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L.B.N.P.S

Sarabika Jaipur

Class - 8th

study time

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Subject- Maths Chapter- Rational numbers.

From your study in the earlier classes you know that as a result of our wish to find a suitable number system we extended the number system several time. We first considered the system of natural numbers or counting number

$$N = \{1, 2, 3, 4, 5, 6, \dots\}$$

To this we added zero and designated the new system as the system of whole number.

$$W = \{0, 1, 2, 3, 4, 5, \dots\}$$

Then we extended this system to include the negative of each positive integer and obtained the complete set of Integers.

$$I \text{ or } Z = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$$

The positive integer are 1, 2, 3, \dots

The negative integer are -1, -2, -3, \dots

Zero is neither positive nor negative.

Next, Fraction were considered and we developed the system of

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rational number:

$\mathbb{Q} = \{$ Numbers which can be expressed in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

p is called the numerator and q is called the denominator.

All these are rational number, $-7, \frac{8}{4}, 0, 73\%$.

But a number as $\frac{5}{0}$ or $\frac{-6}{0}$ is not

defined and hence is not a rational number.

Positive and Negative rational numbers

1- A rational number is said to be positive if its numerator and denominator are both positive or both negative.

Ex $\rightarrow \frac{3}{4}, \frac{-23}{-110}$

2- A rational number is said to be negative if its numerator and denominator are such that one of them is positive integer and other is negative integer. Ex- $-\frac{5}{4}, \frac{6}{-7}$

Equivalent Rational number -

If $\frac{p}{q}$ is a rational number and

n is a non zero integer then

$$\frac{p}{q} = \frac{p \times n}{q \times n}$$

Ex. $\frac{-2}{5} = \frac{(-2) \times 2}{5 \times 2} = \frac{(-2) \times 3}{5 \times 3} = \frac{(-2) \times 4}{5 \times 4} = \dots$

ie $\frac{-2}{5} = \frac{-4}{10} = \frac{-6}{15} = \frac{-8}{20} = \dots$

All these rational number are called equivalent rational number.

Also if $\frac{p}{q}$ is rational number and n is a common divisor of p and q then

$$\frac{p}{q} = \frac{p \div n}{q \div n}$$

For example - $\frac{-32}{48} = \frac{-32 \div 2}{48 \div 2} = \frac{-16}{24}$

$\frac{-32}{48} = \frac{-32 \div 4}{48 \div 4} = \frac{-8}{12}$, $\frac{-32}{48} = \frac{-32 \div 8}{48 \div 8} = \frac{-4}{6}$

$\frac{-32}{48} = \frac{-32 \div 16}{48 \div 16} = \frac{-2}{3}$

As we can see $\frac{-2}{3}$ is in its lowest term. It is also called a standard form.

Standard form of a rational number

A rational number is said to be in standard form if it is in its lowest term.

Step I If already not so, make the denominator of the given rational number positive.

Step II Divide both the numerator and denominator by their H.C.F

Ex. To express $\frac{45}{-70}$ in standard form

Step I Make denominator positive $\frac{45}{-70} = \frac{-45}{70}$

Step II Divide both numerator and denominator by the HCF of 45 and 70 i.e 5.

$$\frac{-45}{70} = \frac{-45 \div 5}{70 \div 5} = \frac{-9}{14}$$

Comparison of Rational number.

Method 1

Step-1 Express each rational number with a positive denominator

Step-2 Find the L.C.M of positive denominator

Step-3 Express each of the given rational number with this L.C.M as common denominator

Step-4. Then number having greater numerator

Exⁿ Compare $-\frac{8}{9}$ and $\frac{4}{-5}$

Solⁿ $-\frac{8}{9} = -\frac{8}{9}$ and $\frac{4}{-5} = -\frac{4}{5}$

L.C.M of 9 and 5 is = 45

$$-\frac{8}{9} = \frac{-8 \times 5}{9 \times 5} = \frac{-40}{45}$$

$$-\frac{4}{5} = \frac{-4 \times 9}{5 \times 9} = \frac{-36}{45}$$

Since $-40 < -36$.

$$\therefore \frac{-40}{45} < \frac{-36}{45} \Rightarrow -\frac{8}{9} < -\frac{4}{5} \Rightarrow \frac{-8}{9} < \frac{4}{-5}$$

Exercise

Q-1 Write four rational number equivalent to each of the following rational number.

[I] $\frac{2}{5}$ [II] $-\frac{5}{9}$ [III] $\frac{8}{-11}$ [IV] $-\frac{12}{13}$

[V] $\frac{6}{-5}$ [VI] $-\frac{4}{-3}$ [VII] $-\frac{5}{2}$ [VIII] $-\frac{7}{9}$

Q-2 Compare [I] $\frac{9}{-11}$ and $\frac{5}{-17}$

[II] 8 and 7

(i) $\frac{-4}{7}$ and $\frac{4}{-11}$ (ii) $\frac{13}{-15}$ and $\frac{10}{-11}$

(iii) $\frac{8}{7}$ and $\frac{12}{9}$ (iv) $\frac{-2}{3}$ and $\frac{4}{-7}$

Q:3 Arrange $\frac{-4}{5}$, $\frac{9}{-15}$, $\frac{-2}{3}$ in descending order

Q:4 Write the standard form of the given rational number.

(i) $\frac{45}{-70}$ (ii) $\frac{-32}{48}$ (iii) $\frac{126}{76}$

(iv) $\frac{84}{-32}$ (v) $\frac{125}{50}$ (vi) $\frac{6248}{-128}$

(vii) $\frac{-999}{99}$ (viii) $\frac{542}{124}$ (ix) $\frac{363}{-121}$

Q:5 Multiply.

(i) $\frac{6}{7}$ by $\frac{2}{3}$ (ii) $\frac{-9}{11}$ by $\frac{22}{63}$ (iii) $\frac{-12}{13}$ by $\frac{-5}{18}$

(iv) $\frac{-90}{11}$ by $\frac{-55}{72}$ (v) $5\frac{1}{7}$ by $-2\frac{1}{3}$

(vi) $\frac{18}{35}$ by $-3\frac{1}{8}$