CLASS- VIII
MATHS
CHAPTER – 1
RATIONAL NUMBER

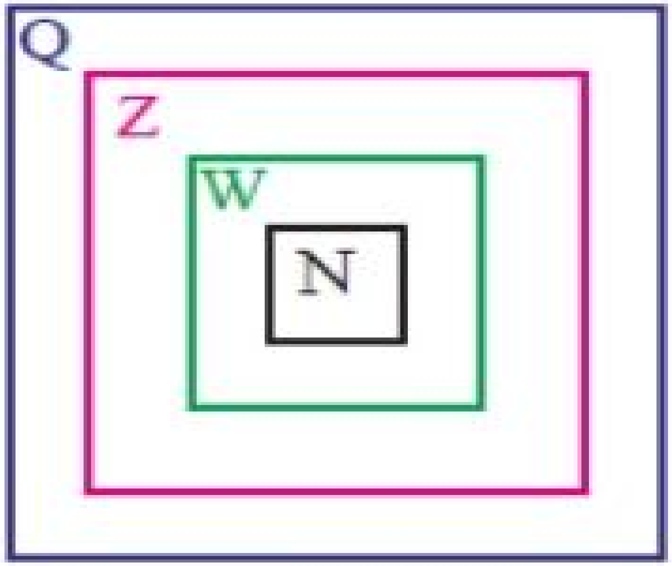
Number System

- Natural numbers N = {1, 2, 3, g},
- Whole numbers W = {0, 1, 2, g},
- Integers Z = {3, – 2, – 1, 0, 1, 2,3g}
- Rational numbers Q

What are Rational Numbers?

- The integers which are in the form of p/q where q is not equal to 0 are known as **Rational Numbers**.

- **Examples :** 5/8; -3/14; 7/-15; -6/-11



tate whether the following statements are True Or Fals

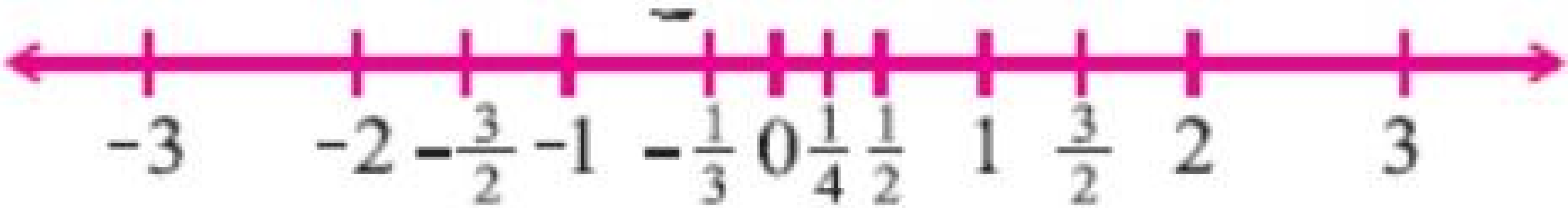
) All Integers are Rational Numbers.
) All Natural Numbers are Integers.
) All Integers are Natural Numbers.
) All Whole Numbers are Natural Numbers.
) All Natural Numbers are Whole Numbers.
) All Rational Numbers are Whole Numbers.

Rational numbers

e numbers of the form $\frac{p}{q}$
here p and q are integers and q ≠ 0 are known
rational numbers.
e collection of numbers of the form $\frac{p}{q}$
where q > 0 is denoted by Q.

tional numbers include natural numbers, whole mbers, integers and all negative and positive ctions.

presentation of Rational Numbers on the Number Li

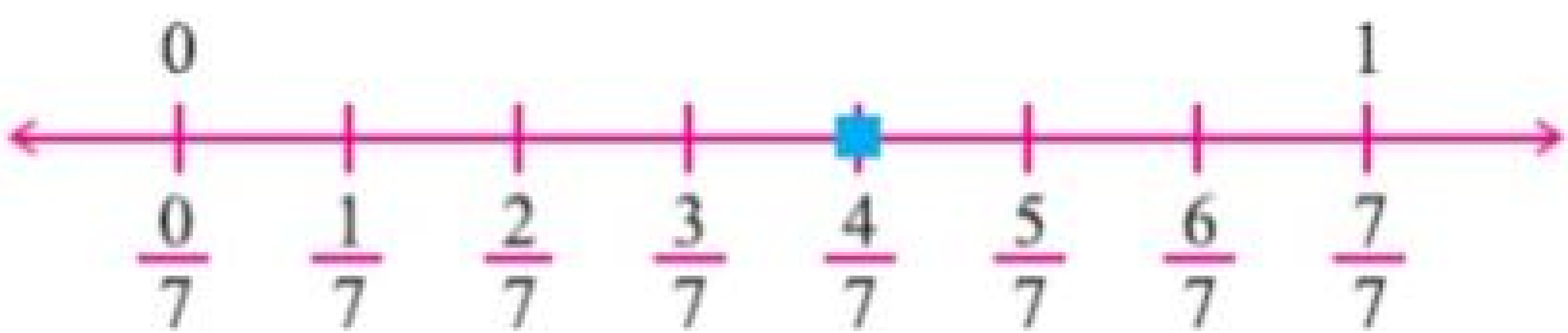


express rational numbers appropriately on the
umber line, divide each unit length into as many
umber of equal parts as the denominator of the
tional number and then mark the given number on
e number line.

resentation of Rational Numbers on the Number Li

Express $\frac{4}{7}$ on the number line.

$\frac{4}{7}$ lies between 0 and 1.

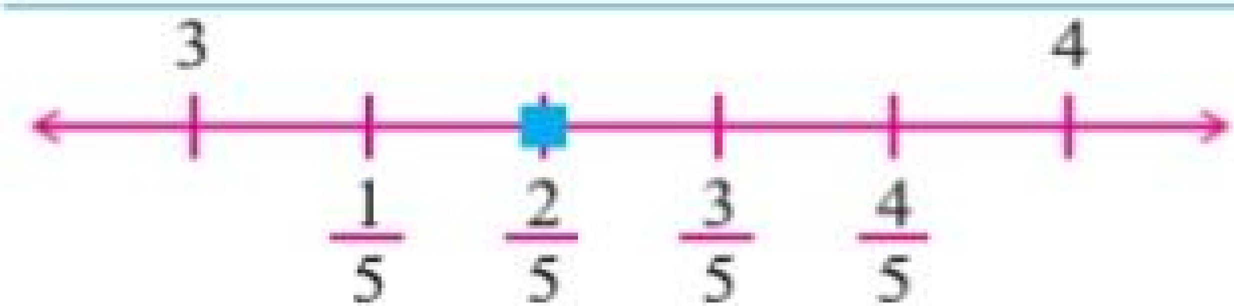


resentation of Rational Numbers on the Number Li

Express $\frac{17}{5}$ on the number line.

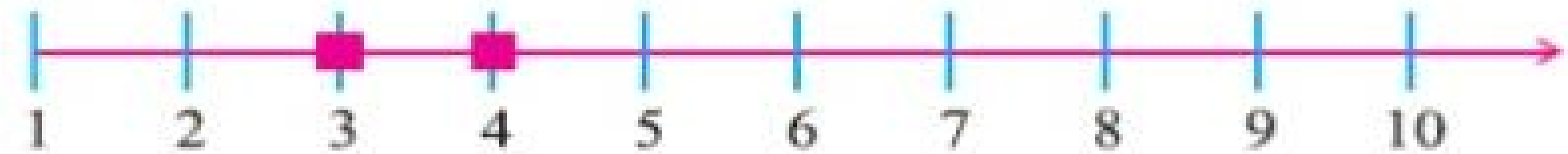
$$\frac{17}{5} = 3\frac{2}{5}$$

It lies between 3 and 4.



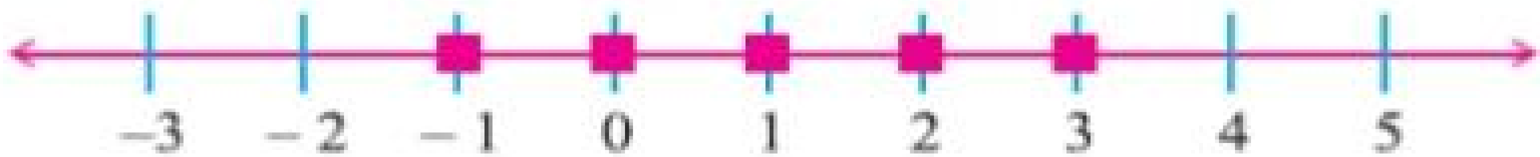
ind rational numbers between two rational number

Can you tell the natural numbers between 2 and 5?



They are 3 and 4.

Can you tell the integers between – 2 and 4?



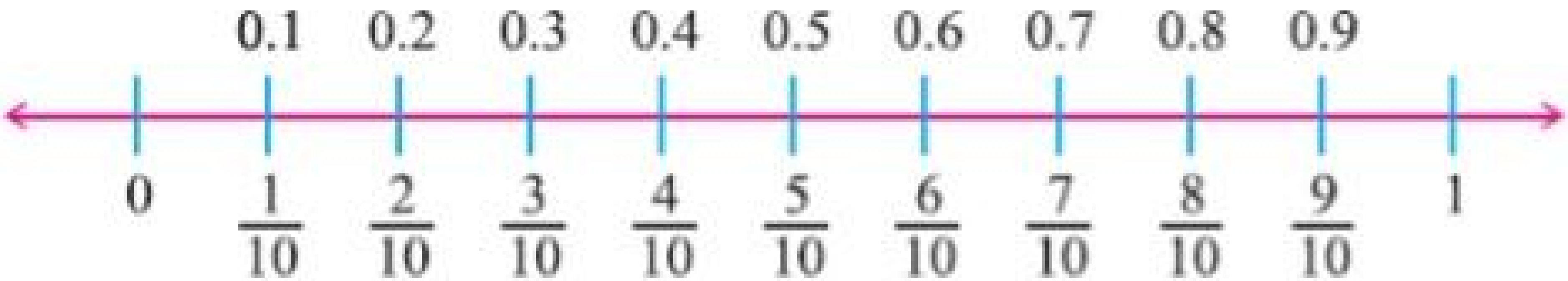
They are – 1, 0, 1, 2, 3.

Now, Can you find any integer between 1 and 2?

No.

find rational numbers between two rational number

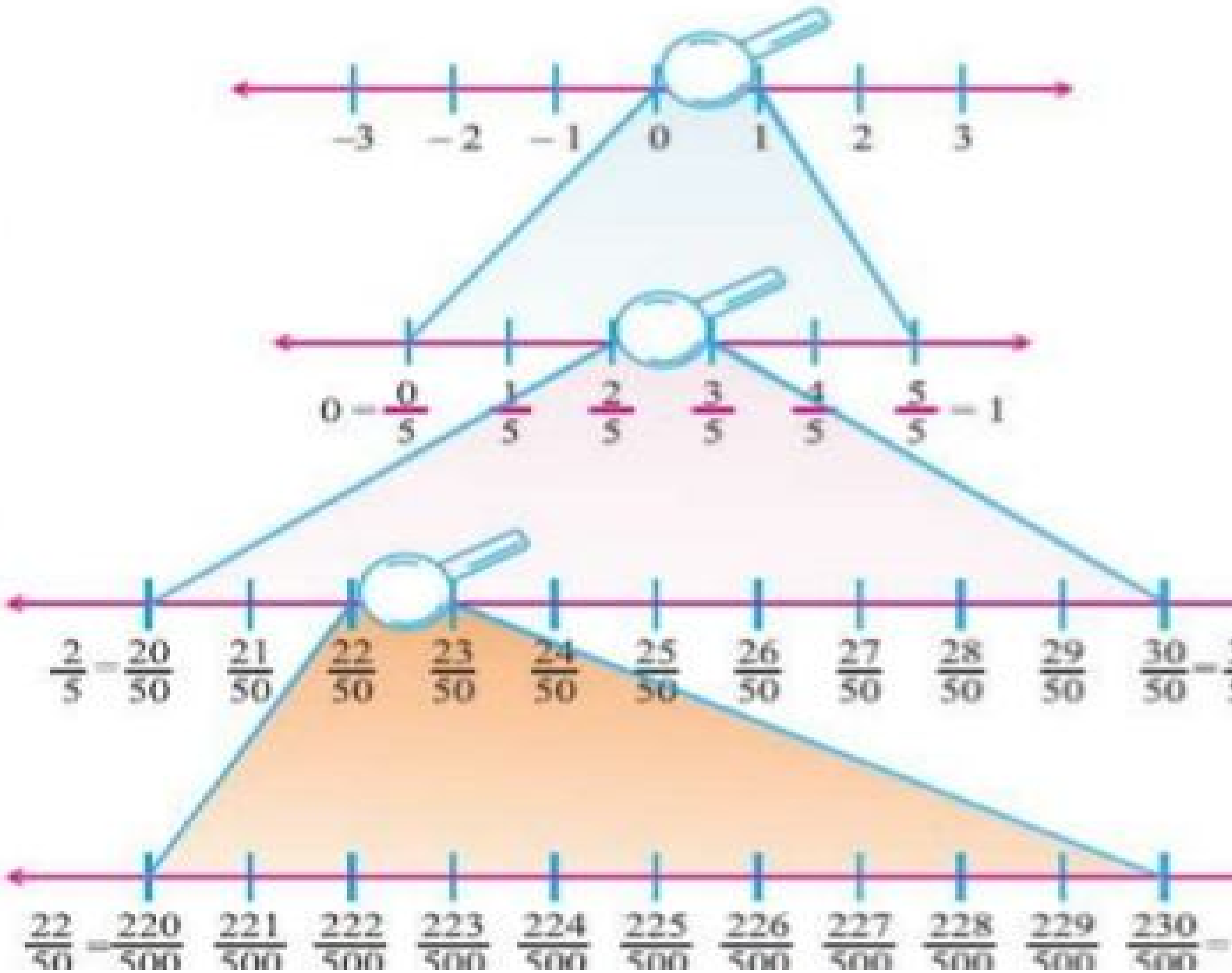
But, between any two integers, we have rational numbers.For exa
en 0 and 1, we can find rational numbers $\frac{1}{10}, \frac{2}{10}, \frac{3}{10}, \cdots$ which can be writ
2, 0.3, $\cdots$.



ind rational numbers between two rational numbe

Let us understand his better with the help of he number line shown in he adjacent figure.

Observe the number ine between 0 and 1 using magnifying lens.



nlike natural numbers
ntegers, there are
tless rational numbers
een any two given
nal numbers.

Four Properties of
Rational Numbers

Addition

sure property

The sum of any two rational numbers is always a rational number. This is

re property of addition' of rational numbers. Thus, Q is closed under add

and $\frac{c}{d}$ are any two rational numbers, then $\frac{a}{b}+\frac{c}{d}$ is also a rational num

Illustration: (i) $\frac{2}{9}+\frac{4}{9}=\frac{6}{9}=\frac{2}{3}$ is a rational number.

(ii) $5+\frac{1}{3}=\frac{5}{1}+\frac{1}{3}=\frac{15+1}{3}=\frac{16}{3}=5\frac{1}{3}$ is a rational nu

Addition

iv) Additive identity

The sum of any rational number and zero is the rational number itself.

If $\frac{a}{b}$ is any rational number, then $\frac{a}{b} + 0 = \frac{a}{b} = 0 + \frac{a}{b}$.

Zero is the additive identity for rational numbers.

Illustration: (i) $\frac{2}{7} + 0 = \frac{2}{7} = 0 + \frac{2}{7}$

(ii) $\left(\frac{-7}{11}\right) + 0 = \frac{-7}{11} = 0 + \left(\frac{-7}{11}\right)$

Do you know?

Zero is a special rational number. can be written a $0 = \frac{0}{q}$ where q

v) Additive inverse

$\left(\frac{-a}{b}\right)$ is the negative or additive inverse of $\frac{a}{b}$.

If $\frac{a}{b}$ is a rational number, then there exists a rational number $\left(\frac{-a}{b}\right)$ such that $\frac{a}{b} + \left(\frac{-a}{b}\right) = 0$.

Illustration: (i) Additive inverse of $\frac{3}{5}$ is $\frac{-3}{5}$

(ii) Additive inverse of $\frac{-3}{5}$ is $\frac{3}{5}$

(iii) Additive inverse of 0 is 0 itself.

Commutative Property

Rational numbers can be added in any order. herefore, addition is commutative for rational numbers. For Example :-

L.H.S.	R.H.S.
- 3/8 + 1/7 L.C.M. = 56 = -21+8 = -13	1 /7 +(-3/8) L.C.M. = 56 = 8+(-21) = -13

Subtraction is not commutative for rational umbers. For Example -

L.H.S.	R.H.S.
2/3 – 5/4 L.C.M. = 12 = 8 – 15 = -7	5/4 – 2/3 L.C.M. = 12 = 15 – 8 = 7

ince, -7 is unequal to 7
lence, L.H.S. Is unequal to R.H.S.
herefore, it is proved that Subtraction is not commutative for rational numbers.

Rational numbers can be multiplied in any order.

herefore, it is said that multiplication

s commutative for rational numbers.

OR EXAMPLE –

L.H.S.	R.H.S.
-7/3*6/5 = -42/15	6/5*(7/3) = -42/

ince, L.H.S = R.H.S.

herefore, it is proved that rational numbers can be multiplied in any order.

Rational numbers can not be divided in any order.

herefore, division is

lot Commutative for rational numbers.

OR EXAMPLE –

L.H.S.	R.H.S.
(-5/4) / 3/7 = -5/4*7/3 = -35/12	3/7 / (-5/4) = 3/7*4/-5 = -12/35

ince, L.H.S. is not equal to R.H.S.

herefore, it is proved that rational numbers can not be divided in any order.

ASSOCIATIVE PROPERTY

Addition is associative for rational numbers.
at is for any three rational numbers a, b and c, :
- (b + c) = (a + b) + c.
- Example
nce, -9/10 = -9/10
nce, L.H.S. = R.H.S.
erefore, the property
s been proved.

L.H.S.	R.H.S.
-2/3+[3/5+(-5/6)]	[-2/3+3/5]+(-5/6)
= -2/3+(-7/30)	=-1/15+(-5/6)
= -27/30	=-27/30
= -9/10	=-9/10

Subtraction is Not Associative for rational numbers
Multiplication is associative for rational numbers.
at is for any rational numbers a, b and c :
(b*c) = (a*b) * c
- Example –
nce, -5/21 = -5/21
nce, L.H.S. = R.H.S

L.H.S.	R.H.S.
-2/3* (5/4*2/7)	(-2/3*5/4) *
= -2/3 * 10/28	= -10/12 * 2
= -2/3 * 5/14	= -5/6 * 2/7
= -10/42	= -10/42
= -5/21	= -5/21

Division is Not Associative for Rational numbers.

DISTRIBUTIVE LAW

DISTRIBUTIVITY OF MULTIPLICATION OVER ADDITION AND SUBTRACTION:

For all rational numbers a, b and c,

a (b+c) = ab + ac

a (b-c) = ab – ac

For Example –

L.H.S.	R.H.S.
4 (2+6) = 4 (8) = 32	4*2 + 4*6 = 8 = 24 = 32

Since, L.H.S. = R.H.S.

Hence, Distributive Law Is Proved.

Additive Inverse

- Additive inverse is also known as negative of a number.

For any rational number a/b, a/b+(-a/b)= (-a/b)+a/b = 0

Therefore, -a/b is the additive inverse of a/b and a/b is the

Additive Inverse of (-a/b).

Reciprocal

- Rational number c/d is called the reciprocal or **Multiplicative Inverse** of another rational number a/b if a/b * c/d = 1