Binary numbers

NOTE06 - Binary number encoding, floating point

*Text reference: **Appx A***

binary (base 2), octal (base 8), hex (base 16), nibble, byte

Hex is common because 4 bits is a nibble, 2 nibbles is a byte.

Important integer transformations:

- radix R => decimal   (general radix R equation)
- decimal <==> binary   (successive division)
- binary <==> oct   (groups of 3 bits)
- binary <==> hex   (groups of 4 bits)

Encoding negative binary numbers:

- Signed-magnitude - easiest, slap a sign bit in front
- One's complement - easy, invert bits
- Two's complement - invert bits, then add 1
- Excess - weirdest, add 2^{m-1} (or whatever) to number

For example, an 8-bit number (2^8 = 256)...

	Min	**Min binary**	**Max**	**Max binary**	**Notes**
Sign-mag	−127	1111 1111	127	0111 1111	Two zeros
1's comp	−127	1000 0000	127	0111 1111	Obsolete, hard to add
2's comp	−128	1000 0000	127	0111 1111	Most popular
Excess 64	−128	0000 0000	127	1111 1111	Used in float standard