

## Formulas and definitions for Number System

- Number system is a writing system for presenting number on the number line. A number system is a system of writing or expressing numbers.
- There are generally two type of Number
  - **Whole Number**
  - **Natural Number.**

### Basics of Number System:

- **Natural Numbers**
  - All positive integers are called natural numbers. All counting numbers from 1 to infinity are natural numbers.  $N = \{1, 2, 3, 4, 5, 6, \dots, \infty\}$
- **Whole Numbers**
  - The set of numbers that includes all natural numbers and the number zero are called whole numbers. They are also called as Non-negative integers.  $W = \{0, 1, 2, 3, 4, 5, 6, 7, 8, \dots, \infty\}$
- **Integers**
  - All numbers that do not have the decimal places in them are called integers.  $Z = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots, \infty\}$
  - a. Positive Integers: 1, 2, 3, 4, .... is the set of all positive integers.
  - b. Negative Integers: -1, -2, -3, .... is the set of all negative integers.
  - c. Non-Positive and Non-Negative Integers: 0 is neither positive nor negative.
- **Real Numbers**

- All numbers that can be represented on the number line are called real numbers.

- **Rational Numbers**

- A rational number is defined as a number of the form  $a/b$  where 'a' and 'b' are integers and  $b \neq 0$ . The rational numbers that are not integers will have decimal values. These values can be of two types
- a. Terminating decimal fractions: For example:  $1551 = 0.5$ ,  $12544125 = 31.25$
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- b. Non-Terminating decimal fractions: For example:  $196619 = 3.1666666$ ,  $219921 = 2.33333$

- **Irrational Numbers**

- It is a number that cannot be written as a ratio  $\frac{p}{q}$  form (or fraction). An Irrational numbers are non-terminating and non-periodic fractions. For example:  $22 = 1.414$

- **Complex Numbers**

- The complex numbers are the set  $\{a+bi\}$ , where, a and b are real numbers and 'i' is the imaginary unit.

- **Imaginary Numbers**

- A number does not exist on the number line is called imaginary number. For example square root of negative numbers are imaginary numbers. It is denoted by 'i' or 'j'.

- **Even Numbers**

- A number divisible by 2 is called an even number.
- For example: 2, 6, 8, 14, 18, 246, etc.

- **Odd Numbers**

- A number not divisible by 2 is called an odd number.
- For example: 3, 7, 9, 15, 17, 373, etc.

- **Prime numbers**

- A number greater than 1 is called a prime number, if it has exactly two factors, namely 1 and the number itself.
- For example: 2, 3, 5, 7, 11, 13, 17, etc.

- **Composite numbers**

- Numbers greater than 1 which are not prime, are known as composite numbers. For example: 4, 6, 8, 10, etc.

Formulas for finding the Squares of a number .

- Squares of numbers 91-100:

- $97^2$

Step 1:  $100 - 97 = 3$

Step 2:  $97 - 3 = 94$

Step 3:  $3^2 = 09$

Final result: From step 2 and

Step 3  $\Rightarrow 97^2 = 9409$

- $91^2$

Step 1:  $100 - 9 = 91$

Step 2:  $91 - 9 = 82$

Step 3:  $9^2 = 81$

Final Result: From step 2 and step 3  $\Rightarrow 91^2 = 8281$

- Squares of numbers 100-109:
- $102^2$

Step 1:  $102-100 = 2$

Step 2:  $102 + 2 = 104$

Step 3:  $2^2 = 04$  Final result:

From step 2 and step 3  $\Rightarrow 102^2 = 10404$

- $107^2$

Step 1:  $107-100 = 7$

Step 2:  $107+7 = 114$

Step 3:  $7^2 = 49$

Final Result: From step 2 and step 3  $\Rightarrow 107^2 = 11449$

- **Squares of numbers 51-60**
- $53^2$

Step 1:  $53-50 = 3$

Step 2:  $25+3 = 28$

Step 3:  $3^2 = 09$

Final result: From step 2 and step 3  $\Rightarrow 53^2 = 2809$ .

- $42^2$

Step 1:  $50 - 42 = 8$

Step 2:  $25 - 8 = 17$

Step 3:  $8^2 = 1764$

Final Result From step 2 and step 3  $\Rightarrow 42^2 = 1764$