

8 bit
 127
 ⋮
 -128

-127

-0

-64 -63

-128

-x + x = 0

1000 0000

+ 1000 0000

0000 0000

0000

1111

+ 1

0000

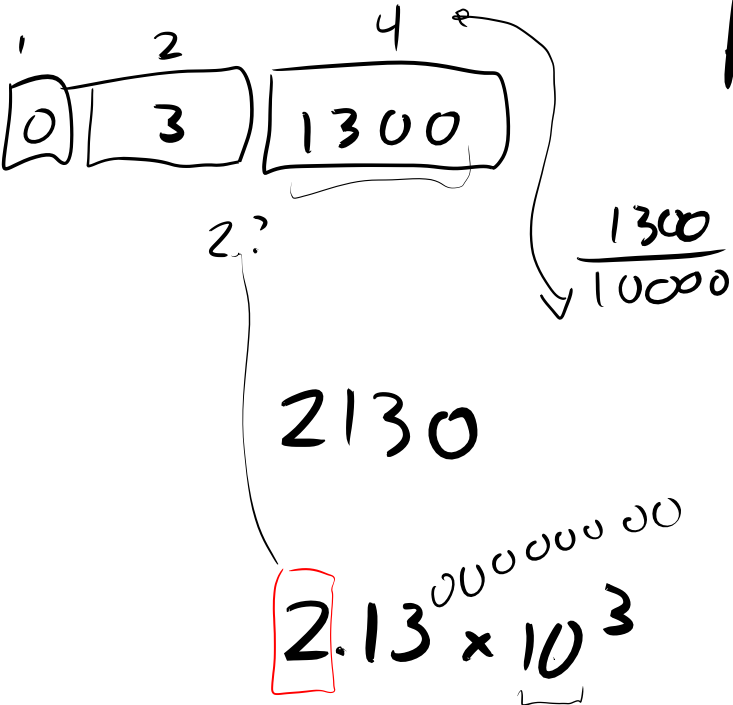
11010011 -45

00101100

00101101 45

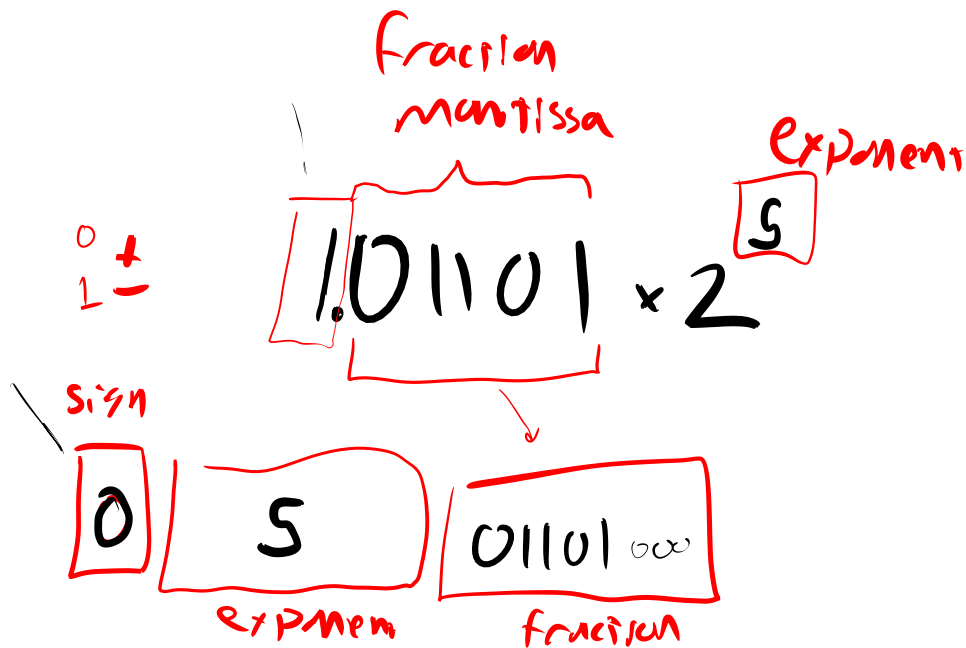
- x
1. flip all bits
 2. add 1

Floating-point



3.1415
 ↑
 decimal point

11.10010
 ↑
 binary point



4-bit
biased

$$2^{-3}$$

$$\frac{1}{2^3}$$

$$\frac{1}{8}$$

bias $\overset{1}{0}\overset{1}{0}\overset{1}{0}\overset{1}{0}$ 2

+ $\left(\begin{array}{r} -0111 \\ \hline \end{array} \right) - 7$

$2^3 \text{ comp } 1011$ -5

$$2^2 + 2^0 + 2^{-2} + 2^{-3}$$

$$4 + 1 + \frac{1}{4} + \frac{1}{8}$$

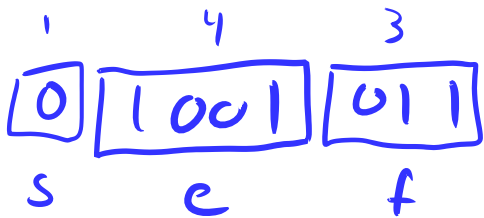
$$\begin{array}{c} 5 \qquad \qquad \frac{3}{8} \\ \left[\begin{array}{ccc} 2^2 & 2^1 & 2^0 \\ 1 & 0 & 1 \end{array} \right] \cdot \left[\begin{array}{ccc} 2^{-1} & 2^{-2} & 2^{-3} \\ 0 & 1 & 1 \end{array} \right] \\ \left[\begin{array}{c} 5 \\ \frac{3}{8} \end{array} \right] \end{array}$$

$$3.141$$

$$= 3 \frac{141}{1000}$$

$$\begin{array}{l} 1.01011 \times 2^2 \\ 1.011 \times 2^2 \end{array}$$

$$3.14159 \approx 3.1416$$

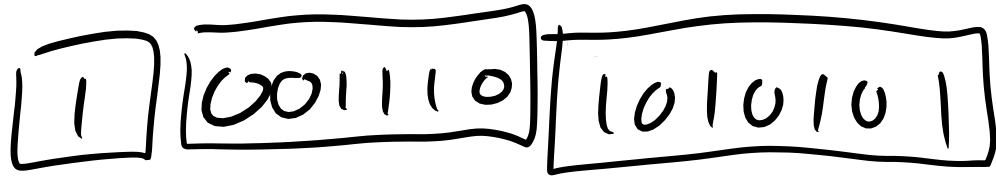


$$\begin{array}{r} 1 \quad 10 \\ + \quad 0111 \leftarrow \text{Bias} \\ \hline 1001 \end{array}$$

excess bits
01...1

$$\begin{array}{r}
 11111 \\
 001110 \\
 - 011111 \\
 \hline
 101111 \\
 010000 \\
 - 010001 \\
 \hline
 \end{array}$$

-17



$$- 1. \underline{1010101} \times 2 \quad \underline{-17}$$

$$- 0.0000000000000000000000011010101$$

0

1. _____

x 2 _____