4}{3} < \frac{-2}{9} < \frac{1}{3}$$

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

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