Edwin Huang
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1. Convert following decimal #s to binary #s:

a) 5.75

$\rightarrow 5.00 + 0.75$

$5_{10} = 0101$

$0.75 = \frac{3}{4} = .11$ $\rightarrow \boxed{101.11}$

b) $\frac{63}{64}$

$64_{10} = 1\,000\,000$

$-\quad 1$

$0\,111\,111 \rightarrow \boxed{0.111111}$

$64 - 1 = 63$

c) 9.8125

$\rightarrow 9_{10} = 8_{10} + 1_{10} = 1001$

$.8125 = \frac{13}{16} = .1101$

$.8125 \cdot 2 = 1.625$

$0.625 \cdot 2 = 1.25$

$0.25 \cdot 2 = 0.5$

$0.5 \cdot 2 = 1$

$\rightarrow 1101$

$= \boxed{1001.1101}$

2. Convert 34.890625 into the IEEE 754 floating-point rep.

1) Sign: (+), positive

2) Exponent: $34 \rightarrow 100010$

$.890625 \rightarrow 111001$

$34.890625 = 100010.111001 = 1.\underline{0010111001} \times 2^5$

3) Mantissa: 0010111001

Sign: 0
Exponent: 0000 0101
Mantissa: 0010111001

128 64 32 16 8 4 2 1

)

3. Convert $\underbrace{0}\,\underbrace{01111011}\,\underbrace{00000\ldots00}$ to decimal.

→ Sign: 0 (+)

Exponent: $0111\ 1011_2$

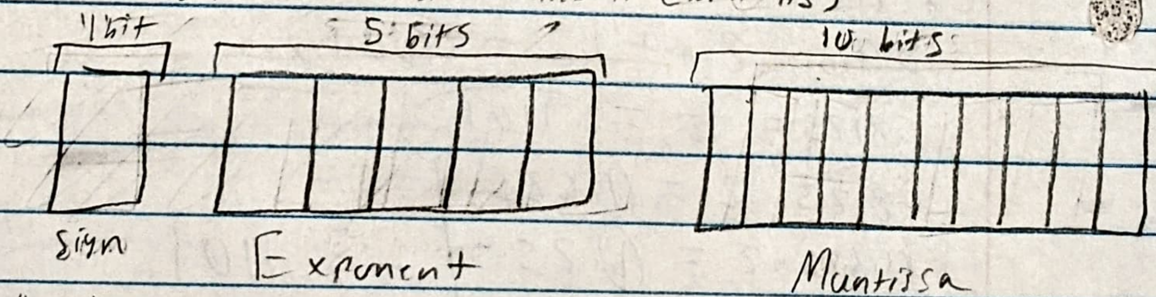
$= 64 + 32 + 16 + 8 + 2 + 1 = 123_2$

→ $123 - 127 = -4$ (since the bias in 32-bits is 127)

$= 1.000\ 0000\ 0000\ 0000\ 0000\ 0000 \times 2^{-4}$

Mantissa: $0.001 = \frac{1}{2^{-4}} = \frac{1}{16} = \boxed{0.0625}$

4. Explain the definition of denormalized number and show the largest denormalized # and smallest normalized # (for (+) #s)



A denormalized number means that it is a number that is less than 0 and is used to act as a offset in floating point arithmetic.

Largest Denormalized Number: $\boxed{\pm 2^{-14} \cdot (1 - 2^{-10})}$

| * | | 0 | 0 | 0 | 0 | 0 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Sign Exponent Mantissa

Smallest Normalized Number: $\boxed{\pm 2^{-127}}$

| * | | 1 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Sign Exponent Mantissa