Exercise - 1.1

1) Add the following rational numbers:

(i) $\frac{-5}{7}$ and $\frac{3}{7}$.

Solution:- clearly, denominators of the given numbers are positive.

The Leam of denominators 7 and 7 is 7.

we have.

$$\frac{-5}{7} + \frac{3}{7} = \frac{-5+3}{7}$$

$$= \frac{-2}{7}.$$

(ii) $\frac{-15}{4}$ and $\frac{7}{4}$.

The Lcm of denominators 4 and 4 is 4.

we have, $\frac{-15}{4} + \frac{7}{4} = \frac{7-15}{4}$.

$\therefore \frac{-15}{4} + \frac{7}{4} = \frac{-8}{4} = -2$.

(iii) $\frac{-8}{11}$ and $\frac{-4}{11}$

The Lcm of denominators 11 and 11 is 11

we have, $\frac{-8}{11} + \left(\frac{-4}{11}\right) = \frac{-8}{11} - \frac{4}{11} = \frac{-8-4}{11}$

$= -12$

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The Lcm of denominators 11 and 11 is 11

we have, $\frac{-8}{11} + \left(\frac{-4}{11}\right) = \frac{-8}{11} - \frac{4}{11} = \frac{-8-4}{11}$

$$= -12$$

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

The denominators of the given rational numbers are 1 and 5 respectevely.

The Lcm of 1 and 5 is 5.

Now, we re-write the given rational numbers into forms inwhich both of them have the same denominator

$\frac{-3\times5}{1\times5} = \frac{-3\times5}{5}$ and $\frac{3}{5}$.

$\therefore \frac{-15}{5} + \frac{3}{5} = \frac{3-15}{5} = \frac{-12}{5}$.

(iv) $\frac{-7}{27}$ and $\frac{11}{18}$.

The denominators of the given rational numbers are 27 and 18 respectevely.

The Lcm of 27 and 18 is 54.

Now, we re-write the given rational numbers into forms in which both of them have the same denominator

$\frac{-7}{27} = \frac{-7\times2}{27\times2} = \frac{-14}{54}$ and $\frac{11\times3}{18\times3} = \frac{33}{54}$

$\therefore \left(\frac{-7\times2}{27\times2}\right) + \frac{33}{54} = \frac{33}{54} - \frac{14}{54} = \frac{33-14}{54} = \frac{19}{54}$

(v) $\frac{31}{-4}$ and $\frac{-5}{8}$.

The denominators of the given rational numbers are $\frac{-4}{8}$ and 8 respectively. The Lcm of $\frac{-4}{8}$ and 8 is 8.

Now we re-write the given rational numbers into forms in which both of them have the same denominator.

$$\frac{31}{-4} = \frac{31\times2}{-4\times2} = \frac{-62}{8} \text{ and } \frac{-5}{8}$$

$$\therefore -\frac{31\times2}{4\times2} + \left(\frac{-5}{8}\right) = -\frac{62}{8} - \frac{5}{8} = \frac{-67}{8}.$$

(vi) $\frac{5}{36}$ and $\frac{-7}{12}$.

The denominators of the given rational numbers are 36 and 12 respectively. The Lcm of 36 and 12. is 36.

Now we-rewrite the given rational numbers in to forms in which both of them have the same denominator.

$$\frac{5}{36} \text{ and } \frac{-7\times3}{12\times3} = \frac{-21}{36}$$

$$\therefore \frac{5}{36} - \frac{21}{36} = \frac{-16}{36} = \frac{-4}{9}.$$

(vii) $\frac{-5}{16}$ and $\frac{7}{24}$.

$\frac{-5}{16} = \frac{-5\times3}{16\times3} = \frac{-15}{48}$ and $\frac{7}{24} = \frac{7\times2}{24\times2} = \frac{14}{48}$.

[$\because$ Lcm of 16 and 24 is 48].

$\frac{-5}{16} + \frac{7}{24} = \frac{-15}{48} + \frac{14}{48} = \frac{-1}{48}$.

(viii) $\frac{7}{-18}$ and $\frac{8}{27}$.

The Lcm of 18 and 27 is 54.

$\frac{-7}{18} = \frac{-7\times3}{18\times3} = \frac{-21}{54}$ and $\frac{8\times2}{27\times2} = \frac{16}{54}$.

$\therefore \frac{-21}{54} + \frac{16}{54} = \frac{16-21}{54} = \frac{-5}{54}$.

3. simplify:

(i) $\frac{8}{9} + \frac{-11}{6}$

The Lcm of 9 and 6 is 18.

$\frac{8}{9} = \frac{8\times2}{9\times2} = \frac{16}{18}$ and $\frac{-11}{6} = \frac{-11\times3}{6\times3} = \frac{-33}{18}$.

$\therefore \frac{16}{18} - \frac{33}{18} = \frac{-17}{18}$.

(ii) $\frac{-5}{16}$ and $\frac{7}{24}$.

The Lcm of 16 and 24 is 48.

$\frac{-5\times3}{16\times3} = \frac{-15}{48}$ and $\frac{7\times2}{24\times2} = \frac{14}{48}$

(iii) $\frac{1}{-12} + \frac{2}{-15}$.

The Lcm of 12 and 15 is 60.

$\frac{-1 \times 5}{12 \times 5} = \frac{-5}{60}$ and $\frac{2 \times 4}{-15 \times 4} = \frac{-8}{60}$.

$\therefore \frac{-5}{60} + \left(\frac{-8}{60}\right) = -\frac{5}{60} - \frac{8}{60} = \frac{-13}{60}$.

(iv) $\frac{-8}{19} + \frac{-4}{57}$

The Lcm of 19 and 57 is 57.

$\frac{-8 \times 3}{19 \times 3} = \frac{-24}{57}$ and $\frac{-4 \times 1}{57 \times 1} = \frac{-4}{57}$

$\therefore -\frac{24}{57} - \frac{4}{57} = \frac{-28}{57}$.

(v) $\frac{7}{9} + \frac{3}{-4}$.

The Lcm of 9 and 4 is 36.

$\frac{7}{9} = \frac{7 \times 4}{9 \times 4} = \frac{28}{36}$ and $\frac{3}{-4} = \frac{3 \times 9}{-4 \times 9} = \frac{-27}{36}$.

$\therefore \frac{28}{36} - \frac{27}{36} = \frac{1}{36}$.

(vi) $\frac{5}{26} + \frac{11}{-39}$.

The Lcm of 26 and 39 is 78.

$\frac{5 \times 3}{26 \times 3} = \frac{15}{78}$ and $\frac{11 \times 2}{-39 \times 2} = \frac{-22}{78}$.

$\therefore \frac{15}{78} - \frac{22}{78} = \frac{-7}{78}$.

(VII) $\frac{-16}{9} + \frac{-5}{12}$

The Lcm of 9 and 12 is 108.

$\frac{-16}{9} \times \frac{12}{12} = \frac{-192}{108}$ and $\frac{-5}{12} = \frac{-5}{12} \times \frac{9}{9} = \frac{-45}{108}$.

$\frac{-192}{108} - \frac{45}{108} = \frac{-237}{108} = \frac{-79}{36}$.

(VIII) $\frac{-13}{8} + \frac{5}{36}$.

The Lcm of 8 and 36 is 72.

$\frac{-13}{8} \times \frac{9}{9} = \frac{-117}{72}$ and $\frac{5}{36} \times \frac{2}{2} = \frac{10}{72}$.

$\therefore \frac{10}{72} - \frac{117}{72} = \frac{-107}{72}$.

(IX) $0 + \left(\frac{-3}{5}\right)$

The Lcm of 0 and 5 is 80.

$\therefore 0 + \left(\frac{-3}{5}\right) = \frac{-3}{5}$.

(X) $1 + \left(\frac{-4}{5}\right)$

The Lcm of 1 and 5 is 5.

$\therefore 1 + \left(\frac{-4}{5}\right) = \frac{5}{5} - \frac{4}{5} = \frac{1}{5}$.

(XI) $3 + \frac{5}{-7}$

The Lcm of 1 and 7 is 7.

$3 + \left(\frac{-5}{7}\right) = \frac{21}{7} - \frac{5}{7} = \frac{21-5}{7} = \frac{16}{7}$

4) Add and express the sum as a mixed fraction

(i) $\frac{-12}{5}$ and $\frac{43}{10}$.

The denominators of the given rational numbers 5 and 10 respectevely. The Lcm of 5 and 10 is 10.

Now we write the given rational numbers into forms in which both of them have the same denominator.

$\frac{-12 \times 2}{5 \times 2} = \frac{-24}{10}$ and $\frac{43}{10}$

$\therefore \frac{-24}{10} + \left(\frac{43}{10}\right) = \frac{43}{10} - \frac{24}{10} = \frac{19}{10} = 1\frac{9}{10}$.

(ii) $\frac{24}{7}$ and $\frac{-11}{4}$.

The denominators of the given rational numbers 7 and 4 respectevely. The Lcm of 7 and 4 is 28.

Now we rewrite the given rational numbers into forms in which both of them have the same denominator.

$\frac{24}{7} \times \frac{4}{4} = \frac{96}{28}$ and $\frac{-11}{4} \times \frac{7}{7} = \frac{-77}{28}$

$\therefore \frac{96}{28} - \frac{77}{28} = \frac{19}{28}$.

<4>

(iii) $\frac{-31}{6}$ and $\frac{-27}{8}$.

The denominators of the given rational numbers 6 and 8 respectevely. The Lcm of 6 and 8 is 24.

Now we re write the given rational numbers into forms in which both of them have the same denominator.

$$\frac{-31}{6} \times \frac{4}{4} = \frac{-124}{24} \text{ and } \frac{-27}{8} \times \frac{3}{3} = \frac{-81}{24}.$$

$$\therefore \frac{-124}{24} + \left(\frac{-81}{24}\right) = \frac{-124-81}{24} = \frac{-205}{24} = -8\frac{13}{24}.$$

(iv) $\frac{101}{6}$ and $\frac{7}{8}$.

The denominators of the given rational numbers 6 and 8 respectevely. The Lcm of 6 and 8 is 24.

Now we re write the given rational numbers into forms in which both of them have the same denominator

$$\frac{101}{6} \times \frac{4}{4} = \frac{404}{24} \text{ and } \frac{7}{8} \times \frac{3}{3} = \frac{21}{24}.$$

$$\therefore \frac{404}{24} + \frac{21}{24} = \frac{425}{24} = 17\frac{17}{24}.$$

# Rational Numbers Exercise 1.2

Exercise-1.2.

1. Verify commutativity of addition of rational numbers for each of the following pairs of rational numbers

(i) $\frac{-11}{5}$ and $\frac{4}{7}$

The addition of rational numbers is commutative i.e., if $\frac{a}{b}$ and $\frac{c}{d}$ are any two rational numbers, then.

$$\frac{a}{b} + \frac{c}{d} = \frac{c}{d} + \frac{a}{b}$$

Verification: In order to verify this property, Let us consider two expressions

$$\frac{-11}{5} + \frac{4}{7} \text{ and } \frac{4}{7} + \frac{-11}{5}$$

we have,

$$\frac{-11}{5} + \frac{4}{7} = \frac{-77}{35} + \frac{20}{35} = \frac{-77+20}{35} = \frac{-57}{35} \text{ and,}$$

$$\frac{4}{7} + \frac{-11}{5} = \frac{20}{35} + \frac{-77}{35} = \frac{20-77}{35} = \frac{-57}{35}.$$

$$\therefore \frac{-11}{5} + \frac{4}{7} = \frac{4}{7} + \left(\frac{-11}{5}\right)$$

Similarly, it can be verified for other pairs of rational numbers.

(ii) $\frac{4}{9}$ and $\frac{7}{-12}$.

$$\frac{4}{9} + \frac{-7}{12} = \frac{16}{36} + \frac{-21}{36} = \frac{16-21}{36} = \frac{-5}{36}.$$

$$\frac{-7}{12} + \frac{4}{9} = \frac{-21}{36} + \frac{16}{36} = \frac{16-21}{36} = \frac{-5}{36}$$

(iii) $\frac{-3}{5}$ and $\frac{-2}{-15}$.

Verification: $\frac{-3}{5} + \frac{-2}{-15} = \frac{-3}{5} + \frac{2}{15} = \frac{-9}{15} + \frac{2}{15} = \frac{-7}{15}$.

$\frac{-2}{-15} + \frac{-3}{5} = \frac{2}{15} - \frac{3}{5} = \frac{2}{15} - \frac{9}{15} = \frac{2-9}{15} = \frac{-7}{15}$

$\therefore \frac{-3}{5} + \frac{-2}{-15} = \frac{-2}{-15} + \frac{-3}{5}$

(iv) $\frac{2}{-7}$ and $\frac{12}{-35}$.

Verification: $\frac{2}{-7} + \frac{12}{-35} = \frac{10+12}{-35} = \frac{-22}{35}$.

$\frac{12}{-35} + \left(\frac{2}{-7}\right) = \frac{12+2(5)}{-35} = \frac{-22}{35}$.

$\therefore \frac{2}{-7} + \frac{12}{-35} = \frac{12}{-35} + \frac{2}{-7}$.

(v) 4 and $\frac{-3}{5}$.

Verification: $\frac{4}{1} + \frac{-3}{5} = \frac{4\times5}{5} - \frac{3}{5} = \frac{20}{5} - \frac{3}{5} = \frac{17}{5}$.

$\frac{-3}{5} + \frac{4}{1} = \frac{-3}{5} + \frac{4}{1} = \frac{-3}{5} + \frac{4}{1} = \frac{-3}{5} + \frac{20}{5} = \frac{17}{5}$.

$\therefore 4 + \frac{-3}{5} = \frac{-3}{5} + 4$.

(vi) $-4$ and $\frac{4}{-7}$.

Verification: $\frac{-4}{1} + \frac{4}{-7} = \frac{-28}{7} - \frac{4}{7} = \frac{-32}{7}$.

$\frac{4}{-7} + -4 = \frac{-4}{7} - \frac{28}{7} = -\frac{32}{7}$

$\therefore -4 + \frac{4}{-7} = \frac{4}{-7} + (-4)$

2. Verify associativity of addition of rational numbers. i.e., $(x+y)+z = x+(y+z)$.

(i) $x = \frac{1}{2}, y = \frac{2}{3}, z = \frac{-1}{5}$.

Verification: In order to verify this property, let us consider the following expressions.

$$\frac{1}{2} + \left(\frac{2}{3} + \left(\frac{-1}{5}\right)\right) = \frac{1}{2} + \left[\frac{10}{15} - \frac{3}{15}\right] = \frac{1}{2} + \frac{7}{15} = \frac{15}{30} \frac{29}{30}.$$

$$\left(\frac{1}{2} + \frac{2}{3}\right) + \left(\frac{-1}{5}\right) = \left(\frac{3}{6} + \frac{4}{6}\right) - \frac{1}{5} = \frac{7}{6} - \frac{1}{5} = \frac{29}{30}$$

(ii) $x = \frac{-2}{5}, y = \frac{4}{3}, z = \frac{-7}{10}$.

$$\frac{-2}{5} + \left(\frac{4}{3} + \left(\frac{-7}{10}\right)\right) = \frac{-2}{5} + \left(\frac{40}{30} - \frac{21}{30}\right) = \frac{-2}{5} + \frac{19}{30}$$

$$= \frac{-12}{30} + \frac{19}{30} = \frac{7}{30}.$$

$$\left(\frac{-2}{5} + \frac{4}{3}\right) + \left(\frac{-7}{10}\right) = \left(\frac{-6}{15} + \frac{20}{15}\right) - \frac{7}{10} = \frac{14}{15} - \frac{7}{10} = \frac{7}{30}.$$

$$\therefore \frac{-2}{5} + \left(\frac{4}{3} + \left(\frac{-7}{10}\right)\right) = \left(\frac{-2}{5} + \frac{4}{3}\right) + \left(\frac{-7}{10}\right).$$

(iii) $x = \frac{-7}{11}, y = \frac{2}{-5}, z = \frac{-3}{22}$.

Verification:-

$$\frac{-7}{11} + \left(\frac{2}{-5} + \left(\frac{-3}{22}\right)\right) = \frac{-7}{11} + \left[\frac{44}{-110} - \frac{15}{110}\right] = \frac{-7}{11} - \frac{89}{110}$$

$$= \frac{-70-29}{110}$$

$$= \frac{-99}{110}.$$

$$\left(\frac{-7}{11} + \frac{2}{-5}\right) + \left(\frac{-3}{22}\right) = \left(\frac{-35+22}{-55}\right) - \frac{3}{22}$$

$$= \frac{13}{55} - \frac{3}{22} = \frac{-99}{110}.$$

(iv) $x = -2$, $y = \frac{3}{5}$, $z = \frac{-4}{3}$

$$-2 + \left(\frac{3}{5} + \left(-\frac{4}{3}\right)\right) = \left(-2 + \frac{3}{5}\right) + \left(-\frac{4}{3}\right)$$

$$-2 + \left(\frac{9 + (-20)}{15}\right) = \left(\frac{-10 + 3}{5}\right) - \frac{4}{3}$$

$$\frac{-30 - 11}{15} = -\frac{7}{5} - \frac{4}{3}$$

$$-\frac{41}{15} = -\frac{21}{15} - \frac{20}{15}$$

$$-\frac{41}{15} = -\frac{41}{15}.$$

(3) write the additive inverse of each of the following rational numbers

(i) $\frac{-2}{17}$.

The additive inverse of $\frac{-2}{17}$ is $\frac{2}{17}$.

(ii) $\frac{3}{-11}$.

The additive inverse of $\frac{3}{-11}$ is $\frac{3}{11}$.

(iii) $\frac{-17}{5}$.

The additive inverse of $\frac{-17}{5}$ is $\frac{17}{5}$.

(iv) $\frac{-11}{-25}$.

The additive inverse of $\frac{-11}{25}$.

<4> Write the negative (additive inverse) of each of the following.

(i) $-\frac{2}{5}$.

The additive inverse of $-\frac{2}{5}$ is $\frac{2}{5}$.

(ii) $\frac{3}{-11}$

The additive inverse of $\frac{3}{-11}$ is $\frac{3}{11}$

(iii) $\frac{-16}{13}$.

The additive inverse of $\frac{-16}{13}$ is $\frac{16}{13}$.

(iv) $\frac{-5}{1}$

The additive inverse of $-5$ is $5$.

(v) $0$.

The additive inverse of $0$ is $0$.

(vi) $1$

The additive inverse of $1$ is $-1$.

(vii) $-1$.

The additive inverse of $-1$ is $1$.

5. Using commutativity and associativity of addition of rational numbers, express each of the following as a rational number.

(i) $\frac{2}{5} + \frac{7}{3} + \left(\frac{-4}{5}\right) + \frac{-1}{3}$.

Rearranging and grouping the numbers in pairs in such away that each group contains a pair of rational numbers with equal denominators, we have.

$$\frac{2}{5} + \frac{7}{3} + \frac{-4}{5} + \frac{-1}{3}$$

$$\frac{2}{5} - \frac{4}{5} + \frac{7}{3} - \frac{1}{3} = \frac{-2}{5} + \frac{6}{3} = -\frac{6}{15} + \frac{30}{15}$$

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

(ii) $\frac{3}{7} + \frac{-4}{9} + \frac{-11}{7} + \frac{7}{9}$.

$$\frac{3}{7} + \frac{-4}{9} + \frac{-11}{7} + \frac{7}{9} = \frac{3}{7} - \frac{11}{7} + \frac{7}{9} - \frac{4}{9}$$

$$= -\frac{8}{7} + \frac{3}{9}$$

$$= -\frac{8}{7} + \frac{1}{3}$$

$$= -\frac{24}{21} + \frac{7}{21} = \frac{-17}{21}.$$

(iii) $\frac{2}{5} + \frac{8}{3} - \frac{11}{15} + \frac{4}{5} + \frac{-2}{3}$.

$$\frac{2}{5} + \frac{8}{3} - \frac{11}{15} + \frac{4}{5} + \frac{-2}{3} = \frac{2}{5} + \frac{4}{5} + \frac{8}{3} - \frac{2}{3} - \frac{11}{15}$$

$$= \frac{6}{5} + \frac{8-2}{3} - \frac{11}{15}$$

$$= \frac{6}{5} + \frac{6}{3} + \frac{-11}{15}$$

$$= \frac{6\times3}{5\times3} + \frac{6\times5}{3\times5} - \frac{11}{15}$$

$$= \frac{18}{15} + \frac{30}{15} - \frac{11}{15}$$

$$= \frac{18+30-11}{15}$$

$$= \frac{37}{15}.$$

(iv) $\frac{4}{7} + 0 + \frac{-8}{9} + \frac{-13}{7} + \frac{17}{21}$.

$$\frac{4}{7} - \frac{13}{7} + 0 + \frac{-8}{9} + \frac{17}{21} = \frac{4-13}{7} + \frac{17}{21} - \frac{8}{9}$$

$$= \frac{-9}{7} + \frac{17}{21} - \frac{8}{9}$$

$$= \frac{-9\times3}{21} + \frac{17}{21} - \frac{8}{9}$$

$$= \frac{-27+17}{21} - \frac{8}{9}$$

$$= \frac{-10\times9}{21\times9} - \frac{8\times21}{9\times21}$$

6. Re-arrange suitably and find the sum in each of the following.

(i) $\frac{11}{12} + \frac{-17}{3} + \frac{11}{2} - \frac{25}{2} = \frac{11}{12} - \frac{17}{3} - \frac{14}{2}$

$= \frac{11-68-84}{12}$

$= \frac{-141}{12}$.

(ii) $\frac{-6}{7} + \frac{-9}{6} + \frac{-4}{9} + \frac{-15}{7} = \frac{-6}{7} - \frac{15}{7} - \frac{5}{6} - \frac{4}{9}$

$= \frac{-21}{+7} - \frac{5}{6} - \frac{4}{9}$

$= \frac{-3\times18-5\times3-4\times2}{18}$

$= \frac{-77}{18}$.

(iii) $\frac{3}{5} + \frac{7}{3} + \frac{9}{5} + \frac{-13}{15} + \frac{-7}{3} = \frac{3}{5} + \frac{9}{5} + \frac{7}{3} - \frac{7}{3} - \frac{13}{15}$

$= \frac{12}{5} - \frac{13}{15}$

$= \frac{12\times3}{5\times3} - \frac{13}{15}$

$= \frac{36-13}{15}$

$= \frac{23}{15}$.

# Rational Numbers Exercise 1.3

Exercise - 1.3

1. Subtract the first rational number from the second in each of the following

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

$\frac{5}{8} - \frac{3}{8} = \frac{5-3}{8}$

$= \frac{2}{8}$ [∵ The Lcm of 8 and 8 is '8']

$= \frac{1}{4}$

(ii) $\frac{-7}{9}, \frac{4}{9}$.

$\frac{4}{9} - \left(\frac{-7}{9}\right) = \frac{4}{9} + \frac{7}{9} = \frac{4+7}{9} = \frac{11}{9}$.

(iii) $\frac{-2}{11}, \frac{-9}{11}$.

$\frac{-9}{11} - \left(\frac{-2}{11}\right) = \frac{-9}{11} + \frac{2}{11} = \frac{2}{11} - \frac{9}{11} = \frac{-7}{11}$.

(iv) $\frac{11}{13}, \frac{-4}{13}$.

$\frac{-4}{13} - \frac{11}{13} = \frac{-4-11}{13} = \frac{-15}{13}$.

(v) $\frac{1}{4}, \frac{-3}{8}$.

$\frac{-3}{8} - \frac{1}{4} = \frac{-3-2}{8} = \frac{-5}{8}$.

(vi) $-\frac{2}{3}, \frac{5}{6}$.

$\frac{5}{6} - \left(-\frac{2}{3}\right) = \frac{5}{6} + \frac{2}{3} = \frac{5+4}{6} = \frac{9}{6} = \frac{3}{2}$.

(vii) $-\frac{6}{7}, \frac{-13}{14}$.

$\frac{-13}{14} + \frac{6}{7} = \frac{-13+12}{14} = \frac{-1}{14}$.

(viii) $\frac{-8}{33}, \frac{-7}{22}$.

$\frac{-7}{22} - \left(\frac{-8}{33}\right) = \frac{-7}{22} + \frac{8}{33} = \frac{-21+16}{66} = \frac{-5}{66}$.

2. Evaluate each of the following:

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

$\frac{2}{3} - \frac{3}{5} = \frac{2\times5 - 3\times3}{15} = \frac{1}{15}$.

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

$-\frac{4}{7} + \frac{2}{3} = \frac{-4\times3 + 2\times7}{21} = \frac{14-12}{21} = \frac{2}{21}$.

(iii) $\frac{4}{7} - \frac{-5}{-7}$.

$\frac{4}{7} - \frac{-5}{-7} = \frac{4}{7} - \frac{5}{7} = \frac{4-5}{7} = \frac{-1}{7}$.

(iv) $-2 - \frac{5}{9}$.

$\frac{-2\times9 - 5}{9} = \frac{-23}{9}$.

(v) $\frac{-3}{-8} - \frac{-2}{7}$.

$\frac{-3}{-8} - \frac{-2}{7} = \frac{3}{8} + \frac{2}{7} = \frac{3\times7+2\times8}{56} = \frac{21+16}{56} = \frac{37}{56}$.

(vi) $\frac{-4}{13} - \frac{-5}{26}$.

$\frac{-4}{13} + \frac{5}{26} = \frac{5}{26} - \frac{4}{13} = \frac{5-4\times2}{26} = \frac{-3}{26}$.

(vii) $\frac{-5}{14} - \frac{-2}{7}$

$\frac{-5}{14} + \frac{2}{7} = \frac{2}{7} - \frac{5}{14} = \frac{2\times2-5}{14} = \frac{-1}{14}$.

(viii) $\frac{13}{15} - \frac{12}{25}$.

$\frac{13}{15} - \frac{12}{25} = \frac{13\times5-12\times3}{75} = \frac{65-36}{75} = \frac{29}{75}$.

(ix) $\frac{-6}{13} - \frac{-7}{13}$.

$\frac{-6}{13} + \frac{7}{13} = \frac{7}{13} - \frac{6}{13} = \frac{7-6}{13} = \frac{1}{13}$.

(x) $\frac{7}{24} - \frac{19}{36}$

$\frac{7}{24} - \frac{19}{36} = \frac{7\times3-19\times2}{72} = \frac{21-38}{72} = \frac{-17}{72}$.

(xi) $\frac{5}{63} - \frac{-8}{21} = \frac{5}{63} + \frac{8}{21} = \frac{5\times1+8\times3}{63} = \frac{5+24}{63} = \frac{29}{63}$.

3. The sum of the two numbers is $\frac{5}{9}$. If one of the numbers is $\frac{1}{3}$, find the other

It is given that.

Sum of the numbers $= \frac{5}{9}$, one of the numbers $= \frac{1}{3}$.

Suppose the other rational number is $x$. Since the sum is $\frac{5}{9}$

$$\therefore x + \frac{1}{3} = \frac{5}{9}$$

$$\Rightarrow \frac{3x+1}{3} = \frac{5}{9}$$

$$\Rightarrow 3x + 1 = \frac{15}{9}$$

$$\Rightarrow 3x + 1 = \frac{5}{3}$$

$$\Rightarrow x = \frac{\frac{5}{3} - 1}{3} = \frac{2}{9}$$

4. The sum of two numbers is $\frac{-1}{3}$. If one of the numbers is $\frac{-12}{3}$, find the other

It is given that.

$$\Rightarrow x + \frac{-1}{3} = \frac{-12}{3} \qquad \Rightarrow \frac{3x-1}{3} = \frac{-12}{3}$$

$$\Rightarrow 3x = 1 - 12$$

3. The sum of the two numbers is $\frac{5}{9}$. If one of the numbers is $\frac{1}{3}$, find the other.

It is given that
sum of the numbers $= \frac{5}{9}$, one of the numbers $= \frac{1}{3}$.

Suppose the other rational number is $x$. Since the sum is $\frac{5}{9}$

$$\therefore x + \frac{1}{3} = \frac{5}{9}$$

$$\Rightarrow \frac{3x+1}{3} = \frac{5}{9}$$

$$\Rightarrow 3x = \frac{5}{3} - 1$$

$$\Rightarrow x = \frac{2}{3\times 3} = \frac{2}{9}.$$

4. The sum of two numbers is $\frac{-1}{3}$. If one of the numbers is $-\frac{12}{3}$, find the other.

It is given that.

Suppose the rational number is $x$. Then,

$$\therefore x + \frac{-12}{3} = \frac{-1}{3}$$

$$\Rightarrow \frac{3x-12}{3} = \frac{-1}{3}$$

$$\Rightarrow 3x = 12 - 01 \Rightarrow x = \frac{11}{3}.$$

5. The sum of two numbers is $-\frac{4}{3}$. If one of the numbers is $-5$, find the other.

It is given that,

Sum of two numbers is $-\frac{4}{3}$, one of the numbers $= -5$.

Suppose the other rational number is $x$. Since the sum is $-\frac{4}{3}$.

$\therefore x + (-5) = -\frac{4}{3}$

$\Rightarrow x - 5 = -\frac{4}{3}$

$\Rightarrow x = 5 - \frac{4}{3} = \frac{5\times3-4}{3} = \frac{15-4}{3} = \frac{11}{3}$.

6. The sum of two rational numbers is $-8$. If one of the numbers is $-\frac{15}{7}$, find the other.

It is given that.

Sum of two rational numbers is $-8$.

Suppose the other rational number be $x$. Since the sum is $-8$.

$\therefore x + -\frac{15}{7} = -8 \Rightarrow \frac{x\times7}{7} - \frac{15}{7} = -8$.

$\frac{7x-15}{7} = -8 \Rightarrow 7x - 15 = -8\times7$

$\Rightarrow 7x = -56 + 15$

$\Rightarrow x = -\frac{41}{7}$.

7. What should be added to $\frac{-7}{8}$ so as to get $\frac{5}{9}$.

Suppose $x$ is the rational number to be added to $\frac{-7}{8}$ to get $\frac{5}{9}$. Then,

$$\frac{-7}{8} + x = \frac{5}{9}$$

$$x = \frac{5}{9} + \frac{7}{8}$$

$$x = \frac{5 \times 8}{9 \times 8} + \frac{7 \times 9}{8 \times 9}$$

$$x = \frac{40 + 63}{72}$$

$$x = \frac{103}{72}.$$

$\therefore$ required number $x = \frac{103}{72}$.

8. What number should be added to $\frac{-5}{11}$ so as to get $\frac{26}{33}$.

Suppose $x$ is the rational number to be added to $\frac{-5}{11}$ to get $\frac{26}{33}$. Then,

$$\frac{-5}{11} + x = \frac{26}{33}$$

$$x = \frac{26}{33} + \frac{5}{11} \Rightarrow x = \frac{26}{33} + \frac{5 \times 3}{33}$$

$$x = \frac{26 + 15}{33}$$

$$x = \frac{41}{33}.$$

9. What number should be added to $\frac{-5}{7}$ to get $\frac{-2}{3}$.

Suppose $x$ is the rational number to be added to $-\frac{5}{7}$ to get $-\frac{2}{3}$. Then,

$$-\frac{5}{7} + x = -\frac{2}{3}$$

$$x = \frac{5}{7} - \frac{2}{3}$$

$$x = \frac{5\times3}{7\times3} - \frac{2\times7}{7\times3}$$

$$x = \frac{15-14}{21}$$

$$x = \frac{1}{21}.$$

10. What number should be subtracted from $-\frac{5}{3}$ to get $\frac{5}{6}$?

Suppose the number $x$ is to be subtracted / added to $-\frac{5}{3}$ to get $\frac{5}{6}$.

$$-\frac{5}{3} \mp x = \frac{5}{6} \Rightarrow -\frac{5}{3} - \frac{x\times3}{3} = \frac{5}{6}.$$

$$\frac{-5 \mp 3x}{3} = \frac{5}{6}$$

$$\Rightarrow -5 \mp 3x = \frac{15}{6}$$

$$\Rightarrow -3x = \frac{5}{2} + 5$$

$$\Rightarrow +x = \frac{-15}{6} = \frac{-5}{2}.$$

11. What number should be subtracted from $\frac{3}{7}$ to get $\frac{5}{4}$.

Suppose $x$ is the rational number to be subtracted from $\frac{3}{7}$ to get $\frac{5}{4}$

$$\frac{3}{7} - x = \frac{5}{4}$$

$$\frac{3}{7} * \frac{x \times 7}{7 \times 1} = \frac{5}{4}$$

$$\frac{3 - 7x}{7} = \frac{5}{4}$$

$$3 - 7x = \frac{35}{4}$$

$$\Rightarrow -x = \frac{35 - 12}{7 \times 4}$$

$$\Rightarrow x = \frac{-23}{28}.$$

12. What should be added to $\left(\frac{2}{3} + \frac{3}{5}\right)$ to get $\frac{-2}{15}$?

Let the number be $x$. It is given that

$$x + \left(\frac{2}{3} + \frac{3}{5}\right) = \frac{-2}{15}$$

$$x + \left(\frac{2 \times 5 + 3 \times 3}{15}\right) = \frac{-2}{15}$$

$$\Rightarrow \frac{15x + 10 + 9}{15} = \frac{-2}{15}$$

$$\Rightarrow 15x = -2 - 19$$

$$\Rightarrow x = \frac{-21}{15}$$

$$\Rightarrow x = \frac{-7}{5}.$$

13. What should be added to $\left(\frac{1}{2}+\frac{1}{3}+\frac{1}{5}\right)$ to get 3?

Let the number be $x$. It is given that.

$$x+\left(\frac{1}{2}+\frac{1}{3}+\frac{1}{5}\right)=3.$$

$$x+\left(\frac{1\times15}{2\times15}+\frac{1\times10}{3\times10}\times\frac{1\times6}{6\times1}\right)=3.$$

[$\because$ The Lcm of 2, 3 & 5 is 30]

$$\frac{30x+15+10+6}{30}=3$$

$$\Rightarrow 30x+31=90$$

$$\Rightarrow 30x=90-31$$

$$\Rightarrow x=\frac{59}{30}.$$

14. What should be subtracted from $\left(\frac{3}{4}-\frac{2}{3}\right)$ to get $\frac{-1}{6}$?

Let the number be $x$. It is given that

$$\left(\frac{3}{4}-\frac{2}{3}\right)-x=\frac{-1}{6}.$$

$$-x+\left[\frac{3\times3}{4\times3}-\frac{2\times4}{4\times3}\right]=\frac{-1}{6}$$

$$-x+\left[\frac{9}{12}-\frac{8}{12}\right]=\frac{-1}{6}$$

$$\Rightarrow \frac{-12x+9-8}{12}=\frac{-1}{6}.$$

$$\Rightarrow -12x+1=-2$$

$$\Rightarrow x=\frac{-3}{-12}=1/4.$$

15. Fill in the blanks:

(i) $-\frac{4}{13} - \frac{-3}{26} = \frac{-4}{13} + \frac{3}{26}$

$= \frac{3}{26} - \frac{4\times 2}{13\times 2}$

$= \frac{3-8}{26}$

$= \frac{-5}{26}$.

(ii) $\frac{-9}{14} + \ldots = -1$

Let $x$ be the rational number. Then

$\frac{-9}{14} + x = -1$

$-9 + 14x = -14$

$\Rightarrow 14x = 9 - 14$

$\Rightarrow x = \frac{-5}{14}$.

(iii) $-\frac{7}{9} + \ldots = 3$

$\Rightarrow -\frac{7}{9} + x = 3 \Rightarrow -\frac{7}{9} + \frac{9x}{9} = 3$

$\Rightarrow 9x - 7 = 27 \Rightarrow 9x = 27 + 7$.

$\Rightarrow x = \frac{34}{9}$.

(iv) $\ldots + \frac{15}{23} = 4$.

$x + \frac{15}{23} = 4 \Rightarrow 23x + 15 = 92$

$\Rightarrow 23x = 92 - 15$

$\Rightarrow x = 77$

Exercise-1.4.

1. Simplify each of the following and write as a rational number of the form $\frac{p}{q}$:

(i) $\frac{3}{4} + \frac{5}{6} + \frac{-7}{8}$.

we have,

$\frac{3}{4} + \frac{5}{6} + \left(\frac{-7}{8}\right)$

$= \frac{3}{4} + \frac{5}{6} - \frac{7}{8}$

$= \frac{3\times 6}{4\times 6} + \frac{5\times 4}{6\times 4} + \frac{-7\times 3}{8\times 3}$ [$\because$ The Lcm of 4, 6 and 8 is 24]

$= \frac{18+20-21}{24}$

$= \frac{17}{24}$.

(ii) $\frac{2}{3} + \frac{-5}{6} + \frac{-7}{9}$.

we have,

$\frac{2}{3} + \left(\frac{-5}{6}\right) + \left(\frac{-7}{9}\right)$.

$= \frac{2}{3} - \frac{5}{6} - \frac{7}{9}$.

$= \frac{2\times 6}{3\times 6} - \frac{5\times 3}{6\times 3} - \frac{7\times 2}{2\times 9}$ [$\because$ The Lcm of 3, 6 & 9 is 18].

$= \frac{12}{18} - \frac{15}{18} - \frac{14}{18} = \frac{12-15-14}{18}$

$\Rightarrow \frac{-17}{18} = \frac{2}{3} + \left(\frac{-5}{6}\right) + \left(\frac{-7}{9}\right)$.

(iii) $\frac{-11}{2} + \frac{7}{6} + \frac{-5}{8}$.

$$-\frac{11}{2} + \frac{7}{6} + \left(\frac{-5}{8}\right) = \frac{7}{6} - \frac{11}{2} - \frac{5}{8}$$

$$= \frac{7\times4}{6\times4} - \frac{11\times12}{2\times12} - \frac{5\times3}{8\times3}$$

$$= \frac{28-132-15}{24}$$ [∵ The Lcm of 2, 6 and 8 is 24]

$$= \frac{-119}{24}$$

(iv) $\frac{-4}{5} + \frac{-7}{10} + \frac{-8}{15}$.

$$\frac{-4}{5} + \left(\frac{-7}{10}\right) + \left(\frac{-8}{15}\right) = \frac{-4}{5} - \frac{7}{10} - \frac{8}{15}$$

$$= \frac{-4\times6}{5\times6} - \frac{7\times3}{10\times3} - \frac{8\times2}{15\times2}$$ [∵ The Lcm of 5, 10 & 15 is 30].

$$= \frac{-24}{30} - \frac{21}{30} - \frac{16}{30}$$

$$= \frac{-24-21-16}{30}$$

$$= \frac{-61}{30}.$$

(v) $\frac{-9}{10} + \frac{22}{15} + \frac{13}{-20}$.

$$-\frac{9}{10} + \frac{22}{15} - \frac{13}{20} = \frac{-9\times6}{10\times6} + \frac{22\times4}{15\times4} - \frac{13\times3}{20\times3}$$

$$= \frac{-54+88-39}{60}$$ [∵ The Lcm of 10, 15 & 20 is 60]

$$= \frac{-5}{60} = \frac{-1}{12}.$$

(vi) $\frac{5}{-3} + \frac{3}{-2} + \frac{-7}{3} + 3$.

$\frac{5}{-3} + \frac{3}{-2} + \frac{-7}{3} + 3 = +\frac{5}{3} - \frac{3}{2} - \frac{7}{3} + 3$

$= \frac{+5\times2 - 3\times3 - 7\times2 + 3\times6}{6}$ [∵ The Lcm of 2, 3, 3 and 1 is 6]

$= \frac{+10 - 9 - 14 + 18}{6}$

$= \frac{5}{6}$

2. Express each of the following as a rational number of the form $\frac{p}{q}$:

(i) $\frac{-8}{+3} + \frac{-1}{4} + \frac{-11}{6} + \frac{3}{8} - 3$.

$-\frac{8}{3} + \left(\frac{-1}{4}\right) + \left(\frac{-11}{6}\right) + \frac{3}{8} + (-3) = \frac{-8}{3} - \frac{1}{4} - \frac{11}{6} + \frac{3}{8} - 3$

$= \frac{-8\times8}{3\times8} - \frac{1\times6}{4\times6} \div \frac{11\times4}{6\times4} + \frac{3\times3}{8\times3} - \frac{72}{24}$

$= \frac{-64 - 6 - 44 + 9 - 72}{24}$

$= \frac{-59\times3}{8\times3} = \frac{-59}{8}$.

(ii) $\frac{6}{7} + 1 + \frac{-7}{9} + \frac{19}{21} + \frac{-12}{7}$

$\frac{6\times9}{7\times9} + \frac{63}{63} - \frac{7\times7}{9\times7} + \frac{3\times19}{21\times3} - \frac{12\times9}{7\times9}$

$= \frac{54 + 63 - 49 + 57 - 108}{63}$ [∵ The Lcm of 7, 1, 9, 21 & 7 is '63']

$= \frac{17}{63}$.

(iii) $\frac{15}{2} + \frac{9}{8} + \frac{-11}{3} + 6 + \frac{-7}{6}$.

we have,

$$\frac{15}{2} + \frac{9}{8} + \frac{-11}{3} + 6 + \frac{-7}{6} = \frac{15}{2} + \frac{9}{8} - \frac{11}{3} + \frac{6}{1} - \frac{7}{6}$$

$$= \frac{15\times12}{2\times12} + \frac{9\times3}{8\times3} - \frac{11\times8}{3\times8} + \frac{6\times24}{24} - \frac{7\times4}{6\times4}$$

$$= \frac{180+27-88+144-28}{24}$$

$$= \frac{235}{24}.$$

(iv) $\frac{-7}{4} + 0 + \frac{-9}{5} + \frac{19}{10} + \frac{11}{14}$.

we have,

$$\frac{-7}{4} + 0 + \frac{-9}{5} + \frac{19}{10} + \frac{11}{14} = \frac{-7}{4} - \frac{9}{5} + \frac{19}{10} + \frac{11}{14}$$

$$= \frac{-7\times35}{4\times35} - \frac{9\times28}{5\times28} + \frac{19\times14}{10\times14} + \frac{11\times10}{14\times10}$$

$$= \frac{-245-252+266+110}{140}$$

$$= -\frac{121}{140}$$

(v) $-\frac{7}{4} + \frac{5}{3} + \frac{-1}{2} + \frac{-5}{6} + 2$.

$$\left(\frac{-7}{4}\right) + \left(\frac{5}{3}\right) + \left(\frac{-1}{2}\right) - \frac{5}{6} + 2 = \frac{-7}{4} + \frac{5}{3} - \frac{1}{2} - \frac{5}{6} + 2$$

$$= \frac{-7\times6}{4\times6} + \frac{5\times8}{3\times8} - \frac{1\times12}{2\times12} - \frac{5\times6}{6\times4} + \frac{2\times12}{24}$$

$$= \frac{-42+40-12-30+48}{24}$$

$$= \frac{14}{24} = \frac{7}{12}$$

3. Simplify

(i) $\frac{-3}{2}+\frac{5}{4}-\frac{7}{4}$.

we have,

$$\frac{-3}{2}+\frac{5}{4}-\frac{7}{4}=\frac{-3\times2+5\times1-7\times1}{4}$$

$$=\frac{-6+5-7}{4}$$ [The Lcm of 2, 4 & 4 is 4].

$$=\frac{-8}{4}=-2$$

(ii) $\frac{5}{3}-\frac{7}{6}+\frac{-2}{3}$.

we have,

$$\frac{5}{3}-\frac{7}{6}-\frac{2}{3}=\frac{5\times2-7\times1-2\times2}{6}=\frac{10-7-4}{6}$$

$$=\frac{-1}{6}$$ [∵ The Lcm of 3, 6 and 3 is 6].

(iii) $\frac{5}{4}-\frac{7}{6}-\frac{-2}{3}$.

we have,

$$\frac{5}{4}-\frac{7}{6}+\frac{2}{3}=\frac{5\times6}{4\times6}-\frac{7\times4}{6\times4}+\frac{2\times8}{3\times8}$$

$$=\frac{30-28+16}{24}$$

$$=\frac{18}{24}$$

$$=\frac{3}{4}$$

(iv) $\frac{-2}{5} - \frac{-3}{10} - \frac{-4}{7}$.

we have,

$$\frac{-2}{5} - \frac{-3}{10} - \frac{-4}{7} = \frac{-2}{5} + \frac{3}{10} + \frac{4}{7}$$

$$= \frac{-2 \times 7 \times 2}{5 \times 7 \times 2} + \frac{3 \times 7}{10 \times 7} + \frac{4 \times 10}{7 \times 10}$$

$$= \frac{-28}{70} + \frac{21}{70} + \frac{40}{70}$$

$$= \frac{21 + 40 - 28}{70}$$

$$= \frac{33}{70}.$$

(v) $\frac{5}{6} + \frac{-2}{5} - \frac{-2}{15}$.

we have,

$$\frac{5}{6} + \frac{-2}{5} + \frac{2}{15} = \frac{5}{6} - \frac{2}{5} + \frac{2}{15} = \frac{5 \times 5}{6 \times 5} - \frac{2 \times 6}{5 \times 6} + \frac{2 \times 2}{15 \times 2}$$

$$= \frac{25 - 12 + 4}{30}$$

$$= \frac{29 - 12}{30}$$

$$= \frac{17}{30}.$$

(vi) $\frac{3}{8} - \frac{-2}{9} + \frac{-5}{36}$.

$$\frac{3}{8} + \frac{2}{9} - \frac{5}{36} = \frac{3 \times 9 + 2 \times 8 - 5 \times 2}{36 \times 2} = \frac{27 + 16 - 10}{72}$$

$$= \frac{33}{72} = \frac{11}{24}.$$

# Rational Numbers Exercise 1.5

Exercise 1.5

1. Multiply :

(i) $\frac{7}{11}$ by $\frac{5}{4}$ . (ii) $\frac{5}{4}$ by $\frac{-3}{4}$ (iii) $\frac{-2}{9}$ by $\frac{5}{11}$ (iv) $\frac{-3}{17}$ by $\frac{-5}{-4}$

(v) $\frac{9}{-7}$ by $\frac{36}{-11}$ (vi) $\frac{-11}{13}$ by $\frac{-21}{7}$ (vii) $\frac{-3}{5}$ by $\frac{-4}{7}$ (viii) $\frac{-15}{11}$ by 7.

we have,

(i) $\frac{7}{11} \times \frac{5}{4} = \frac{7 \times 5}{11 \times 4} = \frac{35}{44}$.

(ii) $\frac{5}{4} \times \frac{-3}{4} = \frac{5 \times -3}{4 \times 4} = \frac{-15}{28}$

(iii) $\frac{-2}{9} \times \frac{5}{11} = \frac{-2 \times 5}{9 \times 11} = \frac{-10}{99}$.

(iv) $\frac{-3}{17} \times \frac{5}{4} = \frac{-3 \times 5}{17 \times 4} = \frac{-15}{68}$.

(v) $\frac{9}{-7} \times \frac{36}{-11} = \frac{9 \times 36}{-7 \times -11} = \frac{324}{77}$

(vi) $\frac{33}{13} * \frac{-11}{13} \times \frac{-21}{7} = \frac{-11 \times -21}{13 \times 7} = \frac{11 \times 3 \times 7}{13 \times 7} = \frac{33}{13}$.

(vii) $\frac{-3}{5} \times \frac{-4}{7} = \frac{(-3) \times (-4)}{5 \times 7}$

$= \frac{3 \times 4}{5 \times 7} = \frac{12}{35}$.

(viii) $\frac{-5}{9} \times \frac{72}{-25}$

$+\frac{5}{9} \times \frac{72}{+25} = \frac{5 \times 72}{9 \times 25} = 40$

(viii) $\frac{-15}{11} \times \frac{7}{1} = \frac{-15 \times 7}{11}$

$= -\frac{105}{11}$

$\therefore \frac{15}{11} \times 7 = \frac{-105}{11}$.

2. Multiply:

(i) $\frac{-5}{17}$ by $\frac{51}{-60}$ (ii) $\frac{-6}{11}$ by $\frac{-55}{36}$ (iii) $\frac{-8}{25}$ by $\frac{-5}{16}$ (iv) $\frac{6}{7}$ by $\frac{-49}{36}$

(v) $\frac{8}{-9}$ by $\frac{-7}{-16}$ (vi) $\frac{-8}{9}$ by $\frac{3}{64}$.

Sol^n:

(i) $\frac{-5}{17} \times \frac{51}{-60} = \frac{-5 \times 51^{3}}{17 \times -60_{12}} = \frac{-3}{-12} = \frac{1}{4}$.

(ii) $\frac{-6}{11} \times \frac{-55}{36} = \frac{-6 \times -55}{11 \times 36} = \frac{-1 \times -5}{1 \times 6} = \frac{5}{6}$.

(iii) $\frac{-8}{25} \times \frac{-5}{16} = \frac{-8 \times -5}{25 \times 16} = \frac{-1 \times -1}{5 \times 2} = \frac{1}{10}$.

(iv) $\frac{6}{7} \times \frac{-49}{36} = \frac{6 \times -49}{7 \times 36} = = \frac{-7 \times 1}{6 \times 1} = \frac{-7}{6}$.

(v) $\frac{8}{-9} \times \frac{-7}{-16} = \frac{8 \times -7}{9 \times 16} = \frac{1 \times -7}{9 \times 2} = \frac{-7}{18}$.

(vi) $\frac{-8}{9} \times \frac{3}{64} = \frac{-8 \times 3}{9 \times 64} = \frac{-1 \times 3}{9 \times 8} = \frac{-3}{72} = \frac{-1}{24}$.

3. Simplify each of the following and express the result as a rational number in standard form.

(i) $\frac{-16}{21} \times \frac{14}{5}$ (ii) $\frac{7}{6} \times \frac{-3}{28}$ (iii) $\frac{-19}{36} \times 16$ (iv) $\frac{-13}{9} \times \frac{87}{-26}$.

(v) $\frac{-9}{16} \times \frac{-64}{-27}$ (vi) $\frac{-50}{7} \times \frac{14}{3}$ (vii) $\frac{-11}{9} \times \frac{-81}{-88}$ (viii) $\frac{-5}{9} \times \frac{72}{-25}$

Solution:

(i) $\frac{-16}{21} \times \frac{14}{5} = \frac{-16 \times 2}{3 \times 5} = \frac{-32}{15}$.

(ii) $\frac{7}{6} \times \frac{-3}{28} = \frac{7 \times -3}{6 \times 28} = \frac{21}{168} = \frac{-7}{56} = \frac{-1}{8}$.

(iii) $\frac{-19}{36} \times 16$

$\frac{-19}{36} \times 16 = \frac{-19 \times 4}{9} = \frac{-76}{9}$

(iv) $\frac{-13}{9} \times \frac{27}{-26} = \frac{-1 \times 3}{1 \times -2} = \frac{-3}{-2} = \frac{3}{2}$.

(v) $\frac{-9}{16} \times \frac{-64}{-27} = \frac{-9 \times 64}{16 \times 27} = \frac{-1 \times 4}{1 \times 3} = \frac{-4}{3}$.

(vi) $\frac{-50}{7} \times \frac{14}{3} = \frac{-50 \times 14}{7 \times 3} = \frac{-50 \times 2}{1 \times 3} = \frac{-100}{3}$.

(vii) $\frac{-11}{9} \times \frac{-81}{-88} = \frac{-11 \times -81}{9 \times -88} = \frac{-1 \times -9}{1 \times -8} = \frac{-9}{8}$.

(viii) $\frac{-5}{9} \times \frac{72}{-25} = \frac{-5 \times 72}{9 \times -25} = \frac{+8}{5}$

4. Simplify:

(i) $\left(\frac{25}{8} \times \frac{2}{5}\right) - \left(\frac{3}{5} \times \frac{-10}{9}\right)$

$\frac{25 \times 2}{8 \times 5} - \frac{3 \times -10}{5 \times 9} = \frac{50}{40} + \frac{30}{45} = \frac{5}{4} + \frac{2}{3} = \frac{15+8}{12}$

$= \frac{23}{12}$.

(ii) $\left(\frac{1}{2} \times \frac{1}{4}\right) + \left(\frac{1}{2} \times 6\right)$

$\frac{1}{8} + \frac{6}{2} = \frac{1}{8} + 3 = \frac{1+24}{8} = \frac{25}{8}$.

(iii) $\left(-5 \times \frac{2}{15}\right) - \left(-6 \times \frac{2}{9}\right)$

$-\frac{5 \times 2}{15} + \frac{6 \times 2}{9} = \frac{12}{9} - \frac{10}{15}$

$= \frac{4}{3} - \frac{2}{3} = \frac{2}{3}$.

(iv) $\left(\frac{-9}{4}\times\frac{5}{3}\right)+\left(\frac{13}{2}\times\frac{5}{6}\right)$.

$\frac{-9\times5}{4\times3}+\frac{13\times5}{2\times6}=\frac{-45+65}{12}=\frac{20}{12}=\frac{5}{3}$.

(v) $\frac{-9}{16}\times\frac{-64}{-27}$

$\frac{-9}{16}\times\frac{64}{27}$

(iv) $\left(\frac{-9}{4}\times\frac{5}{3}\right)+\left(\frac{13}{2}\times\frac{5}{6}\right)$

$\left(\frac{-9\times5}{4\times3}\right)+\frac{13\times5}{2\times6}=\frac{5}{3}$.

(v) $\left(\frac{-4}{3}\times\frac{12}{-5}\right)+\left(\frac{3}{7}\times\frac{21}{15}\right)$

$\frac{-4\times12}{3\times-5}+\frac{3\times21}{7\times15}=\frac{4\times4}{15}+\frac{3}{15}=\frac{16+3}{15}=\frac{19}{15}$.

(vi) $\left(\frac{13}{5}\times\frac{8}{3}\right)-\left(\frac{-5}{2}\times\frac{11}{3}\right)$

$\frac{13\times8}{5\times3}-\left(\frac{-55}{6}\right)=\frac{104}{15}+\frac{55}{6}=\frac{104\times2+55\times5}{30}=\frac{483}{30}$.

(vii) $\left(\frac{13}{7}\times\frac{11}{26}\right)-\left(\frac{-4}{3}\times\frac{5}{6}\right)$

$\frac{13\times11}{7\times26}+\frac{4\times5}{3\times6}=\frac{1\times11}{7\times2}+\frac{4\times5}{3\times6}=\frac{11}{14}+\frac{20}{18}=\frac{11\times9+[illegible]}{126}$

$=\frac{239}{126}$.

(viii) $\left(\frac{8}{5}\times\frac{-3}{2}\right)+\left(\frac{-3}{10}\times\frac{11}{16}\right)$

$\frac{8\times-3}{5\times2}+\frac{-3\times11}{10\times16}=\frac{8\times-3\times16+(-33)}{160}=\frac{-417}{160}$.

5. Simplify:

(i) $\left(\frac{3}{2}\times\frac{1}{6}\right)+\left(\frac{5}{3}\times\frac{7}{2}\right)-\left(\frac{13}{8}\times\frac{4}{3}\right)$

$\left(\frac{3}{12}\right)+\left(\frac{35}{6}\right)-\left(\frac{52}{24}\right)=\frac{3\times2+35\times4-52}{24}=\frac{94}{24}=\frac{47}{12}$.

(ii) $\left(\frac{1}{4}\times\frac{2}{7}\right)\div\left(\frac{5}{14}\times\frac{-2}{3}\right)+\left(\frac{3}{7}\times\frac{9}{2}\right)$

$\left(\frac{2}{28}\right)+\left(\frac{10}{42}\right)+\left(\frac{27}{14}\right)=\frac{3\times2+10\times2+27\times6}{84}$

$=\frac{188}{84}=\frac{47}{21}$.

(iii) $\left(\frac{13}{9}\times\frac{-15}{2}\right)+\left(\frac{7}{3}\times\frac{8}{5}\right)+\left(\frac{3}{5}\times\frac{1}{2}\right)$.

$\frac{13\times-15}{9\times2}+\frac{7\times8}{3\times5}+\frac{3\times1}{5\times2}=-\frac{65}{6}+\frac{56}{15}+\frac{3}{10}$

$=\frac{-65\times5+56\times2+3\times3}{30}$

$=\frac{-204}{30}$

(iv) $\left(\frac{3}{11}\times\frac{5}{6}\right)-\left(\frac{9}{12}\times\frac{4}{3}\right)+\left(\frac{5}{13}\times\frac{6}{15}\right)$

$\left(\frac{3\times5}{11\times6}\right)-\left(\frac{36}{36}\right)+\left(\frac{30}{13\times15}\right)=\frac{15}{66}-1+\frac{2}{26}$

$=\frac{15\times26-286+2\times66}{286}$

$=\frac{-177}{286}$.

# Rational Numbers Exercise 1.6

Exercise-1.6

1. Verify the property : $x \times y = y \times x$ by taking :

(i) $x = \frac{-1}{3}, y = \frac{2}{7}$ (ii) $x = \frac{-3}{5}, y = \frac{-11}{13}$ (iii) $x = 2, y = \frac{-7}{8}$ (iv) $x = 0, y = \frac{-15}{8}$

(i) we have,

$$x \times y = \frac{-1}{3} \times \left(\frac{2}{7}\right) = \frac{-2}{21}$$

$$y \times x = \frac{2}{7} \times \left(\frac{-1}{3}\right) = \frac{-2}{21}.$$

(ii) we have,

$$x = \frac{-3}{5}, y = \frac{-11}{13}.$$

$$x \times y = \frac{-3}{5} \times \frac{-11}{13} = \frac{33}{65}$$

$$y \times x = \frac{-11}{13} \times \frac{-3}{5} = \frac{33}{65}.$$

(iii) we have,

$$x = 2, y = \frac{-7}{8}.$$

$$x \times y = 2 \times \frac{-7}{8} = \frac{-14}{8} = \frac{-7}{4}$$

$$y \times x = \frac{-7}{8} \times 2 = \frac{-14}{8} = \frac{-7}{4}$$

(iv) we have,

$$x = 0, y = \frac{-15}{8}.$$

$$x \times y = 0 \times \frac{-15}{8} = 0.$$

$$y \times x = \frac{-15}{8} \times 0 = 0.$$

2. Verify the property, $x \times (y \times z) = (x \times y) \times z$ by taking

(i) $x = \frac{-7}{3}, y = \frac{12}{5}, z = \frac{4}{9}$. (ii) $x = 0, y = \frac{-3}{5}, z = \frac{-9}{4}$.

(iii) $x = \frac{1}{2}, y = \frac{5}{-4}, z = \frac{-7}{5}$ (iv) $x = \frac{5}{7}, y = \frac{-12}{13}, z = \frac{-7}{18}$.

Sol^n^: (i) we have,

$x = \frac{-7}{3}$, $y = \frac{12}{5}$ and $z = \frac{4}{9}$.

$x \times (y \times z) = \frac{-7}{3} \times \left(\frac{12}{5} \times \frac{4}{9}\right) = \frac{-7}{3}\left(\frac{48}{45}\right) = \frac{-112}{45}$

$(x \times y) \times z = \left(\frac{-7}{3} \times \frac{12}{5}\right) \times \frac{4}{9} = \frac{-7}{3}\left(\frac{48}{45}\right) = \frac{-112}{45}$

(ii) we have,

$x = 0, y = \frac{-3}{5}, z = \frac{-9}{4}$.

$x \times (y \times z) = 0 \times \left(\frac{-3}{5} \times \frac{-9}{4}\right) = 0$.

$(x \times y) \times z = \left(0 \times \frac{-3}{5}\right) \times \left(\frac{-9}{4}\right) = 0$.

(iii) we have,

$x = \frac{1}{2}, y = \frac{5}{-4}, z = \frac{-7}{5}$.

$x \times (y \times z) = \frac{1}{2} \times \left(\frac{5}{-4} \times \frac{-7}{5}\right) = \frac{1}{2} \times \frac{7}{4} = \frac{7}{8}$.

$(x \times y) \times z = \left(\frac{1}{2} \times \frac{5}{-4}\right) \times \left(\frac{-7}{5}\right) = \left(\frac{-5}{8}\right)\left(\frac{-7}{5}\right) = \frac{7}{8}$.

(iv) $x = \frac{5}{7}, y = \frac{-12}{13}, z = \frac{-7}{18}$

$(x \times y) \times z = \left(\frac{5}{7} \times \frac{-12}{13}\right) \times \left(\frac{-7}{18}\right) = -\frac{\overset{10}{60}}{\underset{13}{91}} \times \frac{-7}{\underset{3}{18}} = \frac{10}{39}$.

$x \times (y \times z) = \frac{5}{7} \times \left(\frac{-12}{13} \times \frac{-7}{18}\right) = \frac{10}{39}$

3. Verify the property: $x \times (y+z) = x \times y + x \times z$ by

(i) $x = \frac{-3}{7}, y = \frac{12}{13}, z = \frac{-5}{6}$ (ii) $x = \frac{-12}{5}, y = \frac{-15}{4}, z = \frac{8}{3}$

(iii) $x = \frac{-8}{3}, y = \frac{5}{6}, z = \frac{-13}{12}$ (iv) $x = \frac{-3}{4}, y = \frac{-5}{2}, z = \frac{7}{6}$

(i) We have,

$x = \frac{-3}{7}, y = \frac{12}{13}, z = \frac{-5}{6}$

$$\left(\frac{-3}{7}\right) \times \left(\frac{12}{13} + \frac{-5}{6}\right) = \frac{-3}{7} \times \frac{12}{13} + \frac{-3}{7} \times \frac{-5}{6}$$

$$= \frac{-36}{91} + \frac{15}{42}$$

$$= \frac{-36 \times 6 + 15 \times 13}{546} = \frac{195 - 216}{546} = \frac{-21}{546}$$

$x \times y + x \times z = \frac{-1}{26}$

$$\left(\frac{-3}{7}\right) \times \left(\frac{12 \times 6 - 5 \times 13}{78}\right) = \left(\frac{-3}{7}\right) \times \left(\frac{1}{78}\right)$$

$$= \frac{-1}{26}$$

$$\left(\frac{-3}{7}\right) \times \left(\frac{12}{13} + \frac{-5}{6}\right) = \left(\frac{-3}{7}\right) \times \left(\frac{12}{13}\right) + \left(\frac{-3}{7}\right) \times \left(\frac{-5}{6}\right)$$

(ii) We have,

$$\left(\frac{-12}{5}\right) \times \left(\frac{-15}{4} + \frac{8}{3}\right) = \left(\frac{-12}{5}\right) \times \left(\frac{-15}{4}\right) + \left(\frac{-12}{5}\right) \times \left(\frac{8}{3}\right)$$

$$\Rightarrow \left(\frac{-12}{5}\right) \times \left(\frac{-45+32}{12}\right) = \left(\frac{-12}{5}\right) \times \left(\frac{-15}{4}\right) + \left(\frac{-12}{5}\right) \times \left(\frac{8}{3}\right)$$

$$\Rightarrow \frac{13}{5} = \frac{45 - 32}{5}$$

$$\Rightarrow \frac{13}{5} = \frac{13}{5}$$

(iii) $x = -\frac{8}{3}, y = \frac{5}{6}, z = -\frac{13}{12}$

$$-\frac{8}{3} \times \left(\frac{5}{6} + \frac{-13}{12}\right) = \left(-\frac{8}{3}\right) \times \left(\frac{5}{6}\right) + \left(-\frac{8}{3}\right) \times \left(\frac{-13}{12}\right)$$

$$-\frac{8}{3} \times \left(\frac{10-13}{12}\right) = \frac{-40}{18} + \frac{104}{36}$$

$$\frac{24}{36} = \frac{-80+104}{36}$$

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

LHS = RHS.

(iv) $x = -\frac{3}{4}, y = -\frac{5}{2}, z = \frac{7}{6}$.

$$-\frac{3}{4}\left(-\frac{5}{2} + \frac{7}{6}\right) = \left(-\frac{3}{4}\right) \times \left(-\frac{5}{2}\right) + \left(-\frac{3}{4}\right) \times \left[\frac{7}{6}\right)$$

$$-\frac{3}{4} \times -\frac{5}{2} + -\frac{3}{4} \times \frac{7}{6} = -\frac{3}{4}\left(\frac{-5 \times 6}{2 \times 6} + \frac{7 \times 6}{6 \times 6}\right)$$

$$\frac{15}{8} + \frac{-21}{24} = -\frac{3}{4}\left(\frac{7}{6} - \frac{5}{2}\right)$$

$$\frac{45-21}{24} = -\frac{3}{4}\left(\frac{7}{6} - \frac{5 \times 3}{2 \times 3}\right)$$

$$\frac{24}{24} = -\frac{3}{4}\left(\frac{7-15}{6}\right)$$

$$\frac{24}{24} = \frac{24}{24}$$

$\Rightarrow 1 = 1$

$\therefore$ LHS = RHS

5. Find the multiplicative inverse (reciprocal) of each of the following rational numbers:

(i) 9 (ii) $-7$ (iii) $\frac{12}{5}$ (iv) $-\frac{7}{9}$ (v) $\frac{-3}{5}$ (vi) $\frac{2}{3} \times \frac{9}{4}$.

(vii) $-\frac{5}{8} \times \frac{16}{15}$ (viii) $-2 \times \frac{-3}{5}$. (ix) $-1$ (x) $\frac{0}{3}$ (xi) 1.

(i) reciprocal of 9 is $\frac{1}{9}$

(ii) $\frac{-1}{7}$

(iii) $\frac{5}{12}$

(iv) $\frac{9}{-7}$

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

(vi) $\frac{2}{3}$

(vii) $\frac{-3}{2}$

(viii) $\frac{5}{6}$

(ix) $-1$

[∵reciprocal of $\frac{a}{b}$ is $\frac{b}{a}$]

6. Name the property of multiplication of rational numbers illustrated by the following statements.

(i) $\frac{-5}{16} \times \frac{8}{15} = \frac{8}{15} \times \frac{-5}{16}$ (ii) $\frac{-17}{5} \times 9 = 9 \times \frac{-17}{5}$

(iii) $\frac{7}{4} \times \left(\frac{-8}{3} + \frac{-13}{12}\right) = \frac{7}{4} \times \frac{-8}{3} + \frac{7}{4} \times \frac{-13}{12}$.

(iv) $\frac{-5}{9} \times \left(\frac{14}{15} \times \frac{-9}{8}\right) = \left(\frac{-5}{9} \times \frac{4}{15}\right) \times \left(\frac{-9}{8}\right)$

(v) $\frac{13}{-17} \times 1 = \frac{13}{-17} = 1 \times \frac{13}{-17}$ (vi) $\frac{-11}{16} \times \frac{16}{-11} = 1$

(vii) $\frac{9}{13} \times 0 = 0 = 0 \times \frac{2}{13}$ (viii) $\frac{-3}{2} \times \frac{5}{4} + \frac{-3}{2} \times \frac{-7}{6} = \frac{-3}{2}\left(\frac{5}{4} + \frac{-7}{6}\right)$.

Solution:

(i) Commutativity

(ii) Commutativity

(iii) Distributivity of multiplication over addition

(iv) Associativity of multiplication

(v) Existence of Identity for multiplication

(vi) Existence of multiplication inverse

(vii) multiplication by zero.

(viii) Distributivity law.

7. Fill in the blanks:

(i) The product of two positive rational number is always Positive

(ii) The product of a positive rational number and a negative rational number is always Negative

(iii) The product of two negative rational numbers is always Positive

(iv) The reciprocal of a positive rational number is Positive

(v) The reciprocal of a negative rational number is Negative

(vi) Zero has No reciprocal.

(vii) The number product of a negative rational number is

(viii) The product of a rational number and its reciprocal is 1.

(viii) The numbers 1 and -1 are their own reciprocals.

(ix) If a is reciprocal of b, then the reciprocal of b is a.

(x) The number 0 is not the reciprocal of any numbers

(xi) Reciprocal of $\frac{1}{a}$, $a \neq 0$ is $a$.

(xii) $(17 \times 12)^{-1} = 17^{-1} \times 12^{-1}$.

8. Fill in the blanks.

(i) $-4 \times \frac{7}{9} = \frac{7}{9} \times -4$ (ii) $\frac{5}{11} \times \frac{-3}{8} = \frac{-3}{8} \times \frac{5}{11}$

(iii) $\frac{1}{2} \times \left(\frac{3}{4} + \frac{-5}{12}\right) = \frac{1}{2} \times \frac{3}{4} + \frac{1}{2} \times \frac{-5}{12}$.

(iv) $\frac{-04}{5} \times \left(\frac{5}{7} + \frac{-8}{9}\right) = \left(\frac{-4}{5} \times \frac{5}{7}\right) \times \left(\frac{-8}{9}\right)$

5. Find the multiplicative inverse (reciprocal) of each of following statement

(i) 9

(ii) reciprocal of '9' is $\frac{1}{9}$

(ii) -7 (iii) $\frac{12}{5}$ (iv) $\frac{-7}{9}$ (v) $+\frac{2}{3}\frac{9}{4}$ (vi) $\frac{2}{3}$,

# Rational Numbers Exercise 1.7

Exercise -1.7

(i) 1 by $\frac{1}{2}$ (ii) 5 by $\frac{-5}{7}$ (iii) $\frac{-3}{4}$ by $\frac{9}{-16}$ (iv) $\frac{-7}{8}$ by $\frac{-21}{16}$

(v) $\frac{7}{-4}$ by $\frac{63}{64}$ (vi) 0 by $\frac{-7}{5}$ (vii) $\frac{-3}{4}$ by $-6$ (viii) $\frac{2}{3}$ by $\frac{-7}{12}$

(ix) $-4$ by $\frac{-3}{5}$ (x) $\frac{-3}{13}$ by $\frac{-4}{65}$.

Solution:-

(i) 1 by $\frac{1}{2}$.

$$\frac{1}{\frac{1}{2}} = 1 \times \frac{2}{1} = 2.$$

(ii) $5 \div \frac{-5}{7} = \frac{5}{-5} \times 7 = -7.$

(iii) $\frac{-3}{4} \div \frac{9}{-16} = \frac{+3}{4} \times \frac{+16}{9} = \frac{4}{3}$

(iv) $\frac{-7}{8} \div \frac{-21}{16} = \frac{-7}{8} \times \frac{16}{-21} = \frac{-2}{-3} = \frac{2}{3}$

(v) $0 \div \frac{-7}{5} = 0$

(vi) $\frac{-3}{4} \div -6 = \frac{+3}{4 \times +6} = \frac{1}{8}$

(vii) $\frac{-3}{4} \div -6 = \frac{-3}{4 \times -6} = \frac{1}{8}$

(viii) $\frac{2}{3} \div \frac{-7}{12} = \frac{2}{3} \times \frac{12}{-7} = \frac{-24}{21} = \frac{-8}{7}$

(ix) $-4 \div \frac{-3}{5} = \frac{-4 \times 5}{-3} = \frac{20}{3}.$

(x) $\frac{-3}{13} \div \frac{-4}{65} = \frac{+3}{13} \times \frac{65^{5}}{+4} = \frac{15}{4}$

2. Find the value and express as a rational number in standard form:

(i) $\frac{2}{5} \div \frac{26}{15}$ (ii) $\frac{10}{3} \div \frac{-35}{12}$ (iii) $-6 \div \frac{-8}{17}$ (iv) $\frac{-40}{99} \div (-20)$.

(v) $\frac{-22}{27} \div \frac{-110}{18}$ (vi) $\frac{-36}{125} \div \frac{-3}{75}$.

Solution:-

(i) $\frac{2}{5} \div \frac{26}{15} = \frac{\frac{2}{5}}{\frac{26}{15}} = \frac{\frac{2}{1}}{\frac{26}{3}} = \frac{2}{26} \times \frac{3}{1} = \frac{3}{13}$.

(ii) $\frac{10}{3} \div \frac{-35}{12} = \frac{\frac{10}{3}}{\frac{-35}{12}} = \frac{10}{3} \div \frac{-35}{12} \times$

$= \frac{10}{3} \times \frac{12}{-35} = \frac{2}{3} \times \frac{12}{-7} = \frac{-8}{7}$

(iii) $-6 \div \frac{-8}{17} = \frac{-6 \times 17}{-8} = \frac{51}{4}$

(iv) $\frac{-40}{99} \div -20 = \frac{+40}{+20 \times 99} = \frac{2}{99}$

(v) $-\frac{22}{27} \div \frac{-110}{18} = \frac{+22}{27} \times \frac{18}{+110} = \frac{2}{15}$.

(vi) $\frac{-36}{125} \div \frac{-3}{75} = \frac{-36 \times 75}{-3 \times 125} = \frac{136}{5} = \frac{36}{5}$

3. The product of two rational numbers is 15. If one of the numbers is -10, find the other.

It is given that the product of two rational numbers is 15. If one of the numbers is -10. So the other number is obtained by dividing the product by the given number.

$$\therefore \text{other number} = \frac{15}{-10} = -\frac{3\cancel{15}2}{\cancel{2}} = -\frac{3}{2}.$$

4. The product of two rational numbers is $\frac{-8}{9}$. If one of the numbers is $\frac{-4}{15}$, find the other

It is given that the product of two rational numbers is $\frac{-8}{9}$. If one of the numbers is $-\frac{4}{15}$. So the other number is obtained by dividing the product by the given number.

$$\therefore \text{Other number} = \frac{\frac{-8}{9}}{\frac{-4}{15}} = \frac{2\times 5}{3} = \frac{10}{3}.$$

5. By what number should we multiply $\frac{-1}{6}$ so the product may be $-\frac{23}{9}$

Let the number be $x$.

$$x \times \frac{-1}{6} = -\frac{23}{9} \Rightarrow x = \frac{23\times 2}{3} = \frac{46}{3}.$$

6. By what number should be multiply $\frac{-15}{28}$ so the Product may be $\frac{-5}{7}$.

Soln:- Let 'x' be the required number

$$x \times \frac{-15}{28} = \frac{-5}{7}$$

$$x = \frac{\frac{-5}{7}}{\frac{-15}{28}}$$

$$x = \frac{-5}{7} \times \frac{28}{-15}$$

$$x = \frac{1}{1} \times \frac{4}{3} = \frac{4}{3}.$$

7. By what number should we multiply $\frac{-8}{13}$ so that the product may be 24?

Soln:- Let 'x' be the number

$$x \times \frac{-8}{13} = 24$$

$$x \times \frac{-1}{13} = 3$$

$$x = -39.$$

∴ required number is -39.

8. By what number should $-\frac{3}{4}$ be multiplied in order to produce $\frac{2}{3}$?

Let the required number be 'x'

$$x \times -\frac{3}{4} = \frac{2}{3}$$

$$x = \frac{\frac{2}{3}}{\frac{-3}{4}}$$

$$x = \frac{2 \times 4}{-3 \times 3}$$

$$x = -\frac{8}{9}.$$

9. Find $(x+y) \div (x-y)$, if

(i) $x = \frac{2}{3}, y = \frac{3}{2}$ (ii) $x = \frac{2}{5}, y = \frac{1}{2}$ (iii) $x = \frac{5}{4}, y = -\frac{1}{3}$

(iv) $x = \frac{2}{7}, y = \frac{4}{3}$ (v) $x = \frac{1}{4}, y = \frac{3}{2}$

(i) $(x+y) \div (x-y) = \frac{\frac{2}{3} + \frac{3}{2}}{\frac{2}{3} - \frac{3}{2}} = \frac{\frac{4+9}{6}}{\frac{4-9}{6}} = -\frac{13}{5}$

(ii) $(x+y) \div (x-y) = \frac{\frac{2}{5} + \frac{1}{2}}{\frac{2}{5} - \frac{1}{2}} = \frac{\frac{4+5}{10}}{\frac{4-5}{10}} = \frac{\frac{9}{10}}{\frac{-1}{10}} = -9.$

(iii) $x = \frac{5}{4}, y = \frac{-1}{3}$.

$$\frac{x+y}{x-y} = \frac{\frac{5}{4}+\left(\frac{-1}{3}\right)}{\frac{5}{4}-\left(\frac{-1}{3}\right)} = \frac{\frac{5\times3-1\times4}{12}}{\frac{5\times3+1\times4}{12}} = \frac{\frac{11}{12}}{\frac{19}{12}} = \frac{11}{19}$$

(iv) $\frac{x+y}{x-y} = \frac{\frac{2}{7}+\frac{4}{3}}{\frac{2}{7}-\frac{4}{3}} = \frac{\frac{2\times3+4\times7}{21}}{\frac{2\times3-4\times7}{21}} = \frac{\frac{6+28}{21}}{\frac{-22}{21}}$

$= \frac{-17}{11}$.

(v) $\frac{x+y}{x-y} = \frac{\frac{1}{4}+\frac{3}{2}}{\frac{1}{4}-\frac{3}{2}} = \frac{\frac{1\times1+3\times2}{4}}{\frac{1-3\times2}{4}} = \frac{\frac{1+6}{4}}{\frac{1-6}{4}} = \frac{-7}{5}$

10. The cost of $7\frac{2}{3}$ metres of rope is Rs $12\frac{3}{4}$.

Find cost per meter.

It is given that,

$\frac{7\times3+2}{3}$ meters of rope is Rs $\frac{12\times4+3}{4}$

1 meter → ?

Let cost per meter be $x$.

$x \times \frac{23}{3} = \frac{51}{4} \Rightarrow x = \frac{153}{92} = \text{Rs } 1\frac{61}{92}$.

11. The cost of $2\frac{1}{3}$ metres of cloth is Rs $75\frac{1}{4}$. Find the cost of the cloth per meter

It is given that,

cost of $\frac{6+1}{3}$ metres of cloth is Rs $\frac{301}{4}$

Let the cost of the cloth per meter be 'x'

1 meter $\longrightarrow$ ?

$$x \times \frac{7}{3} = \frac{301}{4}$$

$$x = \frac{3 \times 301}{7 \times 4}$$

$$x = ₹ 32.55$$

12. By what number should $-\frac{33}{16}$ be divided to get $\frac{-11}{4}$?

It is given that,

Let 'x' be the required number

$$\frac{\frac{-33}{16}}{x} = \frac{-11}{4}$$

$$\frac{-33}{16} = x \times \frac{-11}{4}$$

$$\frac{3}{4} = x$$

$\therefore$ Let the required number be $x = \frac{3}{4}$.

# Rational Numbers Exercise 1.8

Exercise - 1.8

1. Find a rational number between -3 and 1.

We know that between two rational numbers $x$ and $y$ such that $x<y$ there is a rational number $\frac{x+y}{2}$

i.e., $x < \frac{x+y}{2} < y$.

So, rational number b/w -3 and 1 is $\frac{-3+1}{2} = -1$.

Thus, we have $-3 < -1 < 1$.

2. Find any five rational numbers less than 2.

five rational numbers less than 2 are.

$0, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}$.

3. Find two rational numbers between $\frac{-2}{9}$ and $\frac{5}{9}$

A rational number lying between $\frac{-2}{9}$ and $\frac{5}{9}$

$$\frac{-\frac{2}{9}+\frac{5}{9}}{2} = \frac{3}{18} = \frac{1}{6}$$

Now a rational number b/w $-\frac{2}{9}$ and $\frac{1}{6}$

$$\frac{-\frac{2}{9}+\frac{1}{6}}{2} = \frac{-2\times2+3}{36} = \frac{-1}{6}.$$

$\therefore -\frac{2}{9}, \frac{1}{6}, \frac{-1}{6}, \frac{5}{9}$.

4. Find two rational numbers between $\frac{1}{5}$ and $\frac{1}{2}$.

A rational number between $\frac{1}{5}$ and $\frac{1}{2}$

$$\frac{\frac{1}{5}+\frac{1}{2}}{2} = \frac{\frac{2+5}{10}}{2} = \frac{7}{20}.$$

Now, a rational number lying between $\frac{1}{5}$ and $\frac{7}{20}$ is

$$\frac{\frac{1}{5}+\frac{7}{20}}{2} = \frac{\frac{4+7}{20}}{2} = \frac{11}{40}.$$

Find two rational numbers $\frac{1}{5}$ and $\frac{1}{2}$ is $\frac{7}{20}$ and $\frac{11}{40}$

5. Find ten rational numbers between $\frac{1}{4}$ and $\frac{1}{2}$.

The Lcm of denominators 4 and 2 is 4. Converting the given rational numbers to equivalent rational numbers having common denominator 4, we get.

$$\frac{1}{4} = \frac{1}{4} \text{ and } \frac{1}{2} = \frac{2}{4}$$

$$\frac{1\times20}{4\times20} \text{ and } \frac{2\times20}{4\times20} \Rightarrow \frac{20}{80} \text{ and } \frac{40}{80}$$

clarly 21, 22, 23, ... 39 are integers b/w numerators 20 and 40. These Equivalent rational numbers, Thus we have

$$\frac{21}{80}, \frac{22}{80}, \ldots, \frac{39}{80}$$

6. Find Ten Rational numbers between $\frac{-2}{5}$ and $\frac{1}{2}$.

The Lcm of denominators -5 and 2 is 10.

converting given rational numbers to equivalent rational number having common denominator

$$\frac{-2}{5} \times \frac{2}{2} = \frac{-4}{10} = \frac{-4 \times 2}{10 \times 2} = \frac{-8}{20}.$$

$$\frac{1}{2} \times \frac{5}{5} = \frac{5}{10} = \frac{5 \times 2}{10 \times 2} = \frac{10}{20}.$$

clearly $-7, -6, -5, -4, \ldots, 8, 9, 10$ are integers between numerators $-8$ and 10 of these equivalent rational numbers. Thus, we have

$$\frac{-7}{20}, \frac{-6}{20}, \ldots, \frac{8}{20}, \frac{9}{20}, \frac{10}{20}.$$

as rational numbers between $\frac{-8}{20} = \left(\frac{-2}{5}\right)$ and $\frac{10}{20} = \left(\frac{1}{2}\right)$.

we can take any 10 of these as required rational numbers.

$$\frac{-7}{20}, \frac{-6}{20}, \ldots, \frac{9}{20}.$$

7. Find the ten rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$.

The LCM of denominators 5 and 4 is 20.

Converting given rational numbers to equivalent rational numbers having common denominator

$$\frac{3}{5} \times \frac{20}{20} = \frac{60}{100}$$

$$\frac{3}{4} \times \frac{25}{25} = \frac{75}{100}$$

clearly 61, 62, 63, ..., 74 are integers between numerators 60 and 75 of these equivalent rational numbers thus we have.

$$\frac{61}{100}, \frac{62}{100}, \frac{63}{100}, \ldots, \frac{74}{100}$$

as rational numbers between $\frac{3}{5} = \frac{60}{100}$ and

$$\frac{75}{100} = \left(\frac{3}{4}\right).$$

we can take only 10 of these as required rational numbers.

$$\frac{61}{100}, \frac{62}{100}, \frac{63}{100}, \ldots, \frac{73}{100}, \frac{74}{100}.$$