

Board – CBSE

Class – 7th

Topic – Rational Numbers 9.1

Q.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 $\frac{2}{3}$

Sol: (i) -1 and 0

$$\frac{-1}{10}, \frac{-1}{20}, \frac{-1}{30}, \frac{-1}{40}, \frac{-1}{50}$$

(ii) -2 and -1

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

Five rational numbers are

$$\frac{-11}{6}, \frac{-10}{6}, \frac{-9}{6}, \frac{-8}{6}, \frac{-7}{6}$$

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

$$\frac{-4}{5} = \frac{-4 \times 9}{5 \times 9} = \frac{-36}{45} \text{ and } \frac{-2}{3} = \frac{-2 \times 15}{3 \times 15} = \frac{-30}{45}$$

Five rational numbers are

$$\frac{-35}{45}, \frac{-34}{45}, \frac{-33}{45}, \frac{-32}{45}, \frac{-31}{45}$$

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

$$\frac{1}{2} = \frac{1 \times 18}{2 \times 18} = \frac{18}{36} \text{ and } \frac{2}{3} = \frac{2 \times 12}{3 \times 12} = \frac{24}{36}$$

Five rational numbers are

$$\frac{19}{36}, \frac{20}{36}, \frac{21}{36}, \frac{22}{36}, \frac{23}{36}$$

Q.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) $\frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24}$

,.....

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

Sol: (i) $\frac{-3}{5}, \frac{-6}{10}, \frac{-9}{15}, \frac{-12}{20}$
 $\frac{-3}{5}, \frac{-3 \times 2}{5 \times 2}, \frac{-3 \times 3}{5 \times 3}, \frac{-3 \times 4}{5 \times 4}, \dots$

It can be observed that the numerator is a multiple of 3 while the denominator is a multiple of 5 and as we increase them further, these multiples are increasing.

Therefore, the next four rational numbers in this pattern are

$$\frac{-3 \times 5}{5 \times 5}, \frac{-3 \times 6}{5 \times 6}, \frac{-3 \times 7}{5 \times 7}, \frac{-3 \times 8}{5 \times 8}, \dots$$

$$\frac{-15}{25}, \frac{-18}{30}, \frac{-21}{35}, \frac{-24}{40}, \dots$$

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

The next four rational numbers in this pattern are

$$\frac{-1 \times 4}{4 \times 4}, \frac{-1 \times 5}{4 \times 5}, \frac{-1 \times 6}{4 \times 6}, \frac{-1 \times 7}{4 \times 7}, \dots$$

$$\frac{-4}{16}, \frac{-5}{20}, \frac{-6}{24}, \frac{-7}{28}, \dots$$

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

The next four rational numbers in this pattern are

$$\frac{-1 \times 5}{-6 \times 5}, \frac{-1 \times 6}{-6 \times 6}, \frac{-1 \times 7}{-6 \times 7}, \frac{-1 \times 8}{-6 \times 8}$$

$$\frac{5}{-30}, \frac{6}{-36}, \frac{-6}{24}, \frac{-7}{28}, \dots$$

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

The next four rational numbers in this pattern are

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

$$\frac{8}{-12}, \frac{10}{-15}, \frac{12}{-18}, \frac{14}{-21}, \dots$$

Q.3 Give four rational numbers equivalent to:

(i) $\frac{-2}{7}$ (ii) $\frac{5}{-3}$ (iii) $\frac{4}{9}$

Sol: (i) $\frac{-2}{7}$

Four rational numbers are

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

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

Four rational numbers are

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

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

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

Four rational numbers are

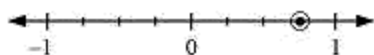
Q.4 Draw the number line and represent the following rational numbers on it:

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

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

This fraction represents 3 parts out of 4 equal parts. Therefore, each space between two integers on number line must be divided into 4 equal parts.

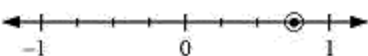
$\frac{3}{4}$ can be represented as



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

This fraction represents 5 parts out of 8 equal parts. Negative sign represents that it is on the negative side of number line. Therefore, each space between two integers on number line must be divided into 8 equal parts.

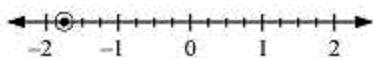
$\frac{-5}{8}$ can be represented as



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

This fraction represents 1 full part and 3 parts out of 4 equal parts. Negative sign represents that it is on the negative side of number line. Therefore, each space between two integers on number line must be divided into 4 equal parts.

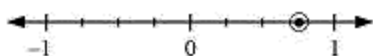
$\frac{-7}{4}$ can be represented as



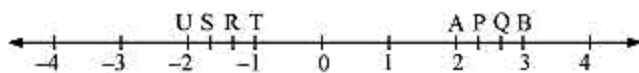
(iv) $\frac{7}{8}$

This fraction represents 7 parts out of 8 equal parts. Therefore, each space between two integers on number line must be divided into 8 equal parts.

$\frac{7}{8}$ can be represented as



Q.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.



Sol: Distance between U and T = 1 unit

It is divided into 3 equal parts.

$$TR = RS = SU = \frac{1}{3}$$

$$R = -1 - \frac{1}{3} = -\frac{3}{3} - \frac{1}{3} = -\frac{4}{3} \quad S = -1 - \frac{2}{3} = -\frac{3}{3} - \frac{2}{3} = -\frac{5}{3}$$

Similarly,

$$AB = 1 \text{ unit}$$

It is divided into 3 equal parts.

$$P = 2 + \frac{1}{3} = \frac{6}{3} + \frac{1}{3} = \frac{7}{3} \quad Q = 2 + \frac{2}{3} = \frac{6}{3} + \frac{2}{3} = \frac{8}{3}$$

Q.6 Which of the following pairs represent the same rational number?

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

Sol: (i) $\frac{-7}{21}$ and $\frac{3}{9}$

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

$$\frac{3}{9} = \frac{1}{3}$$

As, $\frac{-1}{3} \neq \frac{1}{3}$ therefore, it does not represent same rational numbers.

(ii) $\frac{-16}{20}$ and $\frac{20}{-25}$

$$\frac{-16}{20} = \frac{-4}{5}$$

$$\frac{-20}{25} = \frac{-4}{5}$$

Therefore, it represents same rational numbers.

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

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

Therefore, it represents same rational numbers.

(iv) $\frac{-3}{5}$ and $\frac{-12}{20}$

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

Therefore, it represents same rational numbers.

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

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

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

Therefore, it represents same rational numbers.

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

As, $\frac{1}{3} \neq \frac{-1}{9}$ therefore, it does not represent same rational numbers.

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

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

As, $\frac{5}{9} \neq \frac{-5}{9}$ therefore, it does not represent same rational numbers.

Q.7 Rewrite the following rational numbers in the simplest form:

(i) $\frac{-8}{6}$ (ii) $\frac{25}{45}$ (iii) $\frac{-44}{72}$ (iv) $\frac{-8}{10}$

Sol: (i) $\frac{-8}{6} = \frac{-4 \times 2}{3 \times 2} = \frac{-4}{3}$

(ii) $\frac{25}{45} = \frac{5 \times 5}{9 \times 5} = \frac{5}{9}$

(iii) $\frac{-44}{72} = \frac{-11 \times 4}{18 \times 4} = \frac{-11}{18}$

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

Q.8 Fill in the boxes with the correct symbol out of $>$, $<$, and $=$

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

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

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

Sol: (i) $\frac{-5}{7} \square \frac{2}{3}$

$$\frac{-5}{7} = \frac{-5 \times 3}{7 \times 3} = \frac{-15}{21} \quad \frac{2}{3} = \frac{2 \times 7}{3 \times 7} = \frac{14}{21}$$

As $-15 < 14$,

Therefore, $\frac{-5}{7} \square \frac{2}{3}$

(ii) $\frac{-4}{5} \square \frac{-5}{7}$

$$\frac{-4}{5} = \frac{-4 \times 7}{5 \times 7} = \frac{-28}{35} \quad \frac{-5}{7} = \frac{-5 \times 5}{7 \times 5} = \frac{-25}{35}$$

As $-28 < -25$

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

(iii) $\frac{-7}{8} \square \frac{14}{-16}$

$$\text{Here, } \frac{14}{-16} = \frac{7 \times 2}{-8 \times 2} = \frac{7}{-8} = \frac{-7}{8}$$

$$\text{Therefore, } \frac{-7}{8} = \frac{14}{-16}$$

$$\text{(iv) } \frac{-8}{5} \square \frac{-7}{4}$$

$$\frac{-8}{5} = \frac{-8 \times 4}{5 \times 4} = \frac{-32}{20} \quad \frac{-7}{4} = \frac{-7 \times 5}{4 \times 5} = \frac{-35}{20}$$

$$\text{Therefore, } \frac{-8}{5} \boxtimes \frac{-7}{4}$$

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

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

As $-4 < -3$,

$$\text{Therefore, } \frac{1}{-3} \boxtimes \frac{-1}{4}$$

$$\text{(vi) } \frac{5}{-11} = \frac{-5}{11}$$

$$\text{(vii) } 0 \boxtimes \frac{-7}{6}$$

Q.9 Which is greater in each of the following?

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

$$\text{(ii) } \frac{-5}{6}, \frac{-4}{3}$$

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

$$\text{(iv) } \frac{-1}{4}, \frac{1}{4} \quad \text{(v)}$$

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

Sol: (i) $\frac{2}{3}, \frac{5}{2}$

By converting these into like fractions,

$$\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$$

$$\frac{5}{2} = \frac{5 \times 3}{2 \times 3} = \frac{15}{6}$$

As $15 > 4$, therefore, $\frac{5}{2}$ is greater.

$$\text{(ii) } \frac{-5}{6}, \frac{-4}{3}$$

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

As $-5 > -8$, therefore, $\frac{-5}{6}$ is greater.

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

By converting these into like fractions,

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

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

As $-8 > -9$, therefore, $\frac{-2}{3}$ is greater.

(iv) $\frac{-1}{4}, \frac{1}{4}$

$$\frac{1}{4} > \frac{-1}{4}$$

(v) $-3\frac{2}{7}, -3\frac{4}{5}$ or $\frac{-23}{7}, \frac{-19}{5}$

By converting these into like fractions,

$$\frac{-23}{7} = \frac{-23 \times 5}{7 \times 5} = \frac{-115}{35}$$

$$\frac{-19}{5} = \frac{-19 \times 7}{5 \times 7} = \frac{-133}{35}$$

As $-115 > -133$, therefore, $-3\frac{2}{7}$ is greater.

Q.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) $\frac{-3}{7}, \frac{-3}{2}, \frac{-3}{4}$

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

As $-3 < -2 < -1$,

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

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

By converting these into like fractions,

$$\frac{-1 \times 3}{3 \times 3}, \frac{-2}{9}, \frac{-4 \times 3}{3 \times 3},$$

$$\frac{-3}{9}, \frac{-2}{9}, \frac{-12}{9}$$

As $-12 < -3 < -2$,

$$\frac{-4}{3} < \frac{-1}{3} < \frac{-2}{9}$$

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

By converting these into like fractions,

$$\frac{-3 \times 4}{7 \times 4}, \frac{-3 \times 14}{2 \times 14}, \frac{-3 \times 7}{4 \times 7}$$

$$\frac{-12}{28}, \frac{-42}{28}, \frac{-21}{28}$$

$$\text{As } -42 < -21 < -12, \quad \frac{-3}{2} < \frac{-3}{4} < \frac{-3}{7}$$