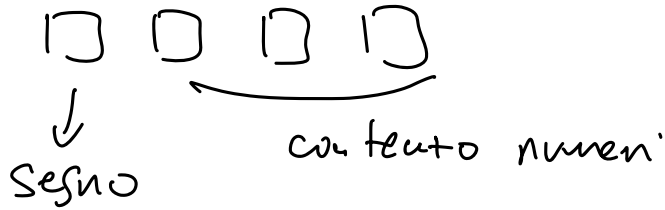


Numeri negativi

4 cifre



$$\begin{matrix} 1 & 000 \\ 0 & 000 \end{matrix} \} \equiv 0$$

Rappresentazione a complemento

$$x = 13$$

$$13 - 13 = 0$$

$$y = -13$$

$$13 + (-13) = 0$$

4 cifre con base 10:



0, ..., 9999

$$\# \text{ numeri} = \text{base}^{\# \text{ cifre}} = 10^4$$

$$x = 3547$$

$$x + K = \text{base}^{\# \text{ cifre}}$$

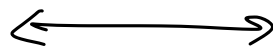
$$K =: \text{base}^n - x$$

$$K = 10^4 - 3547 = 6453$$

$$\boxed{3547} + \boxed{6453} = 1 \boxed{0000}$$

$$3547 - 3547 = \boxed{0000}$$

numero
- 3547



representato
da

6453

0000, ..., 4999, 5000, 5001, ..., 9999

Diagram showing two vertical double-headed arrows. The left arrow is labeled "-4999" and the right arrow is labeled "-1".

$$\text{base} = 10$$

$$\text{cifre} = 10$$

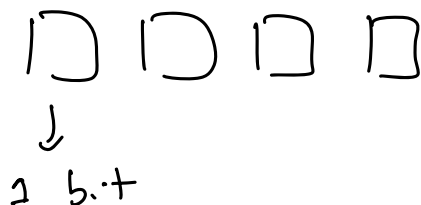
$$0, \dots, \frac{10^{10}}{2}, -\frac{10^{10}}{2}, \dots, -1$$

-4'999'999'999

$$\frac{10\,000\,000\,000}{2}$$

base 2

$$5'000'000'000$$



$$\text{cifre} = 0, 1$$

1 bit

$$8 \text{ bit} = 1 \text{ byte}$$

$$1 \text{ KB} = 1024 \text{ Byte}$$

$$1 \text{ MB} = 1024 \text{ KiloByte}$$

Rep. n Complemento n base 2

$$b=2, n=3 \quad \square \square \square$$

$$000, \dots, 111$$

$$\# \text{ numeri} = \text{base}^{\text{cifre}} = 2^3 = 8$$

$$\text{Senza negativi: } 0, \dots, 7 \equiv 111_2$$

num negativi con $b=2, n=3$

$$x = 11_2 = 3_{10}$$

$$x + K = b^n = 1000$$

$$11_2 + K = 0$$

$$K = b^n - 11_2 = 1000 - 11$$

$$\begin{array}{r} 0 \quad 10 \quad 10 \quad 10 \\ \times \quad \times \quad \times \quad \times \\ \hline 11 \end{array}$$

0101

$$x = 11_2$$

$$K = 101_2$$

$$11 \longleftrightarrow 3$$

$$101 \longleftrightarrow -3$$

$$\begin{array}{r} 1 \quad 1 \\ 0 \quad 10 \quad 10 \quad 10 \\ \times \quad \times \quad \times \quad \times \\ \hline 11 \end{array}$$

1

$$0, 1, 2, 3, 4, -3, -2, -1$$

$$b=2, n=3 \quad 8 \text{ numeri}$$

Calcolo Complemento in base 2

1) $x = 10101001110101$
 $K = ?$

Da destra lasciare bit invariati fino al primo 1
poi scambiare $0 \rightarrow 1, 1 \rightarrow 0$

$$K = 01010110001011$$

$$K + x = ?$$

2) algoritmo 2 Complemento a 1 + Somma di 1.

$$x = 1010$$

$$x' = 0101 \quad \text{complemento a 1}$$

$$x'' = x' + 1$$

$$\begin{array}{r} 0101 + \\ 0001 \\ \hline 0110 \end{array} \quad K$$

base 2

$$1 + 1 = 10$$

macchina a 32 bit intero occupa 32 bit.

$$-\frac{2^{32}}{2} + 1 \quad \text{---} \quad \frac{2^{32}}{2}$$

Numeri reali:

$$x = 23.20197$$

$$= 2 \times 10^1 + 3 \times 10^0 + 2 \times 10^{-1} + 0 \times 10^{-2} + \dots + 7 \times 10^{-5}$$

Sistema pos: Binario

$$\begin{aligned} x &= 101.101_2 = 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 + 1 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} \\ &= 5.625_{10} \end{aligned}$$

$$x = 127.93$$

$$x = -975.75$$

Rappresentazione normale:

$$x = 2.320197 \times 10^1$$

$$= 232.0197 \times 10^{-1}$$

$$x = (\text{segno}) m \times b^e$$

$$0 < m < \text{base}$$

m: mantissa.

b: base.

e: esponente

$$b = 10 \quad m = 2.320197$$

$$e = 1$$

$$x = -127.23 = -1.2723 \times 10^2$$

Numero razionale Standard IEEE



1 b.it
Segno

esponente
repp. a
complemento

Mantissa

$$1 \times 2^{-1} + 1 \times 2^{-2} + \dots + 1 \times 2^{-23}$$

$$x = (\text{segno}) m \times 2^e$$

$$2^8 - 1$$

$$0, \dots, 255$$

$$-127, \dots, 128$$

$$\begin{array}{cccccccc} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \end{array}$$

$$2^5 = 32$$

$$2^6 = 64$$

$$2^7 = 128$$

$$2^8 = 256$$

$$01000001 \equiv -127$$

10 0 0 0

0 0 0 0

0 0 1 1

0 1 0 2

0 1 1 3

1 0 0 4

1 0 1 -3

1 1 0 -2

1 1 1 -1

$$X = \underbrace{1.234}_m \times 2^{\boxed{27}} e$$

00000000 0

00011011 27

01111111 128

10000000 → 128

10000001 -127

27/2 13 1

13/2 6 1

6/2 3 0

3/2 1 1

1/2 0 1

11011₂ =

1 + 2 + 8 + 16