

Rational Numbers

Exercise 4B

Q2

Answer :

(i) $\frac{5}{6}$. This is because 0 can be written as $\frac{0}{6}$ and $\frac{0}{6} < \frac{5}{6}$.

(ii) $\frac{-3}{5} < 0$. This is because 0 can be written as $\frac{0}{5}$ and $-3 < 0$.

(iii) $\frac{5}{8} > \frac{3}{8}$. This is because $5 > 3$.

(iv) $\frac{7}{9} > \frac{5}{9}$. This is because $7 > 5$.

(v) $\frac{-6}{11} < \frac{-5}{11}$. This is because $-6 < -5$.

(vi) $\frac{-15}{4} > \frac{-17}{4}$, $-15 > -17$

Q3

Answer :

(i) $\frac{5}{9}, \frac{-3}{8}$

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

L. C. M. of 9 and 8 is 72.

$$\frac{5 \times 8}{9 \times 8} = \frac{40}{72}$$

$$\frac{3 \times 9}{8 \times 9} = \frac{27}{72}$$

$$27 < 40$$

$$\frac{-3}{8} < \frac{5}{9}$$

So, $\frac{5}{9}$ is greater.

3	9,8
3	3,8
2	1,8
2	4,4
2	1,2
	1,1

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

We will convert each negative denominator into positive.

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

L. C. M. of 3 and 7 is 21.

$$\frac{-4 \times (7)}{(3) \times (7)} = \frac{-28}{21}$$

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

$$(-24) > (-28)$$

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

So, $\frac{-8}{7}$ is greater.

(iii)

$$\frac{-12}{5}, -3$$

L. C. M. of 5 and 1 is 5.

$$\frac{-12 \times 1}{5 \times 1} = \frac{-12}{5}$$

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

$$-12 > -15$$

$$\frac{-12}{5} > -3$$

$\frac{-12}{5}$ is greater.

(iv)

$$\frac{-7}{9}, \frac{-5}{8}$$

L. C. M. of 9 and 8 is 72.

$$\frac{-7 \times 8}{9 \times 8} = \frac{-56}{72}$$

$$\frac{-5 \times 9}{8 \times 9} = \frac{-45}{72}$$

$$-56 < -45$$

$$\frac{-7}{9} < \frac{-5}{8}$$

3	9,8
3	3,8
2	1,8
2	1,4
2	1,2
	1,1

$$(v) \quad \frac{4}{-5}, \frac{-7}{8}$$

We will convert each negative denominator into positive.

$$\frac{4 \times -1}{-5 \times -1} = \frac{-4}{5}$$

L. C. M. of 5 and 8 is 40.

$$\frac{-4 \times 8}{5 \times 8} = \frac{-32}{40}$$

$$\frac{-7 \times 5}{8 \times 5} = \frac{-35}{40}$$

$$-32 > -35$$

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

2	5,8
2	5,4
2	5,2
5	5,1
	1,1

$$(vi) \quad \frac{9}{-13}, \frac{7}{-12}$$

We will convert each negative denominator into positive.

$$\frac{9 \times -1}{-13 \times -1} = \frac{-9}{13}$$

$$\frac{7 \times -1}{-12 \times -1} = \frac{-7}{12}$$

L. C. M. of 13 and 12 is 156.

$$\frac{-9 \times 12}{13 \times (-12)} = \frac{-108}{156}$$

$$\frac{-7 \times 13}{(-12) \times 13} = \frac{-91}{156}$$

$$-108 < -91$$

$$\frac{9}{-13} < \frac{7}{-12}$$

Answer :

$$(i) \frac{-3}{7} > \frac{-6}{13}$$

L. C. M. of 7 and 13 is 91.

$$\frac{-3 \times 13}{7 \times 13} = \frac{-39}{91}$$

$$\frac{-6 \times 7}{13 \times 7} = \frac{-42}{91}$$

$$\frac{-39}{91} > \frac{-42}{91}$$

$$(ii) \frac{5}{-13} = \frac{-35}{91}$$

L. C. M. of 13 and 91 is 91.

$$\frac{5 \times (-7)}{-13 \times (-7)} = \frac{-35}{91}$$

$$(iii) -2 > \frac{-13}{5}$$

L. C. M of 1 and 5 is 5.

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

$$\frac{-13 \times 1}{5 \times 1} = \frac{-13}{5}$$

$$\frac{-10}{5} > \frac{-13}{5}$$

$$(iv) \frac{-2}{3} < \frac{-5}{8}$$

L. C. M. of 8 and 3 is 24.

$$\frac{-2 \times 8}{3 \times 8} = \frac{-16}{24}$$

$$\frac{-5 \times 3}{8 \times 3} = \frac{-15}{24}$$

$$\frac{-16}{24} < \frac{-15}{24}$$

$$(v) 0 < \frac{3}{5}$$

L. C. M. of 1 and 5 is 5.

$$\frac{0 \times 1}{1 \times 5} = \frac{0}{5}$$

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

$$\frac{0}{5} < \frac{3}{5}$$

$$(vi) \frac{-8}{9} > \frac{-9}{10}$$

L. C. M. of 9 and 10 is 90.

$$\frac{-8 \times 10}{9 \times 10} = \frac{-80}{90}$$

$$\frac{-9 \times 9}{10 \times 9} = \frac{-81}{90}$$

$$\frac{-80}{90} > \frac{-81}{90}$$

$$\begin{array}{r|l} 13 & 13,91 \\ 7 & 1,7 \\ \hline & 1,1 \end{array}$$

$$\begin{array}{r|l} 2 & 8,3 \\ 2 & 4,3 \\ 2 & 2,3 \\ 3 & 1,3 \\ \hline & 1,1 \end{array}$$

$$\begin{array}{r|l} 3 & 9,10 \\ 3 & 3,10 \\ 5 & 1,10 \\ 2 & 1,2 \\ \hline & 1,1 \end{array}$$

Q5

Answer :

$$(i) \frac{2}{5}, \frac{7}{10}, \frac{8}{15}, \frac{13}{30}$$

L. C. M. of 5, 10, 15 and 30 is 30

$$\begin{array}{r|l} 5 & 5,10,15,30 \\ 2 & 1,2,3,6 \\ 3 & 1,1,3,3 \\ \hline & 1,1,1,1 \end{array}$$

$$\frac{2 \times 6}{5 \times 6} = \frac{12}{30}$$

$$\frac{7 \times 3}{10 \times 3} = \frac{21}{30}$$

$$\frac{8 \times 2}{15 \times 2} = \frac{16}{30}$$

$$\frac{13 \times 1}{30 \times 1} = \frac{13}{30}$$

Required order: $\frac{2}{5} < \frac{13}{30} < \frac{8}{15} < \frac{7}{10}$

$$(ii) \frac{-3}{4}, \frac{5}{-12}, \frac{-7}{16}, \frac{9}{-24}$$

First, we need to convert each negative denominator into positive.

$$\frac{-3}{4}, \frac{5 \times -1}{-12 \times -1}, \frac{-7}{16}, \frac{9 \times -1}{-24 \times -1}$$

$$\frac{-3}{4}, \frac{5}{12}, \frac{-7}{16}, \frac{-9}{24}$$

2	4,12,16,24
2	2,6,8,12
2	1,3,4,6
2	1,3,2,3
3	1,3,1,3
1	1,1,1,1

L. C. M. of 4, 12, 16 and 24 is 48.

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

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

$$\frac{-7 \times 3}{16 \times 3} = \frac{-21}{48}$$

$$\frac{-9 \times 2}{24 \times 2} = \frac{-18}{48}$$

Required order: $\frac{-3}{4} < \frac{-7}{16} < \frac{-5}{12} < \frac{-9}{24}$

$$(iii) \frac{-3}{10}, \frac{7}{-15}, \frac{-11}{20}, \frac{17}{-30}$$

First, we need to convert the negative denominators to make them positive.

$$\frac{-3}{10}, \frac{7 \times -1}{-15 \times -1}, \frac{-11}{20}, \frac{17 \times -1}{-30 \times -1}$$

$$\frac{-3}{10}, \frac{-7}{15}, \frac{-11}{20}, \frac{-17}{30}$$

5	10,15,20,30
2	2,3,4,6
3	1,3,2,3
3	1,3,1,3
1	1,1,1,1

L. C. M of 10, 15, 20, 30 = 60

$$\frac{-3 \times 6}{10 \times 6} = \frac{-18}{60}$$

$$\frac{-7 \times 4}{15 \times 4} = \frac{-28}{60}$$

$$\frac{-11 \times 3}{20 \times 3} = \frac{-33}{60}$$

$$\frac{-17 \times 2}{30 \times 2} = \frac{-34}{60}$$

Therefore, $\frac{-34}{60} < \frac{-33}{60} < \frac{-28}{60} < \frac{-18}{60}$

i.e. $\frac{-17}{30} < \frac{-11}{20} < \frac{-7}{15} < \frac{-3}{10}$

$$(iv) \frac{2}{3}, \frac{3}{4}, \frac{5}{-6}, \frac{-7}{12}$$

First, we need to convert the negative denominators to positive ones.

$$\frac{2}{3}, \frac{3}{4}, \frac{5 \times -1}{-6 \times -1}, \frac{-7}{12}$$

$$\frac{2}{3}, \frac{3}{4}, \frac{-5}{6}, \frac{-7}{12}$$

2	3,4,6,12
2	1,2,3,6
3	1,1,3,3
1	1,1,1,1

L. C. M of 3, 4, 6, 12 = 12

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

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

$$\frac{-5 \times 2}{6 \times 2} = \frac{-10}{12}$$

$$\frac{-7 \times 1}{12 \times 1} = \frac{-7}{12}$$

Therefore, the correct order is $\frac{-5}{6} < \frac{-7}{12} < \frac{2}{3} < \frac{3}{4}$.

Answer :

$$(i) \frac{-2}{5}, \frac{7}{-10}, \frac{-11}{15}, \frac{19}{-30}$$

First, we need to convert each negative denominator into positive.

$$\frac{-2}{5}, \frac{7 \times -1}{-10 \times -1}, \frac{-11}{15}, \frac{19 \times -1}{-30 \times -1}$$
$$\frac{-2}{5}, \frac{-7}{10}, \frac{-11}{15}, \frac{-19}{30}$$

5	5,10,15,30
2	1,2,3,6
3	1,1,3,3
	1,1,1,1

L. C. M. of 5, 10, 15 and 30 is 30.

$$\frac{-2 \times 6}{5 \times 6} = \frac{-12}{30},$$
$$\frac{-7 \times 3}{10 \times 3} = \frac{-21}{30},$$
$$\frac{-11 \times 2}{15 \times 2} = \frac{-22}{30},$$
$$\frac{-19 \times 1}{30 \times 1} = \frac{-19}{30},$$

Correct order: $\frac{-2}{5} > \frac{19}{-30} > \frac{7}{-10} > \frac{-11}{15}$

$$(ii) -2, \frac{-13}{6}, \frac{8}{-3}, \frac{1}{3}$$

First, we need to convert each negative denominator into positive.

$$-2, \frac{-13}{6}, \frac{8 \times -1}{-3 \times -1}, \frac{1}{3}$$
$$-2, \frac{-13}{6}, \frac{-8}{3}, \frac{1}{3}$$

3	1,6,3,3
2	1,2,1,1
	1,1,1,1

L. C. M. of 6, 3 and 3 is 6.

$$\frac{-2 \times 6}{1 \times 6} = \frac{-12}{6},$$
$$\frac{-13 \times 1}{6 \times 1} = \frac{-13}{6},$$
$$\frac{-8 \times 2}{3 \times 2} = \frac{-16}{6},$$
$$\frac{1 \times 2}{3 \times 2} = \frac{2}{6},$$

Correct order: $\frac{1}{3} > -2 > \frac{-13}{6} > \frac{-8}{3}$

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

First, we need to convert each negative denominator into positive.

$$\frac{-4}{9}, \frac{5 \times -1}{-12 \times -1}, \frac{-7}{18}, \frac{2 \times -1}{-3 \times -1}$$
$$\frac{-4}{9}, \frac{-5}{12}, \frac{-7}{18}, \frac{-2}{3}$$

3	9,12,18,3
3	3,4,6,1
2	1,4,2,1
2	1,2,1,1
	1,1,1,1

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

$$\frac{-4 \times 4}{9 \times 4} = \frac{-16}{36},$$
$$\frac{-5 \times 3}{12 \times 3} = \frac{-15}{36},$$
$$\frac{-7 \times 2}{18 \times 2} = \frac{-14}{36},$$
$$\frac{-2 \times 12}{3 \times 12} = \frac{-24}{36}$$

Correct order: $\frac{-7}{18} > \frac{-5}{12} > \frac{-4}{9} > \frac{-2}{3}$

$$(iv) \frac{17}{-30}, \frac{11}{-15}, \frac{-7}{10}, \frac{3}{5}$$

First, we need to convert each negative denominator into positive.

$$\frac{17 \times -1}{-30 \times -1}, \frac{11 \times -1}{-15 \times -1}, \frac{-7}{10}, \frac{3}{5}$$

$$\frac{-17}{30}, \frac{-11}{15}, \frac{-7}{10}, \frac{3}{5}$$

$$\begin{array}{r|l} 5 & 5, 10, 15, 30 \\ \hline 2 & 1, 2, 3, 6 \\ \hline 3 & 1, 1, 3, 3 \\ \hline & 1, 1, 1, 1 \end{array}$$

L. C. M. of 30, 15, 10 and 5 is 30.

$$\frac{-17 \times 1}{30 \times 1} = \frac{-17}{30},$$

$$\frac{-11 \times 2}{15 \times 2} = \frac{-22}{30},$$

$$\frac{-7 \times 3}{10 \times 3} = \frac{-21}{30},$$

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

Correct order: $\frac{3}{5} > \frac{17}{-30} > \frac{-7}{10} > \frac{11}{-15}$

Q8

Answer :

L. C. M. of 2 and 3 is 6.

$$-3 = \frac{-3 \times 6}{1 \times 6} = \frac{-18}{6}$$

$$-2 = \frac{-2 \times 6}{1 \times 6} = \frac{-12}{6}$$

Therefore, $\frac{-17}{6}, \frac{-16}{6}, \frac{-15}{6}, \frac{-14}{6}$ and $\frac{-13}{6}$ are the five rational number between -3 and -2 .

Q9.

Answer :

$$-1 = \frac{-1 \times 5}{1 \times 5}, 1 = \frac{1 \times 5}{1 \times 5}$$

$$\frac{-5}{5} \text{ and } \frac{5}{5}$$

Hence, the five rational numbers between -1 and 1 are $\frac{-4}{5}, \frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5}$ and $\frac{1}{5}$.

Q10

Answer :

$$\frac{-3}{5} \text{ and } \frac{-1}{2}$$

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

$$\frac{-3 \times 2}{5 \times 2} = \frac{-6 \times 4}{10 \times 4} = \frac{-24 \times 2}{40 \times 2} = \frac{-48}{80},$$

$$\frac{-1 \times 5}{2 \times 5} = \frac{-5 \times 4}{10 \times 4} = \frac{-20 \times 2}{40 \times 2} = \frac{-40}{80},$$

Hence, the five rational numbers between $\frac{-3}{5}$ and $\frac{-1}{2}$ are $\frac{-45}{80}, \frac{-44}{80}, \frac{-43}{80}, \frac{-42}{80}$ and $\frac{-41}{80}$.