

Decimal fractions \rightarrow Binary

$$4\frac{1}{2} = 100.\underline{1} \text{ b}$$

$$\frac{1}{2} * 2 = \frac{2}{2} = 1 \text{ no fractions left}$$

\rightarrow Done

$$2\frac{3}{4} = 10.\underline{11} \text{ b}$$

$$\frac{3}{4} * 2 = \frac{6}{4} = 1\frac{1}{2}$$

$$\frac{1}{2} * 2 = \frac{2}{2} = 1$$

$$1\frac{5}{16} = 1.\underline{0101}$$

$$\frac{5}{16} \times 2 = \frac{10}{16} = 0\frac{5}{8}$$

$$\frac{5}{8} \times 2 = \frac{10}{8} = 1\frac{1}{4}$$

$$\frac{1}{4} \times 2 = \frac{2}{4} = 0\frac{1}{2}$$

$$\frac{1}{2} \times 2 = \frac{2}{2} = 1$$

$$0.3 = 0.\overline{01001}b$$

$$0.3 * 2 = 0.6$$

$$0.6 * 2 = 1.2$$

$$0.2 * 2 = 0.4$$

$$0.4 * 2 = 0.8$$

$$0.8 * 2 = 1.6$$

0.6, Repeats

$$EC + 1pt \quad 0.45 = \overline{0}b$$

max 8 bits

Binary \rightarrow Decimal

$$11.01_2 = 3\frac{1}{4}$$

$$\begin{aligned} 2^0 &= 1 \\ 2^1 &= 2 \\ 0 \times 2^{-1} &= 0 \\ 1 \times 2^{-2} &= \frac{1}{4} \end{aligned}$$

$$110.101_2 = 6\frac{5}{8} = 6.625$$

$$\begin{aligned} \frac{1}{2} & \quad \frac{1}{4} & \quad \frac{1}{8} \\ 2^{-1} & 2^{-2} & 2^{-3} \end{aligned}$$

$$\frac{1}{2} + \frac{1}{8} = \frac{4+1}{8} = \frac{5}{8}$$

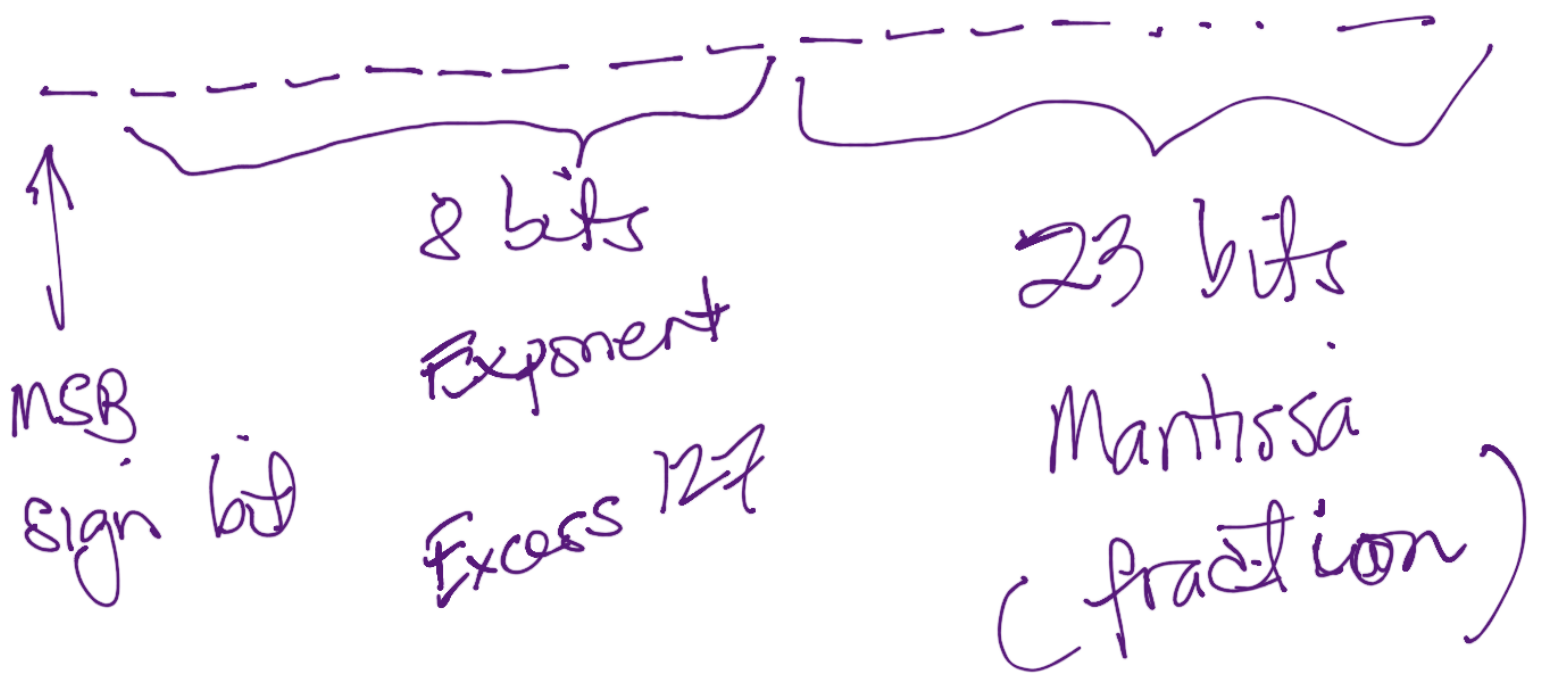
$$0.5 \quad 0.125$$

$$110.101016 = 6 \frac{21}{32}$$

$$\frac{1}{2} + \frac{1}{8} + \frac{1}{32}$$

EC: Take the 8 bits
 11pt from 0.45 \rightarrow Binary
 and convert to
 decimal.

IEEE 754 - Single Precision (32 bits)



Normalization:

— move the radix point to the RIGHT of the LEFTMOST '1'

$$11.016 = +1.101 \times 2^3$$

← sign
← exponent

fraction

$$0.0010116 = +1.011 \times 2^{-3}$$

$$0 \quad \underbrace{10000000}_{23 \text{ bits}} \quad \underbrace{10100000000000000000000}_{23 \text{ bits}}$$

sign

$$\text{Exponent} = 1 + 127 = 128$$

$$0 \quad \underbrace{01111100}_{23 \text{ bits}} \quad \underbrace{01100000000000000000000}_{23 \text{ bits}}$$

sign - 3 + 127 = 124 exp