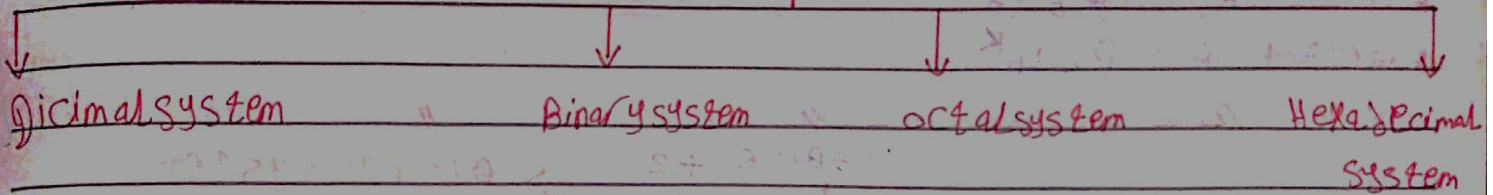


# Numerical System



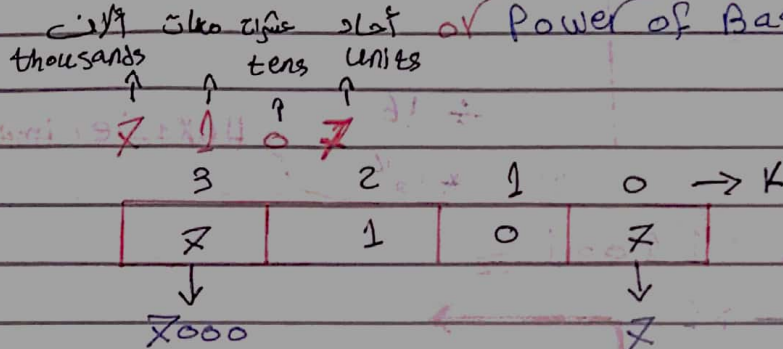
## → Decimal system

\* Digits: { 0, 1, 2, 3, ..., 9 }

\* Base(R):  $R = 10$

\* weight(P): The position or place value of digits

or Power of Base  $P = 10^k$

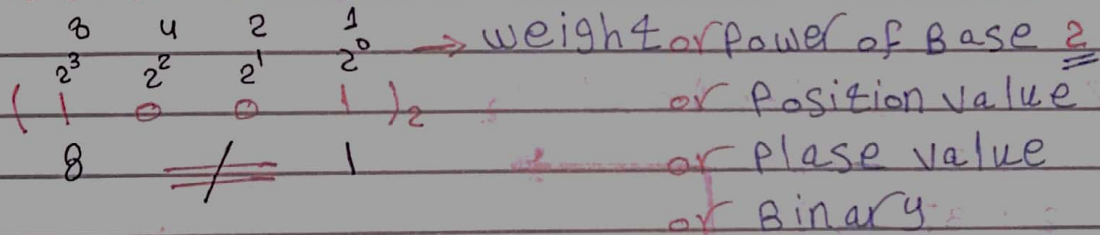


## → Binary system

\* Digits: Alphabet { 0, 1 }

\* Base(R):  $R = 2$

\* weight(P):  $P = 2^k$

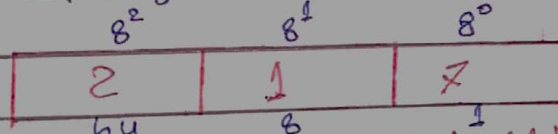


## → Octal system

\* Digits: { 0, 1, 2, ..., 7 }

\* Base(R):  $R = 8$

\* weight(P):  $P = 8^k$  → The Power of eight



\* weight(7) =  $7 \times 1 = 7$

\* weight(1) =  $1 \times 8 = 8$

\* weight(2) =  $2 \times 64 = 128$

# → Hexa decimal system

\* Digits: 0, 1, 2, 3, ..., 8, 9, A, B, C, D, E, F

\* Base (R):  $R = 16$

\* weight (P):  $P = 16^k$

(÷ Base) ÷ 2 → Binary system

(\* The Power of Base)  $\times 2^k$

÷ 8 → Octal system

$\times 8^k$

÷ 16 → Hexa decimal system

$\times 16^k$

## Decimal system

ex  $(25)_{10} = (11001)_2$

2	25	→ 1
2	12	→ 0
2	6	→ 0
2	3	→ 1
2	1	→ 1
quotient	0	

ex  $(751)_{10} = (1001011)_2$

2	751	→ 1
2	375	→ 1
2	187	→ 0
2	93	→ 1
2	46	→ 0
2	23	→ 0
2	11	→ 1
quotient	0	



ex  $(25)_{10} = (31)_8$

8	25	→ 1	↓
8	3	→ 3	
quit		0	

ex  $(25)_{10} = (19)_{16}$

16	25	→ 9	↓
16	1	→ 1	
quit		0	

ex  $(11001)_2 = (25)_{10}$

16	8	4	2	1	↓
$2^4$	$2^3$	$2^2$	$2^1$	$2^0$	
1	1	0	0	1	
16 + 8 + 0 + 0 + 1					
= 25					

ex  $(19)_{16} = (25)_{10}$

16	1	↓
$16^1$	$16^0$	
1	9	
16 + 9		
= 25		

ex  $(31)_8 = (25)_{10}$

8	1	↓
$8^1$	$8^0$	
3	1	
24 + 1		
= 25		

→ Convert from Binary system to Octal system

$\begin{matrix} 2^2 & 2^1 & 2^0 & 2^2 & 2^1 & 2^0 \\ 0 & 0 & 1 & 0 & 1 & 1 \end{matrix} \bigg)_2$

$(03)_8$

$\begin{matrix} 4 & 2 & 1 & 4 & 2 & 1 & 4 & 2 & 1 \\ 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \end{matrix} \bigg)_2$

$(147)_8$

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$0+0+1 \quad 4+0+0 \quad 4+2+1$   
 $(1 \quad 4 \quad 7)_8$

Bin	Oct
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7

→ Convert from Octal to Binary

ex:  $(1 \quad 4 \quad 7)_8$   
 $\begin{matrix} \swarrow \searrow & \swarrow \searrow & \swarrow \searrow \\ 001 & 100 & 111 \end{matrix}$

$(1100111)_2$

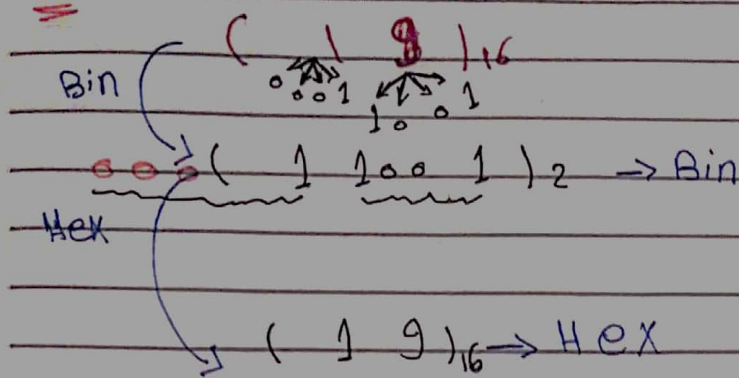
ex:  $(1 \quad 3 \quad 5)_8$   
 $\begin{matrix} \swarrow \searrow & \swarrow \searrow & \swarrow \searrow \\ 001 & 011 & 101 \end{matrix}$

$(1011101)_2$

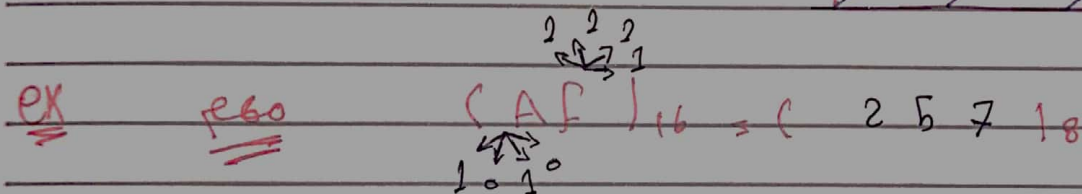
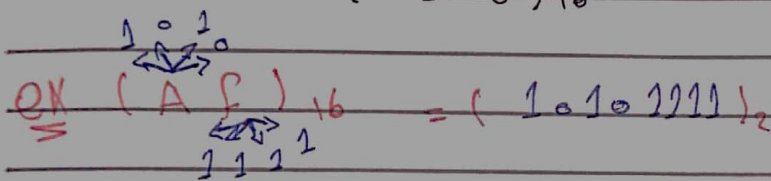
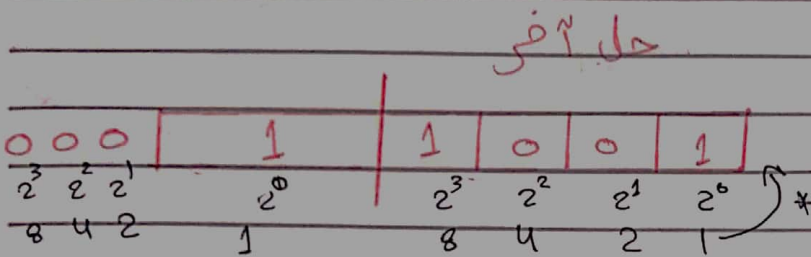


# Convert from Binary system to Hexadecimal system

ex



Bin	Hex
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F



هنا 2 و 5

$(10101111)_2$

$(257)_{10}$

ex  $(AF)_{16} = (175)_{10}$

$16^1 \ 16^0$

A F

$160 + 15 = 175$

abdelhak