Binary Code

0000001

00000011

000000111

00001111

Binary Code

- A base-2 coded language consisting of two digits (0 & 1) that represents numbers, characters and computer instructions
- Each “digit” is known as “One Bit”

Units of Measurement

Bits	Nibbles	Bytes	Kilo Bytes	Mega Bytes	Giga Bytes	Tera Bytes
4	1					
8	2	1				
8,192	4,096	1,024	1			
8,388,608	4,194,304	1,048,576	1,024	1		
8,589,934,592	4,294,967,296	1,073,741,824	1,048,576	1,024	1	
8,796,093,022,208	4,398,046,511,104	1,099,511,627,776	1,073,741,824	1,048,576	1,024	1

8 Bit Binary

2 ^ 7	2 ^ 6	2 ^ 5	2 ^ 4	2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0
128	64	32	16	8	4	2	1

Decode 8 Bit Binary Number

0001 1001

2 ^ 7	2 ^ 6	2 ^ 5	2 ^ 4	2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
128	64	32	16	8	4	2	1	
0	0	0	1	1	0	0	1	

Decode 8 Bit Binary Number

0001 1001

2 ^ 7	2 ^ 6	2 ^ 5	2 ^ 4	2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
128	64	32	16	8	4	2	1	
0	0	0	1	1	0	0	1	
0	0	0	16	8	0	0	1	25

Decode 8 Bit Binary Number

1010 0110

2 ^ 7	2 ^ 6	2 ^ 5	2 ^ 4	2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
128	64	32	16	8	4	2	1	
1	**0**	**1**	**0**	**0**	**1**	**1**	**0**	

Decode 8 Bit Binary Number

1010 0110

2 ^ 7	2 ^ 6	2 ^ 5	2 ^ 4	2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
128	64	32	16	8	4	2	1	
1	**0**	**1**	**0**	**0**	**1**	**1**	**0**	
128	0	32	0	0	4	2	1	**166**

2 ^ 3 = 8	2 ^ 2 = 4	2 ^ 1 = 2	2 ^ 0 = 1	Total
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21		

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1
10		

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1
10	10 / 2 = 5	

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1
10	10 / 2 = 5	0

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1
10	10 / 2 = 5	0
5	5 / 2 = 2.5	1

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1
10	10 / 2 = 5	0
5	5 / 2 = 2.5	1
2	2 / 2 = 1	0

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1
10	10 / 2 = 5	0
5	5 / 2 = 2.5	1
2	2 / 2 = 1	0
1	1 / 2 = 0.5	1

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1
10	10 / 2 = 5	0
5	5 / 2 = 2.5	1
2	2 / 2 = 1	0
1	1 / 2 = 0.5	1
0	0 / 2 = 0	0

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1
10	10 / 2 = 5	0
5	5 / 2 = 2.5	1
2	2 / 2 = 1	0
1	1 / 2 = 0.5	1
0	0 / 2 = 0	0

010101

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
21	21 / 2 = 10.5	1
10	10 / 2 = 5	0
5	5 / 2 = 2.5	1
2	2 / 2 = 1	0
1	1 / 2 = 0.5	1
0	0 / 2 = 0	0

2 ^ 7	2 ^ 6	2 ^ 5	2 ^ 4	2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
128	64	32	16	8	4	2	1	
0	0	0	1	0	1	0	1	
0	0	0	16	0	4	0	1	21

Convert Integer To Binary

Current Number	Divide By 2 (MOD)	Binary Bit
47	47 / 2 = 23.5	1
23	23 / 2 = 11.5	1
11	11 / 2 = 5.5	1
5	5 / 2 = 2.5	1
2	2 / 2 = 1	0
1	1 / 2 = 0.5	1
0	0 / 2 = 0	0

2 ^ 7	2 ^ 6	2 ^ 5	2 ^ 4	2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
128	64	32	16	8	4	2	1	
0	0	1	0	1	1	1	1	
0	0	32	0	8	4	2	1	47

What is Hexadecimal?

- A numerical system (Base 16) used in computer science to represent binary strings
- Converts nibbles into a number between 0 – 9 or a character A – F
- Usually prefixed with “x”
  - xFF
  - x0B

Hex Values

Hex Value	Numerical Value
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Hex Value	Numerical Value
A	10
B	11
C	12
D	13
E	14
F	15

Binary to Hex Conversion

0110 1110

2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
8	4	2	1	
0	1	1	0	
0	4	2	0	6

2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
8	4	2	1	
1	1	1	0	
8	4	2	0	14

6 E → **x6E**

Binary to Hex Conversion

1111 1011

2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
8	4	2	1	
1	1	1	1	
8	4	2	1	15

2 ^ 3	2 ^ 2	2 ^ 1	2 ^ 0	Total
8	4	2	1	
1	0	1	1	
8	0	2	1	11

F B → **xFB**

Hex to Binary Conversion

6E

6

Current Number	Divide By 2	Binary Bit
6	6 / 2 = 3	0
3	3 / 2 = 1.5	1
1	1 / 2 = 0.5	1
0	0 / 2 = 0	0

14

Current Number	Divide By 2	Binary Bit
14	14 / 2 = 7	0
7	7 / 2 = 3.5	1
3	3 / 2 = 1.5	1
1	1 / 2 = 0.5	1
0	0 / 2 = 0	0

0110 1110

Hex to Binary Conversion

FB

15

Current Number	Divide By 2	Binary Bit
15	15 / 2 = 7.5	1
7	7 / 2 = 3.5	1
3	3 / 2 = 1.5	1
1	1 / 2 = 0.5	1
0	0 / 2 = 0	0

11

Current Number	Divide By 2	Binary Bit
11	11 / 2 = 5.5	1
5	5 / 2 = 2.5	1
2	2 / 2 = 1	0
1	1 / 2 = 0.5	1
0	0 / 2 = 0	0

1111 1011

The End?