LESSON 1 : NUMBER SYSTEM

SECTION-A

A. Fill in the blanks :

1. 2
2. decimal number
3. 8
4. 10
5. Binary
6. Hexadecimal
7. 0

B. State True or False :

1. True
2. False
3. True
4. False
5. False

SECTION-B

A. Multiple Choice Questions :

1. b. Aryabhat
2. a. Digital computer
3. c. Binary
4. b. 1
5. a. 2

B. Answer the following :

1. **Explain Number system and its commonly used types.**

   A number system is a way to represent numbers in the computer system architecture. Computer architecture supports following number systems. Decimal number system, Binary number system, Octal number system, Hexadecimal number system.

2. **What are the rules to convert a Decimal number into Binary number?**

   An easy method of converting decimal to binary number equivalents is to write down the decimal number and to continually divide-by-2 (two) to give a result and a remainder of either a “1” or a “0” until the final result equals zero

3. **Write the rules to multiply two Binary numbers.**

   The placement of the binary point in the product of two binary numbers having fractional representation is determined in the same way as in the product of decimal numbers with fractional representation. The total number of places after the binary point in the multiplicand and the multiplier is counted.

4. **Briefly explain the Octal number system.**

   The octal numeral system, is the base-8 number system, and uses the digits 0 to 7. Octal numerals can be made from binary numerals by grouping consecutive binary digits into groups of three (starting from the right). For example, the binary representation for decimal 74 is 1001010

ACTIVITY SECTION

A. Convert the following Decimal numbers into Binary numbers:

a. 68

2	68	0
2	34	0
2	17	1
2	8	0
2	4	0
2	2	0
	1	

$(1000100)_2$

b. 987 = 1111011011

2	987	1
2	493	1
2	246	0
2	123	1
2	61	1
2	30	0
2	15	1
2	7	1
2	3	1
	1	

$(111011011)_2$

c. 657

2	657	1
2	328	0
2	164	0
2	82	0
2	41	1
2	20	0
2	10	0
2	5	1
2	2	0
	1	

$(1010010001)_2$

B. Convert the following Binary numbers into Decimal numbers:

a. 1011 $= (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0)$ = 11

b. 100110 $= (1 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0)$ = 38

c. 10101 $= (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0)$ = 21

C. Perform Binary addition on the following:

a. 10101 + 00111

$$\begin{array}{r} 1\,0\,1\,0\,1 \\ +\ 0\,0\,1\,1\,1 \\ \hline \mathbf{1\,1\,1\,0\,0} \end{array}$$

b. 1001101 + 1000101101

$$\begin{array}{r} 0\,0\,0\,1\,0\,0\,1\,1\,0\,1 \\ +\ 1\,0\,0\,0\,1\,0\,1\,1\,0\,1 \\ \hline \mathbf{1\,0\,0\,1\,1\,1\,1\,0\,1\,0} \end{array}$$

c. 1101 + 1001

$$\begin{array}{r} 1\,1\,0\,1 \\ +\ 1\,0\,0\,1 \\ \hline \mathbf{1\,0\,1\,1\,0} \end{array}$$

D. Find the difference between the following Binary numbers:

a. 10011 – 01010

$$\begin{array}{r} 1\,0\,0\,1\,1 \\ -\ 0\,1\,0\,1\,0 \\ \hline \mathbf{0\,1\,0\,0\,1} \end{array}$$

b. 11001001 – 01100110

$$\begin{array}{r} 1\,1\,0\,0\,1\,0\,0\,1 \\ -\ 0\,1\,1\,0\,0\,1\,1\,0 \\ \hline \mathbf{0\,1\,1\,0\,0\,0\,1\,1} \end{array}$$

c. 111 – 001

$$\begin{array}{r} 1\,1\,1 \\ -\ 0\,0\,1 \\ \hline \mathbf{1\,1\,0} \end{array}$$

E. Multiply the following Binary numbers:

a. 101 x 011

$$\begin{array}{rrrrr} & & 1 & 0 & 1 \\ & \times & 0 & 0 & 1 \\ \hline & & 1 & 0 & 1 \\ & 1 & 0 & 1 & \\ 0 & 0 & 0 & & \\ \hline 0 & \mathbf{1} & \mathbf{1} & \mathbf{1} & \mathbf{1} \end{array}$$

b. 1011 x 101

$$\begin{array}{rrrrrr} & & 1 & 0 & 1 & 1 \\ & & \times & 1 & 0 & 1 \\ \hline & & 1 & 0 & 1 & 1 \\ & 0 & 0 & 0 & 0 & \\ 1 & 0 & 1 & 1 & & \\ \hline \mathbf{1} & \mathbf{1} & \mathbf{0} & \mathbf{1} & \mathbf{1} & \mathbf{1} \end{array}$$

c. 101010 x 1011

			1	0	1	0	1	0	
				×	1	0	1	1	
			1	0	1	0	1	0	
		1	0	1	0	1	0		
	0	0	0	0	0	0			
1	0	1	0	1	0				
1	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**0**	

E. Multiply the following Binary numbers:

a. 1111 ÷ 11 = 101

```
     1  0  1
   ┌──────────
11 │ 1  1  1  1
     1  1  ↓
   ──────────
     0  0  1  1
           1  1
        ──────
           0  0
```

OR

Number 1 in the decimal system
$1111_2 = 15_{10}$

Number 2 in the decimal system
$11_2 = 3_{10}$

Their attitude
15 / 3 = 5

Result in binary form
$5_{10} = 101_2$

b. 111001 ÷ 101 = 1011 Remainder : 10

```
     1  0  1  1
   ┌──────────────
101 │ 1  1  1  0  0  1
     1  0  1  ↓  ↓  │
   ──────────       │
        1  0  0  0  │
           1  0  1  ↓
        ──────────
           1  1  1
           1  0  1
        ──────
              1  0
```

OR

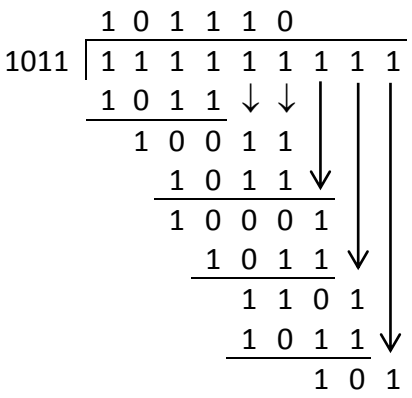
Number 1 in the decimal system
$111001_2 = 57_{10}$

Number 2 in the decimal system
$101_2 = 5_{10}$

Their attitude
57 / 5 = 11.4

Result in binary form
$11.4_{10} = 1011_2$

c. 111111111 ÷ 1011 = 101110 Remainder : 101



OR

Number 1 in the decimal system
$111111111_2 = 511_{10}$

Number 2 in the decimal system
$1011_2 = 11_{10}$

Their attitude
511 / 11 = 46.454545454545

Result in binary form
$46.454545454545_{10} = 101110_2$

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