WORKSHEET ON NUMBER SYSTEM

1. **Natural Numbers**
   Set of counting numbers is called the Natural Numbers
   N = {1,2,3,4,5,…}

2. **Whole number**
   Set of Natural numbers along with Zero is called the Whole Numbers
   W= {0,1,2,3,4,5,….}

   Note:

- So all natural Number are whole number but all whole numbers are not natural numbers
- 2 is Natural Number
- -2 is not a Natural number
- 0 is a whole number

3. **Even Numbers**

   Numbers which are divisible by 2

   E = { 0, 2, 4, 6, ……}

4. **Odd Numbers**

   Numbers which are not divisible by 2

   O = { 1, 3, 5, 7, ……}

5. **Prime Numbers**

   Numbers which have exactly 2 factors, 1 and the number itself.

   P = { 2, 3, 5, 7, 11, 13, 17, 19,…….]

6. **Integers**

   Integers is the set of all the whole number plus the negative of Natural Numbers
   Z={…...,-7,-6,-5,-4,-3,-2,-1,0,1,2,3,4,5,6,7,……}
   Note

- So integers contains all the whole number plus negative of all the natural numbers
- The natural numbers without zero are commonly referred to as positive integers
- Natural numbers with zero are referred to as non-negative integers

7. **Rational Number**
   The numbers which can be expressed in the form p/q where p and q are integers ($q \neq 0$) are called rational numbers.
   Example : 1/2, 4/3 ,5/7 ,1 etc.

Important Points to Note

- Every integer, natural and whole number is a rational number as they can be expressed in terms of p/q
- There are infinite rational number between two rational number
- They either have Terminating decimal expression or Non terminating & repeating decimal expression.
- SO if a number whose decimal expansion is terminating or non-terminating recurring then it is rational

Properties of Rational Numbers

- The sum, difference and the product of two rational numbers is always a rational number.
- The quotient of a division of one rational number by a non-zero rational number is a rational number.
- Rational numbers satisfy the closure property under addition, subtraction, multiplication and division.

8. Irrational Number

A number is called irrational if it cannot be expressed in the form p/q where p and q are integers (q> 0).
Example: $\sqrt{3}$,$\sqrt{2}$,$\sqrt{5}$, $\sqrt{15}$, π, 0.101010110010001 etc.

They have non terminating and non repeating decimal expression. If a number is non terminating and non repeating decimal expression, then it is an irrational number

Important Points to Note

- Pythagoras Theorem: In a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides. Using this theorem we can represent the irrational numbers on the number line.
- The sum, difference, multiplication and division of irrational numbers are not always irrational. Irrational numbers do not satisfy the closure property under addition, subtraction, multiplication and division
- The sum or difference of a rational number and an irrational number is an irrational number.
- The product or division of a rational number with an irrational number is an irrational number.

9. Real Numbers :

All rational and all irrational number makes the collection of real number. It is denoted by the letter R

We can represent real numbers on the number line.

The square root of any positive real number exists and that also can be represented on number line

Real numbers satisfy the commutative, associative and distributive laws.

These can be stated as :

1. Commutative Law of Addition: **a+b = b+a**
2. Commutative Law of Multiplication: **a × b = b× a**
3. Associative Law of Addition: **a + (b+c) = (a+b) +c**
4. Associative Law of Multiplication: **a × (b × c) = (a × b) × c**
5. Distributive Law: **a × (b + c) = (a× b) + (a × c)**

OR

(a + b) × c = (a × c) + (b× c)

Example 1.

Write the following in decimal form and say what kind of decimal expansion each has:
(i) 15/100 (ii) 1/9 (iii) 2/11 (iv) 3/13

Answer

i)	15/100	0.15 (Terminating)
ii)	1/9	0.111111… (Non terminating repeating)
iii)	2/11	.18181818….(Non terminating repeating)
iv)	3/13	0.230769230769… = 0.230769 (Non terminating repeating)

Example 2.

Express $0.\overline{7}$ in the form p/q where p and q are integers and $q \neq 0$.

Solution :

Let $x = 0.777\ldots\ldots$

$10x = 7.777\ldots\ldots$

$10x = 7 + 0.777\ldots.$

$10x = 7 + x$

$9x = 7$

$x = 7/9$

PRACTICE PROBLEMS

1. State whether the following statements are true or false. Give reasons for your answers.
   (i) Every natural number is a whole number.
   (ii) Every integer is a whole number
   (iii) Every rational number is a whole number.
   (iv) Is zero rational number?
   (v) Are integers rational Number ?
   (vi) Are negative number rational Numbers?
   (vii) There are infinite real numbers between 1.2 and 1.3
   (viii) Every irrational number is a real number.
   (ix) Every point on the number line is of the form $\sqrt{m}$, where m is a natural number.
   (x) Every real number is an irrational number.
2. Find two rational numbers between 0.1 and 0.2
3. Find two rational numbers between $\frac{-1}{2}$ and $\frac{1}{4}$.
4. Find six rational numbers between 3 and 4.
5. Which of the following is a rational number?

a. $\sqrt{63}$
b. $\sqrt{250}$
c. $\sqrt{1681}$
d. $\sqrt{123}$

6. Simplify: $(32)^{\frac{2}{5}}$
7. Express $0.\overline{245}$ as a fraction in the simplest form.
8. Is zero a rational number? Can you write it in the form $\frac{p}{q}$ 'where p and q are integers and $q \neq 0$?
9. Are the square roots of all positive integers irrational? If not, give an example of the square root of a number that is a rational number:
10. Write three numbers whose decimal expansions are non-terminating & non-recurring.

** Solve this problems and submit by 2nd April.

** THIS WORKSHEET IS PREPARED AT HOME