

Unsigned binary numbers

- Each bit represents a power of 2
- For unsigned numbers in a fixed width field
 - » the minimum value is 0
 - » the maximum value is $2^n - 1$, where n is the number of bits in the field
- Fixed field widths determine many limits
 - » 5 bits = 32 possible values ($2^5 = 32$)
 - » 10 bits = 1024 possible values ($2^{10} = 1024$)

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Binary, Hex, and Decimal

$2^8 = 256_{10}$	$2^7 = 128_{10}$	$2^6 = 64_{10}$	$2^5 = 32_{10}$	$2^4 = 16_{10}$	$2^3 = 8_{10}$	$2^2 = 4_{10}$	$2^1 = 2_{10}$	$2^0 = 1_{10}$	Hex ₁₆	Decimal ₁₀
1	0	0	1	1	1	1	1	1	0x3	3
1	0	1	0	0	0	0	0	1	0x9	9
1	0	0	1	1	1	1	1	0	0xA	10
1	1	1	1	1	1	1	1	1	0xF	15
1	0	0	0	0	0	0	0	0	0x10	16
1	1	1	1	1	1	1	1	1	0x1F	31
1	1	1	1	1	1	1	1	1	0x7F	127
1	1	1	1	1	1	1	1	1	0xFF	255

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Binary, Hex, and Decimal

Binary ₂	$16^4 = 65536_{10}$	$16^3 = 4096_{10}$	$16^2 = 256_{10}$	$16^1 = 16_{10}$	$16^0 = 1_{10}$	Decimal ₁₀
11				3		3
1001				9		9
1010				A		10
1111				F		15
1 0000			1	0		16
1 1111			1	F		31
111 1111			7	F		127
1111 1111			F	F		255

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Binary, Hex, and Decimal

Binary ₂	Hex ₁₆	$10^3 = 1000_{10}$	$10^2 = 100_{10}$	$10^1 = 10_{10}$	$10^0 = 1_{10}$
11	0x3				3
1001	0x9				9
1010	0xA			1	0
1111	0xF			1	5
1 0000	0x10			1	6
1 1111	0x1F			3	1
111 1111	0x7F		1	2	7
1111 1111	0xFF	2	5	5	

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