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

$=\frac{-3\times3+5\times2}{12}=\frac{-9+10}{12}=\frac{1}{12}$

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

$=\frac{2\times5-3\times7}{35}=\frac{10-21}{35}=-\frac{11}{35}$

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

$=\frac{2\times(-4)}{9\times3}=-\frac{8}{27}$

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

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

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- 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.

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

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 $\left[12+\left\{17-\left(12-\overline{2\times3}\right)\right\}+2\right]-3\times5$ can be solved as:

$\left[12+\left\{17-\left(12-\overline{2\times3}\right)\right\}+2\right]-3\times5$

= [12 {17 − (12 − 6} + 2] − 3 × 5

= [12 + {17 − 6} + 2] − 3 × 5

= {12 + 11 + 2} − 3 × 5

= 25 − 3 × 5

= 25 − 15 (On multiplication)

= 10 (On subtraction)

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