RATIONAL NUMBERS

(i) INTRODUCTION of WHOLE NUMBERS

(ii) Representation of Whole Numbers on the Number line

(iii) INTEGERS

(iv) Negative of a Negative Integer

(v) FRACTIONS

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RATIONAL NUMBERS

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RATIONAL NUMBERS

(xiii) PROPERTIES OF RATIONAL NUMBERS

(a) Closure Property

(b) Commutative Property

(c) Associative Property

(d) Distributive Property

(e) Property of Zero (0)

(f) Property of One (1)

(xiv) TO FINDA RATIONAL NUMBER BETWEEN TWO GIVEN RATIONAL NUMBERS

RATIONAL NUMBERS

- DIGITS :- The symbols 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are known as digits. Using these 10 digits we can write any number in decimal system.
- NATURAL NUMBERS :- The counting numbers starting from 1, i ,e 1,2,3,4,………. are Natural Numbers.
- The smallest Natural Number is 1 and there is no largest Natural Number.

RATIONAL NUMBERS

- WHOLE NUMBERS :- The set of natural numbers together with 0 form the set of WHOLE NUMBRS.
- The smallest Whole Number is 0 and there is no largest Whole number.
- INTEGERS :- The set of Natural Numbers its negative together with 0 form the set of Integers.
- There is no smallest as well as largest Integers.

RATIONAL NUMBERS

- The Integers 1,2,3,4,……… are called positive Integers .
- The Integers -1,-2,-3,-4,……… are called negative Integers .
- 0 (zero) is neither positive nor negative.

RATIONAL NUMBERS

- RATIONAL NUMBERS :- The numbers which can be written in the form of p/q , where p and q are Integers and q ǂ 0 are called Rational Numbers.

Important points to remember

- Rational numbers include integers and fractions.
- All fractions are rational numbers.
- Decimal numbers are rational numbers.
- Zero (0) is a rational number.

RATIONAL NUMBERS

Positive and Negative Rational Numbers

If in a rational number, the numerator and denominator both are positive or both are negative, then it is called a positive rational number, otherwise, it is a negative rational number.

> *For example,* $-\frac{5}{6}, \frac{2}{-3}, \frac{3}{-4}$ *are all negative rational numbers*
>
> *where as* $\frac{5}{6}, \frac{-2}{-3}, \frac{-3}{-4}$ *are all positive Rational numbers*

RATIONAL NUMBERS

Standard Form of a Rational Number

A rational number is in its standard form if its denominator is positive and there is no common factor (except) 1 between the numerator and denominator.

Equivalent Rational Numbers

If in a rational number, we multiply the numerator and denominator by the same non-zero integer, we obtain another rational number which is equivalent to the given rational number.

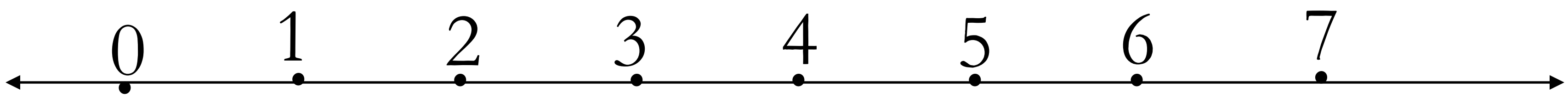
RATIONAL NUMBERS

Representation of Rational Numbers on the Number Line

Recall the number line and mark some integers on it as shown below.

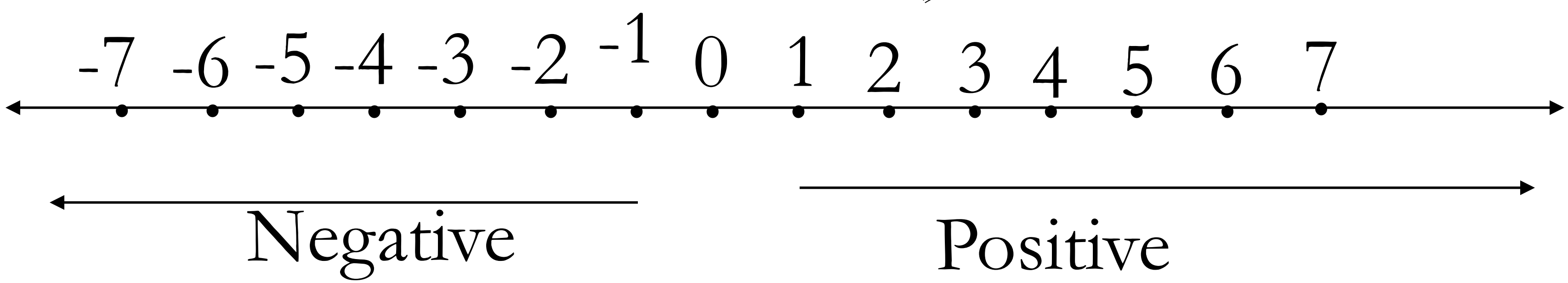
Rational Numbers

The Number Line - Whole Numbers



Rational Numbers

The Number Line



RATIONAL NUMBERS

In order to place a rational number on this number line, we will have to change the divisions on the number line according to the given number.

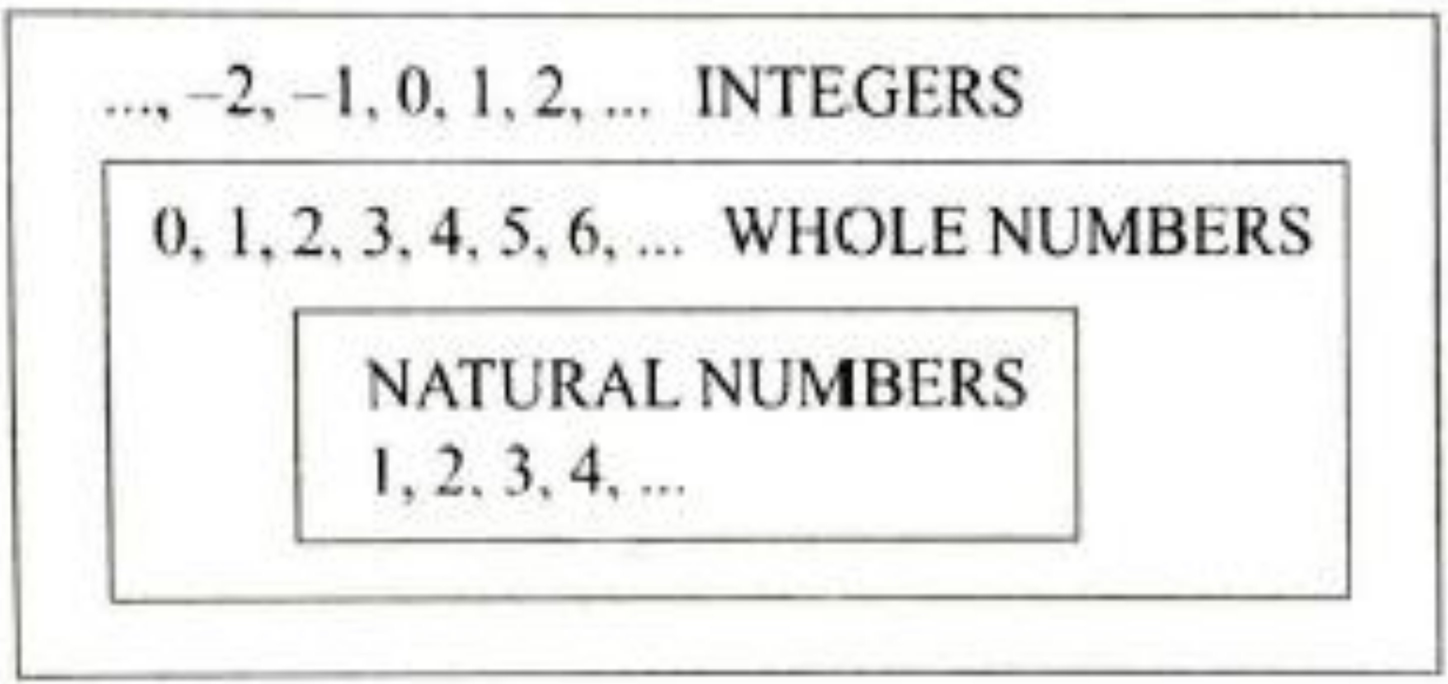
$$Let\,us\,plot\ \frac{3}{4}\,and - \frac{3}{4}\ \ on\ the\ number\ line\,\cdot$$

$$We\ know\ \frac{3}{4}\ \ lies\ between\ 0\ and\ 1, -\ hes\ between\ O\ and - I\,\cdot$$

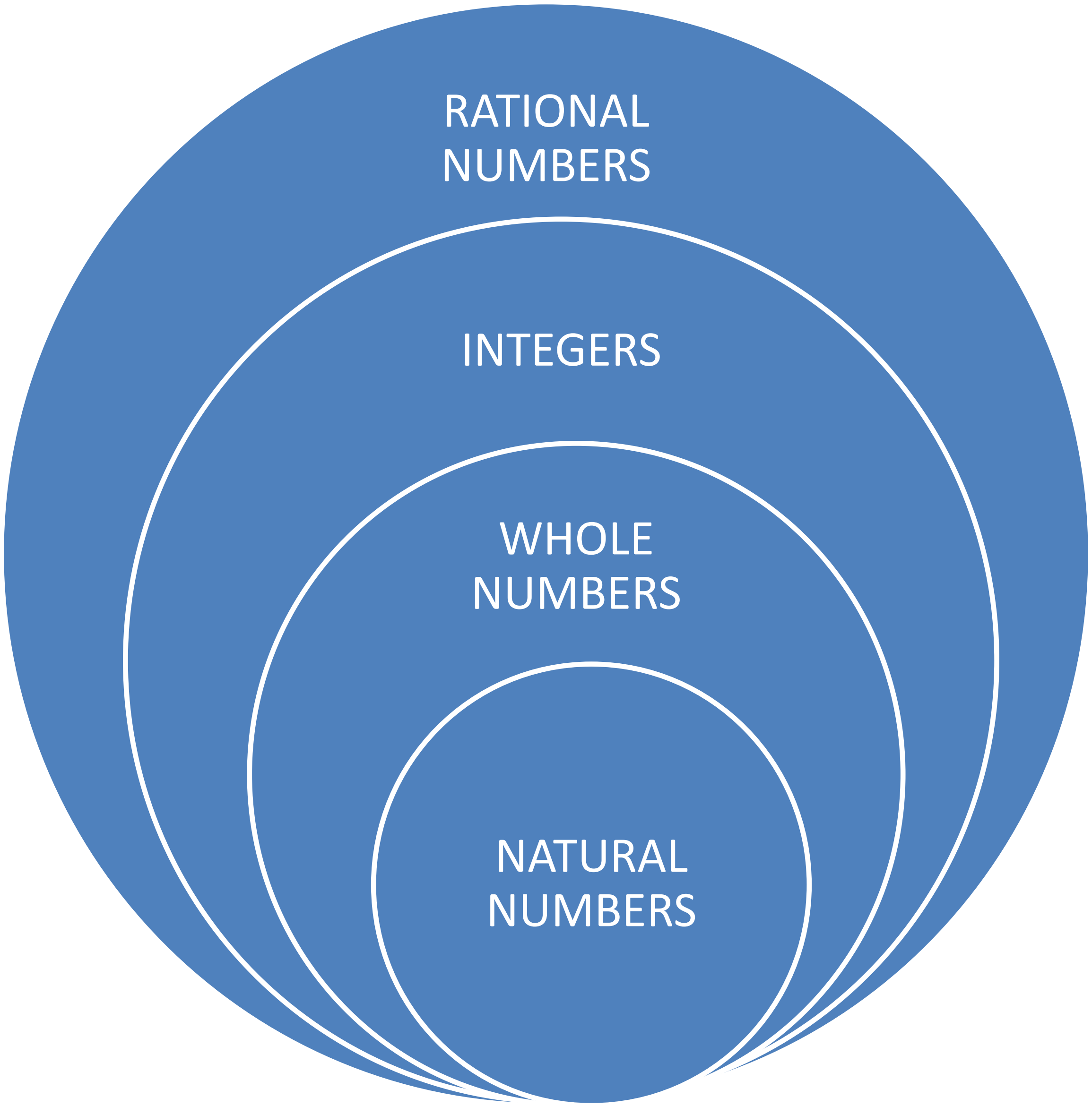
$$4\ 4\ We\ will\ have\ to\ divide\ the\ distance\ between$$

$$O\ and\ I\ into\ 4\ equal\ parts\cdot Similarly\ between\ O\ and - 1\,\cdot$$

RATIONAL NUMBERS



RATIONAL NUMBERS



RATIONAL NUMBERS

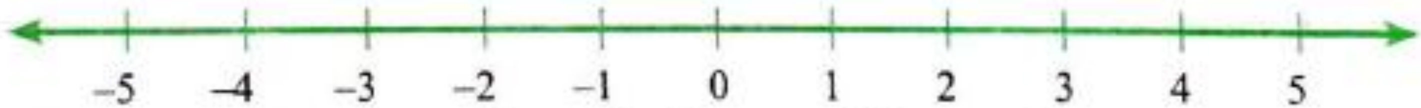
(viii) Standard Form of a Rational Number – A rational number is in its standard form if its denominator is positive and there is no common factor (except) 1 between the numerator and denominator.

(ix) **Equivalent Rational Numbers -** If in a rational number, we multiply the numerator and denominator by the same non-zero integer, we obtain another rational number which is equivalent to the given rational number.

RATIONAL NUMBERS

Representation of Rational Numbers on the Number Line

Recall the number line and mark some integers on it as shown below.

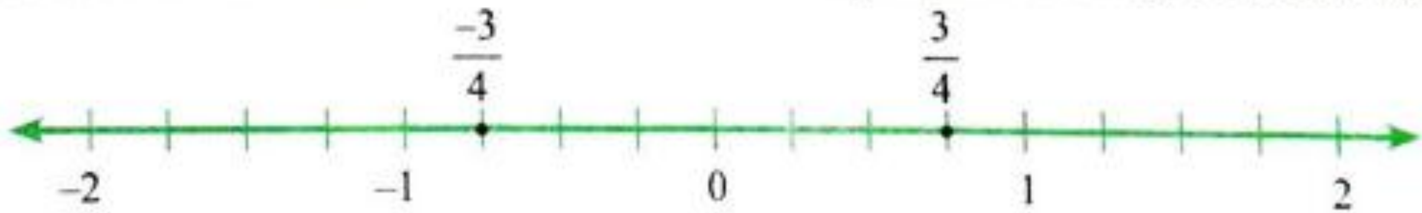


In order to place a rational number on this number line, we will have to change the divisions on the number line according to the given number.

Let us plot $\frac{3}{4}$ and $\frac{-3}{4}$ on the number line.

We know $\frac{3}{4}$ lies between 0 and 1, $\frac{-3}{4}$ lies between 0 and –1.

We will have to divide the distance between 0 and 1 into 4 equal parts. Similarly between 0 and –1.



RATIONAL NUMBERS

Absolute Value of a Rational Number – The value of the number irrespective of its sign.

Absolute value of a rational number is the always positive.

positive.

$$\textit{Absolute value of a rational number } \frac{a}{b} \textit{ is denoted by } \left|\frac{a}{b}\right|$$

$$\textit{For Example Absolute value of } \frac{3}{4} = \left|\frac{3}{4}\right| = \frac{3}{4}$$

$$\textit{Absolute value of } -\frac{3}{7} = \left|-\frac{3}{7}\right| = \frac{3}{7}$$

$$\textit{Absolute value of } -5 = |-5| = 5$$

RATIONAL NUMBERS

Comparison and Ordering of Rational Numbers

(i) If one positive and other negative – Any Positive Rational Number is greater than any negative numbers.

(ii) If two rational numbers have the same denominator, then the rational number with the greater numerator is greater.

(iii) If two rational numbers have the same numerator, then the rational number with the smaller denominator is greater.

Rational Numbers

Comparison and Ordering of Rational Numbers

(iv) If the two rational numbers have different denominators, then we take the LCM of the denominators. Then , the rational number with the greater numerator is greater.

Properties of Rational Numbers

Closure Property -

(i) Closure Property for Addition - Sum of two Rational Numbers always a Rational Number. For rational numbers *a and b, a + b, is also a rational number.*

$$For\ example\ any\ two\ Rational\ Numbers\ \frac{3}{7}\ \&\ \frac{5}{7}\ ,$$

$$Their\ sum\ \frac{3}{7} + \frac{5}{7} = \frac{3+5}{7} = \frac{8}{7}\ ,\ is\ a\ Rational\ Number$$

PROPERTIES OF RATIONAL NUMBERS

Closure Property -

(i) Closure Property for Subtraction - Difference of two Rational Numbers always a Rational Number. For any rational numbers *a and b, a - b, is also a rational number.*

$$For\ example\ any\ two\ Rational\ Numbers\ \frac{1}{3}\ \&\ \frac{1}{4},$$

$$Their\ difference\ \frac{1}{3}-\frac{1}{4}=\frac{4-3}{12}=\frac{1}{12},\ is\ a\ Rational\ Number$$

PROPERTIES OF RATIONAL NUMBERS

Closure Property -

Closure Property for Multiplication - Product of two Rational Numbers always a Rational Number. For rational numbers *a and b*. *a X b is also a rational number.*

For example any two Rational Numbers $\frac{-5}{4}$ & $\frac{-3}{8}$,

Their product $\left(\frac{-5}{4}\right) \times \left(\frac{-3}{8}\right) = \frac{15}{32}$, *is a Rational Number*.

PROPERTIES OF RATIONAL NUMBERS

Closure Property -

Closure Property for Division - Division of two Rational Numbers is a Rational Number, provided that divisor (denominator) is not equal to zero (0). For rational numbers *a and b. a / b is also a rational number, if b is not equal to 0 .*

$$For\ example\ any\ two\ Rational\ Numbers\quad \frac{-5}{4}\ \&\ \frac{-3}{8}\ ,$$

$$Their\ division\ \left(\frac{-5}{4}\right) \div \left(\frac{-3}{8}\right) = \frac{-5}{4} \times \left(\frac{8}{-3}\right) = \frac{10}{3}\ ,$$

$$is\ a\ Rational\ Number\cdot$$

PROPERTIES OF RATIONAL NUMBERS

- **COMMUTATIVE PROPERTY –**
- **Commutative Property for Addition: For rational numbers *a and b*, $a + b = b + a$**
- **Commutative Property for Subtraction : For rational numbers *a and b*, $a - b \neq b - a$**
- Thus, commutative property does not hold true for subtraction of rational numbers

PROPERTIES OF RATIONAL NUMBERS

- **COMMUTATIVE PROPERTY –**
- **Commutative Property for Multiplication : For rational numbers *a and b*, $a \times b = b \times a$**
- **Commutative Property for Division : For rational numbers *a and b*, $a \div b \neq b \div a$**
- Thus, commutative property does not hold true for division of rational numbers.

PROPERTIES OF RATIONAL NUMBERS

- **COMMUTATIVE PROPERTY –**

- Thus, commutative property does not hold true for subtraction of rational numbers