

5. Operations on Rational Numbers

All the operations on rational numbers are performed as in fractions.

Example: Solve

1. $-\frac{3}{4} + \frac{5}{6}$

2. $\frac{2}{7} - \frac{3}{5}$

Solution:

1. $-\frac{3}{4} + \frac{5}{6}$

$$= \frac{-3 \times 3 + 5 \times 2}{12} = \frac{-9 + 10}{12} = \frac{1}{12}$$

2. $\frac{2}{7} - \frac{3}{5}$

$$= \frac{2 \times 5 - 3 \times 7}{35} = \frac{10 - 21}{35} = -\frac{11}{35}$$

- When 0 is added to any rational number, say $\frac{p}{q}$, the same rational number is obtained. Therefore, 0 is the additive identity of rational numbers.

$$\frac{p}{q} + 0 = \frac{p}{q} = 0 + \frac{p}{q}$$

- $-\frac{p}{q}$ is the additive inverse of the rational number $\frac{p}{q}$.

Example: $-\frac{4}{7}$ is the additive inverse of the rational number $\frac{4}{7}$.

Example: Solve

1. $\frac{2}{9} \times \left(-\frac{4}{3}\right)$

2. $-\frac{3}{7} \div \frac{11}{21}$

Solution:

1. $\frac{2}{9} \times \left(-\frac{4}{3}\right)$

$$= \frac{2 \times (-4)}{9 \times 3} = -\frac{8}{27}$$

2. $-\frac{3}{7} \div \frac{11}{21}$

$$= -\frac{3}{7} \times \frac{21}{11} = -\frac{9}{11}$$

- To find rational numbers between any two given rational numbers, firstly we have to make their denominators same and then find the respective rational numbers.

Example:

Find some rational numbers between $\frac{1}{6}$ and $\frac{7}{8}$.

Solution:

The L.C.M. of 6 and 8 is 24.

Now, we can write

$$\frac{1}{6} = \frac{1 \times 4}{6 \times 4} = \frac{4}{24}$$

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

Therefore, some of the rational numbers between $\frac{4}{24}\left(\frac{1}{6}\right)$ and $\frac{21}{24}\left(\frac{7}{8}\right)$ are

$$\frac{5}{24}, \frac{6}{24}, \frac{7}{24}, \frac{8}{24}, \frac{9}{24}, \frac{10}{24}, \frac{11}{24}, \frac{12}{24}, \frac{13}{24}, \frac{14}{24}, \frac{15}{24}, \frac{16}{24}, \frac{17}{24}, \frac{18}{24}, \frac{19}{24}, \frac{20}{24}$$

- Decimal expansion of a rational number can be of two types:

(i) Terminating

(ii) Non-terminating and repetitive

In order to find decimal expansion of rational numbers we use long division method.

For example, to find the decimal expansion of $\frac{1237}{25}$.

We perform the long division of 1237 by 25.

$$\begin{array}{r}
 49.48 \\
 25 \overline{) 1237.00} \\
 \underline{100} \\
 237 \\
 \underline{225} \\
 120 \\
 \underline{100} \\
 200 \\
 \underline{200} \\
 0
 \end{array}$$

Hence, the decimal expansion of $\frac{1237}{25}$ is 49.48. Since the remainder is obtained as zero, the decimal number is terminating.

- Collection of numbers connected by one or more operations of ‘addition, subtraction, multiplication, division, and of’ is called a **numerical expression**. It may also involve brackets.
- Numerical expressions are solved using **BODMAS** (Bracket, Of, Division, Multiplication, Addition and Subtraction) rule.

For example, the expression $\left[12 + \left\{ 17 - (12 - 2 \times 3) \right\} + 2 \right] - 3 \times 5$ can be solved as:

$$\left[12 + \left\{ 17 - (12 - 2 \times 3) \right\} + 2 \right] - 3 \times 5$$

$$= [12 \{ 17 - (12 - 6) \} + 2] - 3 \times 5$$

$$= [12 + \{ 17 - 6 \} + 2] - 3 \times 5$$

$$= \{ 12 + 11 + 2 \} - 3 \times 5$$

$$= 25 - 3 \times 5$$

$$= 25 - 15 \text{ (On multiplication)}$$

$$= 10 \text{ (On subtraction)}$$