

Hexadecimal Numbers (2A)

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Number Systems

radix=2

	2^3	2^2	2^1	2^0
0	0	0	0	0
0	0	0	0	1
0	0	0	1	0
0	0	0	1	1
0	0	1	0	0
0	0	1	0	1
0	0	1	1	0
0	0	1	1	1
0	1	0	0	0
0	1	0	0	1
0	1	0	1	0
0	1	0	1	1
0	1	1	0	0
0	1	1	0	1
0	1	1	1	0
0	1	1	1	1

Binary

radix=16

16^0
0
1
2
3
4
5
6
7
8
9
A
B
C
D
E
F

Hexadecimal

radix=8

8^1	8^0
0	0
0	1
0	2
0	3
0	4
0	5
0	6
0	7
1	0
1	1
1	2
1	3
1	4
1	5
1	6
1	7

Octal

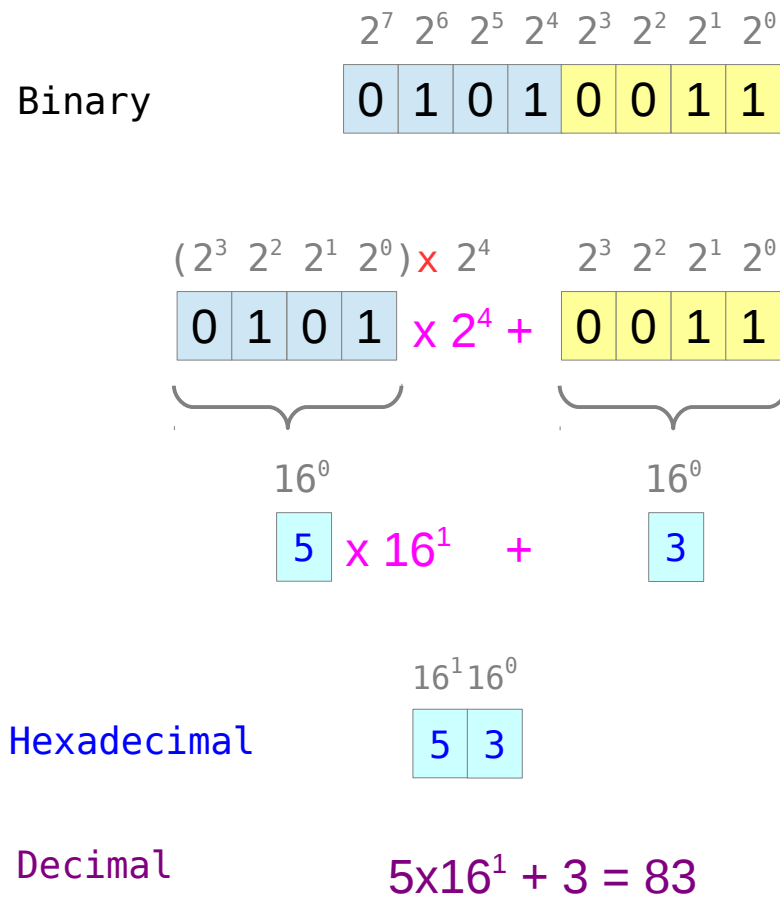
radix=10

10^1	10^0
0	0
0	1
0	2
0	3
0	4
0	5
0	6
0	7
0	8
0	9
1	0
1	1
1	2
1	3
1	4
1	5

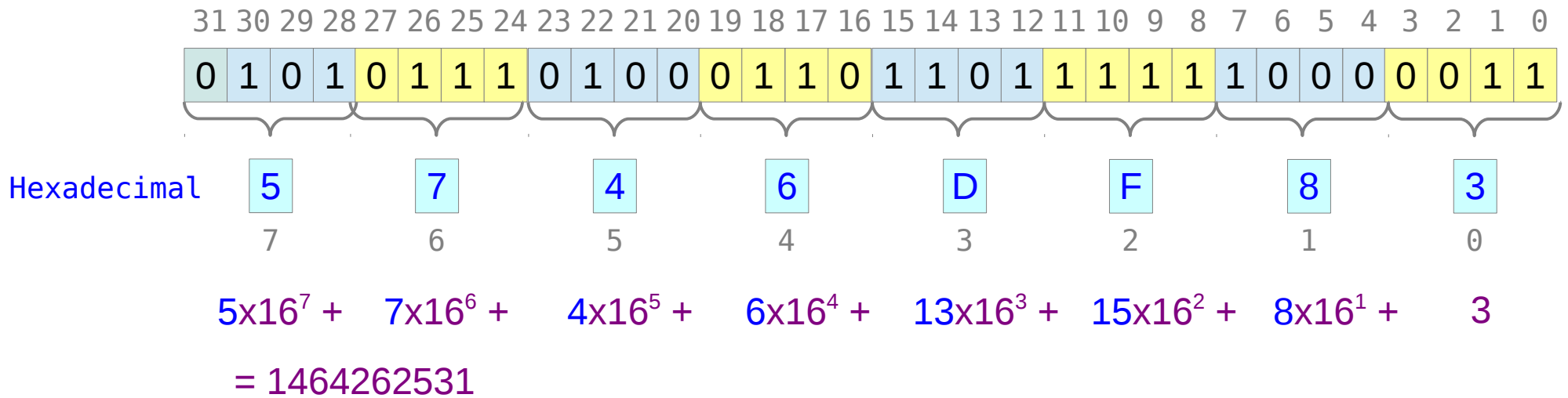
Decimal

Binary and Hexadecimal Numbers

	2^3	2^2	2^1	2^0		16^0
radix=2	0	0	0	0	radix=16	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		A
	1	0	1	1		B
	1	1	0	0		C
	1	1	0	1		D
	1	1	1	0		E
	1	1	1	1		F
	Binary					Hexadecimal



4 Byte Unsigned Integer



4 Byte Signed Integer

31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

0 1 0 1 0 1 1 1 0 1 0 0 0 1 1 0 1 1 0 1 1 1 1 1 1 0 0 0 0 0 1 1

5 7 4 6 D F 8 3

7 6 5 4 3 2 1 0

$$5 \times 16^7 + 7 \times 16^6 + 4 \times 16^5 + 6 \times 16^4 + 13 \times 16^3 + 15 \times 16^2 + 8 \times 16^1 + 3$$

$$= +1464262531$$

31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

1 1 0 1 0 1 1 1 0 1 0 0 0 1 1 0 1 1 0 1 1 1 1 1 1 0 0 0 0 0 1 1

0 0 1 0 1 0 0 0 1 0 1 1 1 0 0 1 0 0 1 0 0 0 0 0 0 1 1 1 1 1 0 1

- 2 8 B 9 2 0 7 D

7 6 5 4 3 2 1 0

$$-(2 \times 16^7 + 8 \times 16^6 + 11 \times 16^5 + 9 \times 16^4 + 2 \times 16^3 + 0 \times 16^2 + 7 \times 16^1 + 13)$$

$$= -683221117$$

Sign Extension (1)

4-bit
Signed
Number

8-bit
Signed
Number

16-bit
Signed
Number

(+3)

(+3)

(+3)

3 2 1 0
0 0 1 1

7 6 5 4 3 2 1 0
0 0 0 0 0 0 1 1

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

(-3)

(-3)

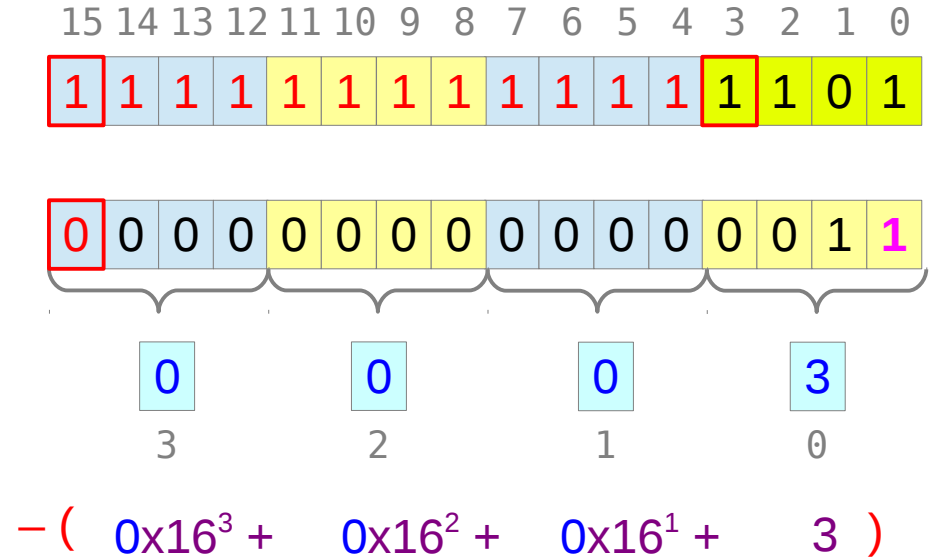
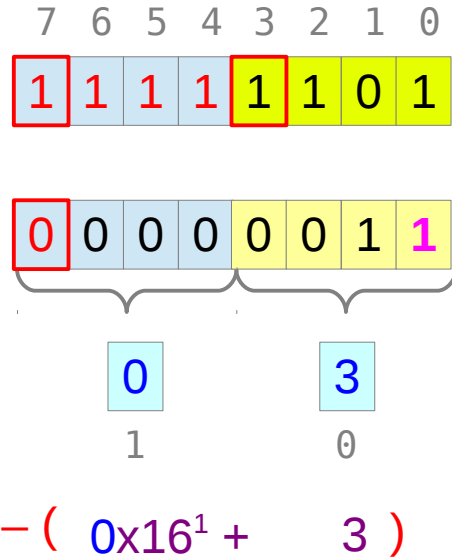
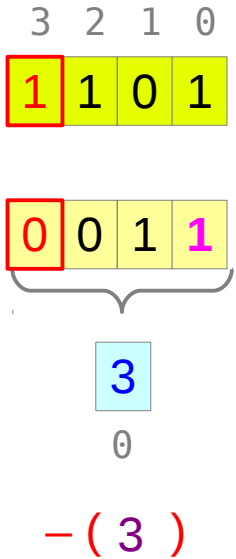
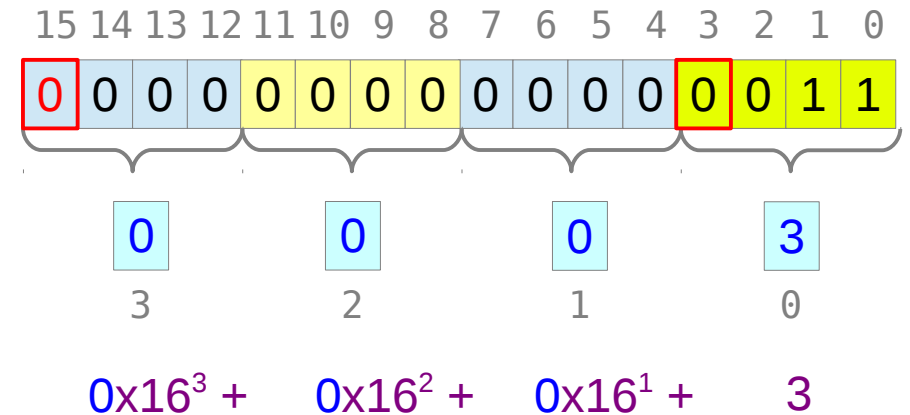
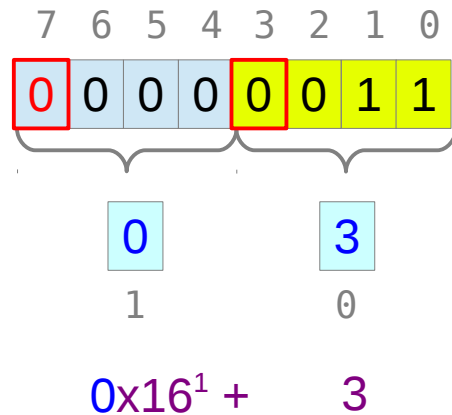
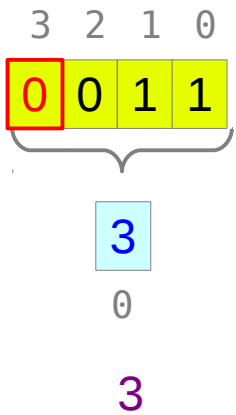
(-3)

3 2 1 0
1 1 0 1

7 6 5 4 3 2 1 0
1 1 1 1 1 1 0 1

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

Sign Extension (2)



References

- [1] <http://en.wikipedia.org/>
- [2] M. M. Mano, C. R. Kime, “Logic and Computer Design Fundamentals”, 4th ed.
- [3] M. M. Mano, M. D. Ciletti, “Digital Design”, 5th ed.
- [4] D. M. Harris, S. L. Harris, “Digital Design and Computer Architecture”