ST. LAWRENCE HIGH SCHOOL

TOPIC- Real Numbers

Class: 9 **Sub :Mathematics**

Study Material - 1. **Date: 4.5.2020**

Definitions

1. The integers greater than 0 are called Positive Integers.

Example : 1,2,3,......

2. The integers less than 0 are called Negative Integers.

Example : - 1,-2,-3,.....

3. All the positive integers are called Natural Numbers. It is denoted by N.

Therefore N ={ 1,2,3......}

4. 0 and natural numbers are together called Whole Numbers. It is denoted by W.

Therefore W ={ 0,1,2,3,....}

5. If p and q are two integers prime to each other then any numbers expressed as p/q is called a rational number.

Here q is taken as positive integer and p is taken as positive, negative or zero.

The fraction whose expansion in decimal is terminating decimal or recurring decimal is also called a rational number.

6. The number which cannot be expressed as p /q (p and q are integers but q not equal to 0) is called irrational number.

The fraction whose expansion in decimal is infinite non-recurring decimal number also called an irrational number.

7. All the rational and irrational numbers are collectively called Real Numbers. The set of real numbers is denoted by R.

Therefore R ={ - 3,-2,-1,0,1,2,3.......}

8. There are infinite number of rational numbers between two rational numbers a and b. For example, a rational number between a and b is 1/2(a +b).

Again rational number between a and 1/2(a+b) is 1/2{a+1/2(a+b)}=1/4(3a+b) and so on....

9. Expanding the rational number of the form p/q in decimal, we get the terminating decimal if the prime factors of q are only 2 and 5.

For example :5/16 is a terminating decimal number since prime factor of 16 is 2.

10. If the prime factor of q are any prime number other than 2 and 5 then we get recurring decimal number.

For example : 5/9 is a recurring decimal number since prime factor of 9 is 3.

PROPERTIES OF REAL NUMBERS :

Addition :

1.Closure Properties :

Sub of two real numbers is also a real numbers.

Example : 2+3=5

2.Commutative Properties :

If a and b are real numbers then a+b =b +a.

Example : 1+2=2+1.

3.Associatative Properties :

If a, b, c are real numbers then (a+b) +c = a +(b+c).

Example : (1+2)+3 = 1+(2+3).

4. Existence of Identity element :

Zero is the additive identity for all real numbers, such that a+0=0+a=a.

Example : 2+0=0+2=2.

5. Existence of Inverse element :

If a is a real number then there exists a real number (-a) such that :

a+(-a) =(-a) +a =0.

Example : 3+(-3)=(-3)+3 =0.

Multiplication :

1. Closure Properties :

If a and b is a real numbers then a x b is also a real number.

Example : 2 x ✔ 3 =✔ 3 x 2.

2.Commutative Properties :

If a and b are real numbers then a x b = b x a.

Example : 3 x ✔ 5 = ✔ 5 x 3.

3.Associatative Properties :

If a, b, c, are real numbers then (a x b) x c = a x (b x c).

Example : (2 x 3) x 4 = 2 x(3 x 4).

4. Existence of Identity element :

One is the identity element for all real numbers such that :

a x 1 =1 x a = a.

Example : ✔ 2 x 1=1 x ✔ 2 = ✔ 2.

5. Existence of Inverse element :

For every non zero real number (a) there exists a real number such that :

a x 1/a = 1/a x a =1.

Example : 3 x1/3 =1/3 x 3 =1.

THE FOLLOWING POINTS ARE TO BE NOTED :

11. The sum of two natural number is always a natural number.

For example : 2+2=4, 2+3=6 etc.

12. The difference of two natural number may or may not be a natural number.

For example :3-8= - 5,where 3 and 8 are natural numbers but - 5 is not a natural number.

13. The product of two negative integers is always a natural number.

For example : (- 2)(-3)=6

14. The sum of two rational numbers is always a rational number.

For example : 2/3 +3/5=19/15.

15. The product of two irrational numbers may or may not be a rational number.

For example : ✔ 2x✔ 2=2 (rational number)

✔ 2x✔ 3=✔ 6 (irrational number)

16. The sum of two irrational numbers may or may not be an irrational number.

For example : (3+✔ 5)+(3-✔ 5)=6 (rational number)

✔ 3+✔ 3=2✔ 3 (irrational number)

17. If x is a rational number then 1/x is not always a rational number.

For example : 0 is a rational number but 1/0 is undefined and not a rational number.

18. The quotient of two irrational numbers is not always an irrational number.

For example : ✔ 8÷✔ 2=2 (rational number)

20. Pythagoras theorem : In a right-angled triangle, the area of the square on the side opposite to the right angle (hypotenuse) is equal to the sum of the areas of the squares on the other two sides.

Solved Sums :

1. Which of the following is a rational number and which one is an irrational number?

i) 2/3, ii) 0, iii) ✔ 2.

Ans: i) 2/3 is real and rational.

ii) 0 is real and rational.

iii) ✔ 2 is real and irrational.

2. Write two rational numbers between 1/3 and 1/2.

Ans : One rational number between 1/3 and 1/2 is

1/2 (1/3 +1/2)=5/12.

One rational number between 1/3 and 5/12 is

1/2(1/3 +5/12)=3/8.

3. Fill in the blanks:

i) A rational number between - 1 and - 2 is____.

Ans: 1/2{(-1)+(-2)}= - 3/2

ii) Sum of least whole number and least natural number is____.

Ans: 0+1=1

iii) 5/7 is a______ number.

Ans: recurring decimal

4. Simplify :

3✔ 3 - 4(✔ 7 +✔ 3) +4✔ 7 +✔ 3

=3✔ 3 - 4✔ 7 - 4✔ 3 +4✔ 7 +✔ 3

=4✔ 3 - 4✔ 3

=0

Ans:0.

5. Find the simplest value of (3✔ 2 +✔ 5)(3✔ 2 - ✔ 5)

Ans: (3✔ 2 +✔ 5)(3✔ 2 - ✔ 5)

=18 - 5 =13.

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