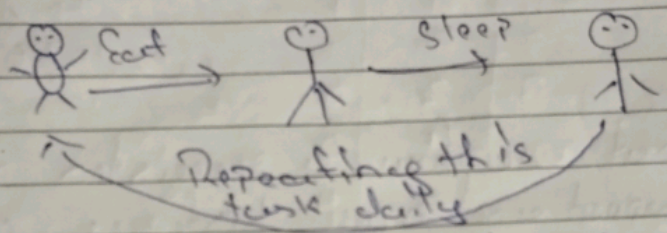
Rohit Negi DSA Course

Date Page

180 Days challenge Accepted

Day-(1) [Date: 18-04-2023]

Topic:



=> Because of absence of wealth farming they use to eat meat.

=> In that time to count goat he used to kept stone of number of goat and at night when he came he throws stone by seeing the goat.

Goat Stone

G. G $ $
G G $ $ $
G

-> But having 500 goat, this method will not work.

In Previous time, People use Egypt System having Base - 60.

=> Then Indian setup Decimal System Base - 10. Digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Calculation in that time! 7+4 = 11

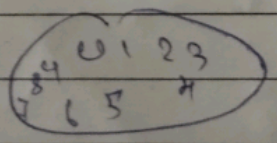
Cycle Moving 4 from 7 in repeat cycle

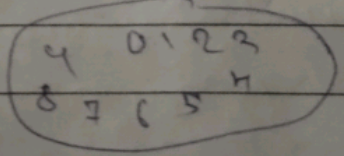
=> After that we have a register to store import and export history and to calculate that 500 entries is difficult.

Import	Export	Profit?
100	2000	
500	1000	
650	120	
50	:	

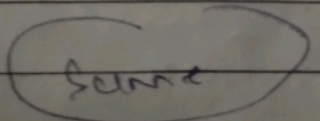
To calculate this fast and Accurate we invent computer

=>





Mechanical computers a person required to operate



Transistors:

Evolution: Binary Numbers $\{0, 1\}$ = Base-2

Operation:

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

repeat cycle

(reverse)

$$\begin{array}{r} 1 \\ 111 \\ +\;\;1 \\ \hline 100 \end{array} \qquad \begin{array}{r} 100 \\ +\;\;1 \\ \hline 101 \end{array} \qquad \begin{array}{r} 1\,1\,0 \\ +\;\;\;1 \\ \hline 1000 \end{array}$$

Binary → Decimal

0 → 0
1 → 1
2 → 10
3 → 11
4 → 100
5 → 101

How to convert Decimal to Binary

	Quotient	Remainder
2	27	
2	13	1
2	6	1
2	3	0
2	1	1
	0	1

⇒ Binary of 27: 11011

Example.2

	Quotient	R
2	14	
2	7	1
2	4	1
2	2	0
2	1	0
	0	1

Binary of 14: 1011

Hence steps to find convert from decimal to base (n), divide it from n and note remainder till quotient = 0.

Example.3 278 in base 10

10	278	
10	27	8
10	2	7
	0	2

278

Now $2\ 7\ 8 = 2\times10^2 + 7\times10^1 + 8\times10^0$

$10^2\ 10^1\ 10^0 = 200 + 70 + 8$

$= 278$

Hence LHS = RHS

Example $(1010)_2$ in Decimal

1 0 1 0 $= 0\times2^0 + 1\times2^1 + 0\times2^2 + 1\times2^3$

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

$= (10)_{10}$

Here to find (base)n to decimal multiply digit to their respective powers ofn.

$(a\ b\ c\ d)_{base(n)}$

In decimal: $dn^0 + cn^1 + bn^2 + an^3$

Octal Number -> Base(8)

Now digits: {0,1,2,3,4,5,6,7}

Converting 27 to Octal

Q R -> Ans: 33

Base 8	27	
8	3	3 ↑
	0	3

Verifying:

33

$8^1\ 8^0$

$= 3\times8 + 3\times1 = 24+3$

$= 27$

Converting 71 in decimal

71

$8^1\ 8^0$

$= 1\times8^0 + 7\times8$

$= 56+1 = 57$

Hexadecimal -> Base(16)

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

10 11 12 13 14 15

Convert 54 in Hexadecimal Number

Base 16 | 54 | B
16 | 3 | 6 ↑
0 | 3 |

= 36 -> Hexadecimal

Verification:

36 = $6 \times 16^0 + 3 \times 16^1$

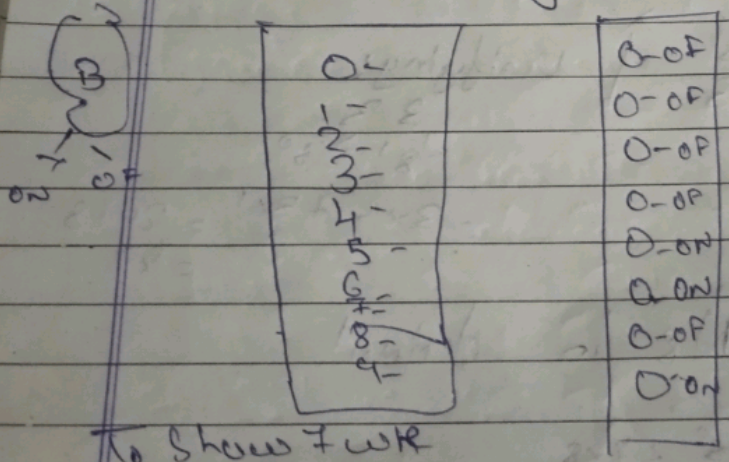
$16^1 16^0$ = 6 + 48 = 54

Convert AEB in Decimal Number

AEB = $10 \times 16^2 + 14 \times 16^1 + 11$

= 2795

When computer want to store number using transistor



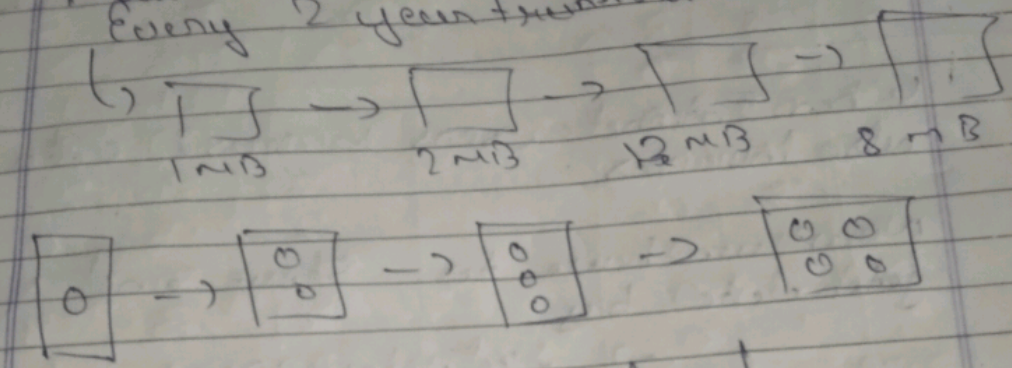
To store 13 we use binary 1101

To show 7 we open 7 bulb but when we have to store biggest number we want some different thing

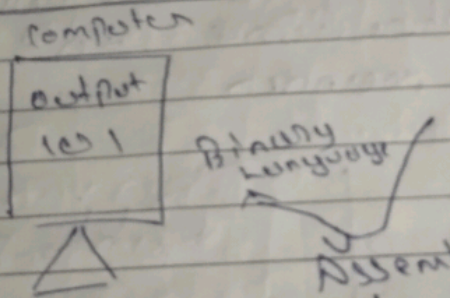
Now 2 bulb store 2^2 = 4 numbers

10 transistor store 2^{10} = 1024 numbers

Moore's law:
Every 2 years transistor double



Transistors size shrunk results hence Space increase



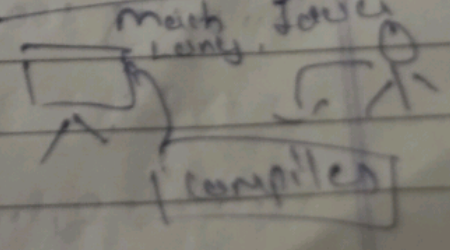
C, understand Binary language
=> Machine language

=> To communicate we require a translators.

After Assembly we have High level language

Python, Java

Command
2+5
5*7



Machine language >> Assembly >> HLL
Time of Execution

When Internet users increase data also increases

Now we have to store and fetch data by
-> reducing space
-> reducing time

And to implement this we have to use Data Structure to store in sorted manner

Gurdeep Bhaiya

Ask to Sum 100 natural numbers

1+2+3 . . . +100

=5050

Time 15 min

Similarly 100000

1+2+ . . . 100000

Time: 3days

Bablo bhaiya

Ask to Sum 100 Natural Numbers

$\frac{100 \times (100+1)}{2}$

=5050

Time: 1USec

$\frac{100000 (100000+1)}{2}$

Time: 2Sec

So we have to give command to reduce operation time and we learn Algorithm for it.

Day - (1) Homework

- Convert Decimal to Binary

(1) 37

=>

Base	Quotient	Rem.
2	37	
2	18	1
2	9	0
2	4	1
2	2	0
2	1	0
	0	1

$(37)_{10} = (100101)_2$

(2) 42

B O R

2	42	
2	46	0
2	23	0
2	11	1
2	5	1
2	2	1
2	1	0
	0	1

$(42)_{10} = (101100)_2$

(3) 128

B	Q	R
2	128	
2	64	0
2	32	0
2	16	0
2	8	0
2	4	0
2	2	0
2	1	0
	0	1

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

(4) 243

B	Q	R
2	243	
2	121	1
2	60	1
2	30	0
2	15	0
2	7	1
2	3	1
2	1	1
	0	1

$(243)_{10} = (11110011)_2$

- Convert Binary to Decimal

(5) 1011

⇒ 10 11

$2^3\ 2^2\ 2^1\ 2^0$

$= 1\times2^3 + 0\times2^2 + (1\times2^1) + (1\times2^0)$

$= 8 + 0 + 2 + 1$

$= 11$

(6) 111001

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

$= 32 + 16 + 8 + 1$

$= 57$

(7) 1001101

6 5 3 2 1 0

⇒ $1\times2^0 + 1\times2^1 + 1\times2^3 + 1\times2^4 + 1\times2^7$

$= 128 + 16 + 8 + 2 + 1$

$= 155$

8 7 6 5 4 3 2 1

8 1 0 1 0 0 1 0 0

⇒ $2^8 + 2^6 + 2^3$

$= 256 + 64 + 8$

$= 260 + 68$

$= 328$

• Convert Decimal to Octal

(10) 28

B	Q	R
8	28	
8	3	4
	0	3

(28)10 = (34)8

(14) 47

B	Q	R
8	47	
8	5	7
	0	5

(47)10 = (57)8

(11) 428

B	Q	R
8	428	
8	116	0
8	14	4
8	1	6
	0	1

(428)10 = (1640)8

(12) 1243

B	Q	R
8	1243	
8	155	3
8	19	3
8	2	3
	0	2

(1243)10 = (2333)8

• Convert Octal to Decimal

(13) (41)8
= 4×8¹ + 1×8⁰
= 32 + 01
= (33)10

(14) (147)8
= 1×8² + 4×8¹ + 7×8⁰
= 128 + 7
= 135

(15) (124)8
= 1×8² + 2×8¹ + 4×8⁰
= 64 + 16 + 4
= 84

(16) 311
= 3×8² + 1×8¹ + 1×8⁰
= 64×3 + 8 + 1
= 192 + 1 = 193

• Convert Decimal to HexaDecimal

17) 317

B	Q	R
16	317	
16	19	D
	1	3
	0	1

$(317)_{10} = (13D)_{16}$

18) 411

B	Q	R
16	411	
16	25	11
	1	9
	0	1

$(411)_{10} = (19B)_{16}$

19) 14

B	Q	R
16	14	E
	0	

$(14)_{10} = (E)_{16}$

20) 845

B	Q	R
16	845	
16	52	D
16	3	4
	0	3

$(845)_{10} = (34D)_{16}$

• Convert Hexadecimal to decimal

21) A11

$= 10 \times 16^2 + 16 + 1$

$= 2560 + 17$

$= 2577$

22) 4C

$= 4 \times 16 + 12$

$= 76$

23) AE2F

$= 10 \times 16^3 + 14 \times 16^2 + 2 \times 16 + 15$

$= 40960 + 3584 + 32 + 15$

$= 44591$

24) D47

$= 13 \times 16^2 + 4 \times 16 + 7$

$= 3328 + 64 + 7$

$= 3479$