Binary Coded Octal

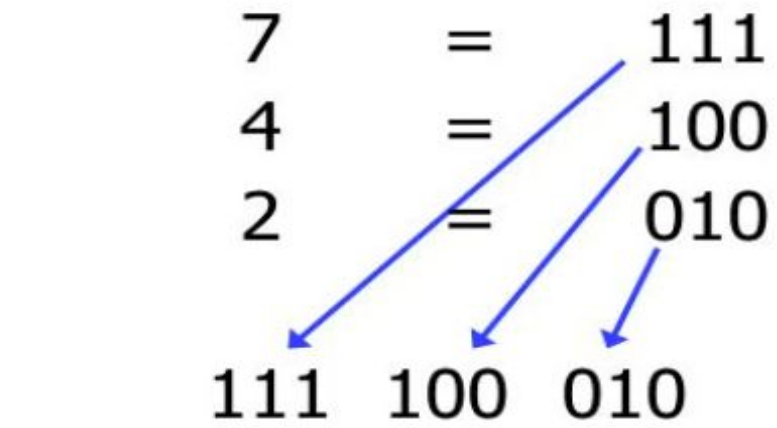
- Three binary digits (also known as binary-coded octal) can be combined to form one octal digit.

Three-bit Group	Decimal Digit	Octal Digit
000	0	**0**
001	1	**1**
010	2	**2**
011	3	**3**
100	4	**4**
101	5	**5**
110	6	**6**
111	7	**7**

Base (8) to base (2)

Ex : Convert 742_8 to binary

Convert each octal digit to 3 bits:



$742_8 = 111100010_2$

Base (2) to base (8)

Ex : Convert 10100110_2 to octal

Starting at the right end, split into groups of 3:

10 100 110 →

110 = 6

100 = 4

010 = 2 (pad empty digits with 0)

$10100110_2 = 246_8$

Binary Coded Hexadecimal

- Four binary digits (also known as binary-coded hexadecimal) can be combined to form one hexadecimal digit.

Four-bit Group	Decimal Digit	Hexadecimal Digit
0000	0	**0**
0001	1	**1**
0010	2	**2**
0011	3	**3**
0100	4	**4**
0101	5	**5**
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**

Base (16) to base (2)

Ex : Convert $3D9_{16}$ to binary

Convert each hex digit to 4 bits:

3 = 0011

D = 1101

9 = 1001

0011 1101 1001 →

$3D9_{16} = 1111011001_2$ (can remove leading zeros)

Base (2) to base (16)

Ex : Convert 110100110_2 to hex

Starting at the right end, split into groups of 4:

1 1010 0110 →

0110 = 6

1010 = A

0001 = 1 (pad empty digits with 0)

$110100110_2 = 1A6_{16}$

Hexadecimal(16) to Octal(8)

Ex : Convert $E8A_{16}$ to octal

First convert the hex to binary:

$1110\ \ 1000\ \ 1010_2$

111 010 001 010 and re-group by 3 bits (starting on the right)

Then convert the binary to octal:

7 2 1 2

So $E8A_{16} = 7212_8$

Octal(8) to Hexadecimal(16)

Example: Octal to Hexadecimal

$$3756_8$$

3	7	5	6_8
011	111	101	110
0111	1110		1110
7	E		E_{16}

Questions

Q1. Convert the following Binary to Octal numbers.

a. 1110101110_2

b. 111101.01101_2

Ans: 1656_8

Ans: 75.32_8

Q2. Convert the following Octal to binary.

a. 1573_8

b. 64.175_8

Ans: 1101111011_2

Ans: 110100.001111101_2

Questions

Q3. Convert the following Binary to Hexadecimal numbers.

a. 1111101101_2

b. 11110.01011_2

Ans: $3ED_{16}$

Ans: $1E.58_{16}$

Q4. Convert the following Hexadecimal to binary.

a. $A748_{16}$

b. $BA2.23C_{16}$

Ans: 1010011101001000_2

Ans: $101110100010.0010001111_2$

Questions

Q5. Convert the 1573_8 to hexa-decimal

Ans: $\mathbf{37B_{16}}$

Q6. Convert the $A748_{16}$ to Octal

Ans: 123510_8

Q7. Convert the 725.25_{10} to Hexadecimal

Ans: 2D5.4

Q8. Convert the 236.45_{10} to Octal

Ans: 354.346

Q9. Convert to 94.56_{10} to binary

Ans: 1011110. 10001