Number Systems & Base Conversions

hexadecimal shortens binary

Three number systems:

- Binary
- Decimal (10)
- Hexadecimal (base 16)

Decimal

numbers are sum of digits, each multiplied by a power of 10

$735 = 700 + 30 + 5$

$700 = 7 \times 10^2$

Index 2, 1, 0

Hexadecimal

16 digits: 0-9, A-F

In base 10, A = 1010 (10), B = 1011 (11), ..., F=1111 (15)

Split into two sections, each with powers of 2

Each digit contains 4 bits

15_{10} means 15 in decimal

Convert Decimal to Binary

See if power numbers (64, 32, 16, 8) fit in 35?

$32 \leq 35$, so 1 under 32, then $35 - 32 = 3$

Hex to Binary

Split into four digit segments

1111=0xf

Binary to Hex

Conversion same except split into separate charts of 4 digits

If over ten but < 16, convert to letter

Concat, dont sum separate charts

11011001=0xD9

0x prefix represents a hexadecimal number

Also, 0xD9=D9h, h suffix also means hexadecimal

Hex to Binary

Split each digit into chart of 4 binary digits

Only need 4 because hex only goes to 15 anyways

Also just concat at the end