Digital Eletronics :-

* Unit 1 :- Number system :-

[1] Decimal [2] Octal [3] Hexadecimal [4] Binary

other number systems

[1] Decimal :-

↳ Base = 10 = radix (r)

2 digit set

000 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 009

10 | 11 | 12 | 13 | 14 | ⋮ | 19

20 ---- 90

21 | 22 | 23 | ⋮ | 29

100 --- 990

99 | 109 | 999

10 symbols
10 digit quantities.

$(542)_{10}$ =

$2 \times 10^0 = 2 \times 1 = 2$

$4 \times 10^1 = 4 \times 10 = 40$

$5 \times 10^2 = 5 \times 100 = 500$

$(542)_{10}$

To convert any number system into Decimal.

$(a\,b\,c\,.\,d\,e\,f)_r \dashrightarrow$ Decimal

↳ $(a \times r^2) + (b \times r^1) + (c \times r^0) + (d \times r^{-1}) + (e \times r^{-2}) + (f \times r^{-3})$

$= (\quad)_{10}$

$(341.925)_{10} \Rightarrow r = 10$

$= (3 \times 10^2) + (4 \times 10^1) + (1 \times 10^0) + (9 \times 10^{-1}) + (2 \times 10^{-2}) + (5 \times 10^{-3})$

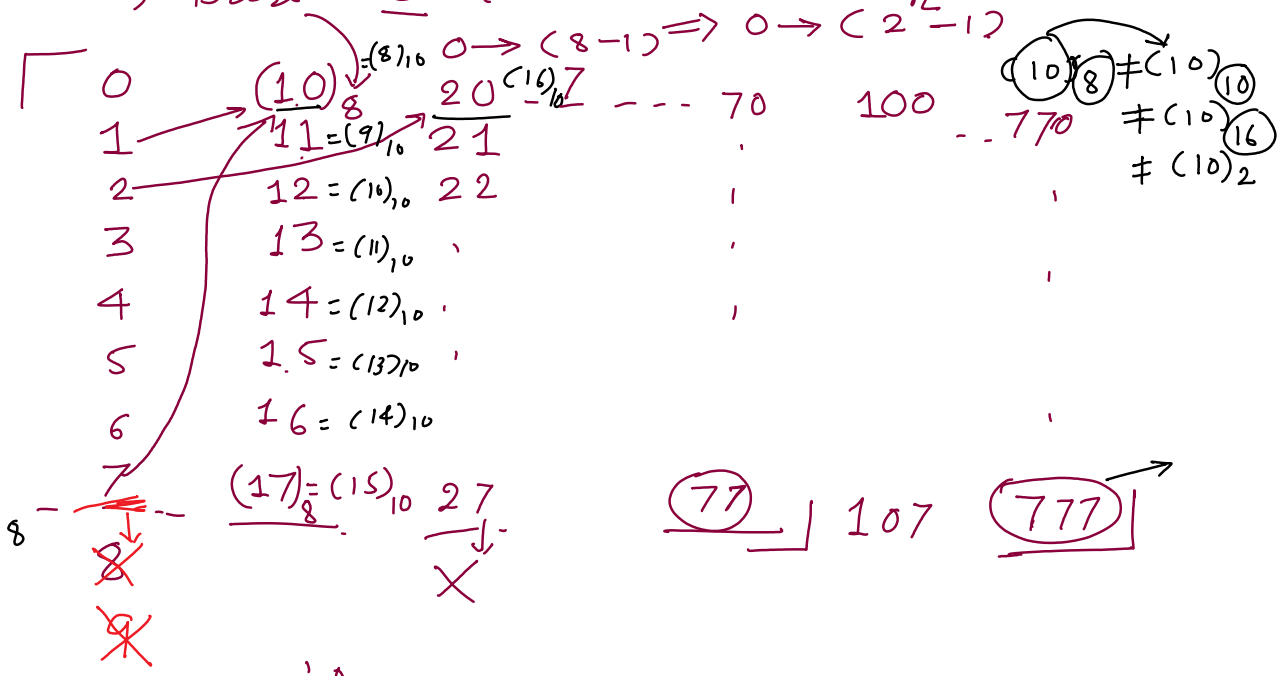
$10^{-2} = 1/100$; $10^{-3} = 1/1000$

$= 300 + 40 + 1 + 0.9 + 0.02 + 0.005$

$= (341.925)_{10}$

[2] Octal :-

↳ Base = 8 ($r = 8$)



$(10)_8 = (8)_{10}$

$r = 8$

$1 \times 8^1 + 0 \times 8^0 = (8)_{10}$

0 → 7

(1) $(770)_8 = (504)_{10}$ ⇒

$r = 8$

(2) $(345.24)_8 = (229.3125)_{10}$

$(3 \times 8^2) + (4 \times 8^1) + (5 \times 8^0) + (2 \times 8^{-1}) + (4 \times 8^{-2})$

$= 192 + 32 + 5 + 0.25 + 0.0625$

$= (229.3125)_{10}$

(3) $(547.642)_8 = (359.81640625)_{10}$

(4) $(382.106)_8 = (258.13671875)_{10}$

(4) $(382.106)_8 = (258.136718750)_{10}$

[3] Hexa Decimal Number System :-

↳ Base = 16 ($r = 16$)

00 → 10 90 A0 ... F0 | 100 ... FF0

1 → 11 F1

2 → 12 F2

3 → 13 F3

4 → 14

5

6

7

8

9

A → (10)

B → (11)

C → (12)

D → (13)

E → (14)

0F → (15)

1F 9F AF ... FF | 10F

FFF

$(10)_{16} \neq (10)_{10} \Rightarrow (16)_{10}$

$r = 16$

$1 \times 16^1 + 0 \times 16^0 = (16)_{10}$

(1) $(1E5.5A)_{16} = (\quad)_{10}$

$r^2\ r^1\ r^0\ r^{-1}\ r^{-2}$

wrong way ✗ $(1\ 14\ 5.5\ 10)_{16}$ ✗

Right way ✓ $= 1 \times r^2 + E \times r^1 + 5 \times r^0 + 5 \times r^{-1} + A \times r^{-2}$

$= 1 \times (16)^2 + (14) \times (16)^1 + 5 \times (16)^0 + 5 \times (16)^{-1} + (10) \times (16^{-2})$

$= 256 + 224 + 5 + 0.3125 + 0.0390625$

$= (485.3515625)_{10}$

(2) $(F019.CE)_{16} = (61465.8046875)_{10}$ ✓

(3) $(ABC.DEF)_{16} = (2748.870849609)_{10}$ ✓

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[4] Binary Number System:-

⇒ Base = (2) : radix

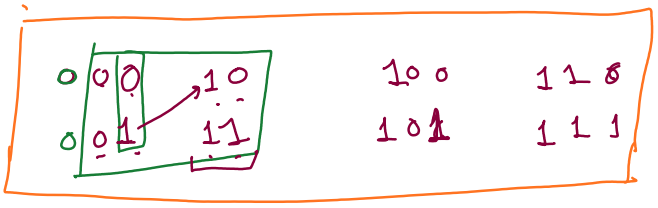
↳ unary → single

Binary → Two → Two states (levels) of logic

↳ 0 (Low)

1 (High) Binary Digit

↳ Bit



3-bit Binary:-

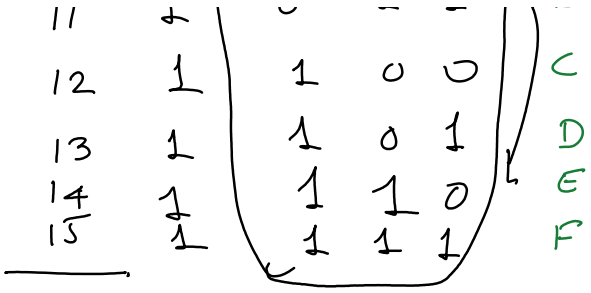
Decimal	Binary	Hex
0	000	0
1	001	1
2	010	2
3	011	3
4	100	4
5	101	5
6	110	6
7	111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C

$(101)_2 = (\quad)_{10}$

$1 \times r^2 + 0 \times r^1 + 1 \times r^0 =$

$1 \times (2)^2 + 0 + (1) \times (2)^0 =$

$4 + 0 + 1 = (5)_{10}$



(1) $(1011.1011)_2 = (\quad)_{10}$

(2) $(1001011.0011)_2 = (\quad)$