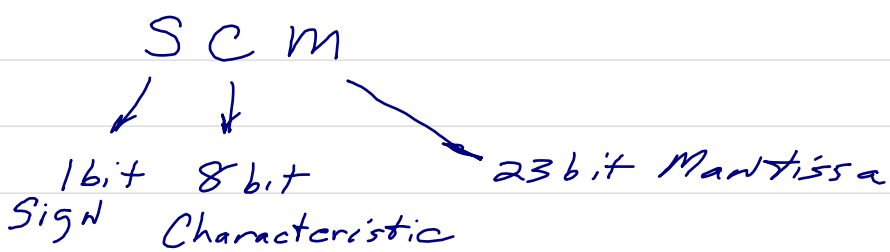
IEEE 754 (Float Representation)



We change our previous NASA float representation by

1) Location of C vs M
2) No 2's complement either C or M
3) Scientific notation scaling
   $1.xxx \cdot 2^{Y}$ vs $0.1xxx \cdot 2^{Y+1}$
4) Bias the characteristic by
   + 127 or 0111 1111

So Let us take the previous example

$2.8_{10} \rightarrow 10.\underline{1100}_2$

$1.\underline{0110} \times 2^{1}$

All scaled this way to start with 1 so leave it off and gain an extra bit

So S C M

Sign is positive meaning 0

Characteristic $2^{(1)}$ is biased by 127 so

$$\begin{array}{r} 0111\ 1111 \\ +\ \ 1 \\ \hline 1000\ 0000 \end{array}$$

Mantissa = .0110

Placing into bits

S C M

0 | 1000 0000 | 0 | 0110 0110 0110 0110 0110 0110

4 | 0 | 3 | 3 | 3 | 3 | 3 | 3

Go to online converter and compare Hexadecimal Representation

2.8 ~ 2.79999995 = $0x\ 40333333$

Double Float Representation

S C m

S → 1 bit
C → 11 bits
m → 52 bits

Bias double by 1023 → 01111111111_2 for characteristic

Previous Example

$2.8_{10} = 1.0110_2 \times 2^{1}$

Sign → 0

Characteristic

$$\begin{array}{r} 01111111111 \\ +\ \ 1 \\ \hline 10000000000 \end{array}$$

Mantissa = 0110

So

s	c	m
0	10000000000	0110
4	0	0	6	6	→

Answer for double representation

$2.8_{10} =$ 0x 4006666666666666