RATIONAL NUMBER

Any number that can be put into the form of $\frac{p}{q}$ such that

1. p and q are integers
2. p and q are prime to each other and also, known as co-primes
3. q $\neq$ 0
   is known as a RATIONAL NUMBER.

SOME OBSERVATIONS

Any integer 'a' may be written as $\frac{a}{1}$ .Hence the condition of a rational number is satisfied.

For the number $\frac{22}{7}$ we find

1) 22 and 7 are integers

2). 22 and 7 are prime to each other (i.e., they do not have any common factor other than 1)

3). 7 $\neq$ 0

Therefore, it is a RATIONAL NUMBER

Can you tell whether $\frac{4}{8}$ or 0.25 is a RATIONAL NUMBER or not?

In fact, if we represent a RATIONAL NUMBER in terms of DECIMALS, we get the number as either a terminating DECIMAL or a recurring DECIMAL.

PROPERTIES OF RATIONAL NUMBERS

All natural numbers, whole numbers, integers and fractions are RATIONAL NUMBERS.

If a, b and c are any three rational numbers then

1.Commutative Property

If a and b are any two integers, then

i) a + b = b + a

ii)a x b = b x a

2.Associative Property

If a, b and c are any three integers, then

i) (a + b) + c = a + (b + c)

ii) (a x b) x c = a x (b x c)

3.Property of Identity

If a is an integer, then

i) 0 is the additive identity

i.e a + 0= 0 +a =a

ii) 1 is the multiplicative identity

i.e a x 1 = 1 x a =a

4.Property of Inverse

i) For any RATIONAL NUMBER ‘a ‘ , ‘-a ‘ is the additive inverse,

i.e., a + (-a)=(-a) +a =0

ii) For any RATIONAL NUMBER ‘a ‘ , $\frac{1}{a}$ is the multiplicative inverse,

i.e., a x $\frac{1}{a}$ = $\frac{1}{a}$ x a =1

5. Distributive Property:

If a ,b and c are any three integers, then

i) a x (b +c) =a x b +a x c [left distributive property]

ii) (b + c) x a = b x a + c x a [right distributive property]

REPRESENTATION OF RATIONAL NUMBERS ON NUMBER LINE:

Like natural numbers and integers, rational numbers can also be represented on number line. All positive rational number are plotted on the right side of zero and all negative rational number are plotted on the left side of zero on the number line .

Example

Represent each of the following on the number line.

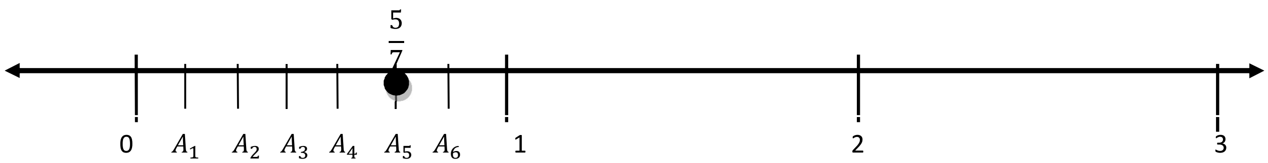
i) $\frac{5}{7}$

ii) $-\frac{14}{3}$

Solution

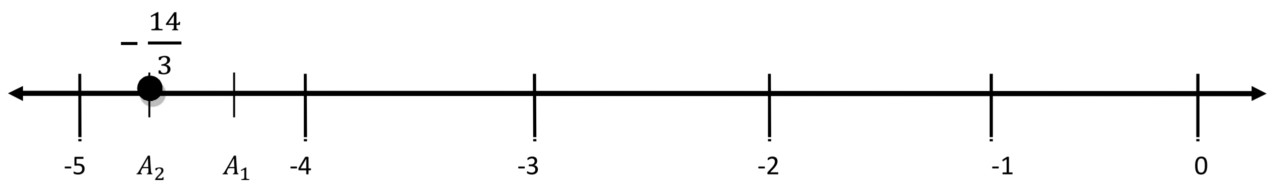
i) The given number is $\frac{5}{7}$ which lies between 0 and 1 in the positive direction of the number line.

∴ Distance between 0 and 1 is divided into 7 equal parts and the third point represent $\frac{5}{7}$ on number line as shown below.



ii)The given number is $-\frac{14}{3}$ =- 4 $\frac{2}{3}$ lies between -5 and -4

∴ Distance between -5 and -4 is to be divided into 3 equidistant parts.



<u>INSERTION OF A RATIONAL NUMBER BETWEEN TWO RATIONAL NUMBERS:</u>

If a and b are two **RATIONAL** numbers , then another **RATIONAL** number which lies between a and b is $\frac{1}{2}$ (a + b).This method of inserting a **RATIONAL** number between two given **RATIONAL** numbers is called the 'mean method'.

Example

Find two RATIONAL numbers between $\frac{1}{5}$ and $\frac{1}{2}$ using mean method.

Solution

A **RATIONAL** number between $\frac{1}{5}$ and $\frac{1}{2}$ $= \frac{1}{2} \times (\frac{1}{5} + \frac{1}{2}) = \frac{7}{20}$

$\therefore \frac{1}{5} < \frac{7}{20} < \frac{1}{2}$

Now a **RATIONAL** number between $\frac{1}{5}$ and $\frac{7}{20} = \frac{1}{2} \times (\frac{1}{5} + \frac{7}{20}) = \frac{11}{40}$

$\therefore \frac{1}{5} < \frac{11}{40} < \frac{7}{20} < \frac{1}{2}$

Note

If we express a rational number in decimals, we either get a terminating decimal or a recurring decimal.

What happens if a decimal is a non-terminating and non-recurring?

Think about it and let us discuss this in person.