Mathematics

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(Chapter – 9) (Rational Numbers)

(Class – VII)

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.

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

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

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

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.

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

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

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

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.

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

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

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

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.

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

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

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

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

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

Question 2:

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

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

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

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

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

Answer 2:

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

$\Rightarrow \frac{-3\times1}{5\times1}, \frac{-3\times2}{5\times2}, \frac{-3\times3}{5\times3}, \frac{-3\times4}{5\times4}, \ldots\ldots\ldots$

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

$\frac{-3\times5}{5\times5}, \frac{-3\times6}{5\times6}, \frac{-3\times7}{5\times7}, \frac{-3\times8}{5\times8} = \frac{-15}{25}, \frac{-18}{30}, \frac{-21}{35}, \frac{-24}{40}$

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

$\Rightarrow \frac{-1\times1}{4\times1}, \frac{-1\times2}{4\times2}, \frac{-1\times3}{4\times3}, \ldots\ldots\ldots$

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

$\frac{-1\times4}{4\times4}, \frac{-1\times5}{4\times5}, \frac{-1\times6}{4\times6}, \frac{-1\times7}{4\times7} = \frac{-4}{16}, \frac{-5}{20}, \frac{-6}{24}, \frac{-7}{28}$

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

$\Rightarrow \frac{-1\times1}{6\times1}, \frac{1\times2}{-6\times2}, \frac{1\times3}{-6\times3}, \frac{1\times4}{-6\times4}, \ldots\ldots\ldots$

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

$\frac{1\times5}{-6\times5}, \frac{1\times6}{-6\times6}, \frac{1\times7}{-6\times7}, \frac{1\times8}{-6\times8} = \frac{5}{-30}, \frac{6}{-36}, \frac{7}{-42}, \frac{8}{-48}$

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

$\Rightarrow \frac{-2\times1}{3\times1}, \frac{2\times1}{-3\times1}, \frac{2\times2}{-3\times2}, \frac{2\times3}{-3\times3}, \ldots\ldots\ldots$

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

$\frac{2\times4}{-3\times4}, \frac{2\times5}{-3\times5}, \frac{2\times6}{-3\times6}, \frac{2\times7}{-3\times7} = \frac{8}{-12}, \frac{10}{-15}, \frac{12}{-18}, \frac{14}{-21}$

Question 3:

Give four rational numbers equivalent to:

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

Answer 3:

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

$\frac{-2\times2}{7\times2} = \frac{-4}{14}, \frac{-2\times3}{7\times3} = \frac{-6}{21}, \frac{-2\times4}{7\times4} = \frac{-8}{28}, \frac{-2\times5}{7\times5} = \frac{-10}{35}$

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

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

$\frac{5\times2}{-3\times2} = \frac{10}{-6}, \frac{5\times3}{-3\times3} = \frac{15}{-9}, \frac{5\times4}{-3\times4} = \frac{20}{-12}, \frac{5\times5}{-3\times5} = \frac{25}{-15}$

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

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

$\frac{4\times2}{9\times2} = \frac{8}{18}, \frac{4\times3}{9\times3} = \frac{12}{27}, \frac{4\times4}{9\times4} = \frac{16}{36}, \frac{4\times5}{9\times5} = \frac{20}{45}$

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

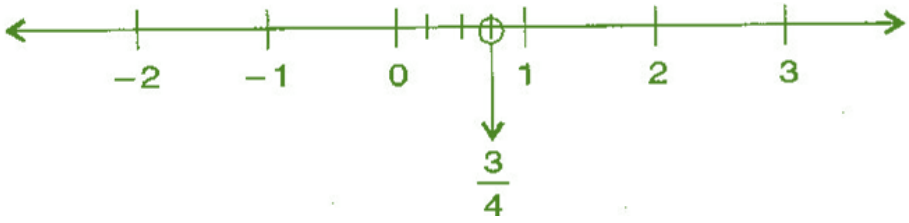
Question 4:

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

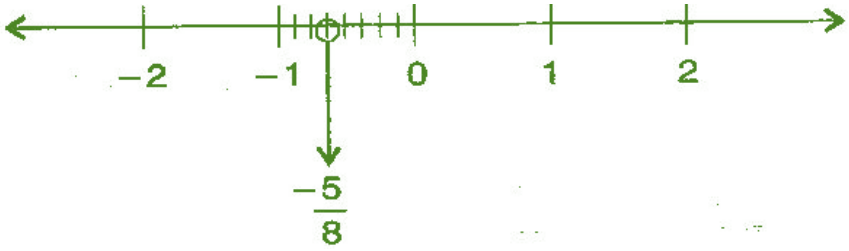
(i) $\frac{3}{4}$ (ii) $\frac{-5}{8}$ (iii) $\frac{-7}{4}$ (iv) $\frac{7}{8}$

Answer 4:

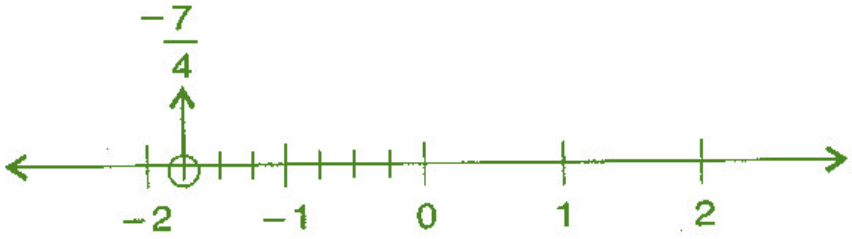
(i) $\frac{3}{4}$



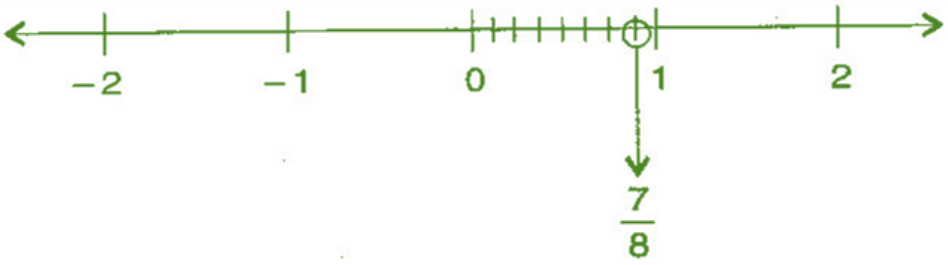
(ii) $\frac{-5}{8}$



(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:

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

$\Rightarrow \frac{-7}{21} = \frac{-1}{3}$ and $\frac{3}{9} = \frac{1}{3}$ [Converting into lowest term]

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

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

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

$\Rightarrow \frac{-16}{20} = \frac{-4}{5}$ and $\frac{20}{-25} = \frac{4}{-5} = \frac{-4}{5}$ [Converting into lowest term]

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

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

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

$\Rightarrow \frac{-2}{-3} = \frac{2}{3}$ and $\frac{2}{3} = \frac{2}{3}$ [Converting into lowest term]

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

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

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

$\Rightarrow \frac{-3}{5} = \frac{-3}{5}$ and $\frac{-12}{20} = \frac{-3}{5}$ [Converting into lowest term]

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

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

(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]

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

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

(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]

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

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

(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]

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

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

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]

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

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

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

Question 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) $0 \square \frac{-7}{6}$

Answer 8:

(i) $\frac{-5}{7} \boxed{<} \frac{2}{3}$ Since, the positive number if greater than negative number.

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

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

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

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

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

(vii) $0 \boxed{>} \frac{-7}{6}$ 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) $\frac{2\times2}{3\times2}=\frac{4}{6}$ and $\frac{5\times3}{2\times3}=\frac{15}{6}$

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

(ii) $\frac{-5\times1}{6\times1}=\frac{-5}{6}$ and $\frac{-4\times2}{3\times2}=\frac{-8}{6}$

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

(iii) $\frac{-3\times3}{4\times3}=\frac{-9}{12}$ and $\frac{2\times(-4)}{-3\times(-4)}=\frac{-8}{12}$

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

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

(v) $-3\frac{2}{7}=\frac{-23}{7}=\frac{-23\times5}{7\times5}=\frac{-115}{35}$ and $-3\frac{4}{5}=\frac{-19}{5}=\frac{-19\times7}{5\times7}=\frac{-133}{35}$

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

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

Answer 10:

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

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

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

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

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

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