



finite, fixed # of bits

$$\begin{array}{r} 1111111 \\ 00101101 \\ + 11010011 \\ \hline 00000000 \end{array}$$

↷ 1

$$\begin{array}{r} 00101100 \\ + 11010011 \\ \hline 11111111 \\ 1 \\ \hline 00000000 \end{array} \quad \longleftrightarrow \quad 11010100$$

64 32 16 8 4 2 1

$$\begin{array}{r}
 11 \rightarrow \\
 \underline{-8} \\
 3 \quad 1 \quad 0 \quad 1 \quad 1 \\
 \underline{-2} \\
 1 \\
 \underline{-1} \\
 0
 \end{array}$$

$$\begin{array}{r}
 1 \quad 1 \quad 1 \quad 1 \quad 1 \\
 001011 \\
 + 011111 \\
 \hline
 101010
 \end{array}$$

$$\begin{array}{r}
 1 \\
 101111 \\
 - 011111 \\
 \hline
 010000
 \end{array}$$

$$\begin{array}{r}
 111111 \\
 010000 \\
 - 011111 \\
 \hline
 101111 \\
 - 010001
 \end{array}$$

$$\begin{array}{r}
 101111 \\
 - 010001
 \end{array}$$

Z's comp

01111
+ bias

Bias



0111
- bias
←
1001

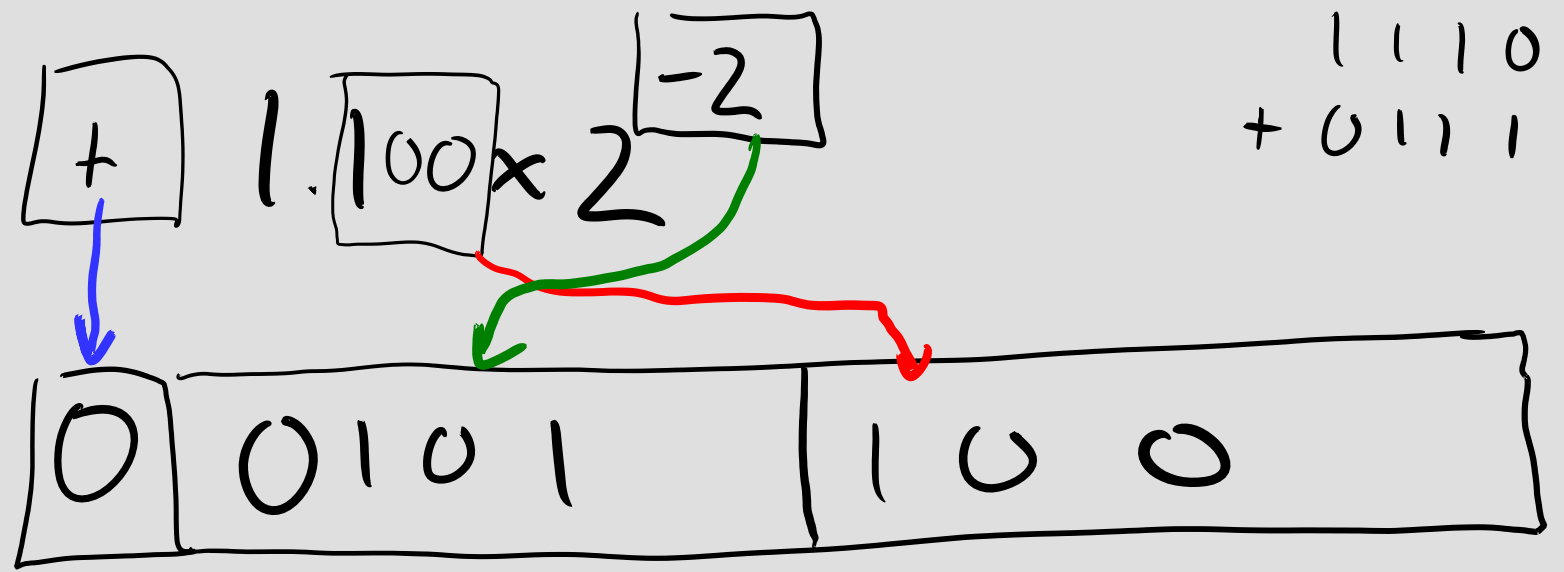
$$\frac{\textcircled{3}}{8} \quad \text{''} \quad 2^{-1} \quad 2^{-2} \quad 2^{-3}$$

$$\frac{3}{8} \quad \frac{1}{8} \quad \frac{1}{2} \quad \frac{1}{4} \quad \frac{1}{8}$$

$$\begin{array}{r} 1116 \\ + 0111 \\ \hline 0101 \end{array}$$

$$0.000 \cdot 011000$$

$$\begin{array}{r} 0010 \\ 1101 \\ 1110 \\ + 0111 \end{array}$$



$$\begin{array}{r}
 1001 \\
 - 0111 \\
 \hline
 0010
 \end{array}$$



$$- 1.100 \times 2^2$$

$$- 110$$

$$- 6$$

5

00000101

bit vectors

bit-wise

operators

and

&

or

|

not

~

xor

^

$$\begin{array}{r} 0110 \\ \& 1100 \\ \hline 0100 \end{array}$$

$$\begin{array}{r} 0110 \\ \wedge 1100 \\ \hline 1010 \end{array}$$