

Review Final

1) Binary and machine numbers

$$x = \pm b_n 2^n + b_{n-1} 2^{n-1} + \dots + b_0 + b_1 2^{-1} + \dots$$

Ex: What is the decimal number that corresponds to the binary number

$$(11001.10)_2 = 2^4 + 2^3 + 1 + 2^{-1} = 16 + 8 + 1 + \frac{1}{2} = 25.5$$

$\begin{matrix} \uparrow & \uparrow & & \uparrow & & \uparrow \\ b_4 & b_3 & & b_0 & & b_1 \end{matrix}$

Ex. Write $\frac{1}{3}$ as a decimal number

$$\frac{1}{3} \rightarrow \frac{2}{3} \rightarrow \frac{4}{3} \Big| \frac{1}{3} \rightarrow \frac{2}{3} \rightarrow \frac{4}{3} \Big| \frac{1}{3} \dots$$

$$(0.01\overline{01} \dots)_2$$

Ex. Write the machine number

$$1 \quad \begin{matrix} b_{10} & b_9 & b_8 & b_7 & b_6 & b_5 & b_4 & b_3 & b_2 & b_1 & b_0 \end{matrix} \quad 00010010001 \quad 1001001000 \dots$$

in the form $(-1)^s 2^{c-1023} (1+f)$

$$s=1 \quad 2^7 + 2^4 + 1 = 128 + 16 + 1 = 145 = c$$

$$f = 1 \cdot 2^{-1} + 1 \cdot 2^{-4} + 1 \cdot 2^{-7} = \frac{1}{2} + \frac{1}{16} + \frac{1}{128} = 0.5703125$$