CS 208

Mon, 5 Jan 2026

$357 \rightarrow 3\times10^2 + 5\times10^1 + 7\times10^0$

100's 10's 1's

1 1 1

10^2 10^1 10^0

"Base ten"

"Decimal"

0 1 2 3 4 5 6 7 8 9

Binary — base 2

$0b10110 = 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 0\times2^0$

$2^4\ 2^3\ 2^2\ 2^1\ 2^0$

$= 16 + 0 + 4 + 2 + 0$

$= 22_{ten}$

0 1

$0b\ 11011 = ?$

27 ten

$1 \times 2^4 + 1 \times 2^3 + 0 + 2^1 + 2^0$

16 8 2 1

$= 27$

(binary to decimal = easy but tedious)

Decimal to binary

- harder
- even more tedious

173_{ten}

$173 - 128 = 45$

$45 - 32 = 13$

$13 - 8 = 5$

$5 - 4 = 1$

Highest power of two ≤ 173?

$= 128 = 2^7$

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

Words

bit — "binary digit"
a box that can hold either a 0 or a 1

byte
~ 8 bits

Hexadecimal

$$0xA3 = 10 \times 16 + 3$$

$16^1 \quad 16^0$

$$= 163_{ten}$$

10 11 12 13 14 15

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

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

hexadecimal → binary

0x BC52

→ 1011 1100 0101 0010

0x B C 5 2

binary → hexadecimal