Q1. List five rational numbers between:
(i) - 1 and 0 (ii) - 2 and - 1

(iii) $\dfrac{-4}{5}$ and $\dfrac{-2}{3}$ (iv) $\dfrac{1}{2}$ and $\dfrac{2}{3}$

Ans:

(i) - 1 and 0

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

(ii) - 2 and - 1

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

Five rational numbers are

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

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

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

Five rational numbers are

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

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

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

Five rational numbers are

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

Q2. Write four more rational numbers in each of the following patterns:

(i) $\frac{-3}{5}, \frac{-6}{10}, \frac{-9}{15}, \frac{-12}{20}, ...$ (ii) $\frac{-1}{4}, \frac{-2}{8}, \frac{-3}{12}, ...$

(iii) $\frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24}, ...$ (iv) $\frac{-2}{3}, \frac{2}{-3}, \frac{4}{-6}, \frac{6}{-9}, ...$

Ans:

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

$$\frac{-3}{5}, \frac{-3 \times 2}{5 \times 2}, \frac{-3 \times 3}{5 \times 3}, \frac{-3 \times 4}{5 \times 4} .....$$

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

$$\frac{-3\times5}{5\times5}, \frac{-3\times6}{5\times6}, \frac{-3\times7}{5\times7}, \frac{-3\times8}{5\times8} \cdots$$

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

(ii)

$$\frac{-1}{4}, \frac{-2}{8}, \frac{-3}{12} \cdots$$

$$\frac{-1}{4}, \frac{-1\times2}{4\times2}, \frac{-1\times3}{4\times3} \cdots$$

The next four rational numbers in this pattern are

$$\frac{-1\times4}{4\times4}, \frac{-1\times5}{4\times5}, \frac{-1\times6}{4\times6}, \frac{-1\times7}{4\times7} \cdots$$

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

(iii)

$$\frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24} \cdots$$

$$\frac{-1}{6}, \frac{1\times2}{-6\times2}, \frac{1\times3}{-6\times3}, \frac{1\times4}{-6\times4} \cdots$$

The next four rational numbers in this pattern are

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

$$\frac{5}{-30}, \frac{6}{-36}, \frac{7}{-42}, \frac{8}{-48} \cdots$$

(iv) $\dfrac{-2}{3}, \dfrac{2}{-3}, \dfrac{4}{-6}, \dfrac{6}{-9} \cdots$

$$\frac{-2}{3}, \frac{2}{-3}, \frac{2 \times 2}{-3 \times 2}, \frac{2 \times 3}{-3 \times 3} \cdots$$

The next four rational numbers in this pattern are

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

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

Q3. Give four rational numbers equivalent to:

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

Ans:

(i) $\dfrac{-2}{7}$

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) $\dfrac{5}{-3}$

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) $\dfrac{4}{9}$

Four rational numbers are

$$\frac{4 \times 2}{9 \times 2}, \frac{4 \times 3}{9 \times 3}, \frac{4 \times 4}{9 \times 4}, \frac{4 \times 5}{9 \times 5}$$

$$\frac{8}{18}, \frac{12}{27}, \frac{16}{36}, \frac{20}{45}$$

Q4. Draw the number line and represent the following rational numbers on it:
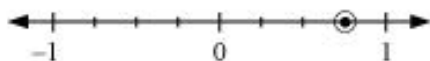
(i) $\frac{3}{4}$ **(ii)** $\frac{-5}{8}$

(iii) $\frac{-7}{4}$ **(iv)** $\frac{7}{8}$

Ans:

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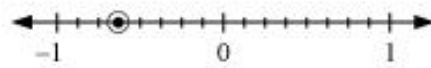
$\frac{3}{4}$ can be represented as

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

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.
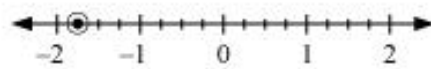
$\dfrac{-5}{8}$ can be represented as

(iii) $\dfrac{-7}{4} = -1\dfrac{3}{4}$

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.
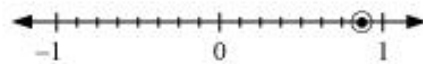
$\dfrac{-7}{4}$ can be represented as
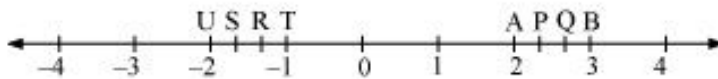

(iv) $\dfrac{7}{8}$

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.

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

Q5. 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.

Ans:

Distance between U and T = 1 unit

It is divided into 3 equal parts.

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

$$R = -1 - \dfrac{1}{3} = -\dfrac{3}{3} - \dfrac{1}{3} = \dfrac{-4}{3}$$

$$S = -1 - \dfrac{2}{3} = -\dfrac{3}{3} - \dfrac{2}{3} = -\dfrac{5}{3}$$

Similarly,

AB = 1 unit

It is divided into 3 equal parts.

$$P = 2 + \dfrac{1}{3} = \dfrac{6}{3} + \dfrac{1}{3} = \dfrac{7}{3}$$

$$Q = 2 + \dfrac{2}{3} = \dfrac{6}{3} + \dfrac{2}{3} = \dfrac{8}{3}$$

Q6. Which of the following pairs represent the same rational number?

(i) $\dfrac{-7}{21}$ and $\dfrac{3}{9}$ (ii) $\dfrac{-16}{20}$ and $\dfrac{20}{-25}$ (iii) $\dfrac{-2}{-3}$ and $\dfrac{2}{3}$

(iv) $\dfrac{-3}{5}$ and $\dfrac{-12}{20}$ (v) $\dfrac{8}{-5}$ and $\dfrac{-24}{15}$ (vi) $\dfrac{1}{3}$ and $\dfrac{-1}{9}$

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

Ans:

(i) $\dfrac{-7}{21}$ and $\dfrac{3}{9}$

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

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

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

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

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

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

Therefore, it represents same rational numbers.

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

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

Therefore, it represents same rational numbers.

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

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

Therefore, it represents same rational numbers.

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

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

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

Therefore, it represents same rational numbers.

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

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

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

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

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

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

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

Therefore, it represents same rational numbers.

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

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

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

Therefore, it represents same rational numbers.

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

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

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

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

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

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