

Bin	Dec	Hex.	Ex:
0000	0	0	$13 \cdot 2^4 + 2 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 0 \cdot 2^0 \Rightarrow [1 0 1 0 0 0 1 0]$
0001	1	1	
0010	2	2	
0011	3	3	
0100	4	4	
0101	5	5	(i) $\Rightarrow \text{unsigned}$ = $(162)_{10}$ (but)
0110	6	6	
0111	7	7	
1000	8	8	
1001	9	9	
1010	10	A	
1011	11	B	
1100	12	C	
1101	13	D	
1110	14	E	
1111	15	F	

Annotations:

- Nibble:** A red bracket groups the first four columns of the table.
- Ex:** An example of binary conversion is shown: $13 \cdot 2^4 + 2 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 0 \cdot 2^0 \Rightarrow [1|0|1|0|0|0|1|0]$
- (i) unsigned:** Refers to the first row (0000).
- (ii) signed:** Refers to the first row (0000) with a negative sign.
- Calculation:** $-(1 \cdot 2^7) + (32 \cdot 1) + (2 \cdot 1) = -94$
- Range:** The range is indicated by $-128 \rightarrow 127$.
- Second Complement:** A bracket groups the last three rows (1110, 1111, 1111) with the text "الثانية في معاشرة القيمة الممدة" and "الثانية في معاشرة القيمة الممدة" (2nd complement).

* Number representation systems

• الاتصالات الالكترونية هي المدخلات والخرجات.

$$0 \quad (4586)_{10} = \\ -4000 + 500 + 80 + 6 \quad (4586)_{10}$$

Bin	Dec	Hex	C/C++
0000	0	0	0x00000000
0001	1	1	0x00000001
0010	2	2	0x00000002
0011	3	3	0x00000003
0100	4	4	0x00000004
0101	5	5	0x00000005
0110	6	6	0x00000006
0111	7	7	0x00000007
1000	8	8	0x00000008
1001	9	9	0x00000009
1010	10	A	0x0000000A
1011	11	B	0x0000000B
1100	12	C	0x0000000C
1101	13	D	0x0000000D
1110	14	E	0x0000000E
1111	15	F	0x0000000F

(↑ unsigned)

= (162)10
(0x00)

(↓ signed)

= $-(1 \times 2^7) + (32 \times 1) + (3 \times 1)$
 $= (-94)_{10}$

→ 129 → ? → 127

النحوين في تطبيقات
المبرمجة لـ C و C++

* Number Representation Systems:

$$\begin{array}{ccccccc} & & & & & & \times \\ & & & & & & \text{in the 8-bit number} \\ \therefore 1091C & \& \text{Digital circuit} & \rightarrow & 1091C & \& \end{array}$$

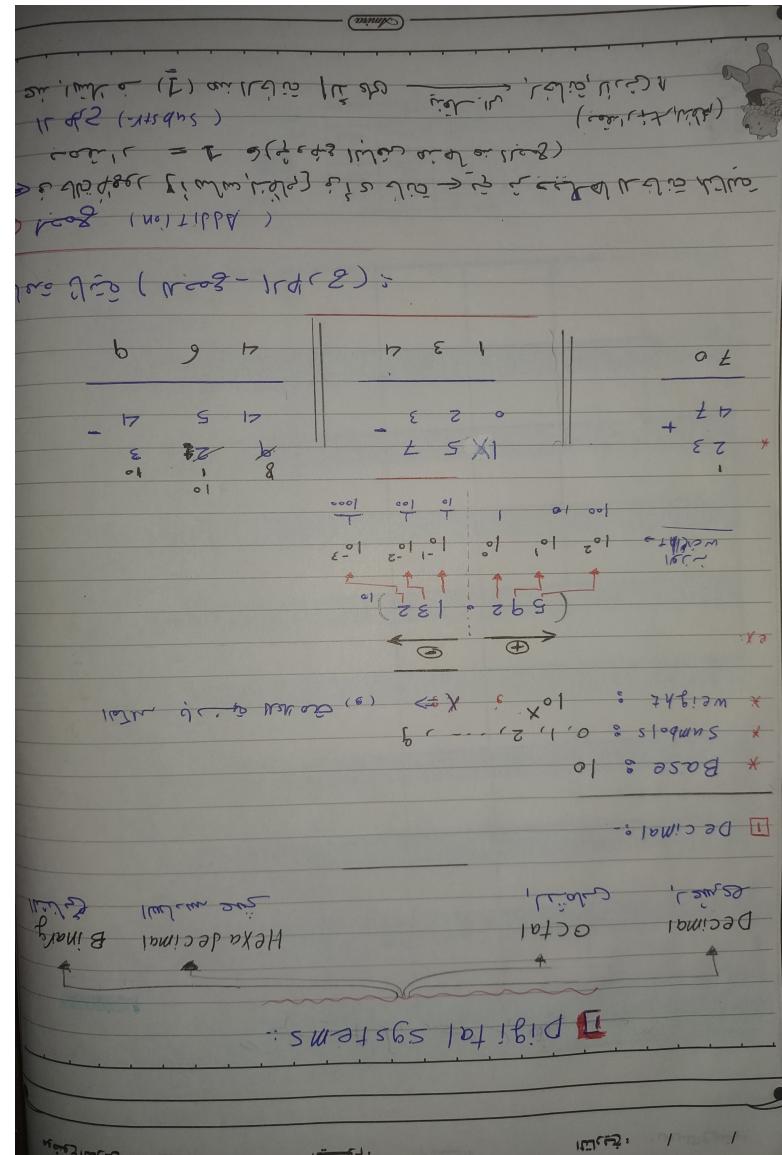
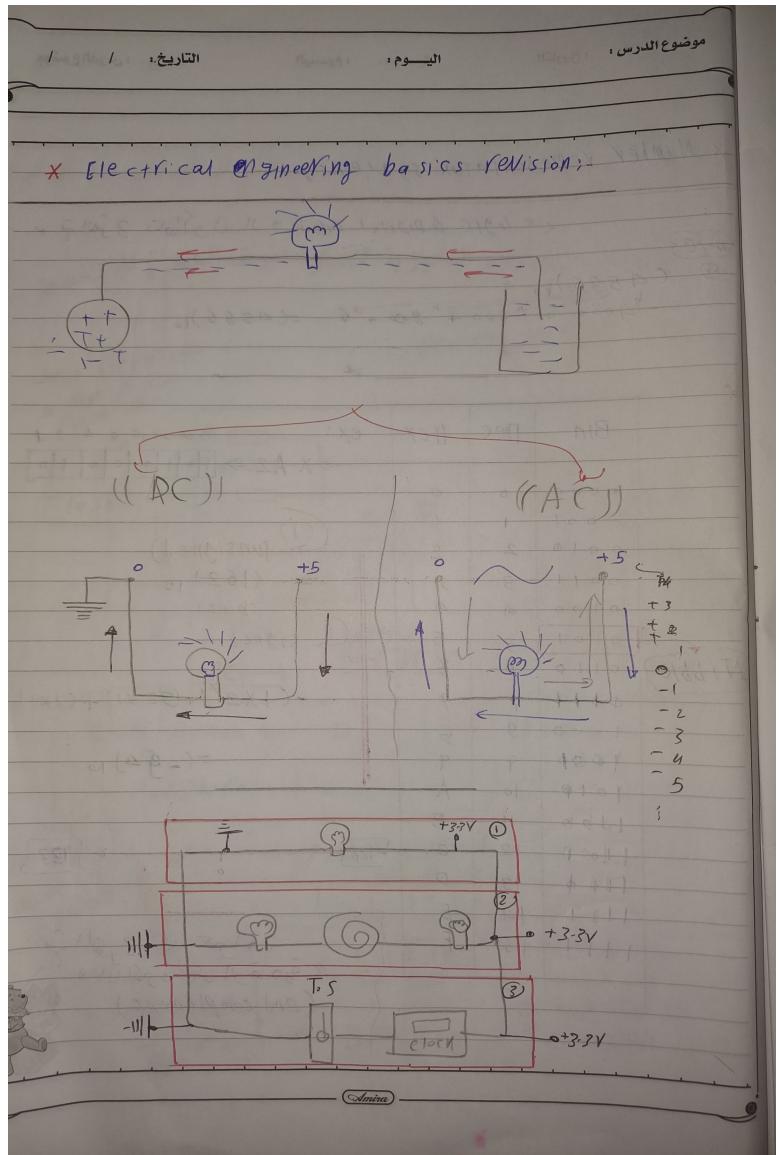
Bin	Dec	Hex.	Ex:
0000	0	0	$0 \times A2 \Rightarrow [0 0 1 0 0 0 0 1 0]$
00001	1	1	
0010	2	2	(i) \Rightarrow <u>unsigned</u>
0011	3	3	$= (162)_10$
0100	4	4	<u>but</u>
0101	5	5	(ii) signed
0110	6	6	$= -(1 \times 2^7) + (32 \times 1) + (2 \times 1)$
0111	7	7	$= (-94)_10$
1000	8	8	
1001	9	9	
1010	10	A	
1011	11	B	
1100	12	C	
1101	13	D	
1110	14	E	
1111	15	F	

{

128 ! 127

(الثانية في المعاشرة)
الناتئ منك الرقمه
(2nd complement)





Handwritten notes on a lined notebook page. The page contains several mathematical calculations, including addition and subtraction of binary numbers, and a diagram illustrating the relationship between base 8 and octal. There are also some handwritten labels and symbols.

Top row:

$$\begin{array}{r} 1551 \\ - 1183 \\ \hline 368 \end{array}$$

Middle row:

$$\begin{array}{r} 2541 \\ - 283 \\ \hline 2514 \end{array}$$
$$\begin{array}{r} 3312 \\ - 28 \\ \hline 3284 \end{array}$$

Third row:

$$\begin{array}{r} 14153 \\ + 3298 \\ \hline 17431 \end{array}$$
$$\begin{array}{r} 02425 \\ + 04514 \\ \hline 06939 \end{array}$$

Fourth row:

$$\begin{array}{r} 7371 \\ + 7437 \\ \hline 14808 \end{array}$$

Bottom row:

Diagram:

Diagram illustrating the relationship between base 8 and octal:

Base 8: $(523 : 41) \oplus 0 \rightarrow$

Octal: $8 \times$

Labels:

WEIGHTS: $8^0, 8^1, 8^2, 8^3$

SUMS: $0, 1, 2, \dots, 7$

BASE: 8

OCTAL: $-$

Labels:

ADDITION & SUBTRACTION:

ADDITION & SUBTRACTION:

Handwritten notes on binary conversion:

- Hexadecimal to Decimal:
 - Base 16: $(ABCDEF)_{16} = 16^5A + 16^4B + 16^3C + 16^2D + 16^1E + 16^0F$
 - Example: $(ABCDEF)_{16} = 16^5 \cdot 1 + 16^4 \cdot 2 + 16^3 \cdot 3 + 16^2 \cdot 4 + 16^1 \cdot 5 + 16^0 \cdot 6 = 16666$
- Binary to Decimal:
 - Base 2: $(ABCDEF)_{2} = 2^5A + 2^4B + 2^3C + 2^2D + 2^1E + 2^0F$
 - Example: $(ABCDEF)_{2} = 2^5 \cdot 1 + 2^4 \cdot 0 + 2^3 \cdot 1 + 2^2 \cdot 1 + 2^1 \cdot 0 + 2^0 \cdot 1 = 13$
- Decimal to Binary:
 - Conversion rule: Divide by 2 and record remainders.
 - Example:

16 ²	16 ¹	16 ⁰	16 ⁻¹	16 ⁻²	16 ⁻³	16 ⁻⁴	16 ⁻⁵	16 ⁻⁶	16 ⁻⁷	16 ⁻⁸	16 ⁻⁹	16 ⁻¹⁰	16 ⁻¹¹	16 ⁻¹²	16 ⁻¹³	16 ⁻¹⁴	16 ⁻¹⁵	
256	16	1																
16 ²	16 ¹	16 ⁰	16 ⁻¹	16 ⁻²	16 ⁻³	16 ⁻⁴	16 ⁻⁵	16 ⁻⁶	16 ⁻⁷	16 ⁻⁸	16 ⁻⁹	16 ⁻¹⁰	16 ⁻¹¹	16 ⁻¹²	16 ⁻¹³	16 ⁻¹⁴	16 ⁻¹⁵	
- Binary Addition:
 - Example:

D	16 ¹	16 ⁰	C	16 ¹	16 ⁰	A	16 ¹	16 ⁰	E	16 ¹	16 ⁰	B	16 ¹	16 ⁰	F	16 ¹	16 ⁰	
16 ²	16 ¹	16 ⁰	8	16 ¹	16 ⁰	4	16 ¹	16 ⁰	2	16 ¹	16 ⁰	1	16 ¹	16 ⁰	0	16 ¹	16 ⁰	
16 ³	16 ²	16 ¹	16 ⁰	16 ⁻¹	16 ⁻²	16 ⁻³	16 ⁻⁴	16 ⁻⁵	16 ⁻⁶	16 ⁻⁷	16 ⁻⁸	16 ⁻⁹	16 ⁻¹⁰	16 ⁻¹¹	16 ⁻¹²	16 ⁻¹³	16 ⁻¹⁴	16 ⁻¹⁵
- Binary Subtraction:
 - Example:

9	16 ¹	16 ⁰	6	16 ¹	16 ⁰	2	16 ¹	16 ⁰	1	16 ¹	16 ⁰	0	16 ¹	16 ⁰	1	16 ¹	16 ⁰	
16 ²	16 ¹	16 ⁰	8	16 ¹	16 ⁰	4	16 ¹	16 ⁰	2	16 ¹	16 ⁰	1	16 ¹	16 ⁰	0	16 ¹	16 ⁰	
16 ³	16 ²	16 ¹	16 ⁰	16 ⁻¹	16 ⁻²	16 ⁻³	16 ⁻⁴	16 ⁻⁵	16 ⁻⁶	16 ⁻⁷	16 ⁻⁸	16 ⁻⁹	16 ⁻¹⁰	16 ⁻¹¹	16 ⁻¹²	16 ⁻¹³	16 ⁻¹⁴	16 ⁻¹⁵

Binary → Decimal → Binary Output

Binary:

$$1101 \quad \text{Base: 2}$$

Symbol:

$$0, 1 \quad \text{Weight: } 2^0, 2^1, 2^2, 2^3, 2^4$$

Ex:

$$(1101)_2 = 1 \cdot 2^0 + 0 \cdot 2^1 + 1 \cdot 2^2 + 1 \cdot 2^3 = 1 + 0 + 4 + 8 = 13$$

Addition & Subtraction:

$$\begin{array}{r} 00101 \\ + 1111 \\ \hline 100001 \end{array}$$

$$\begin{array}{r} 00111 \\ + 1111 \\ \hline 100001 \end{array}$$

$$\begin{array}{r} 00111 \\ - 1111 \\ \hline 100001 \end{array}$$

Conversion:

$$1101011_2 = 1 \cdot 2^0 + 1 \cdot 2^1 + 0 \cdot 2^2 + 1 \cdot 2^3 + 0 \cdot 2^4 + 1 \cdot 2^5 + 1 \cdot 2^6 = 1 + 2 + 0 + 8 + 0 + 32 + 64 = 107$$

