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CSC 137 - 4 Harvey

HW #1

1.3 What is the 16-bit FP number representation of -5.375 in hex with 1-bit sign, 4-bit biased exponent, and 11-bit fraction, where bias offset = 7?

5 = 101 .375 = .011 → -5.375 in binary = 101.011

$= 1.01011 \times 2^2$

Exponent = 2 + bias

= 2 + 7 = 9

= 1001 → Fraction = 01011

The 16-bit FP number is: 1100101011000000

1.4 What is the real number equivalent to FP number 0x3400 with 1-bit sign, 4-bit biased exponent, 11-bit fraction, and bias offset = 7?

$0x3400 \rightarrow 0011010000000000_2$

4 bit exponent : 0110

Exponent = 6 - 7 = -1

Fraction = 10000000000 = $1 \times 2^{-1} = 0.5$

Real number = 0.5 + 0.25 = 0.75

1.5 What is the real number equivalent to FP number 0x3400 with 1-bit sign, 4-bit biased exponent, 11-bit fraction, and bias offset = 8?

$0x3400 \rightarrow 0011010000000000_2$

1-bit = 0 (+) 4-bit = 0110 bias = 8

exponent = 0110 - 8 → 6 - 8 = -2

Fraction = 10000000000 = $1 \times 2^{-1} = 0.5$

Real number = $(-1)^0 \times 1.5 \times 2^{-2} = 3/8 = 0.375$

1.14 What is a Von Neumann architecture bottleneck?

The Von Neumann bottleneck is a limitation on the throughput that is caused by the standard PC architecture. overcomming approaches includes: caching, perfetching, Multi threading, New types of Ram, Ram bus, Processing in memory which means integration of a processor and memory in a single micro chip. Basically the architecture having both data as well as instructions stored in the same memory space making it easier to access them for faster computation.