Section 1 / Hexadecimal

Hex is only lightly covered here because there is a very good chance you are already familiar with the concept.

The TL;DR is: Hex is base sixteen. Hex is useful because 16 is 2 raised to the power of 4. Each hex digit represents 4 bits. Just two hex digits completely specify the 8 bits in a byte. Hex digits run from 0 through 9 and then A through F.

Example: decimal 255 is hex FF.

Numbers in Base 10

You already know that each digit in a base 10 number is multiplied by a power of 10. The least significant digit is multiplied by 10 to the 0. The next least significant digit is multiplied to 10 to the 1 and so on.

Floating point numbers in decimal are multiplied by negative powers of 10.

The digits available to us are 0 through 9.

Numbers in Base 2

Binary is the same thing except with powers of 2. The digits available to us are 0 and 1.

The first (least significant) digit is multiplied by 2 to the 0. The second is multiplied by 2 to the 1 and so on.

The digits of the fractional part of a floating point number are multiplied with negative powers of 2. See Section 2 for more detailed information.

Number in Base 16 - Hexadecimal

In decimal there are 10 values available for each digit.

In binary there are 2 values available for each digit.

Hex numbers work the same way as binary and decimal except there are 16 values for each digit. We draft the letters A through F to mean the values 10 through 15.

Hex is a handy way of describing binary numbers with much less effort because each hex digit encodes 4 binary digits.

Octal - Numbers in Base 8

Base 8, or octal, is used far less than hex in CS because base 8 doesn't naturally encode into a powers-of-two centric digital world. Two hex digits perfectly fit

in a byte but two octal digits are 6 bits... too small. Three octal digits are 9 bits... too big.

Goldilocks does not approve of octal.

Printing Hex

With `printf()` use `%x`.

With `iostream` use the modifier `hex` but note this is sticky. It will remain active until switched back to `dec`.

The REAL Reason We Love Hex

You can spell stuff with hex.

Hex Value	Notes
DEADBEEF	Found frequently in MC68K code especially Amiga
8BADFOOD	Found for similar reasons but on Apple products
DEADDEAD	Associated with the Blue Screen of Death
F003BA11	Used by undergraduates everywhere
C0EDBABE	Used by misogynists everywhere
B16B00B5	Used by misogynists at Microsoft