Integer Representation

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Bits, Bytes, Int Representations

CS107 Question 1: How do computers represent integer types?

Defn. A bit is a single binary value, i.e. 0 or 1

Defn. A byte is an ordered collection of 8 bits.

All things are stored in bits, but expressed in more human-understandable ways in code.

Byte values.

Min: 00000000 = 0

Max: 111 111 11 = 255

Hexadecimal

Motivation. Representing 32-64 bits in binary becomes cumbersome! Instead, use base 16 (hex).

Alphabet. 0 1 2 3 4 5 6 7 8 9 a b c d e f

Distinction. 0x for hex and 0b for binary

i.e., 0x15 = 0b11110101

Integer representations

Unsigned int. positive and 0

signed int negative, positive, 0

32 bit — Holds 2^{32} values

unsigned int 0 ... 4 billion

int -2 bil ... 2 bil

64 bit — Holds 2^{64} values

unsigned LL $0 \ldots 2^{64}-1$

signed LL $-2^{63} \ldots 2^{63}-1$