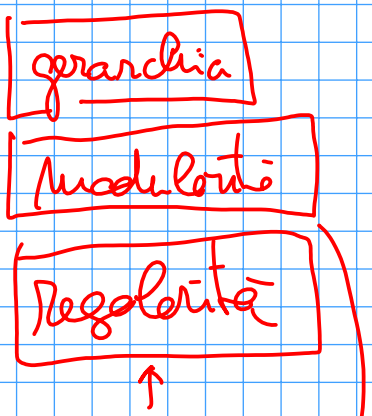
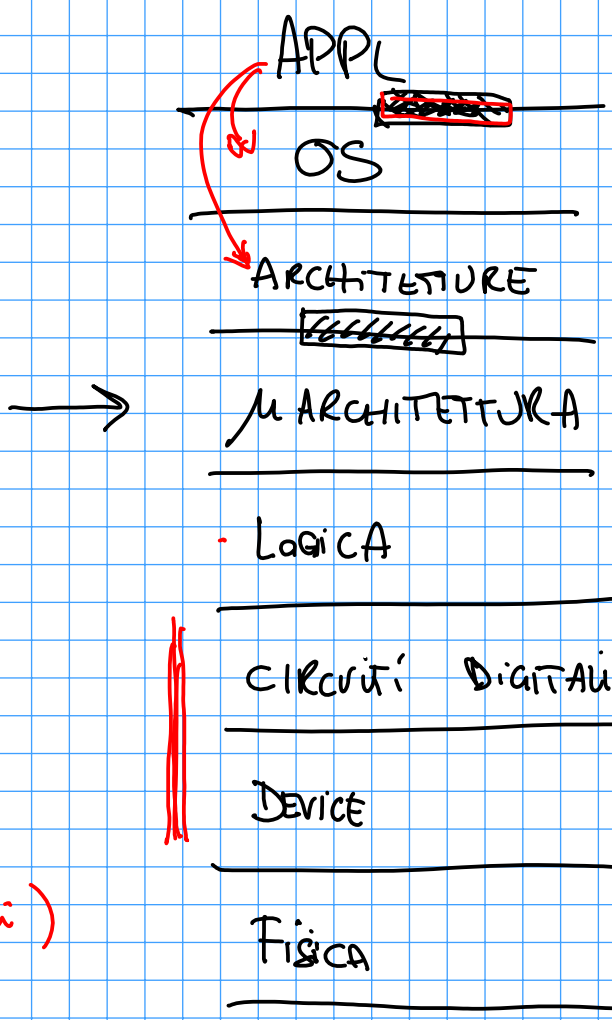
Astrazione



automi indipendenti (sequenziali)

```
while (true) {
    op ∈ { op1 ... opk }
}
```



DISCIPLINA

regolarità

CISC
(x86)

RISC
(ARM)

Complex

Instruction set computers

Reduced

ARITMETICA BINARIA

V	F
0	1 ←
0V	+5V

↓

Sistema posizionale

2 1 0
1 2 3 $\qquad 10$

$1 \times 10^2 + 2 \times 10^1 + 3 \times 10^0$

$10^0 = 1$

$10^1 = 10$

$10^2 = 100$

$2^2\ 2^1\ 2^0$

pos 4 2 1

$101_2 = 5_{10} \qquad 0101$

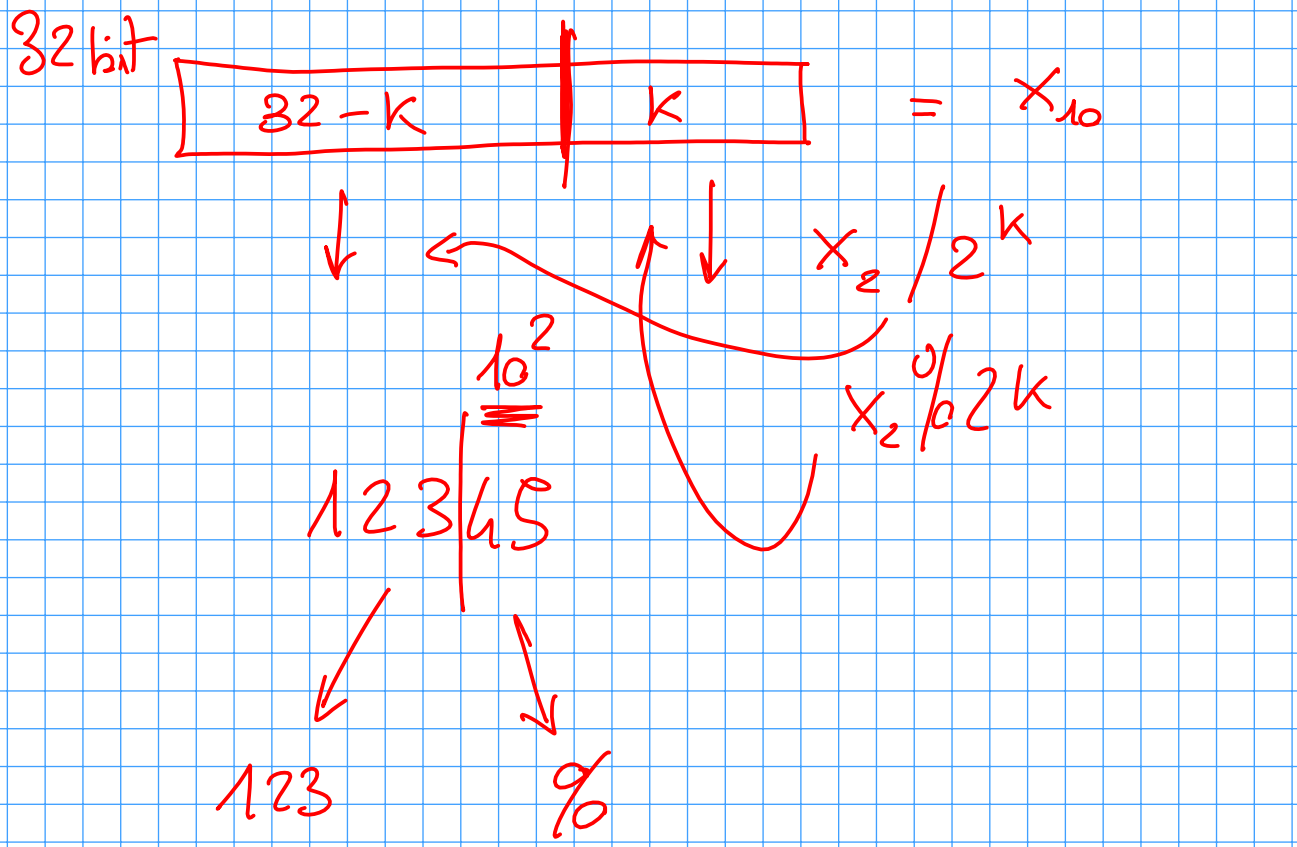
$123 \leftarrow 1\,pos = 1230$

$1230 \rightarrow 1\,pos = 123$

4 2 1
$101_2 = 5_{10}$

8 4 2 1
$1010_2 = 10_{10}$

8 4 2 1
$1100_2 = 12_{10} \rightarrow 1\,pos$ $\quad$ 4 2 1
$110_2 = 6_{10}$



123 |2
1 61 |2
1 30 |2
0 15 |2
1 7 |2
1 3 |2
1 1

64 32 16 8 4 2 1
1 1 1 1 0 1 1 $_2$ = 123_{10}

64 32 16 8 4 2 1
1 1 1 1 0 1 1

123 (64)
64
59 (32)
32
27 - (16)
11
(8)
3
(2)
(1)

1 1
1 2 3 +
4 8 =
1 7 1

1 1
1 0 1
1 1
1 0 0 0

5
3
8_{10}

101×11

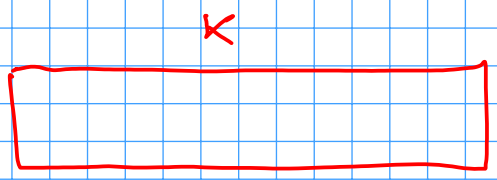
101

$101-$

1111

$8\ 4\ 2\ 1$

$5 \times 3 = 15$



$000 \ldots 0 = 0_{10}$

$(2^K - 1)_{10}$

$111 \ldots 1$

$000 \ldots 01$

$1|000 \ldots 00$

4 bit — nibble

8 bit — byte

4004

16 bit

word

64 bit — 32 bit

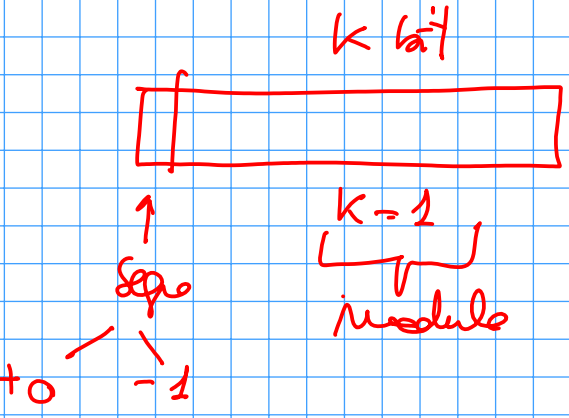
K	2^{10}	1024
M	2^{20}	1024×1024
G	2^{30}	miliardi
T	2^{40}	

32

Numeri Relativi

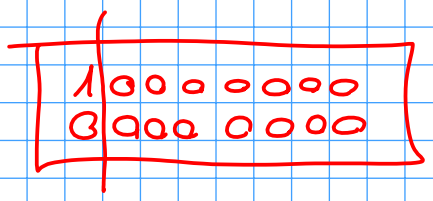
$\pm n_{10}$

Modulo e segno



byte $\pm$ $0 \div 127$

$-127 \qquad +127$



doppia rappresentazione

Complemento a 2

$n_{10} \rightarrow x_2$

$n \geq 0 \rightarrow$ binario "ricorsivo"

$n < 0 \rightarrow$ binario normale negato $+1$

5	101	0000 0101
-5	101	1111 1010
		1
		1111 1011

$$\begin{array}{r} {\scriptstyle 1\,1\,1\,1\;\;1\,1\,1} \\ 1\,1\,1\,1\;\;1\,0\,1\,1 \\ 0\,0\,0\,0\;\;0\,1\,0\,1 \\ \hline 1\;0\,0\,0\,0\;\;0\,0\,0\,0 \end{array}$$

$5 - 5$

$3 - 5$

$$\begin{array}{r} {\scriptstyle 1\;1} \\ 0\,0\,0\,0\;\;0\,0\,1\,1 \\ 1\,1\,1\,1\;\;1\,0\,1\,1 \\ \hline 1\,1\,1\,1\;\;1\,1\,1\,0 \end{array}$$

-2

$0000\;\;0010$

$$\begin{array}{r} {\scriptstyle 1\;\;\;1} \\ 1\,1\,1\,1\;\;1\,1\,0\,1 \\ \hline 1\,1\,1\,1\;\;1\,1\,1\,0 \end{array}$$

$0000\;\;0000$

$k \quad -2^{k-1} \ldots 2^{k-1} - 1$

k

$0 \div 2^{k-1}$

$$\frac{2^k}{2^1} = 2^{k-1}$$

$$\begin{array}{r} \times \\ \times \\ \times \\ \hline \times \end{array}$$

b_1	b_2	ris	rip
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

uguali

$$ris = (not(b_1)\ AND\ b_2)\ OR\ (b_1\ AND\ not(b_2))$$

$$rip = b_1\ AND\ b_2$$