Class: 7th **Subject: Computer Science**

Lesson No 2. [Number System]

Points at a glance:

i. Number system is a way to represent numbers.

ii. Number systems are the techniques to represent numbers in the computer system architecture, every value that we are saving or getting into/from computer memory has a defined number system.

iii. There are two types of number systems: Positional and Non Positional Number System.

iv. The value in a number system that depends on the position of the digits is called the Positional Number System.

v. In non-positional number systems each digit in a number represents the same value regardless of its position. In other words, the position in non-positional number systems isn't a determining factor.

vi. There are mainly four types of Positional number systems:

- Decimal Number System
- Binary Number System
- Octal Number System
- HexaDecimal Number System

vii. The Decimal number system consists of ten digits 0 to 9 with the base 10.

viii. The Binary number system is a base 2 number system , and the symbols it uses are 0 and 1.

ix. The Octal Number System consists of 8 digits (0 to 7) with the base 8.

x. The Hexadecimal Number System consists of 16 digits (0 to 15) with the base 16. It represents 0 – 9 with numbers and 10 – 15 digits with letters A – F respectively.

xi. The base of the number system is defined as the total number of digits available in the number system.

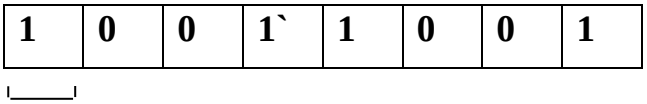
xii. If the last digit of a binary number is 1, the number is odd; if it's 0, the number is even. Example: 1101 represents an odd number 13; 10010 represents an even number 18.

Exercises [Formative and Summative]

1. Tick (✓) the correct answer:
   a. On and Off
   b. 1 and 0
   c. Off
   d. Byte
   e. Nibble
   f. Bit
   g. Decimal
   h. Binary
   i. 0 to 7
2. Write 'T' for True and 'F' for False statement.
   a. False
   b. True
   c. True
   d. False
   e. False
3. Fill in the blanks
   a. Positional Number System
   b. 10
   c. Binary Number System
   d. Octal Number System
   e. Hexadecimal Number System
4. Answer the following questions
   a. Computers can only read instructions in binary code. The binary number system consists of only two digits 0 and 1. The 0 represents OFF state whereas 1 represents ON state of a signal. The base of the binary number system is 2, since it uses only two digits.
   b.

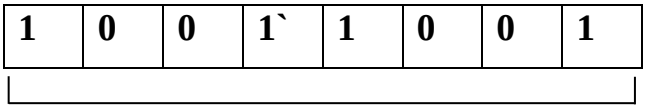
Decimal Number System	**Binary Number System**
1. The Decimal number system uses 10 symbols: (0 – 9).	The Binary number system consists Of only two digits 0 and 1.
2. The base of the Decimal number system is 10.	The base of the Binary number System is 2.

c. **Bit:** The smallest unit in computer processing is called Bit. It is a unit of data that can be either of two conditions 0 or 1.



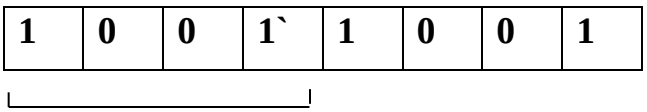
Bit

Byte: A group of eight bits is called a Byte.



Byte

Nibble: Half a byte is called Nibble. A nibble is a collection of bits on a 4 – bit boundary.



Nibble

d. The number system is divided into two categories:
   1. Positional Number System 2. Non Positional Number System
e. The different number systems used in positional number system are:
   1. Decimal Number System
   2. Binary Number System
   3. Octal Number System
   4. HexaDecimal Number System
f. The base of Decimal Number System is 10
g. The base of Octal Number System is 8.
h. **Positional Number System:** The value in a number system that depends on the position of the digits is called the Positional Number System. The Positional Number System depends on where the numbers are placed in the sequence of numbers. It is also known as weighted Number System.
   Non – Positional Number System: The Non – Positional Number system does not depend on the position of the number and symbols are used to represent the number. In non-positional Number Systems each digit in a number represents the same value regardless of its position. It is also known as Non-weighted Number System.

5. Convert the following
   a. Decimal to Binary
   i. 345

			Remainder
2	345	→	1
2	172	→	0
2	86	→	0
2	43	→	1
2	21	→	1
2	10	→	0
2	5	→	1
2	2	→	0
	1		

Hence, $(345)_{10} = (101011001)_2$

ii. 113

			Remainder
2	113	→	1
2	56	→	0
2	28	→	0
2	14	→	0
2	7	→	1
2	3	→	1
2	1		

Hence, $(113)_{10} = (1110001)_2$

iii. 145

		Remainder
2	145 →	1
2	72 →	0
2	36 →	0
2	18 →	0
2	9 →	1
2	4 →	0
2	2 →	0
	1	

Hence, $(145)_{10} = (10010001)_2$

b. Binary to Decimal

i. 111

$111 = 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$
$= 4 + 2 + 1$
$= 7$

Therefore, $(111)_2 = (7)_{10}$

ii. 1101

$1101 = 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
$= 8 + 4 + 0 + 1$
$= 13$

Therefore, $(1101)_2 = (13)_{10}$

ii. 1000

$1000 = 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
$= 8 + 0 + 0 + 0$
$= 8$

Therefore, $(1000)_2 = (8)_{10}$

c. Decimal to Octal

i. 45

			Remainder
8	45	→	5
	5		

Hence, $(45)_{10} = (55)_8$

ii. 70

			Remainder
8	70	→	6
8	8	→	0
	1		

Hence, $(70)_{10} = (106)_8$

iii. 220

			Remainder
8	220	→	4
8	27	→	3
	3		

Hence, $(220)_{10} = (334)_8$

d. Decimal to HexaDecimal

i. 22

			Remainder
16	22	→	6
	1		

Hence, $(22)_{10} = (16)_{16}$

ii. 330

			Remainder
16	330	⟶	10
16	20	⟶	4
	1		

Hence, $(330)_{10} = (14A)_{16}$

iii. 840

			Remainder
16	840	⟶	8
16	52	⟶	4
	3		

Hence, $(8400)_{10} = (348)_{16}$