#180 days of code 18/08/23

Day 1/180

Lec-1

Introduction to Programming

Number System

- Binary number System → Base 2 (0, 1)
  - used in electronic System
  - machine understandable no. system
  - Two digit/bits
- Decimal number System → Base 10 (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)
  - used in our day to day life
  - human understandable no. system
  - 10 unique digits
- Octal number System → Base 8 (0, 1, 2, 3, 4, 5, 6, 7,)
  - 8 digits
- Heradecimal number System → Base 16 (
  - used IP address

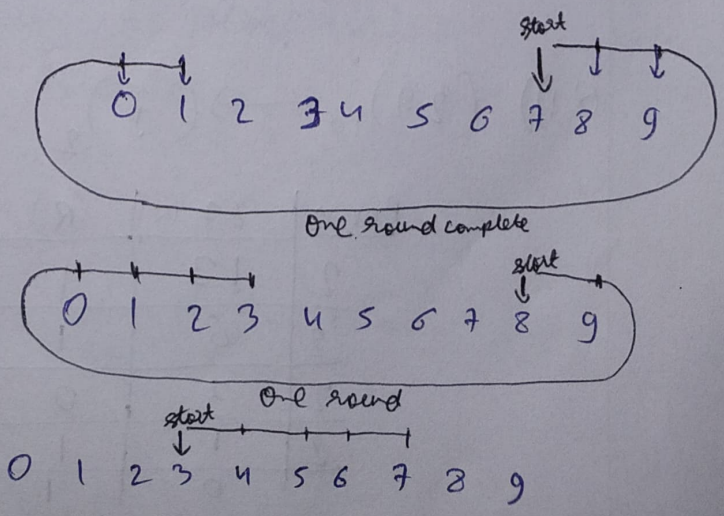
Decimal no. System

How it works?

7 + 4 = 11

8 + 5 = 13

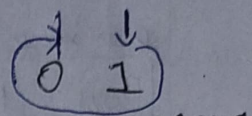
3 + 4 = 7



Binary no. System

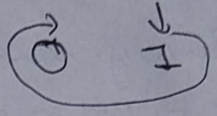
↳ Two digit (0, 1)

↳ Base 2 no.



$$\begin{array}{r} 0 \\ +0 \\ \hline 0 \end{array} = 0 \qquad \begin{array}{r} 0 \\ +1 \\ \hline 1 \end{array} = 1 \qquad \begin{array}{r} 1 \\ +0 \\ \hline 1 \end{array} = 1 \qquad \begin{array}{r} {\scriptstyle 1}\,1 \\ +1 \\ \hline 10 \end{array} = 2$$

$$\begin{array}{r} 10 \\ +1 \\ \hline 11 \end{array} = 3 \qquad \begin{array}{r} {\scriptstyle 1\ 1}\ \ \\ 11 \\ +1 \\ \hline 100 \end{array} = 4$$



* Conversion of Decimal no. System into Binary no. System

i.e. $\text{Base}_{10} \xrightarrow{\text{convert}} \text{Base}_2$

Rule :-) Check the base of the no. system

) Divide the given no. by base until the quotient becomes 0

) When the quotient becomes 0 take the reverse order of the remainder & it will be the ans

Q1)) $(27)_{10} \longrightarrow (\ ?\ )_2$

Base→2	27 (Q)	(R)
2	13	1
2	6	1
2	3	0
2	1	1
	0	1

$\therefore (27)_{10} = (11011)_2$

$(43)_{10} \longrightarrow (?)_2$

Base→2	43 (Q)	(R)
2	21	1
2	10	1
2	5	0
2	2	1
2	1	0
	0	1

$\therefore (43)_{10} \longrightarrow (1001011)_2$

Verification

Convert 278 into decimal no. system

→ means Base 10

Base→10	278 (Q)	(R)
10	27	8
10	2	7
	0	2

we get 278

2 7 8 → $2\times10^2 + 7\times10^1 + 8\times10^0 = 278$

(2: hundreds place, 7: tens place, 8: ones place)

multiplying the digit with its place value & add them

Similar approach is used to convert Binary no. System into Decimal no. System

Binary to Decimal conversion i.e. Base 2 ⟶ Base 10

Q3)) $(101)_2 \longrightarrow (?)_{10}$

↳ Base 2 no.

101

PV PV PV

2^2 2^1 2^0

$1\times2^2 + 0\times2^1 + 1\times2^0 \Rightarrow 4 + 0 + 1$

multiplying bits with its place value & adding them $\Rightarrow 5$

$\therefore (101)_2 \Rightarrow (5)_{10}$

Q4)) $(110101)_2 \longrightarrow (?)_{10}$

$1\ 1\ 0\ 1\ 0\ 1 \Rightarrow 1\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0$

$2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0 \Rightarrow 32 + 16 + 0 + 4 + 0 + 1$

$\Rightarrow 53$

Homework (Decimal to Binary)

↳ Base 2

i) 37

	Q	R
N=37	37/2=18	1
N=9	18/2=9	0
N=4	9/2=4	1
N=2	4/2=2	0
N=1	2/2=1	0
N=0	1/2=0	1

$\therefore (37)_{10} \Rightarrow (100101)_2$

ii) 92

	(Q)	(R)
Num=92	92/2=46	0
Num=46	46/2=23	0
Num=23	23/2=11	1
Num=11	11/2=5	1
	5/2=2	1
	2/2=1	0
Num=0	1/2=0	1

$\therefore (92)_{10} = (1011100)_2$

(iii) 128

Base→2	128 (Q)	(R)
2	64	0
2	32	0
2	16	0
2	8	0
2	4	0
2	2	0
2	1	0
	0	1

$\therefore (128)_{10} = (10000000)_2$

Homework (Binary to Decimal)

i) → $1011 \rightarrow 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0 = 11$

ii) → $111001 \rightarrow 1\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0 = 57$

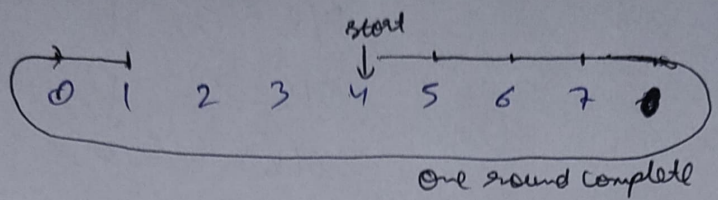
iii) → $10011011 \rightarrow 1\times2^7 + 0\times2^6 + 0\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0 = 155$

Octal no. System

(0, 1, 2, 3, 4, 5, 6, 7)

↳ Base 8 no. system

$$\begin{array}{r} {\scriptstyle 1}\ 4 \\ +\ 5 \\ \hline 1\,0 \end{array}$$



Decimal	Octal
9	11

Conversion Decimal to octal

↳ Base 8 (divide the no. by 8)

Q)) $(23)_{10} \longrightarrow (?)_8$

Base 8	23 (Q)	(R)
8	2	7
	0	2

$\therefore (23)_{10} = (27)_8$

Convert int. Decimal

$\Rightarrow 2 \times 8^1 + 7 \times 8^0 \longleftarrow 27$ (PV: 8^1, 8^0)

$\Rightarrow 16 + 7$

$\Rightarrow 23$

Hexadecimal no. System

→ Base 16

↓

16 unique digits

(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F)

A → 10, B → 11, C → 12, D → 13, E → 14, F → 15

Convert Decimal to Hexadecimal

Q)) $(11)_{10} \longrightarrow (?)_{16}$

↓

Base 16 (Divide the no. by 16)

Base 16	11 (Q)	R
	0	11 → B

$\therefore (11)_{10} = (B)_{16}$

↓ convert Hexadecimal into decimal

$\Rightarrow B \xrightarrow{means} 11$

$\Rightarrow 11 \times 16^0$

$\Rightarrow 11$

$\therefore (B)_{16} = (11)_{10}$

Q)) $(17)_{10} = (?)_{16}$

Base 16	17 (Q)	R
16	1	1 ↑
	0	1

$\therefore (17)_{10} = (11)_6$

Read as one one not eleven

↓ convert into Decimal

$= 1 \times 16^1 + 1 \times 16^0$

$= 16 + 1$

$= 17$

Q)) Convert $(AC2)_{16} \longrightarrow (?)_{10}$

A C 2 $\Rightarrow$ $A\times16^2 + C\times16^1 + 2\times16^0$

16^2 16^1 16^0 $\Rightarrow$ $10\times16^2 + 12\times16^1 + 2$

$\Rightarrow 10\times256 + 12\times16 + 2$

$\Rightarrow 2754$

Sheet

Questions to solve

•) Convert Decimal to Binary

1) 37 3) 128

2) 92 4) 243

•) Convert Binary to Decimal

5) 1011 7) 10011011

6) 1110011 8) 10100100

•) Convert Decimal to octal

9) 28 11) 928

10) 47 12) 1243

•) Convert octal to Decimal

13) 41 15) 124

14) 207 16) 311

•) Convert Decimal to Hexadecimal

17) 317 19) 14

18) 41 20) 845

•) Convert Hexadecimal to Decimal

21) A11 23) AE29

22) 49 24) D97