

Homework #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?

① $2\sqrt[4]{5} \rightarrow 1$ $2\sqrt[2]{2} \rightarrow 0$ $2\sqrt{1} \rightarrow 1 \Rightarrow 5_{10} = 101_2$

~~scribbles~~

$-5.375_{10} = 101.011_2$

② $0.375 \times 2 = 0 + 0.75$

$0.75 \times 2 = 1 + 0.5$

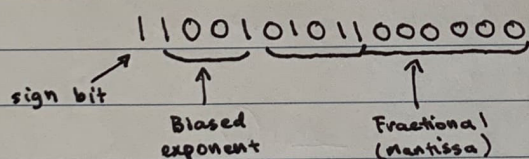
$\Rightarrow 0.375_{10} = 011_2$

$0.5 \times 2 = 1 + 0.0$

③ $101.011_2 \Rightarrow 1.01011_2 \times 2^2$

④ Biased exponent = $2 + 7 = 9_{10} = 1001_2$

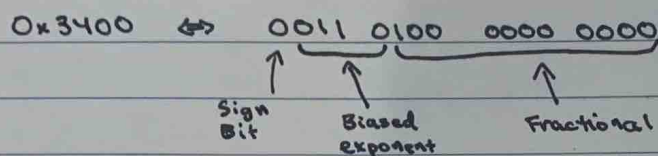
⑤ $-1.01011_2 \times 2^{9_{10} = 1001_2}$



⑥ $1100 \ 1010 \ 1100 \ 0000$
 C A C 0

$\Rightarrow \boxed{0 \times \text{CAC0}}$

- 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?



$$+1.1_2 \times 2^{0110_2 = 6_{10}}$$

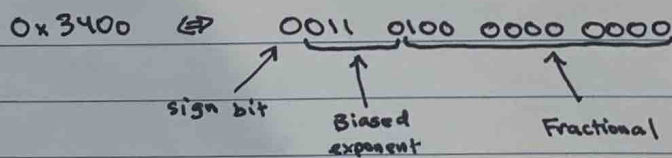
$$6 - 7 = -1$$

$$+1.1_2 \times 2^{-1} \Leftrightarrow 0.11_2 \Rightarrow 0 + \frac{1}{2} + \frac{1}{4} = 0.75$$

~~XXXXXXXXXXXXXXXXXXXX~~
~~XXXXXXXXXXXXXXXXXXXX~~

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?



$$+1.1_2 \times 2^{0110_2 = 6_{10}}$$

$$6 - 8 = -2$$

$$+1.1_2 \times 2^{-2} \Leftrightarrow 0.011_2 \Rightarrow 0 + \frac{0}{2} + \frac{1}{4} + \frac{1}{8} = 0.375$$

~~XXXXXXXXXXXXXXXXXXXX~~
~~XXXXXXXXXXXXXXXXXXXX~~
~~XXXXXXXXXXXXXXXXXXXX~~

0.375

1.14

What is a Von Neumann architecture bottleneck?

- Von Neumann bottleneck is where a computer system has a limitation on throughput due to inadequate weight of data transfer between memory and CPU. The VNB causes the system to wait and idle for a certain amount of cycles for a certain amount of time, while the low-speed memory is still being accessed.