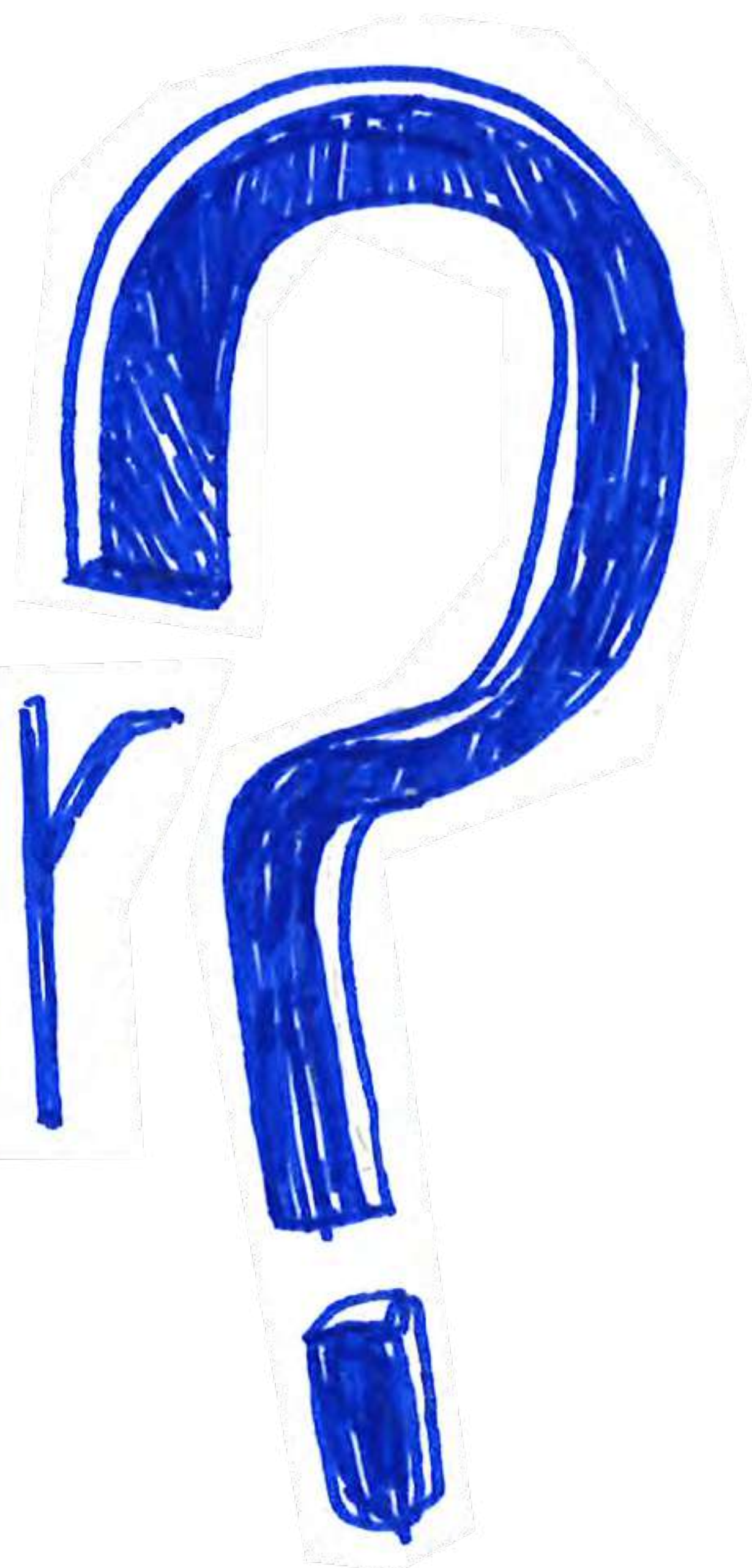


COME é

FATTO

un

computer





I primi concetti

Bit

BIT

Binary digit

cifra binaria

può assumere
solo due valori

vero

1

falso

0

A chi dobbiamo
il concetto di

bit ?

Claude Shannon



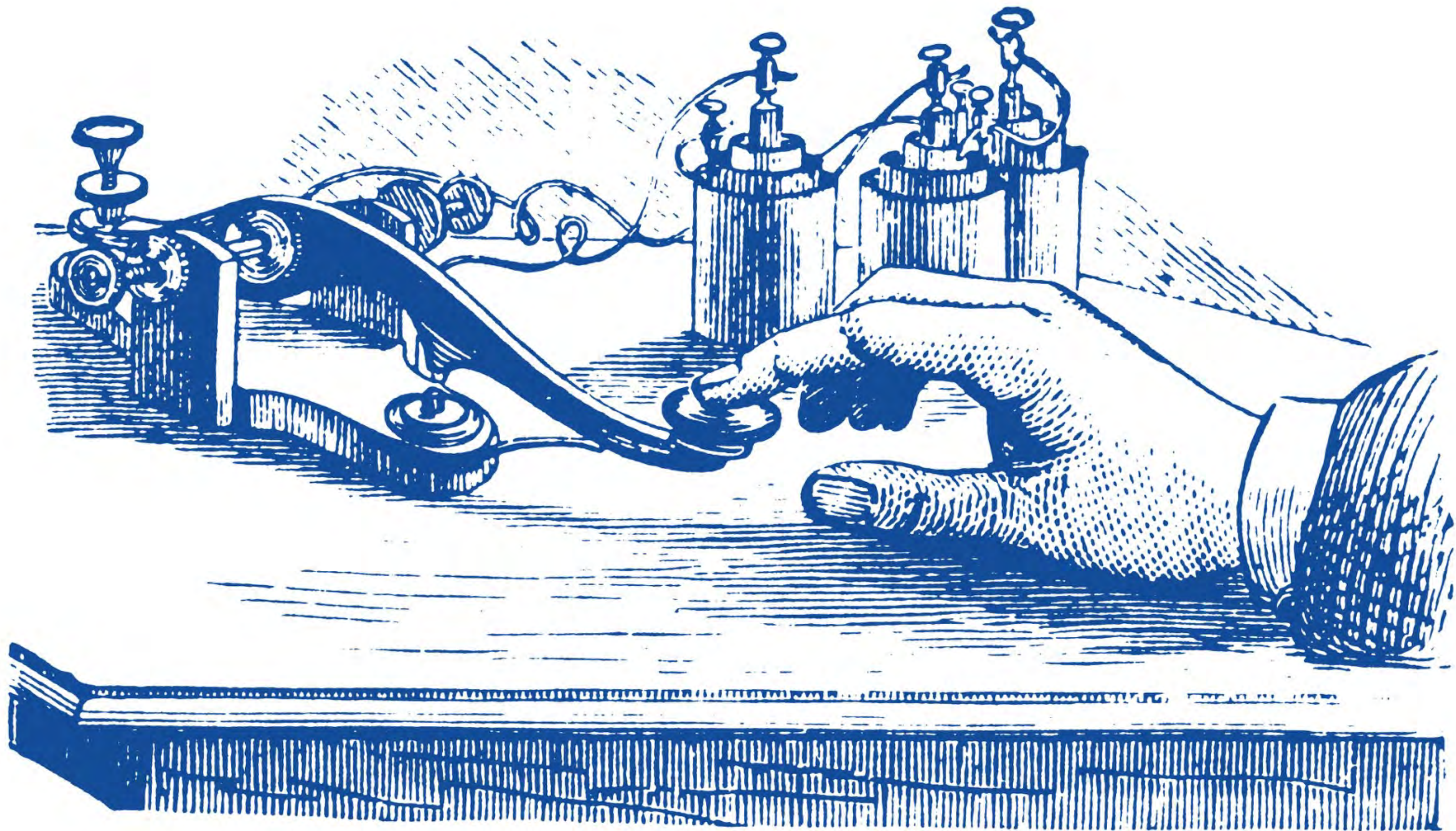
Matematico e ingegnere
statunitense

introdusse il termine
BIT nel 1948

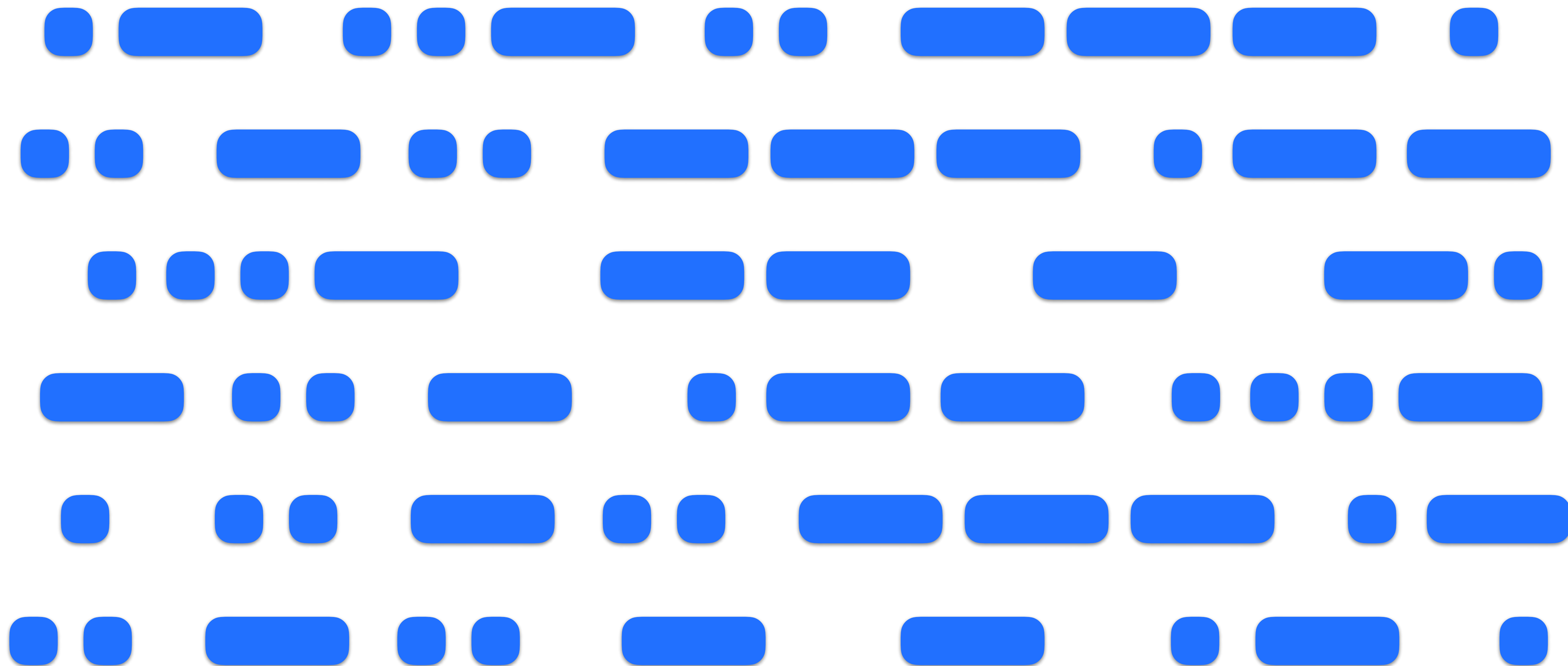
Shannon

bit

Unità minima
di informazione



Sistemi telegrafici



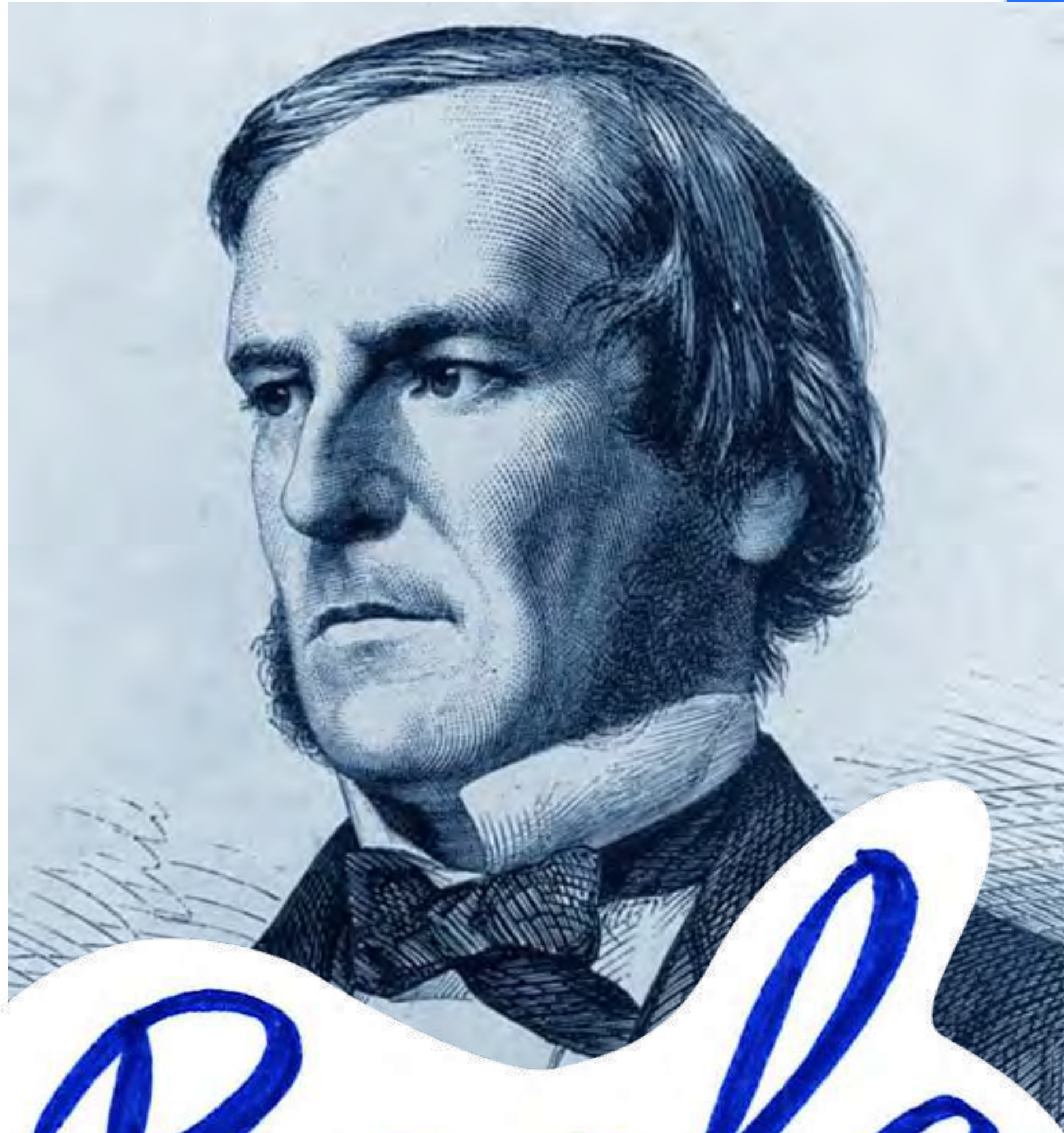
| ALGEBRA |

| BOOLEANA |





George Boole



Matematico
inglese

Boole

vero

1

falso

0

and

not

or

congiunzione Logica

“Se prendo almeno un 7 all’interrogazione di italiano e supero il test di matematica, vengo promosso”

disgiunzione logica

*“Se ho la chiave o mi ricordo il codice
a sei cifre, riesco ad aprire la porta di casa”*

computer

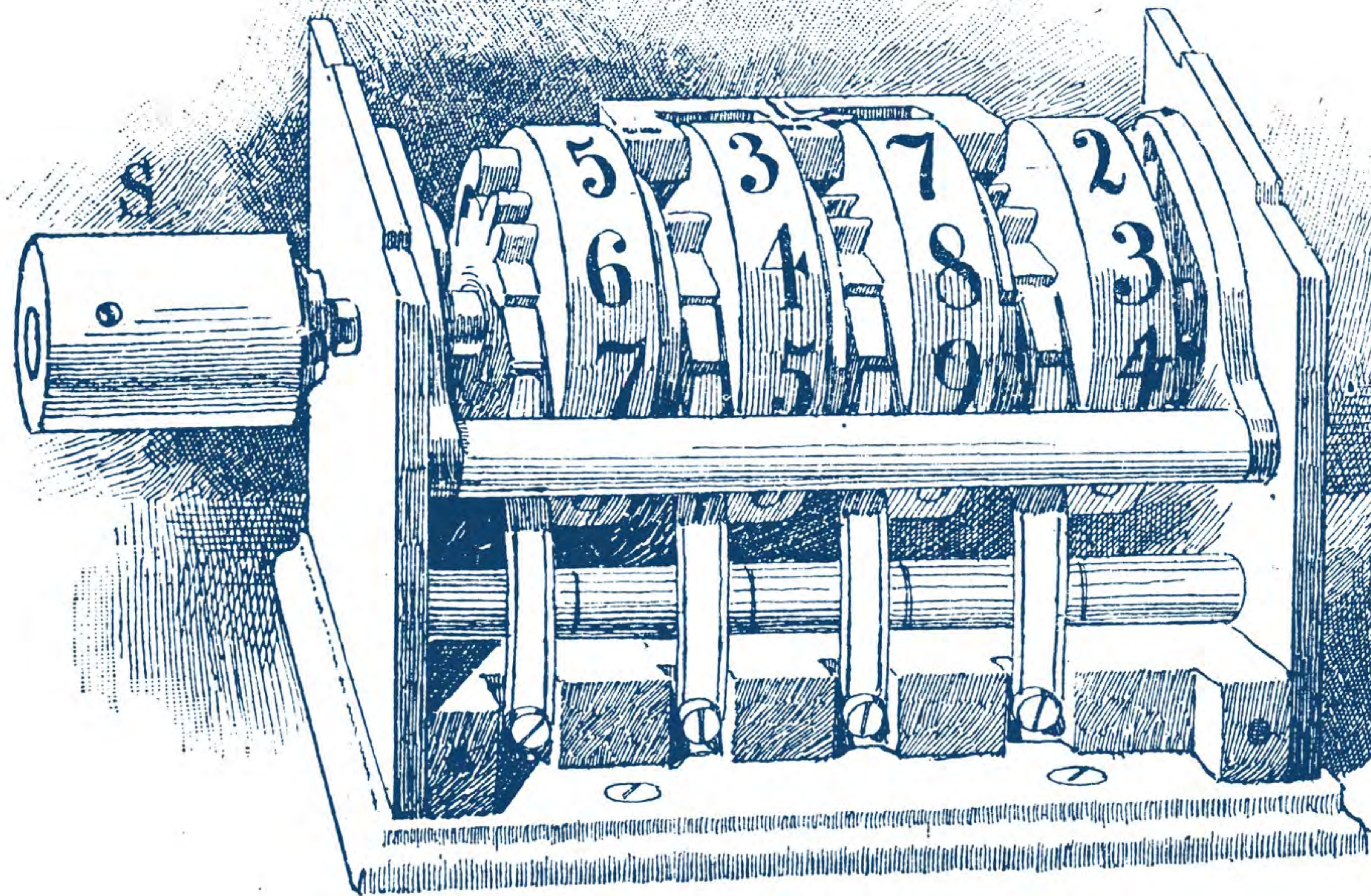


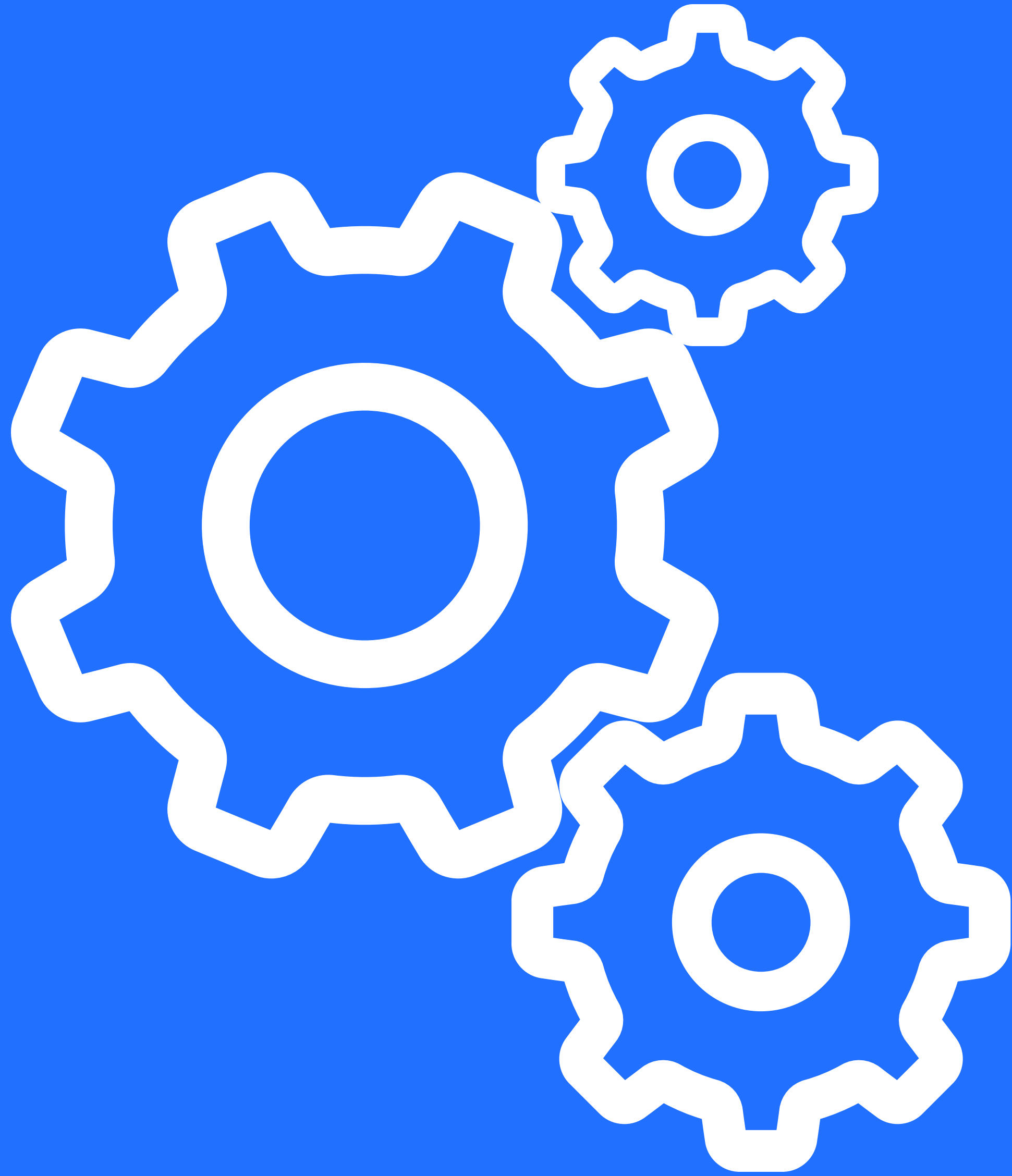
o

CALCULATOR



**calcolatrici
meccaniche**

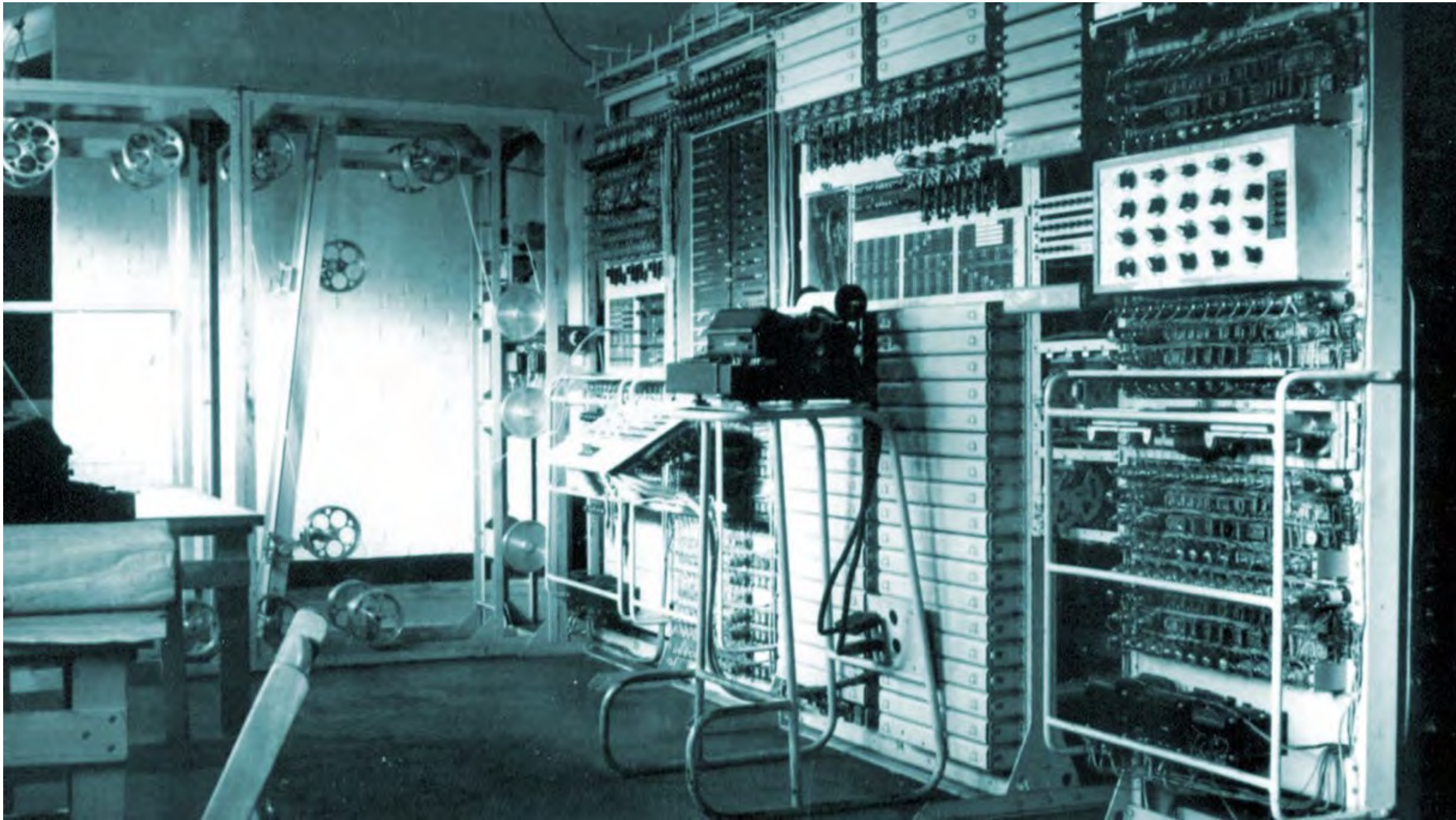




Blaise Pascal

Leibniz

costruzione di
calcolatrici meccaniche,
che funzionavano a
ingranaggi, un po'
come gli orologi.



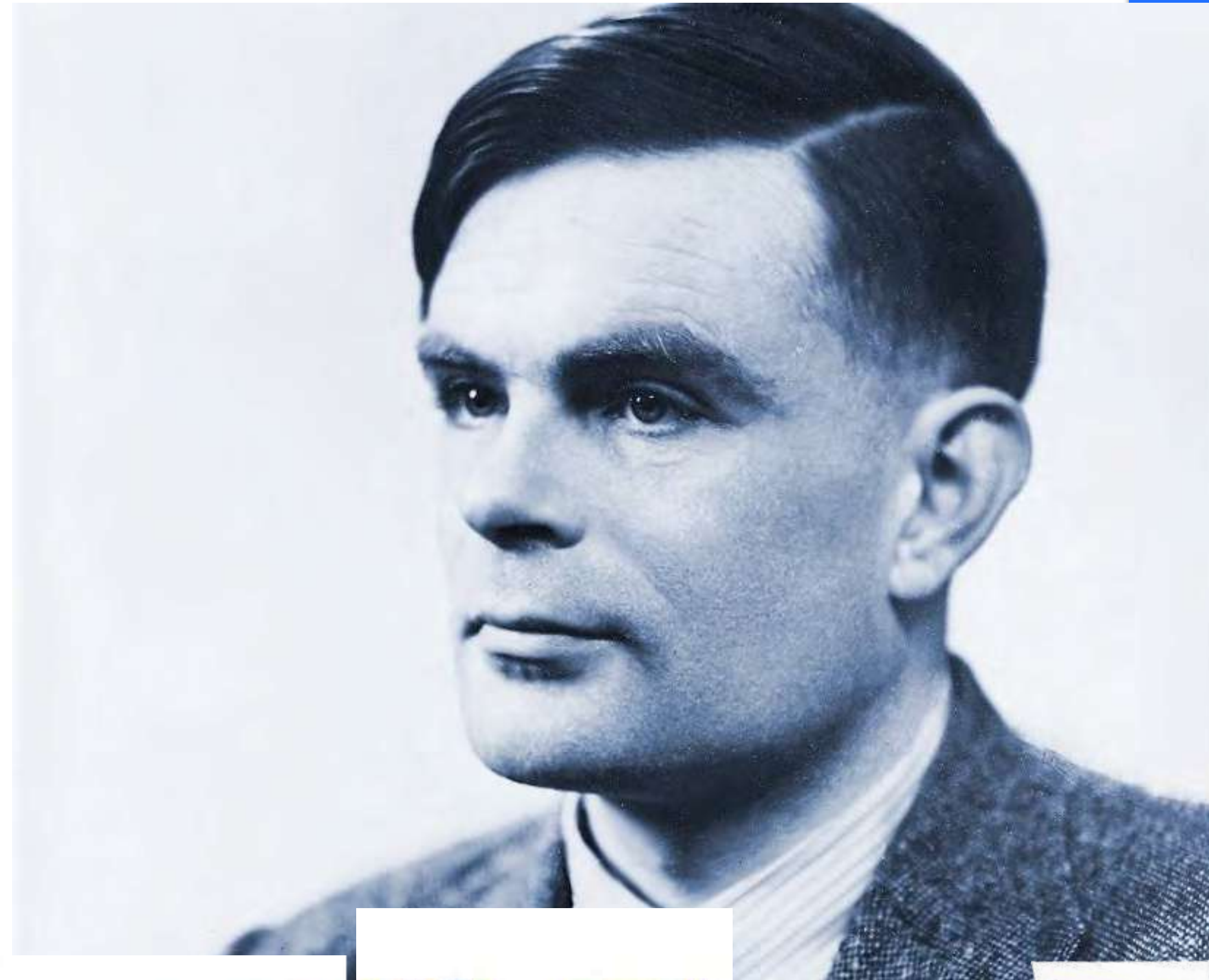
operazioni
matematiche

operazioni
logiche

Possono essere
programmati

“computer” =
qualsiasi oggetto che sia
programmabile

Alan Turing

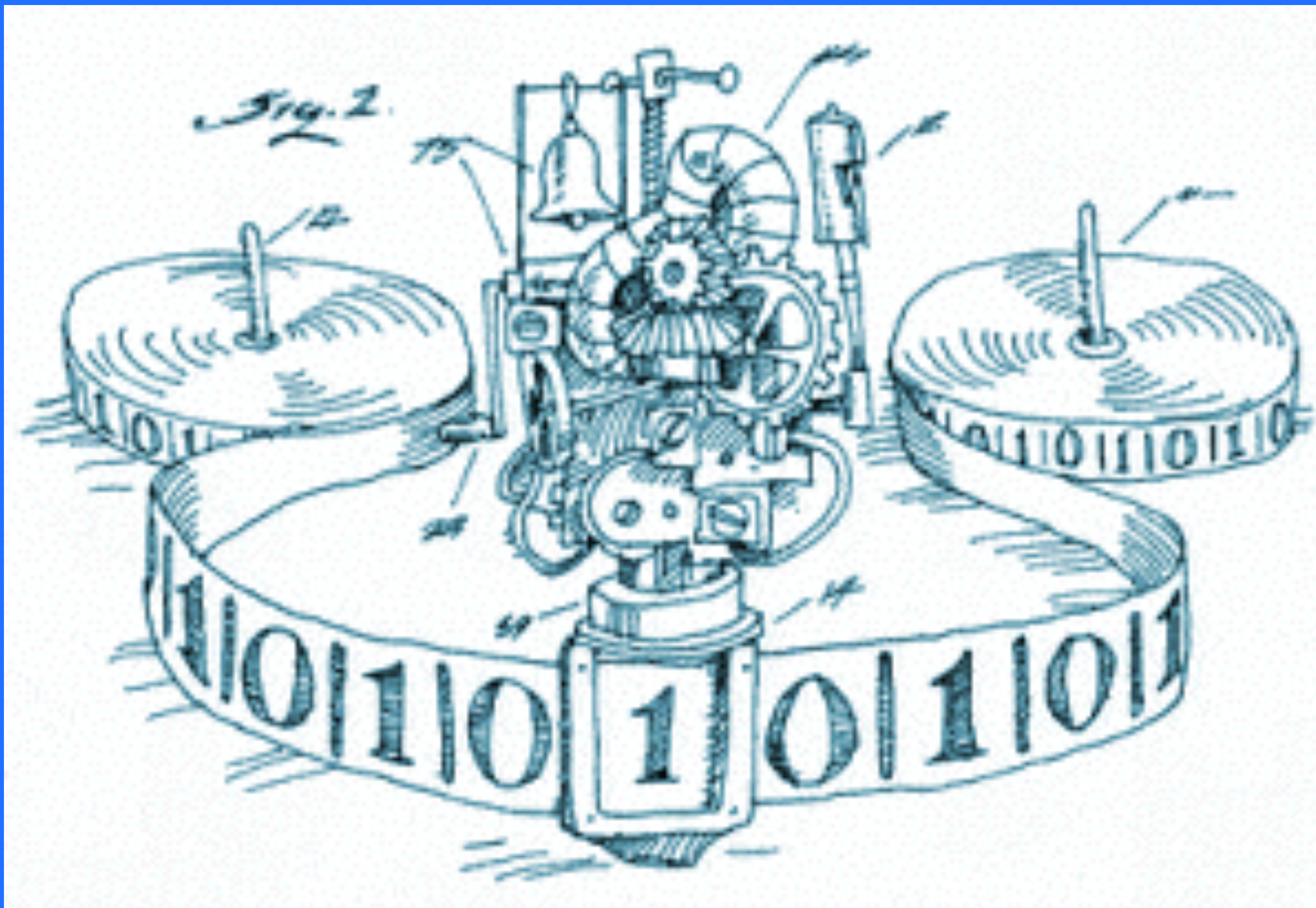


matematico e crittografo
inglese

decrittava i messaggi
che le forze armate
tedesche si scambiavano
durante la seconda
guerra mondiale

TURING

Macchina di Turing



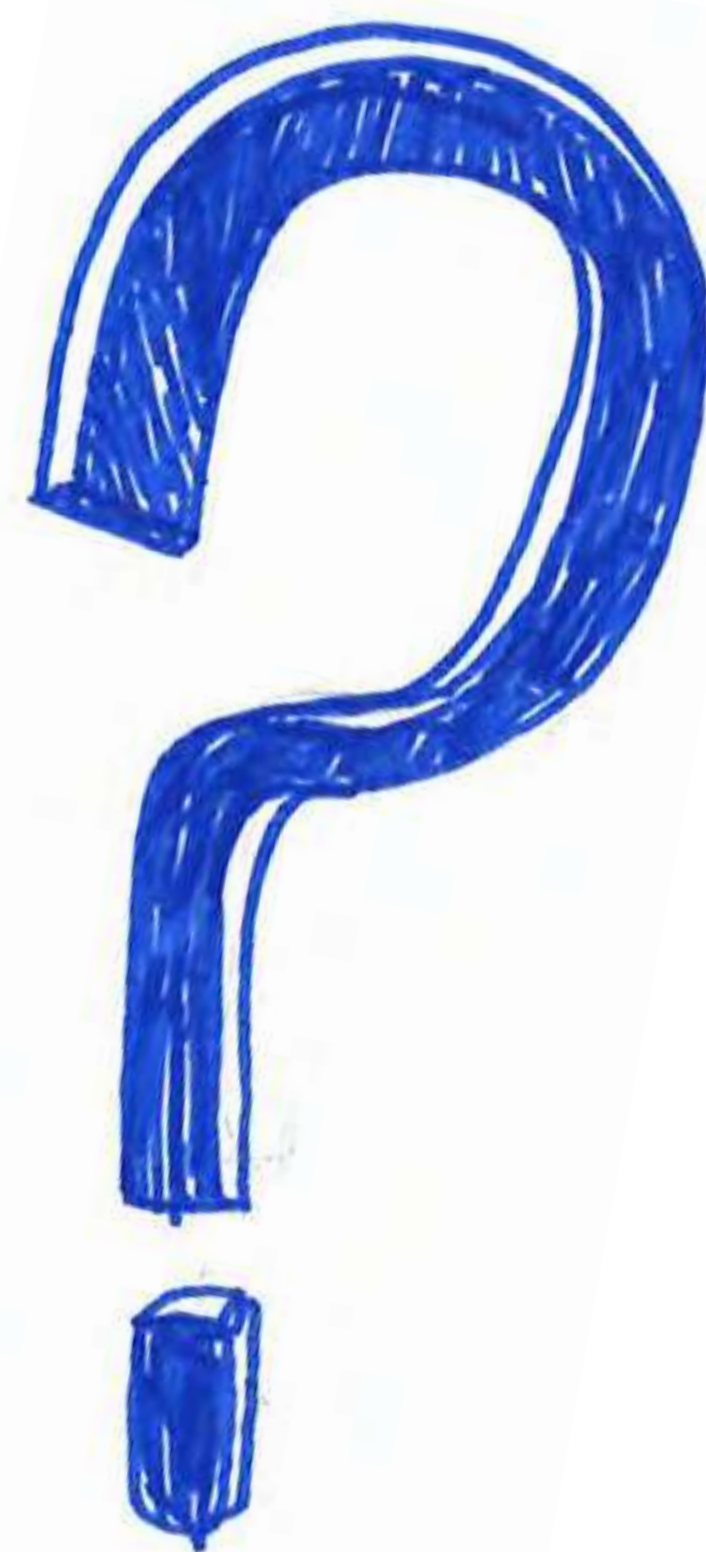
Una macchina ideale, mai costruita, teoricamente in grado di essere programmata leggendo istruzioni da un nastro di infinita lunghezza per effettuare calcoli, risolvendo così problemi di diverso genere.

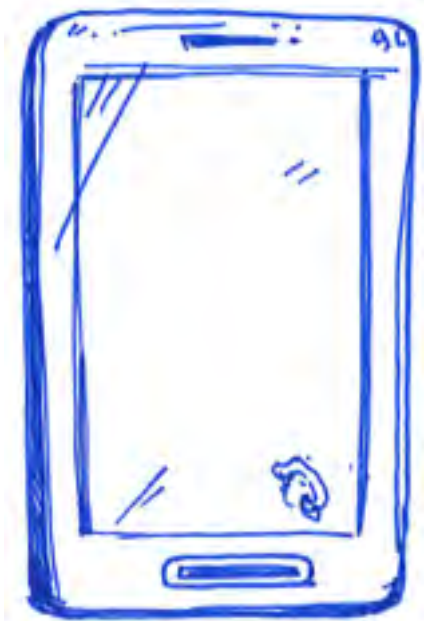
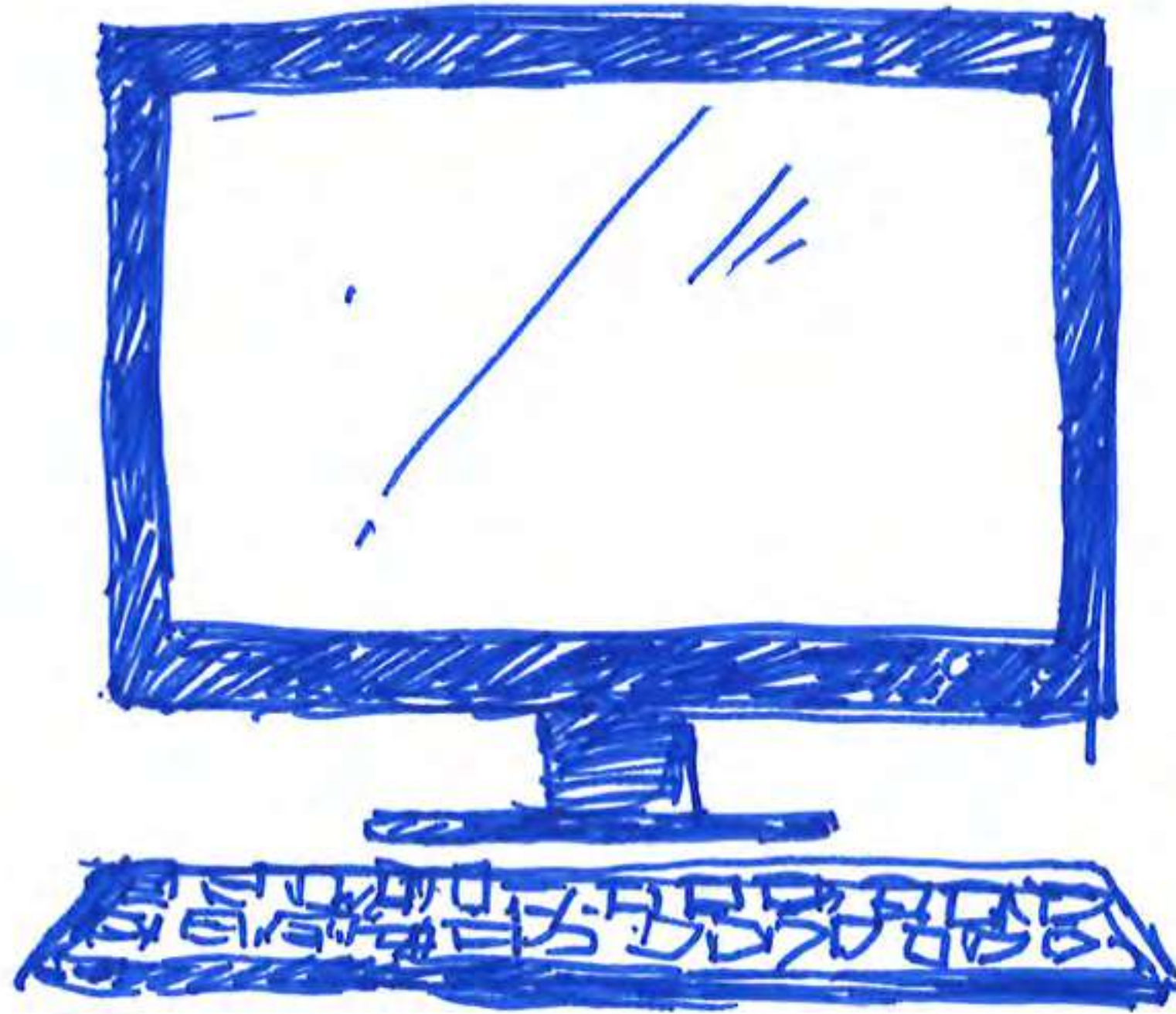
software

COME É FATTO

UN

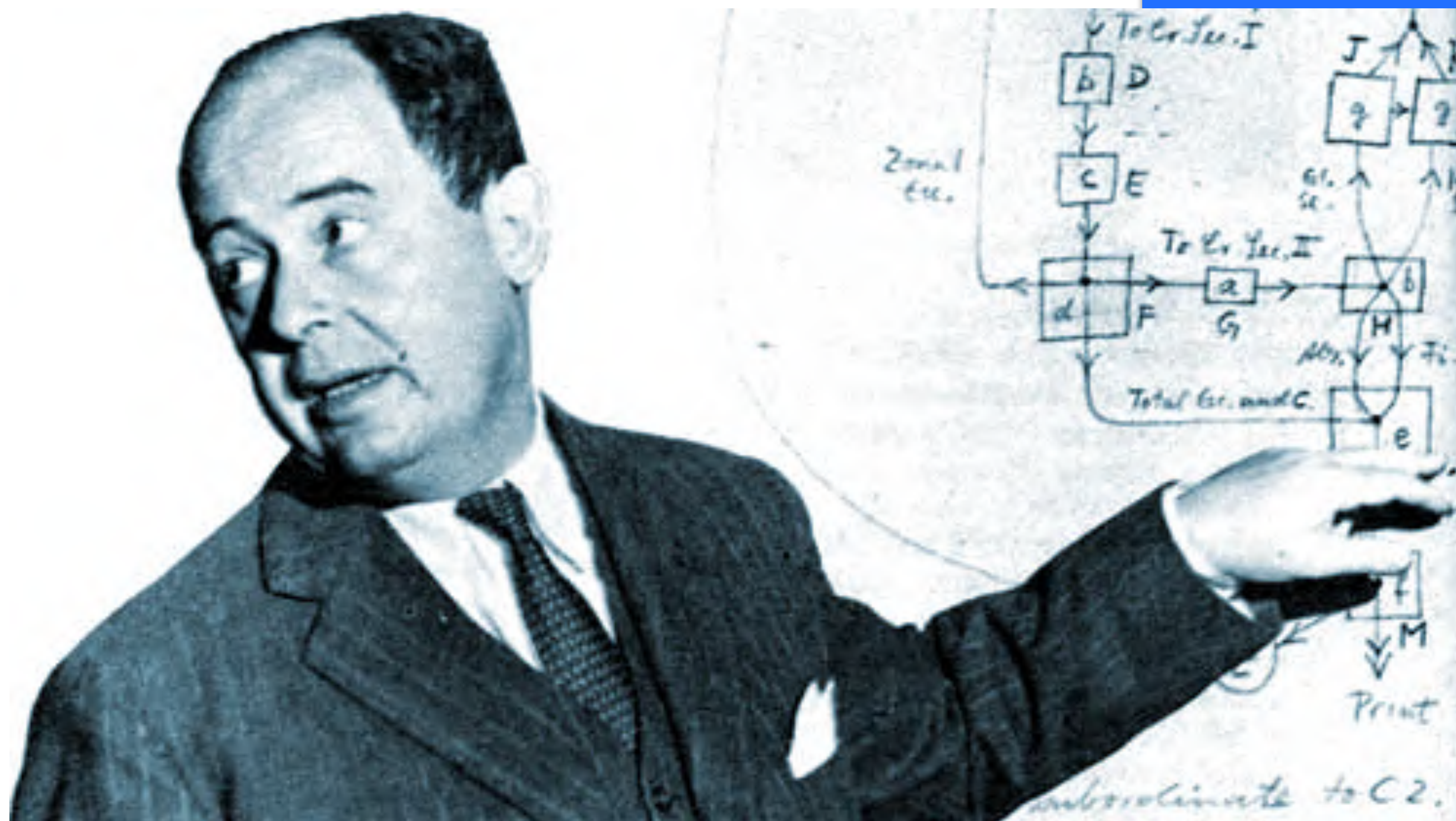
computer





modello
“base”

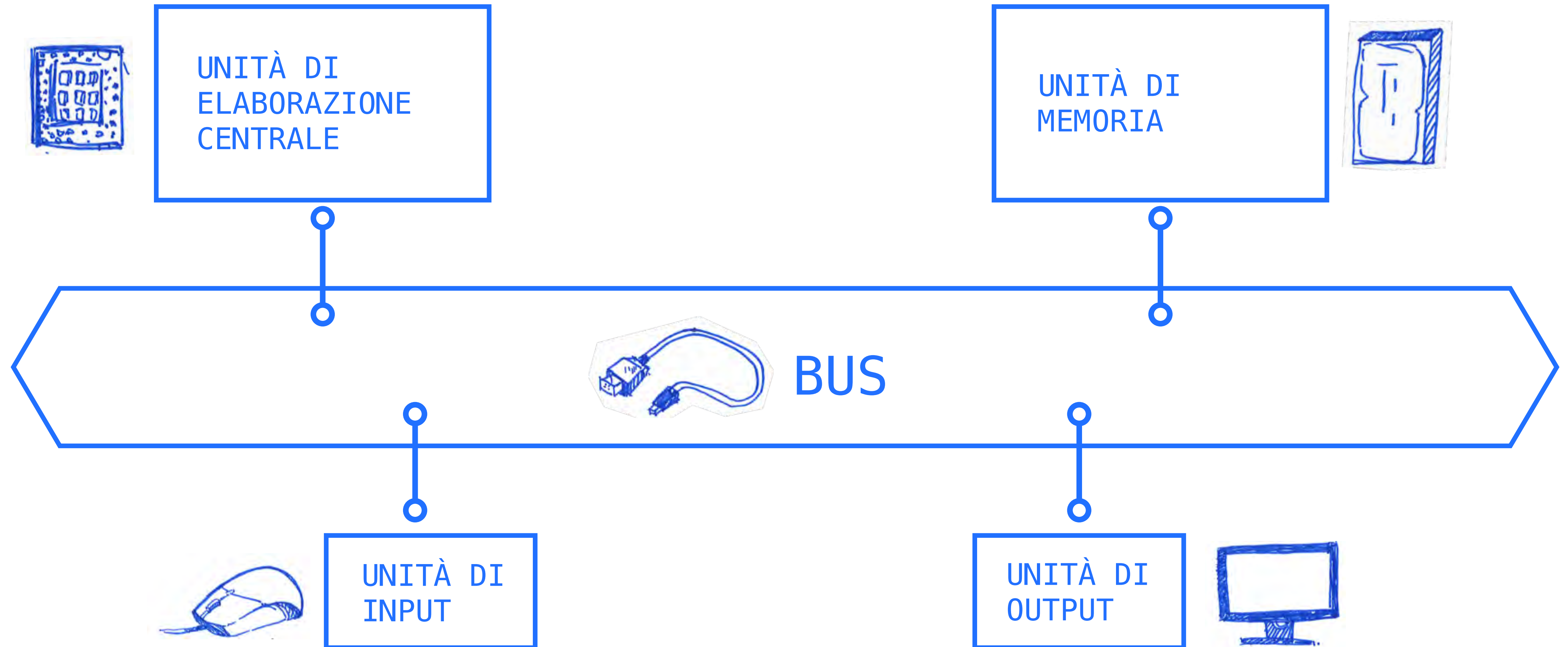
John von Neumann



scienziato di
origine ungherese

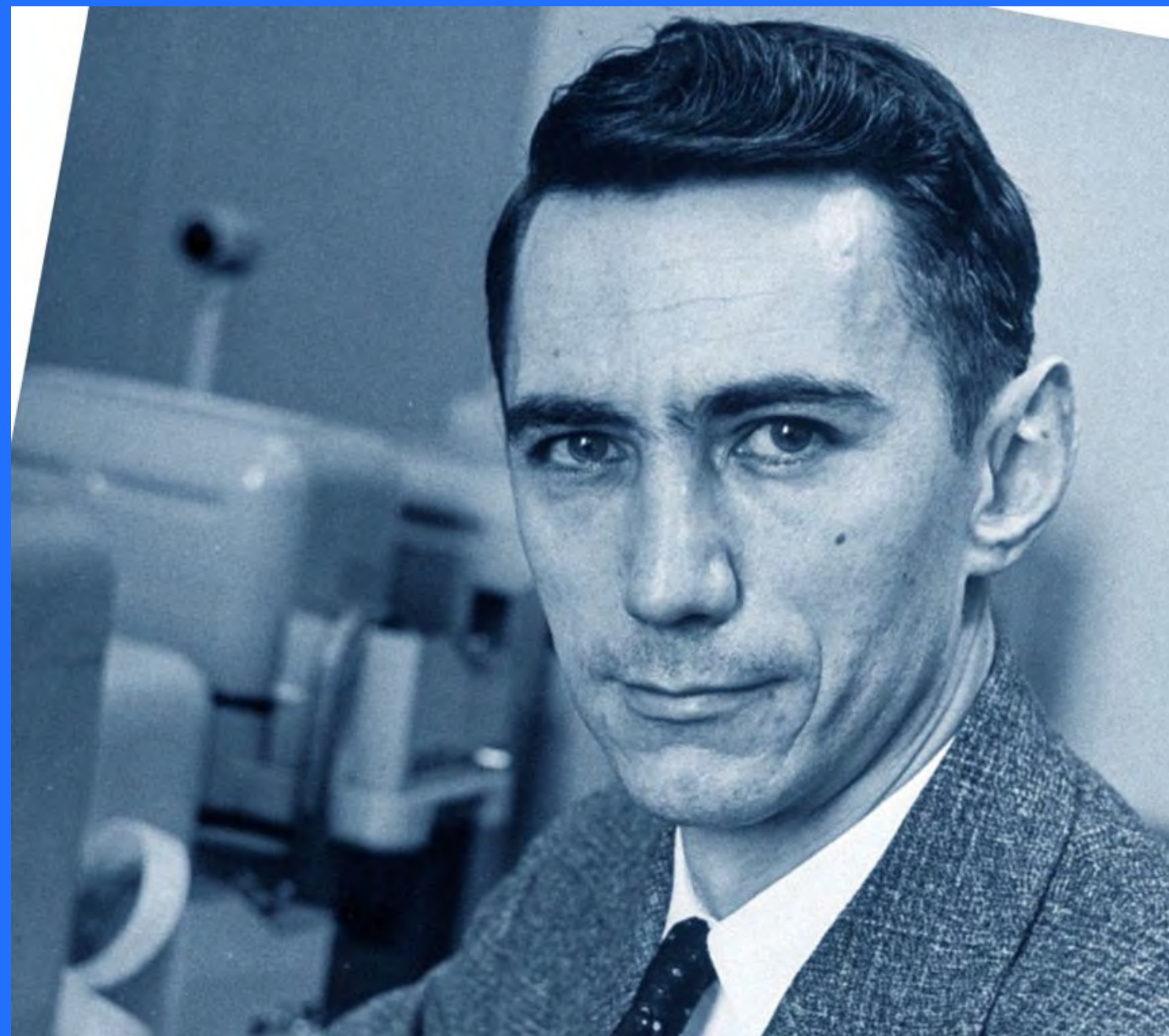
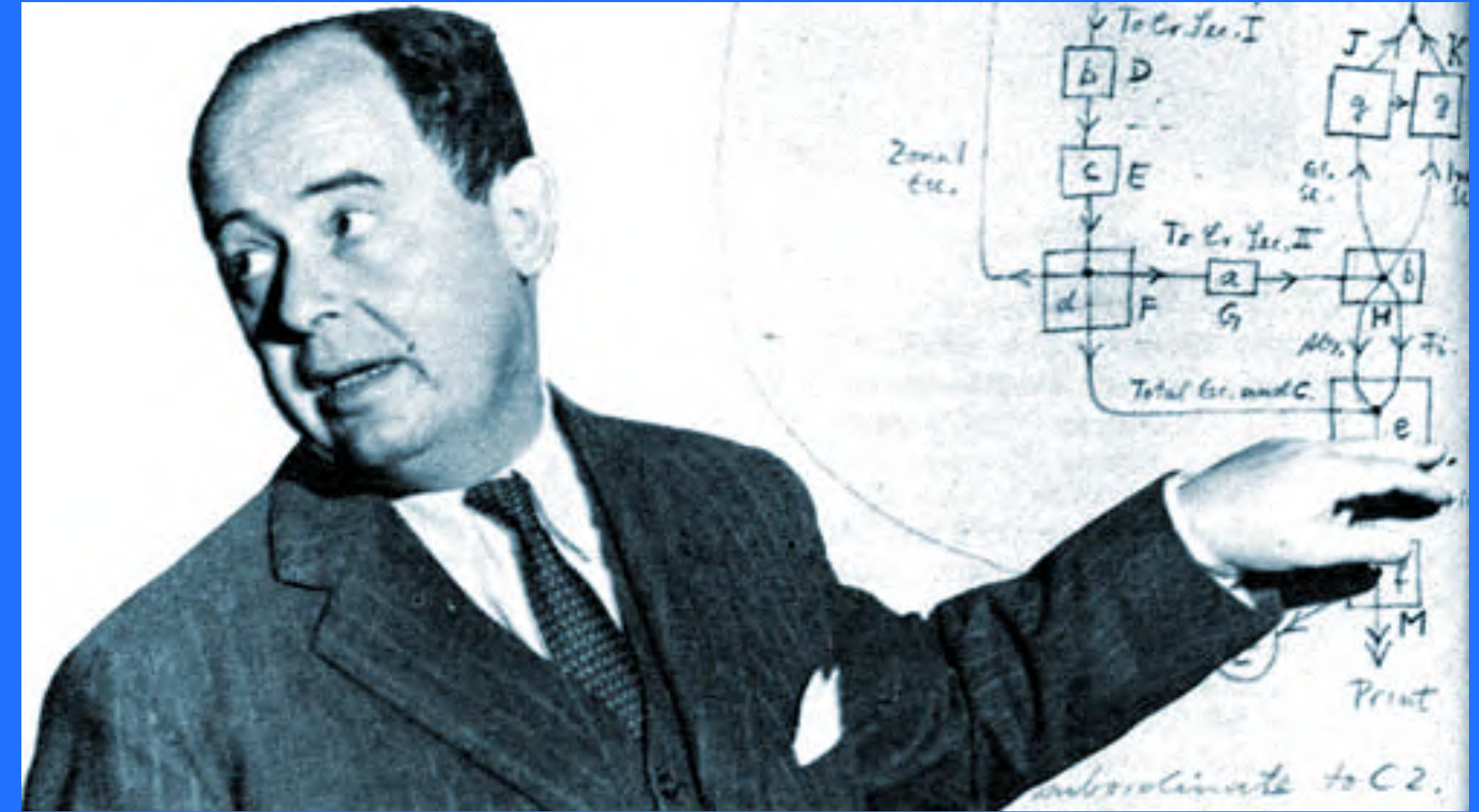
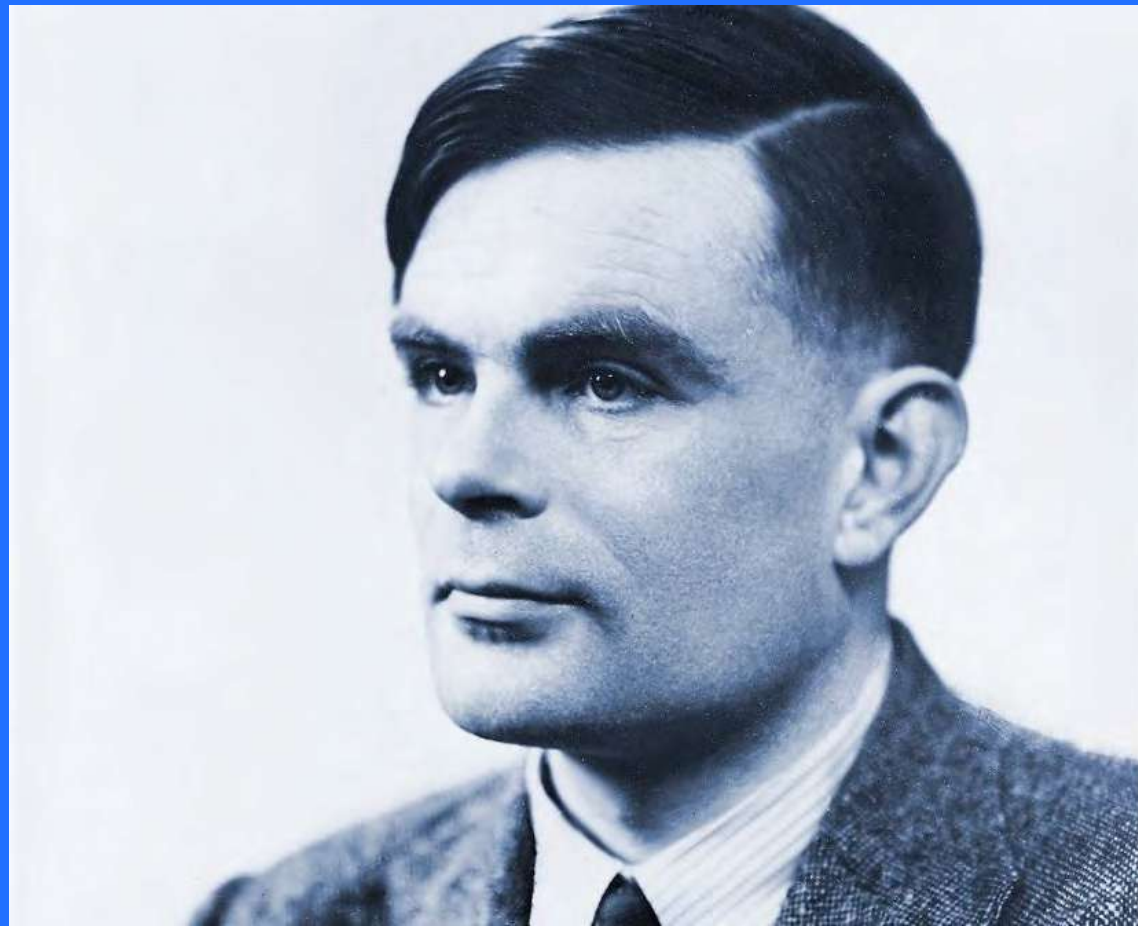
von neumann

Architettura di von Neumann



i computer

pensano ?

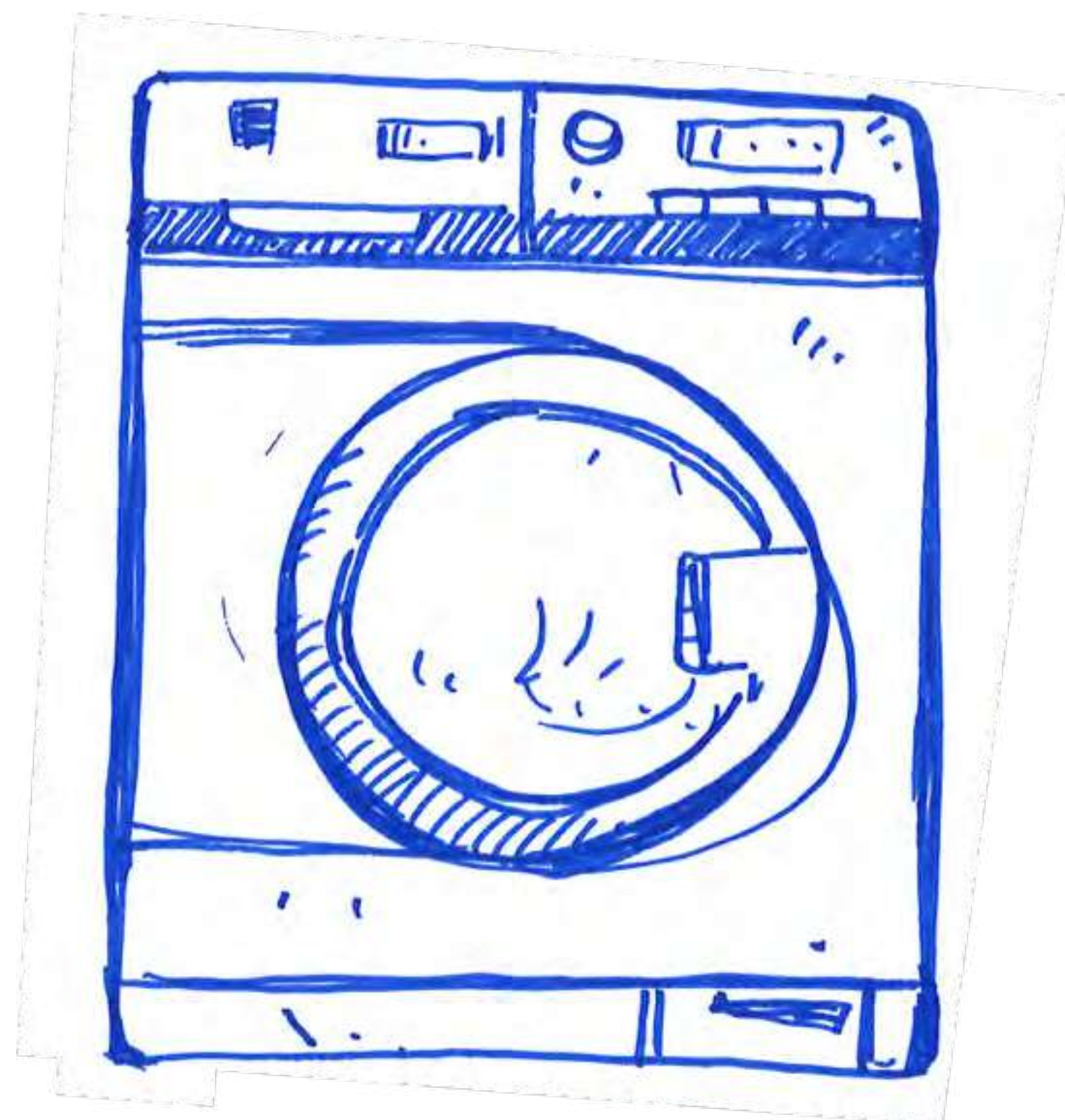


intelligenza artificiale

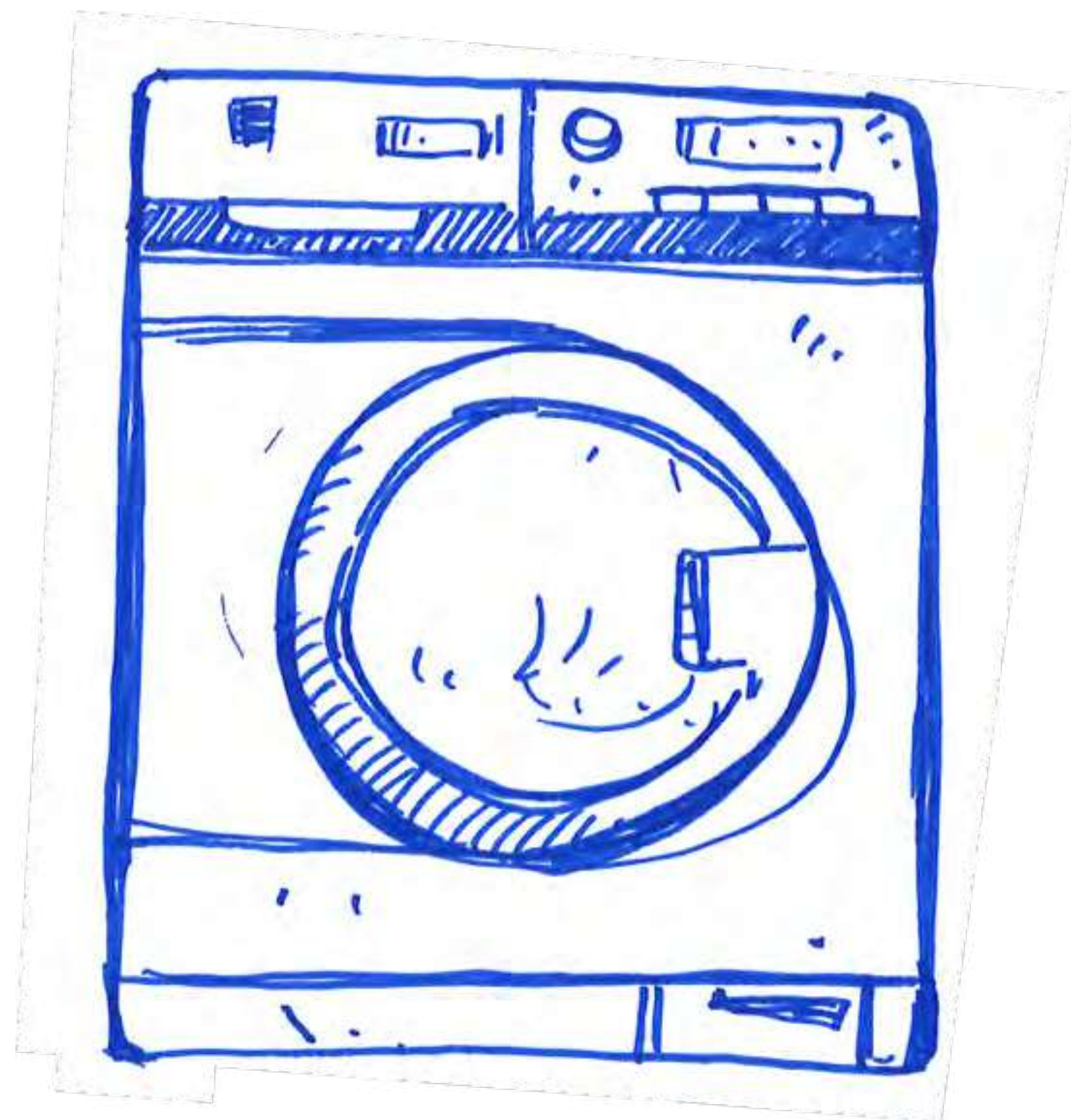
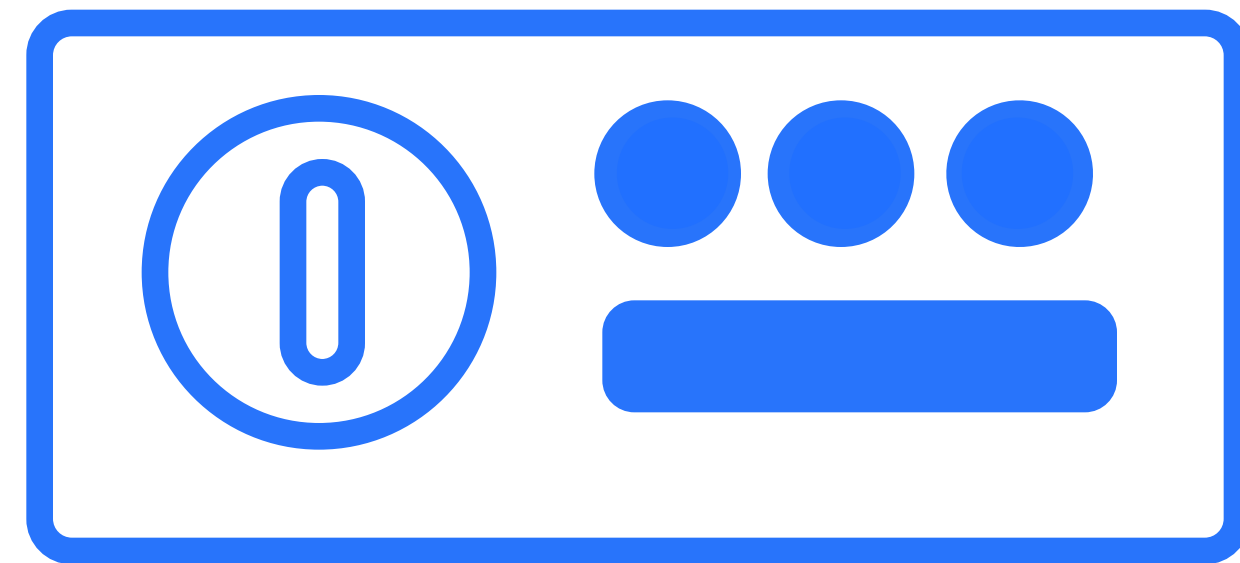


**Perché dovremmo
imparare a programmare?**

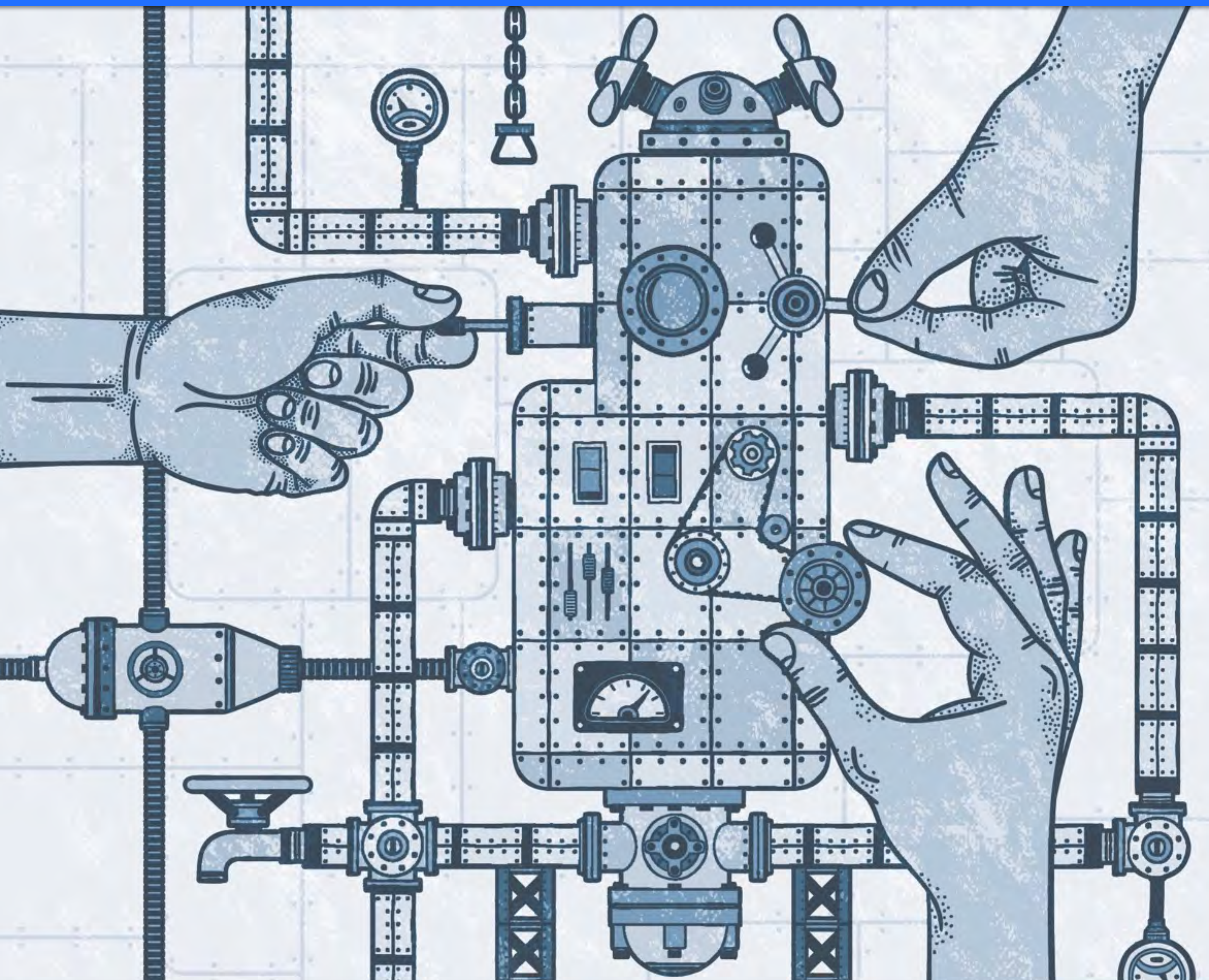
oggetti computerizzati



Programmabili



Programmabile agendo
su manopole e tasti



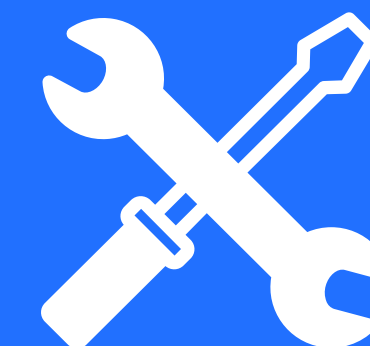
ROBOT

COOKING

obiettivo



strumento



• imparare A

PROGRAMMARE

Presentazioni

simulazioni

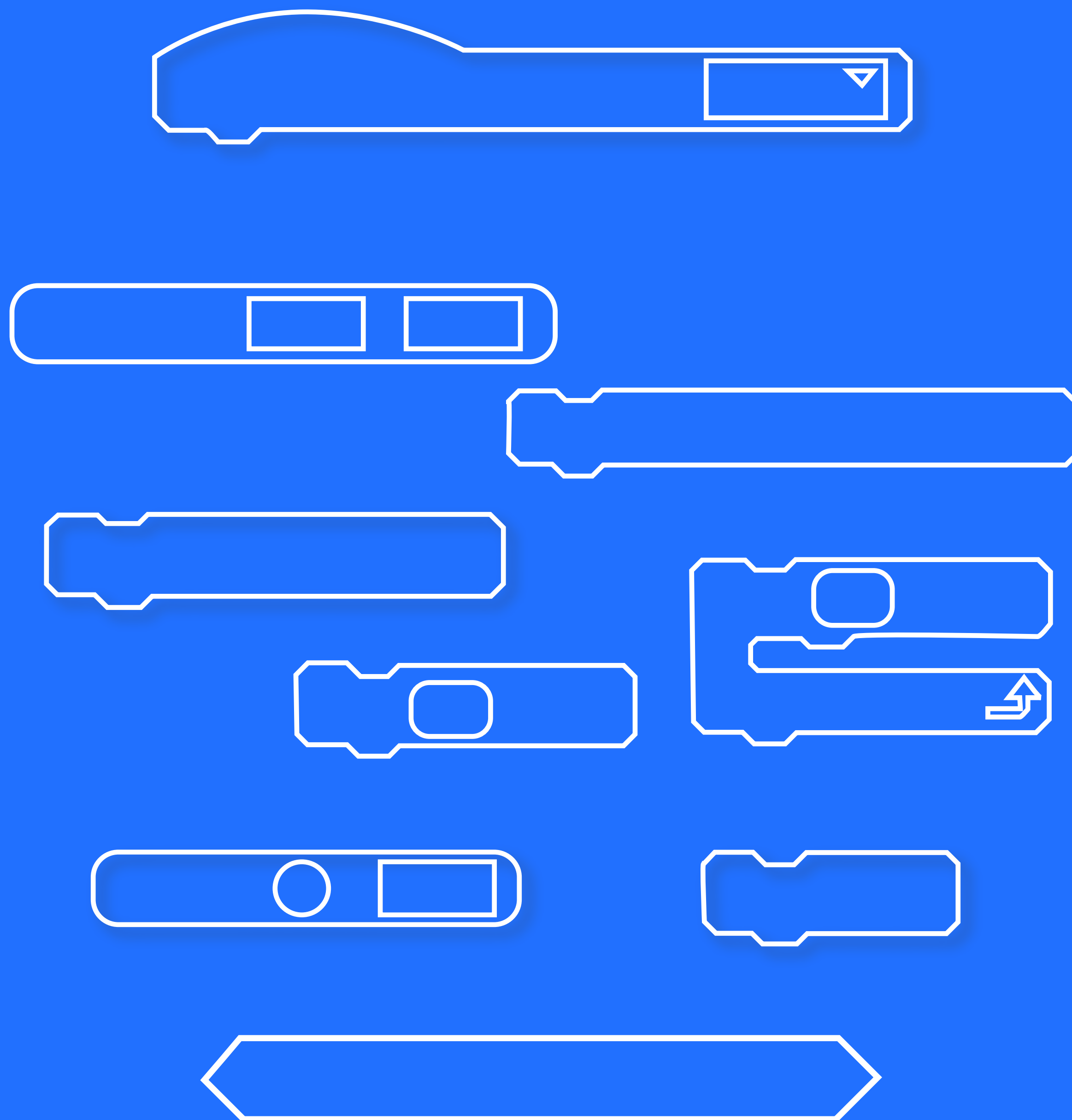
videogame educativi

Coding – come iniziare

SCRATCH



λ Snap!



Approccio visuale
e facilitato alla
programmazione

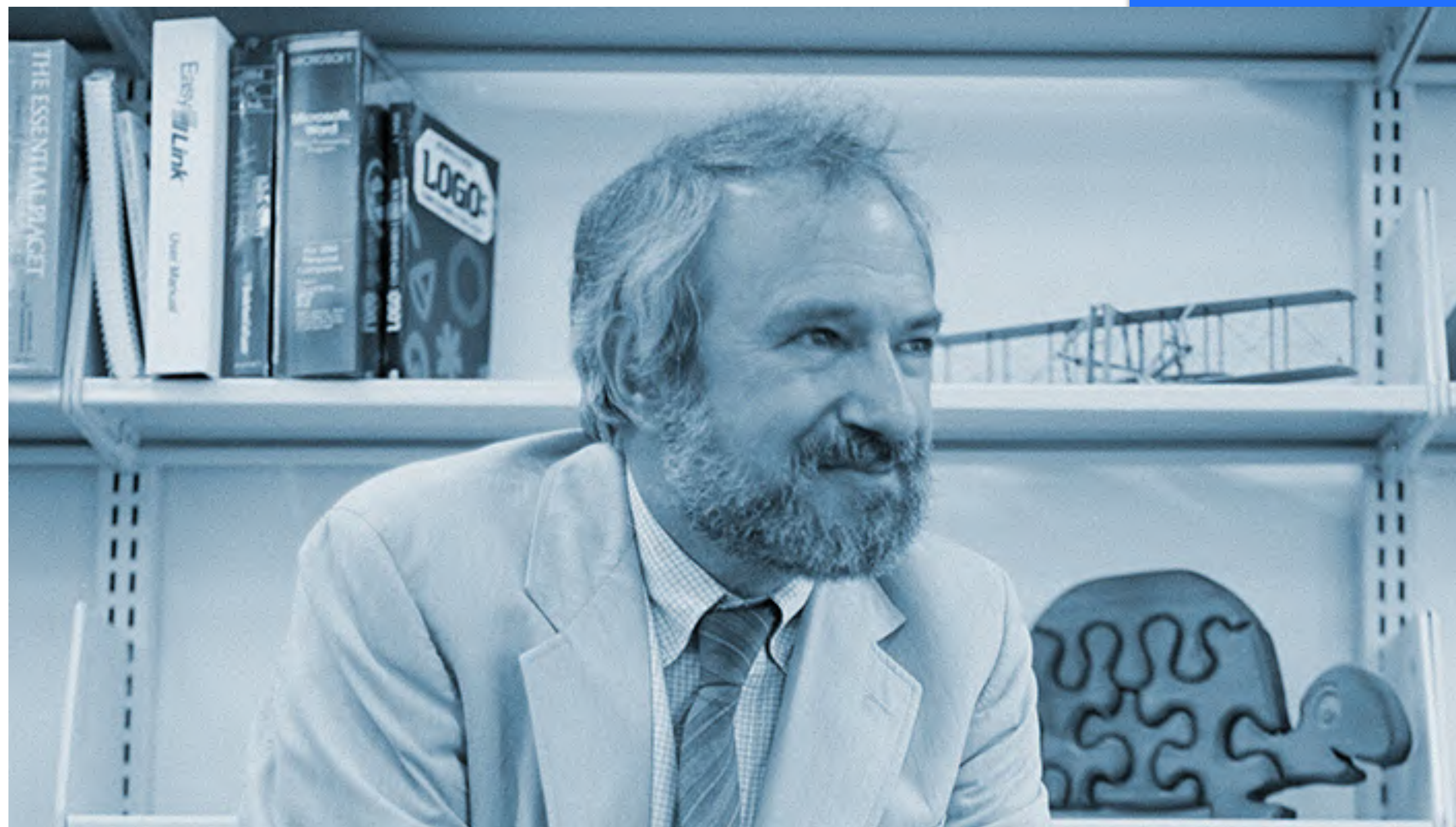
I computer erano
molto costosi



i linguaggi di
programmazione erano
pensati solo per uso
professionale



Seymour Papert



matematico e
logico di origine
sudafricana

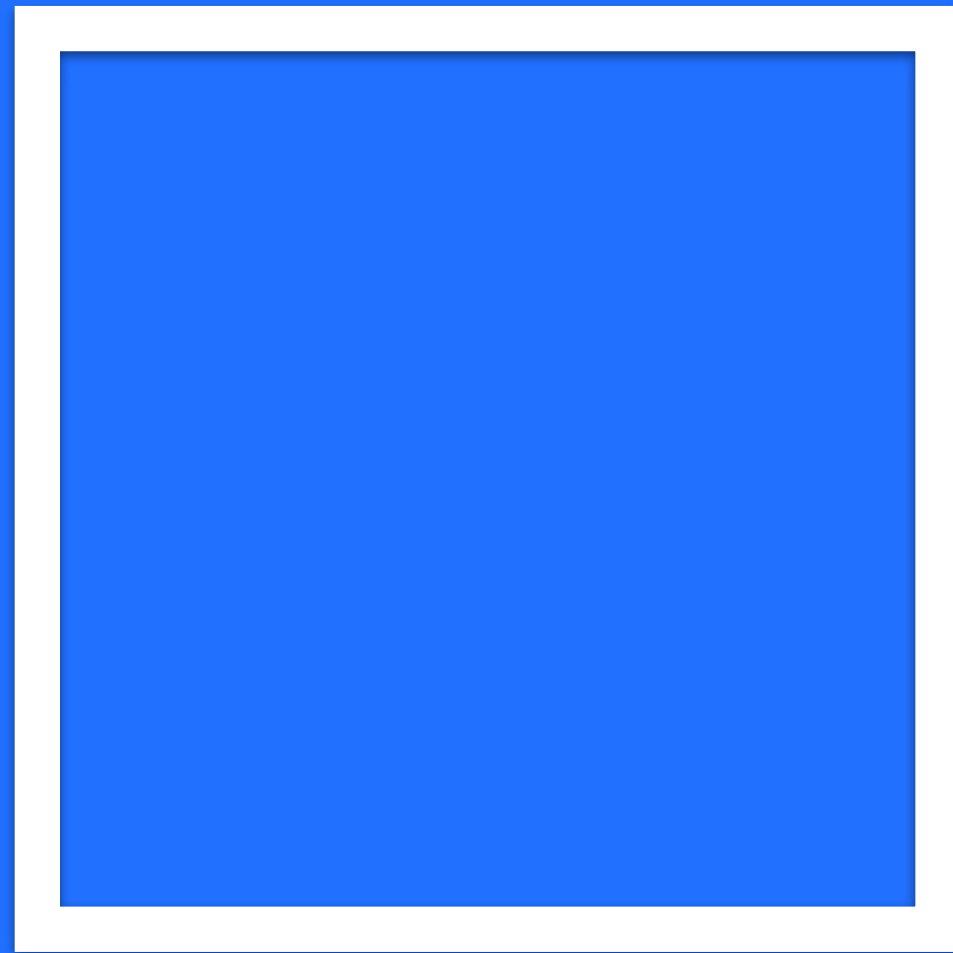
Assistente di **Jean
Piaget**

Si trasferì al **MIT**
per occuparsi di
**intelligenza
artificiale**

PAPERT

Principale autore
del **Logo**

Logo



```
REPEAT 3 [LEFT 120 FORWARD 50]  
REPEAT 3 [LT 120 FD 50]
```

Primo linguaggio di
programmazione creato
con finalità didattiche

Ebbe una certa
diffusione anche in
Italia a cavallo degli
anni '80 e '90.

costruZIONismo

artefatti COGNITIVI

oggetti che facilitano l'apprendimento



progettano e imparano
collaborando tra di loro

condividono idee

sviluppano strategie

Gary Stager



Scienziato di
origine ungherese

STAJER



grandi



idee

1. Imparare facendo

2. Tecnologia
come materiale da costruzione

3. Divertimento “tosto”

4. Imparare ad imparare

5.

Prendersi il giusto tempo

6.

Sbagliando si impara

7.

Fare da esempio

8.

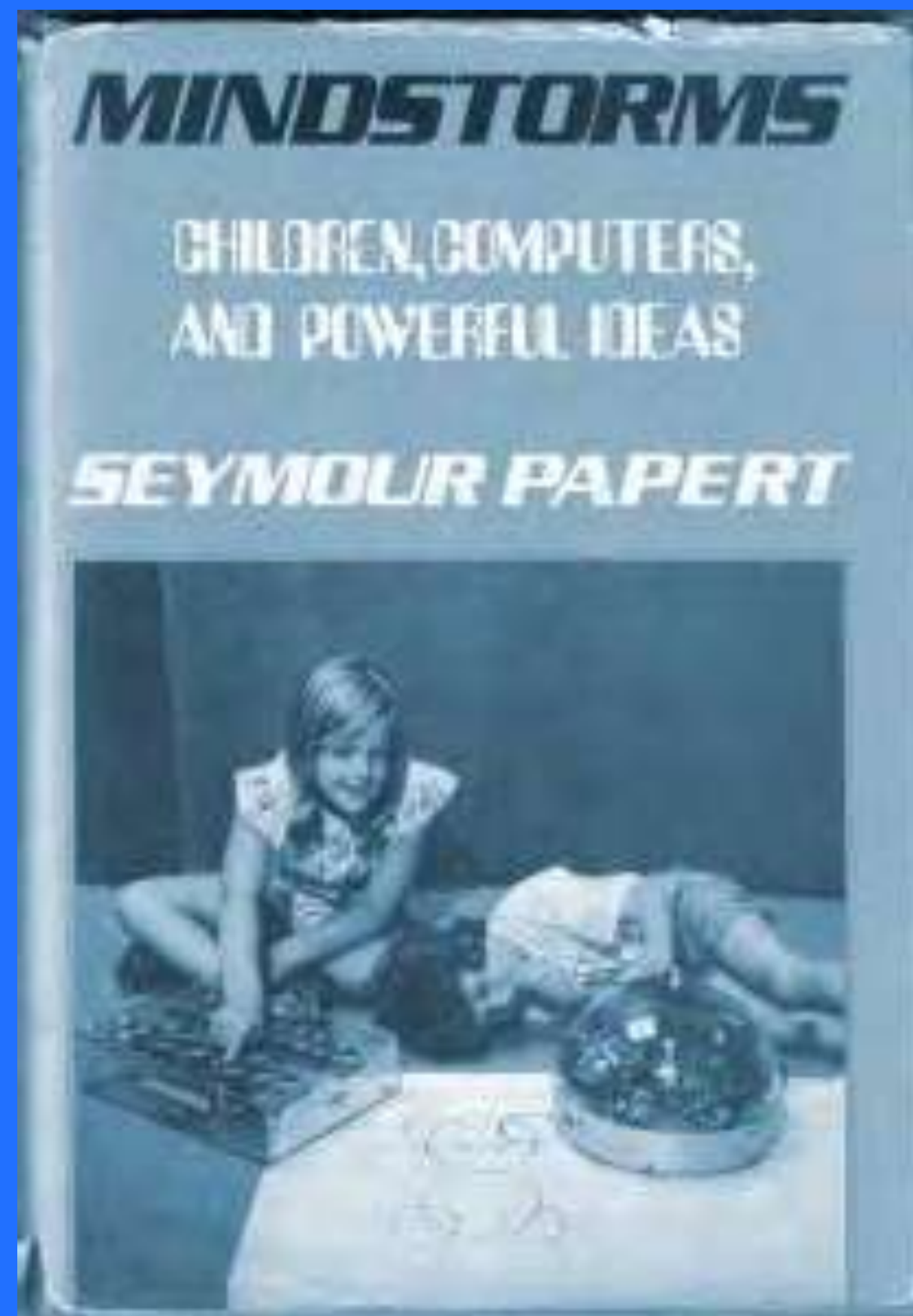
Il nostro è un mondo digitale

Rapporto tra coding e pensiero computazionale



*pensiero
computazionale*

PAPERT



*"Mindstorms: Children, computers,
and powerful ideas," 1980*

Jeannette Marie Wing



WIN

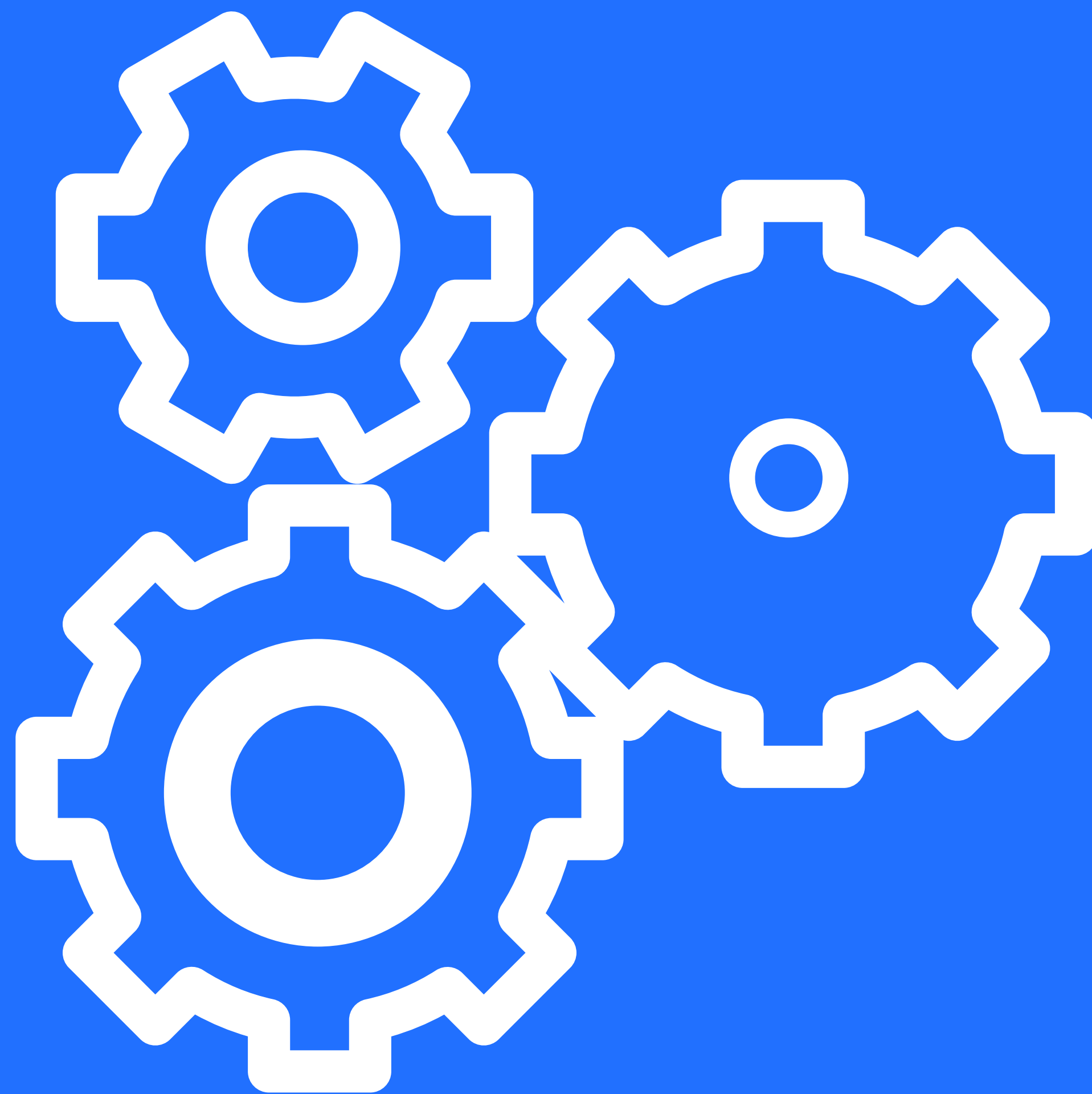
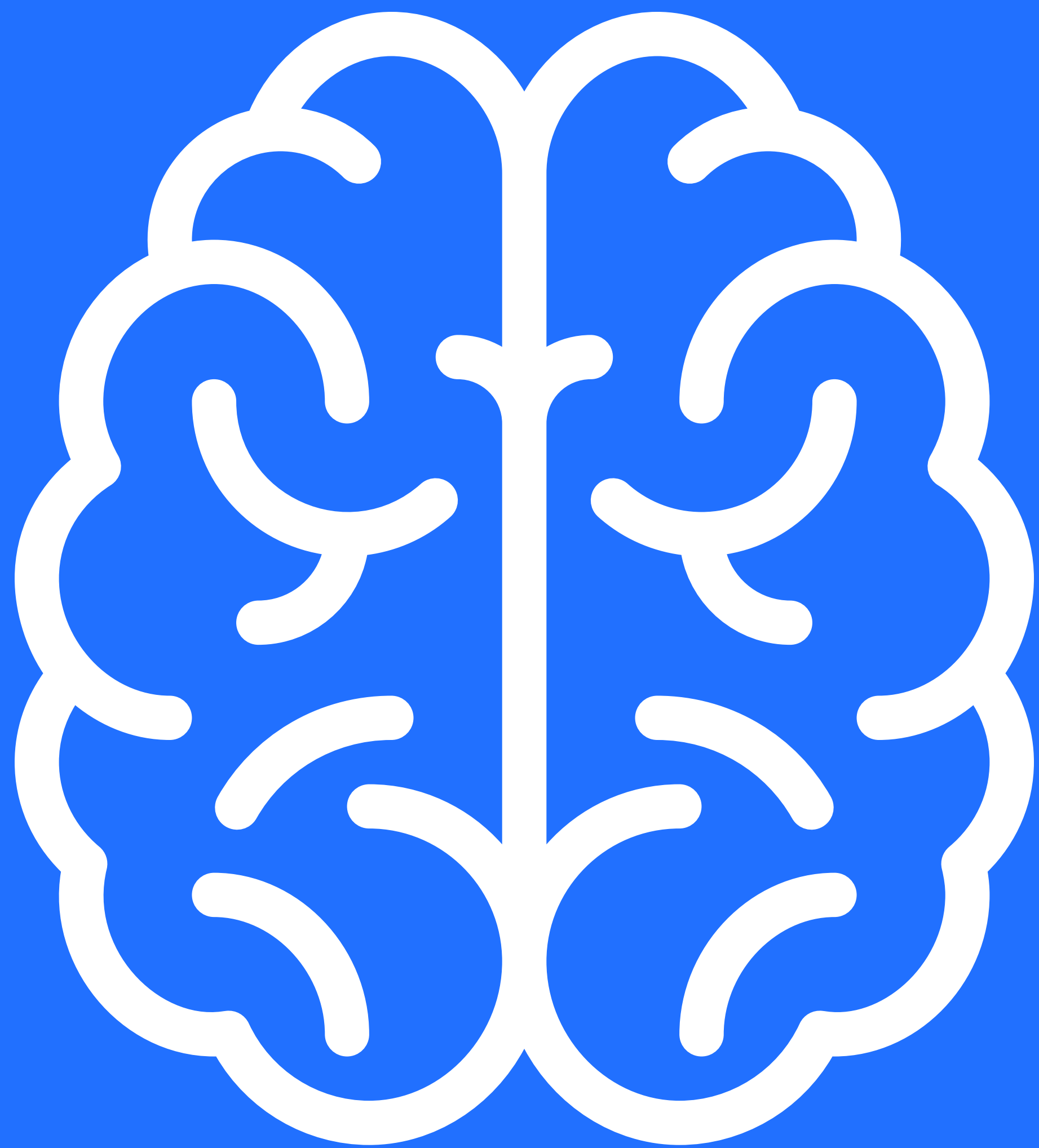
G

P
PENSIERO

COMPUTAZIONALE

*L'insieme dei processi mentali coinvolti
nella formulazione di un problema e nella
sua soluzione*

*Tale soluzione deve poter essere eseguita
da un essere umano o da una macchina*

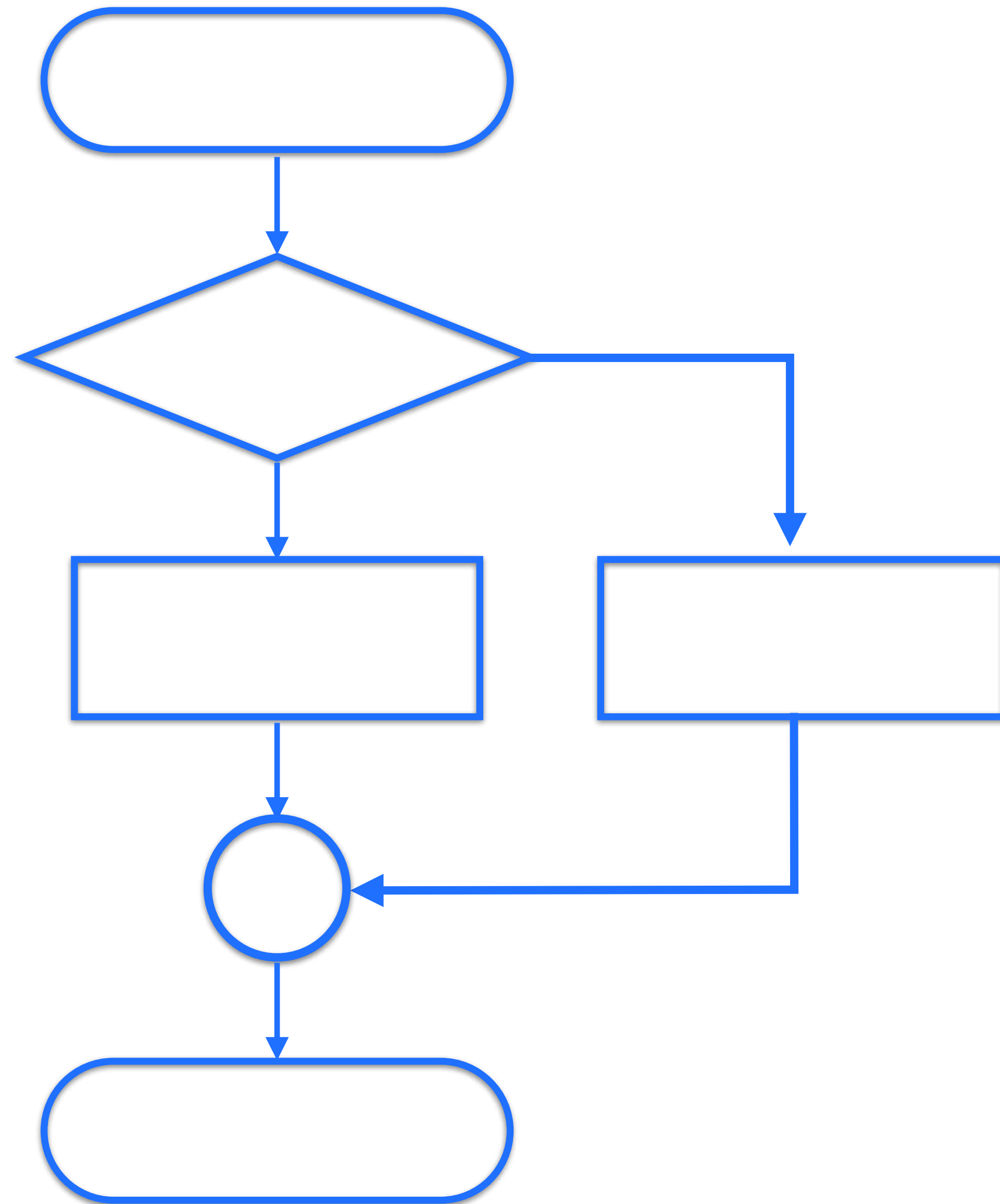


3 FAST

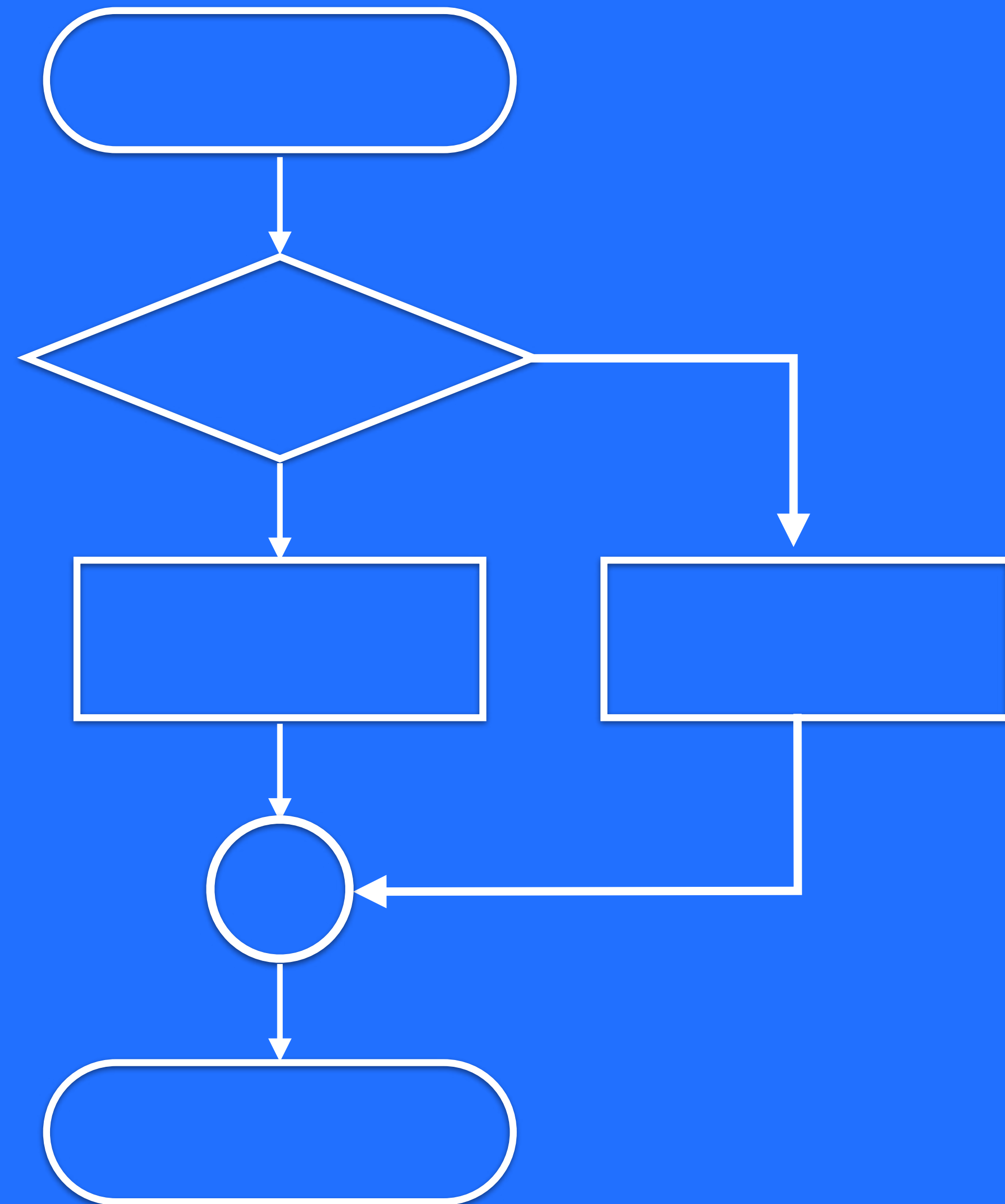
1. la formulazione del problema

2. l'individuazione della soluzione

3. l'esecuzione della soluzione
e la valutazione dei risultati



progettazione
di un algoritmo



algoritmo:

Procedimento di
risoluzione
di un problema
descritto in maniera
non ambigua con un
numero finito di
passi elementari

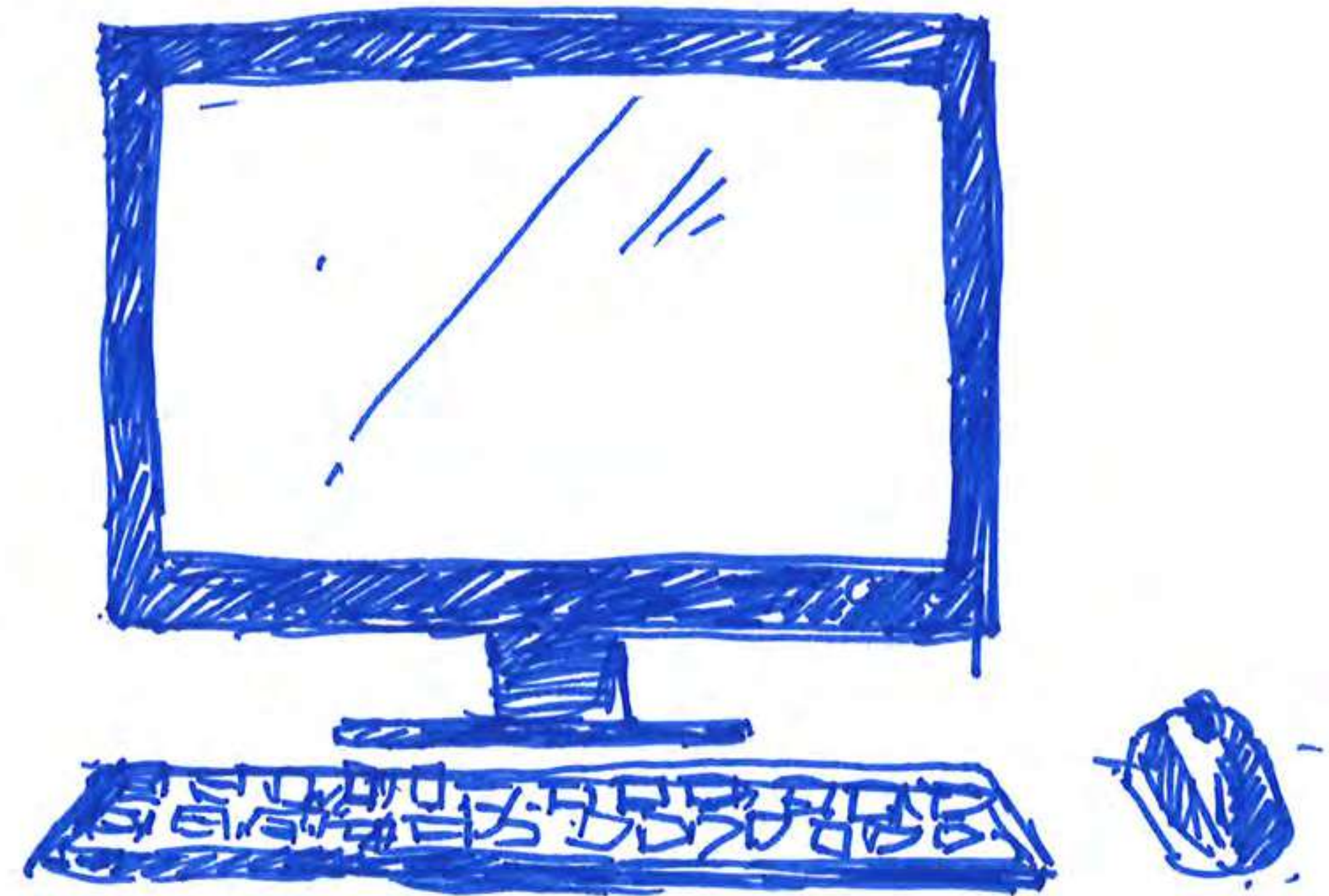
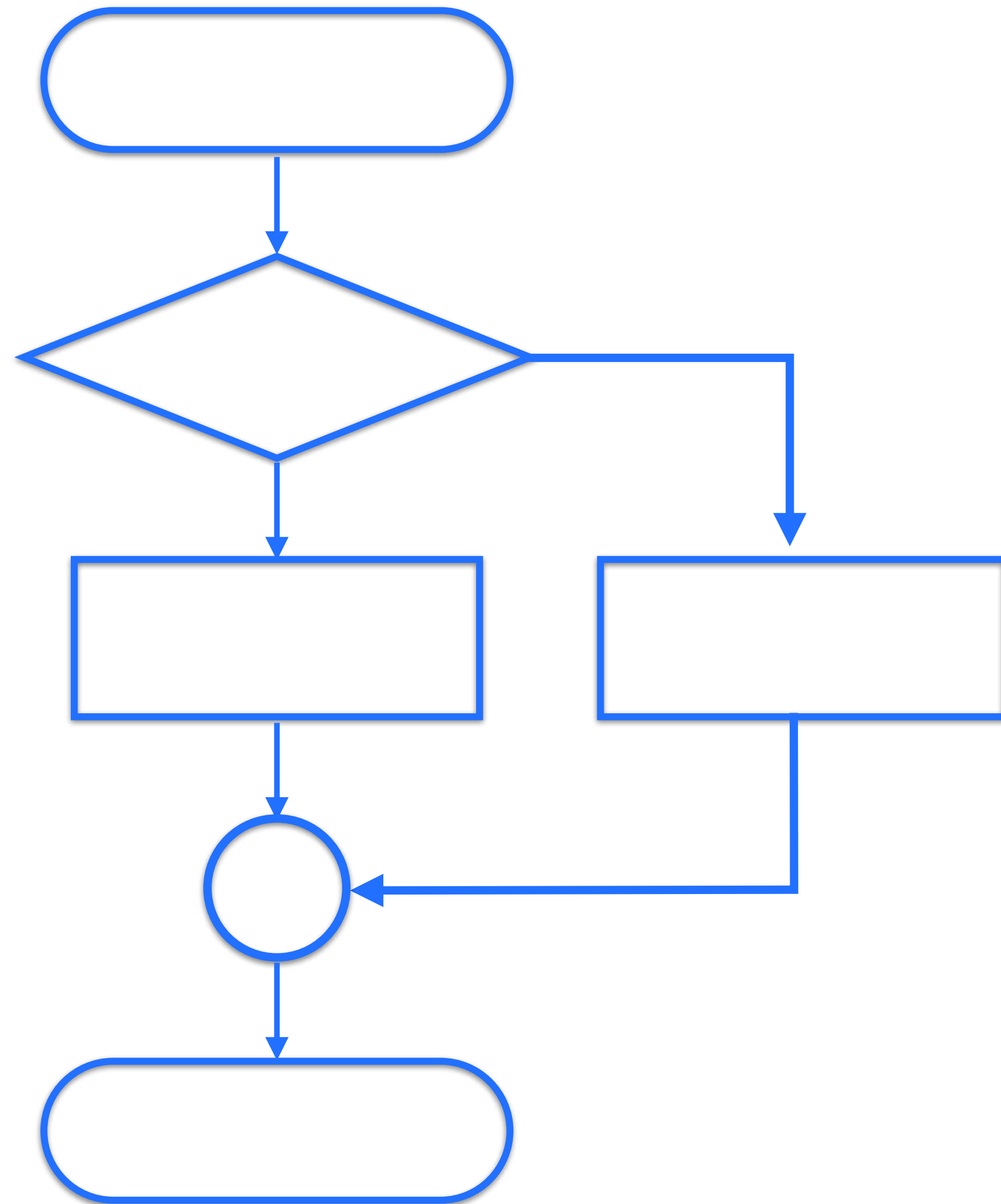
algoritmo:



Già gli “Elementi” di Euclide, conteneva un algoritmo

algoritmo:

può essere scritto a parole o
visualizzato sotto forma di
diagramma di flusso



COODING

Mitchel Resnick

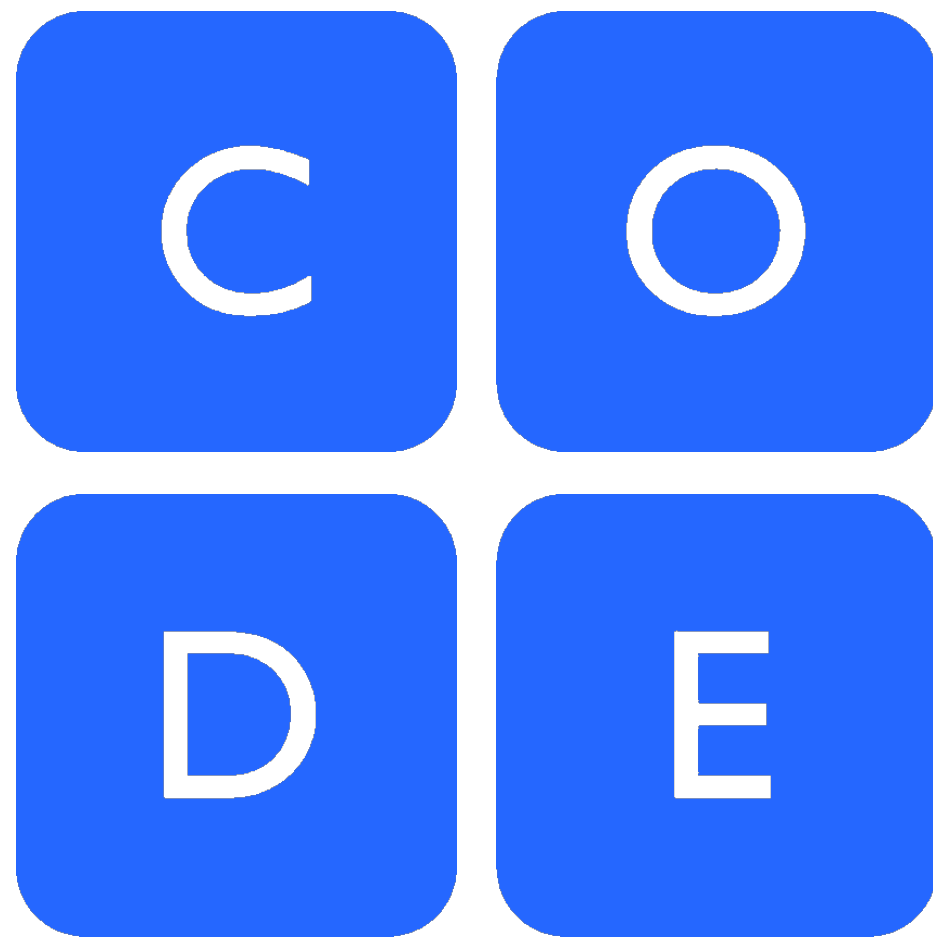


Professore del MIT
a Capo del progetto
Scratch

Resnick

Ambienti sviluppati
a scopo didattico





si accede via web



contiene sfide di difficoltà crescente



con video tutorial ed esercizi su carta

SCRATCH



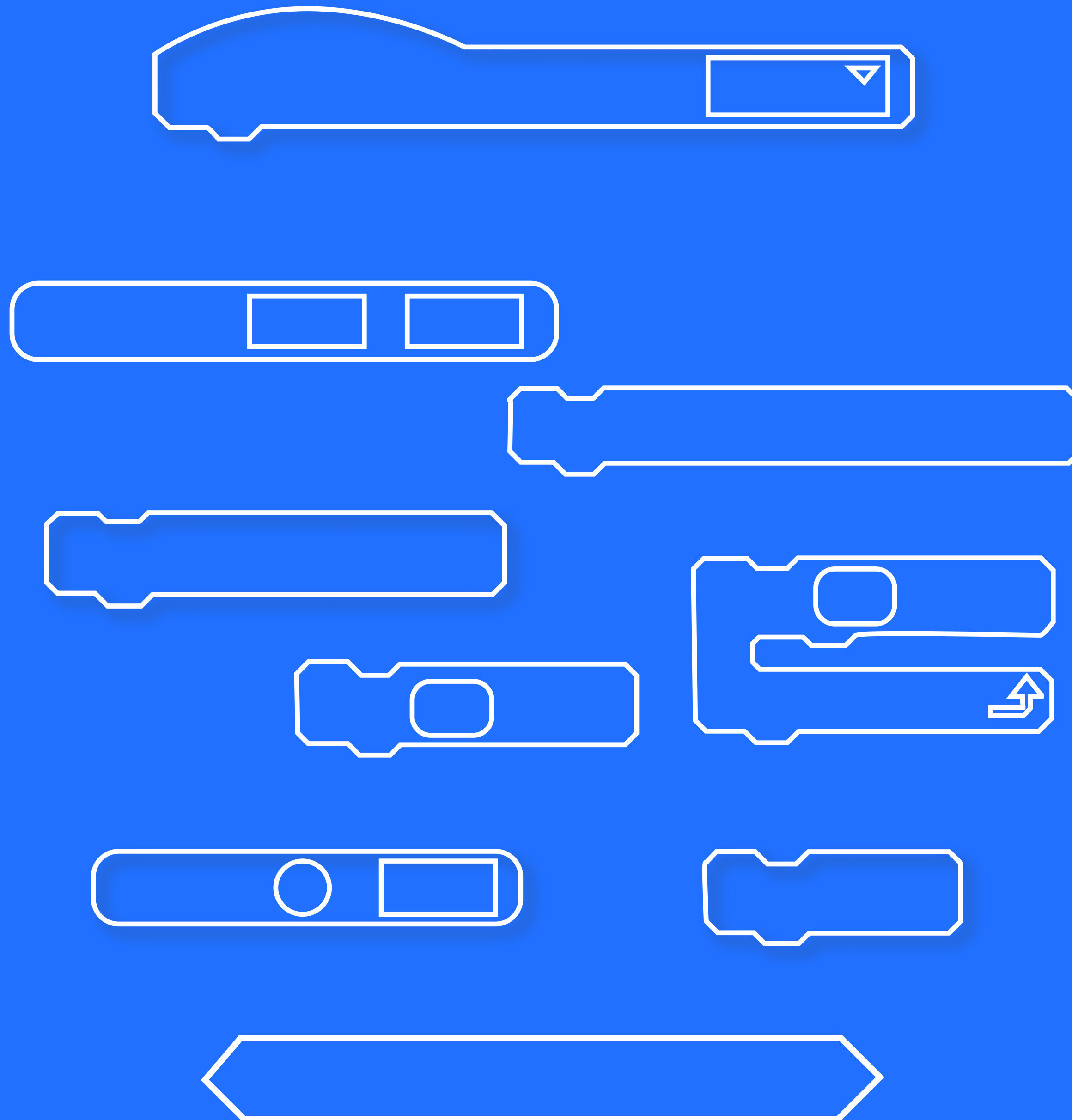
- ➡ linguaggio di programmazione visuale
- ➡ sviluppato all'interno del MIT
- ➡ contiene un editor grafico e un editor sonoro

λ Snap!



- ➡ variante di Scratch, sviluppata dalla University of California – Berkley
- ➡ risulta molto utile per le materie scientifiche
- ➡ può essere scaricato e utilizzato in locale

Elementi comuni



L'interfaccia grafica

i comandi sono espressi
sotto forma di **blocchetti**

ci sono 3 aree principali



Sprite

Nuovo sprite:

Stage
1 sfondo

Nuovo sfondo:

Sprite1

Script Costumi Suoni

Movimento

- Situazioni
- Controllo
- Sensori
- Operatori
- Altri Blocchi

fai 10 passi

ruota di 15 gradi

ruota di 15 gradi

punta in direzione 90

punta verso puntatore del mouse

vai a x: 0 y: 0

raggiungi puntatore del mouse

scivola in 1 secondi a x: 0 y: 0

cambia x di 10

vai dove x è 0

cambia y di 10

vai dove y è 0

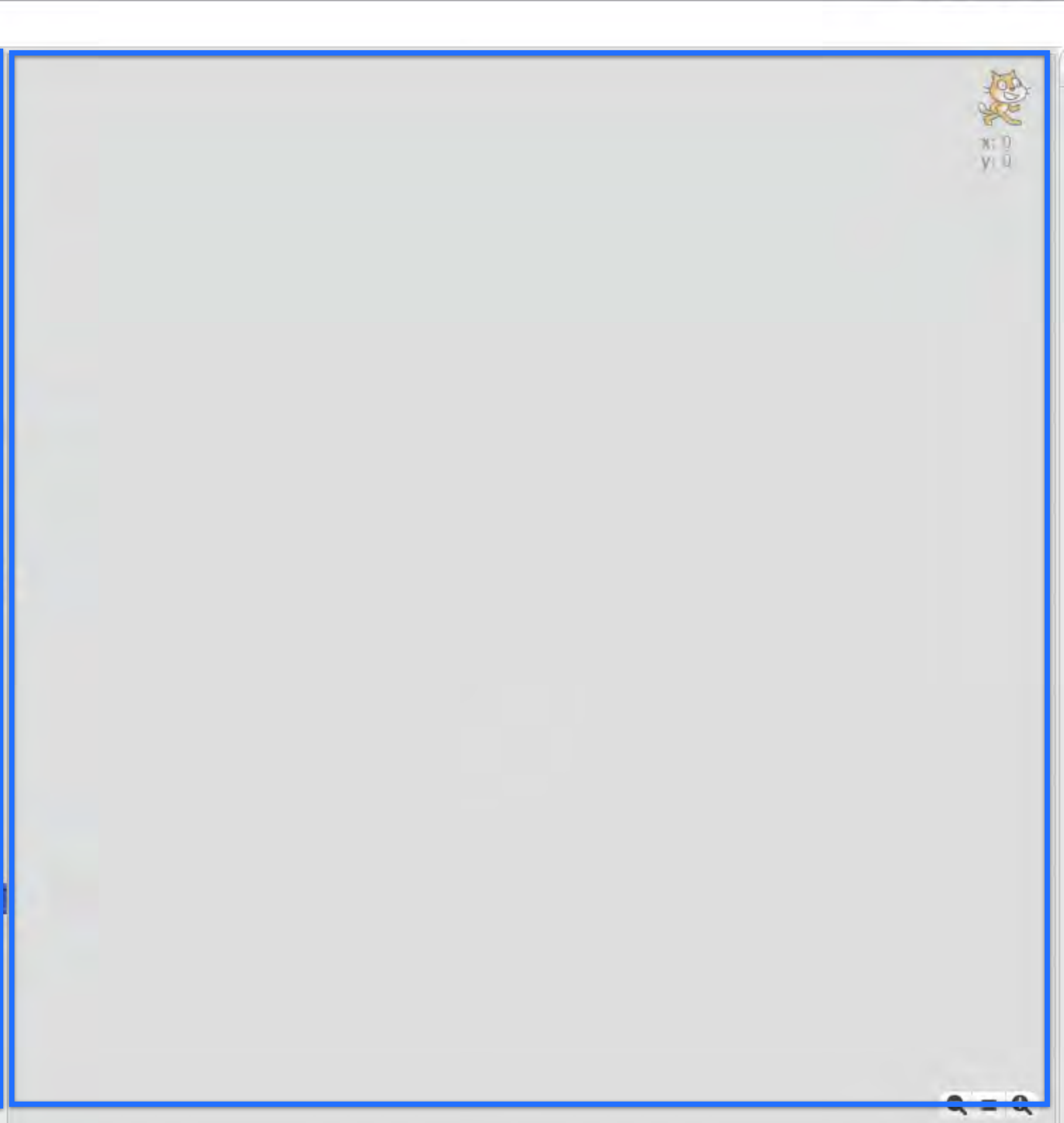
rimbalza quando tocchi il bordo

porta stile rotazione a sinistra-destra

posizione x

posizione y

direzione

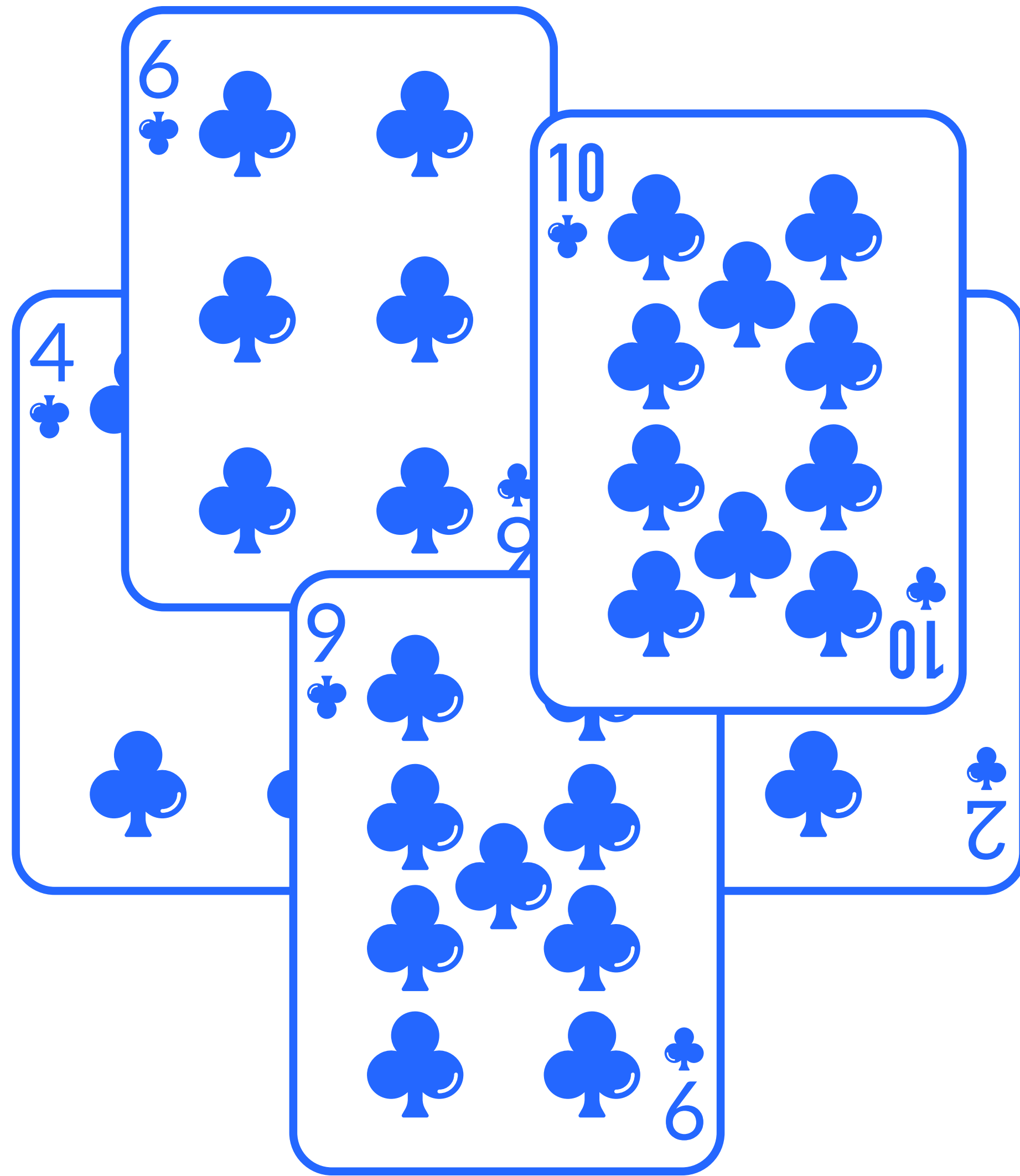


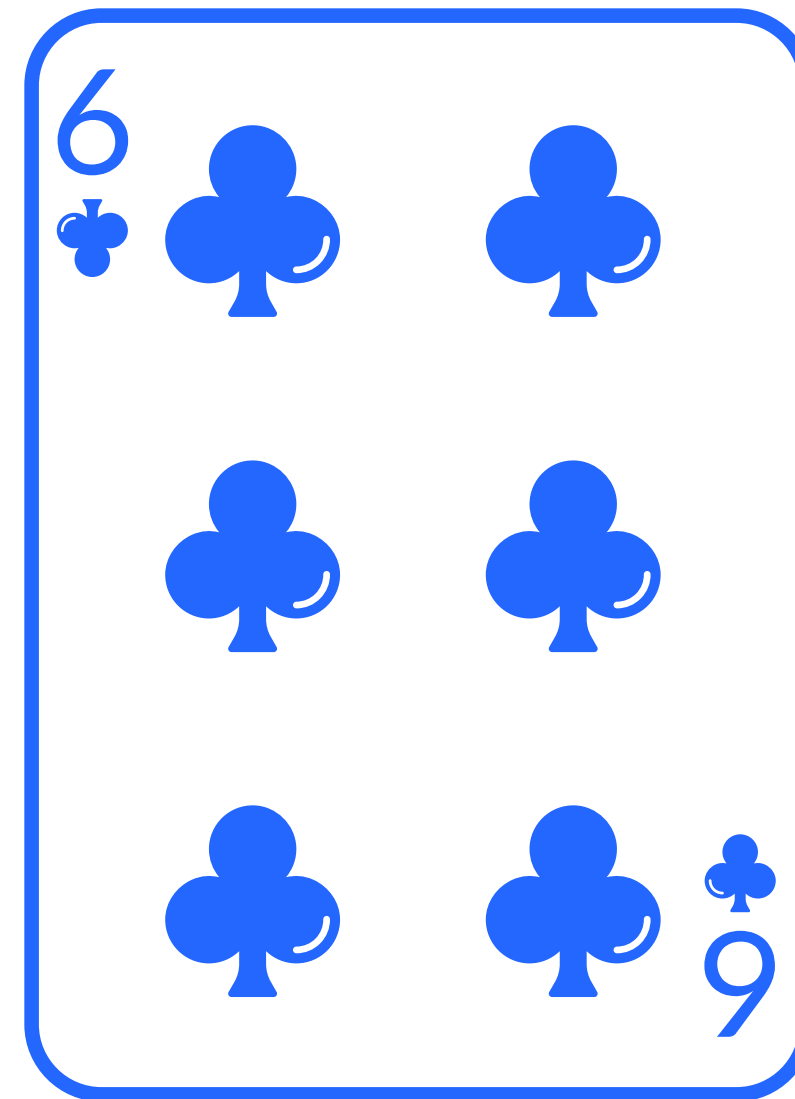
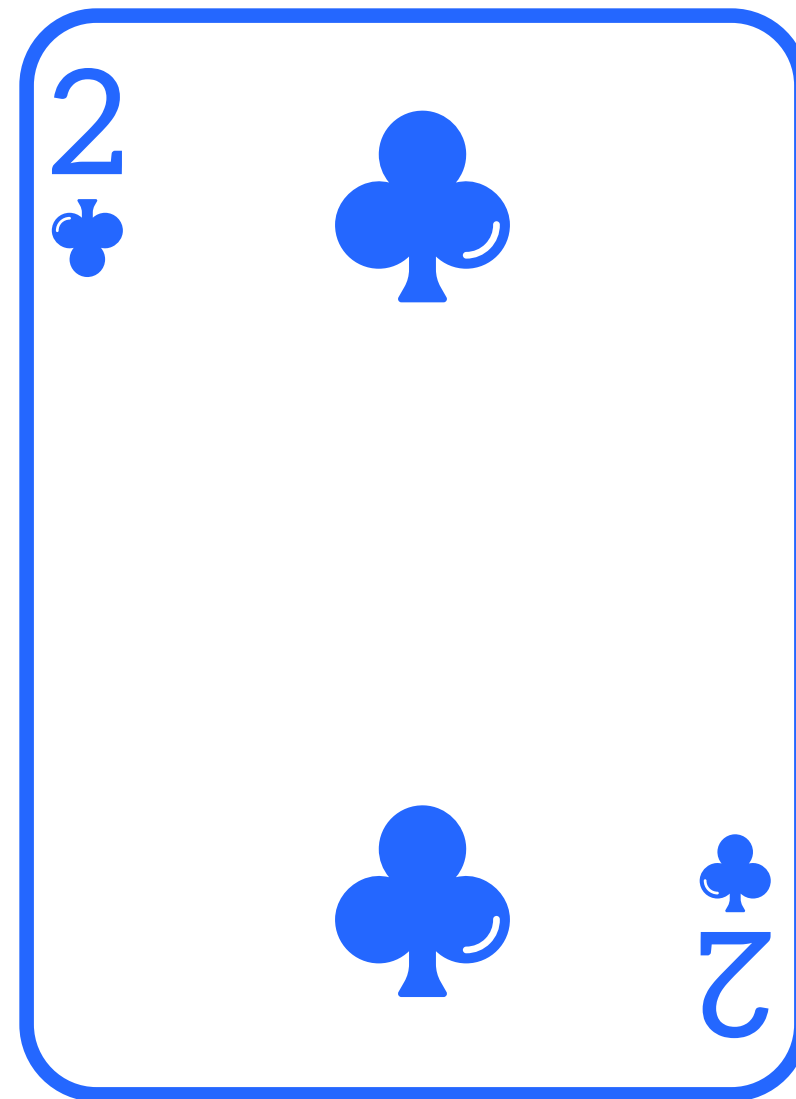
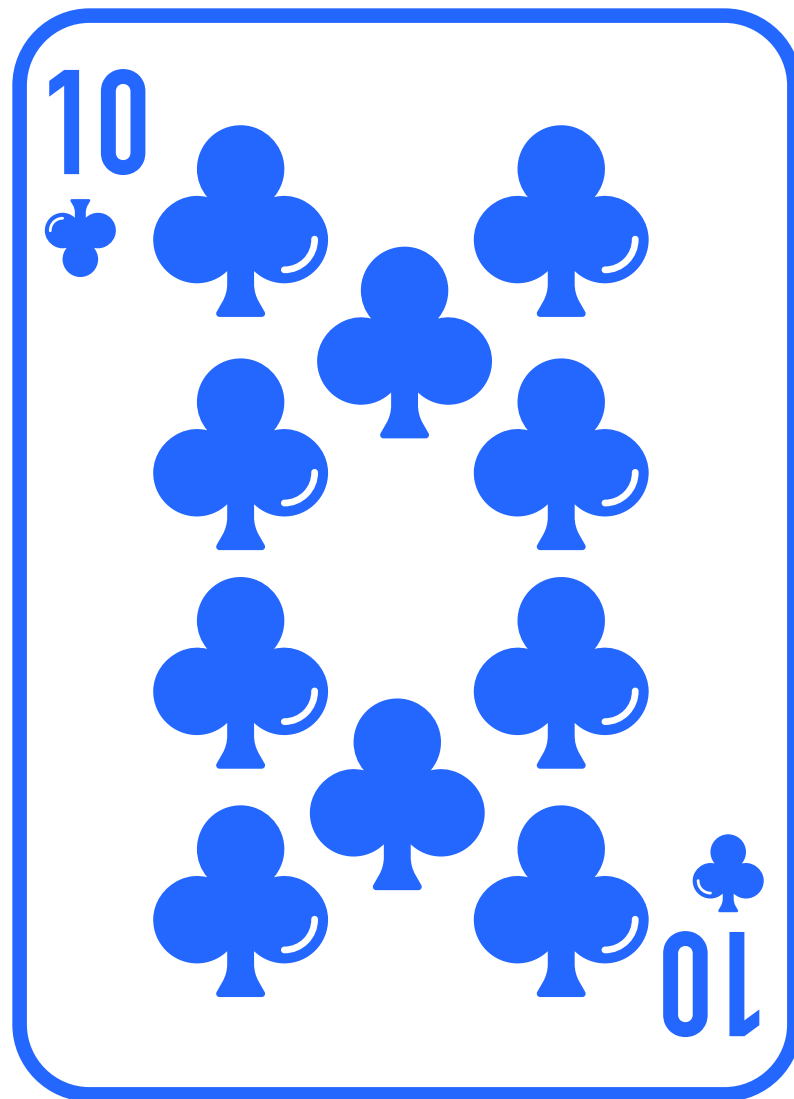
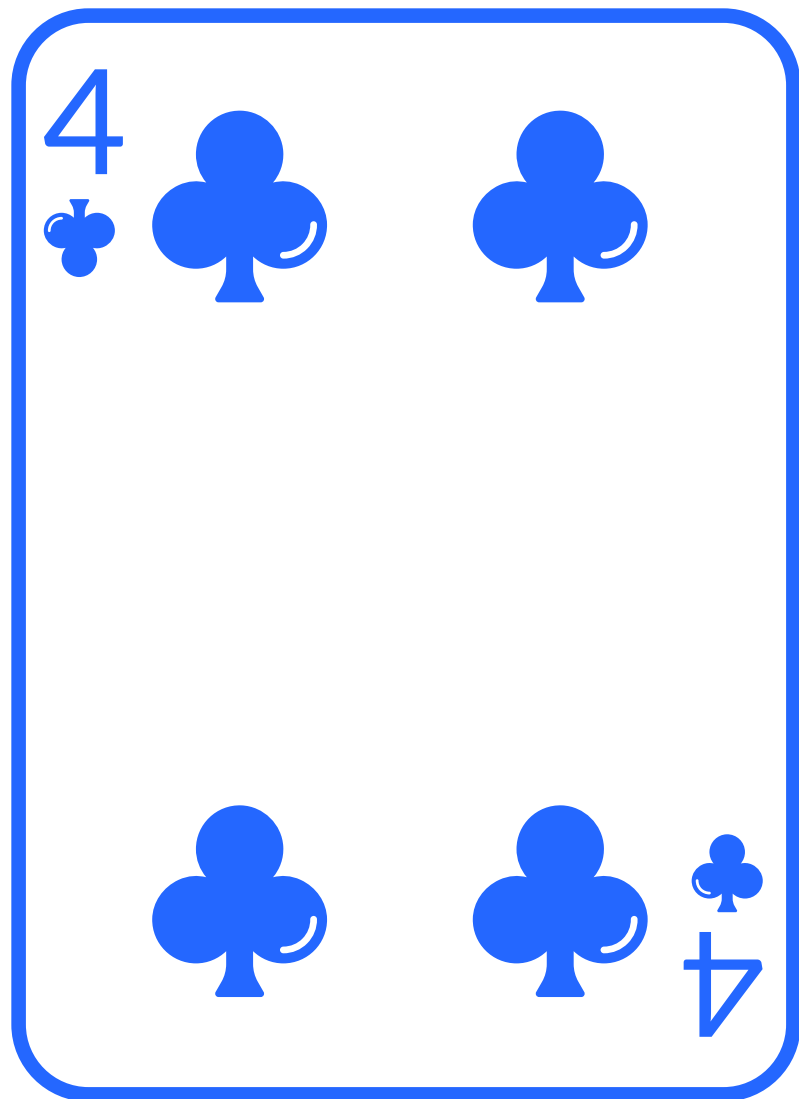
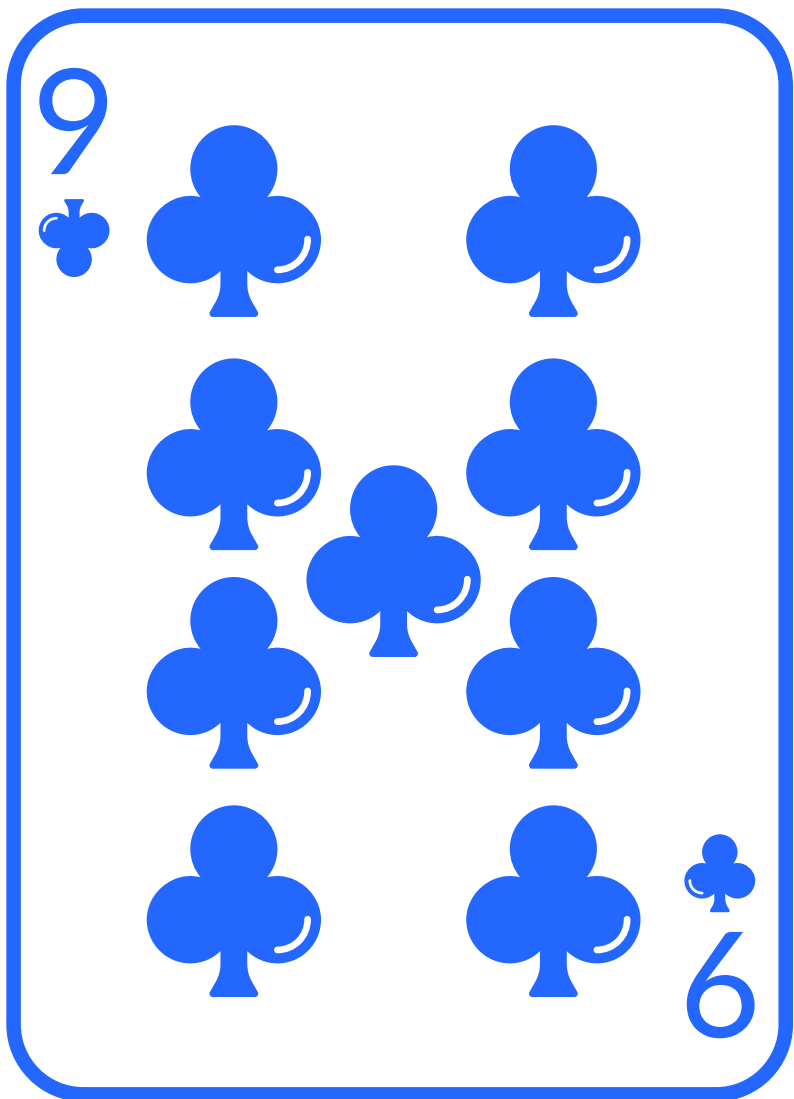


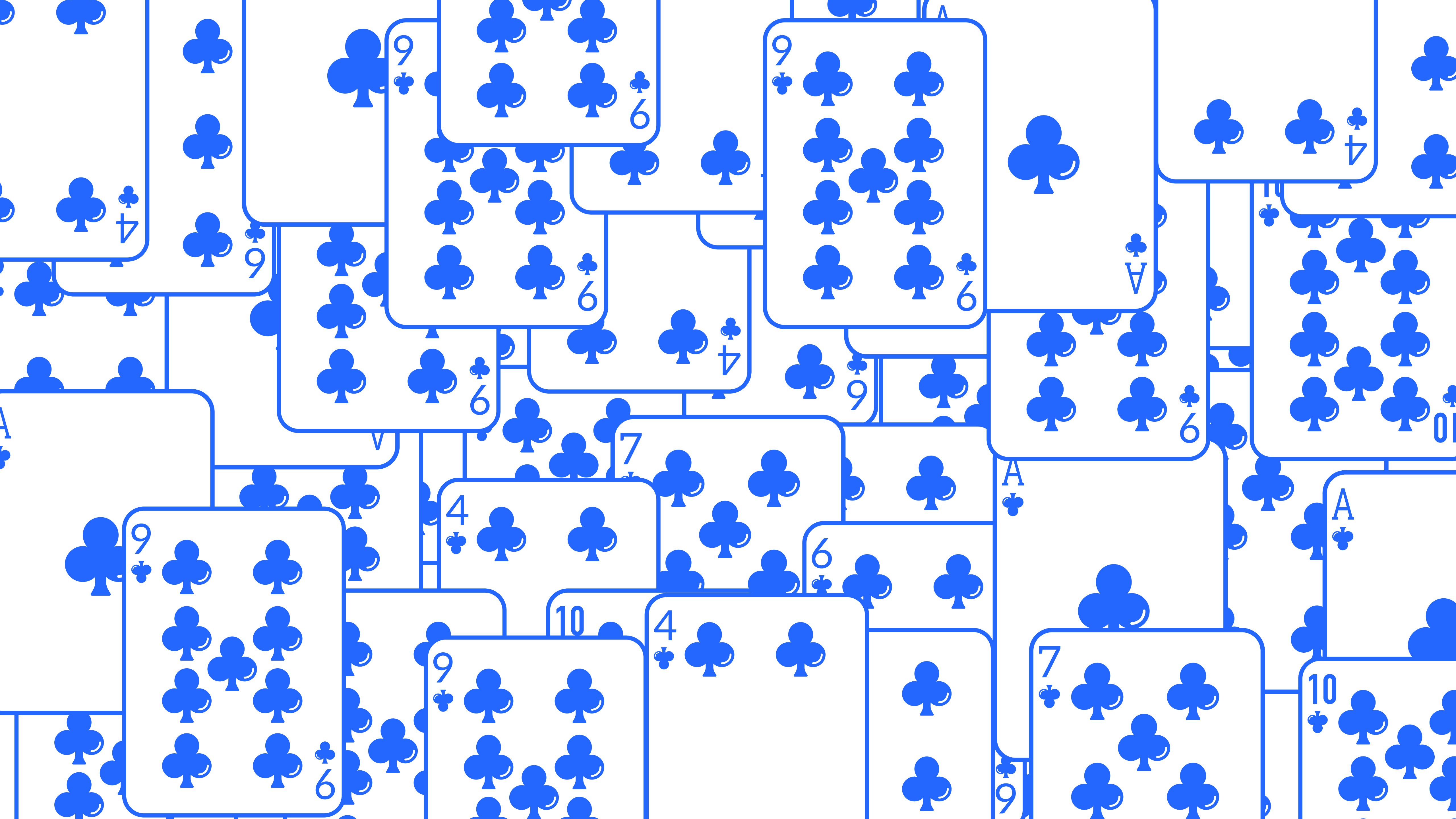
Idee e algoritmi

ALGORITMO

"Minimo"







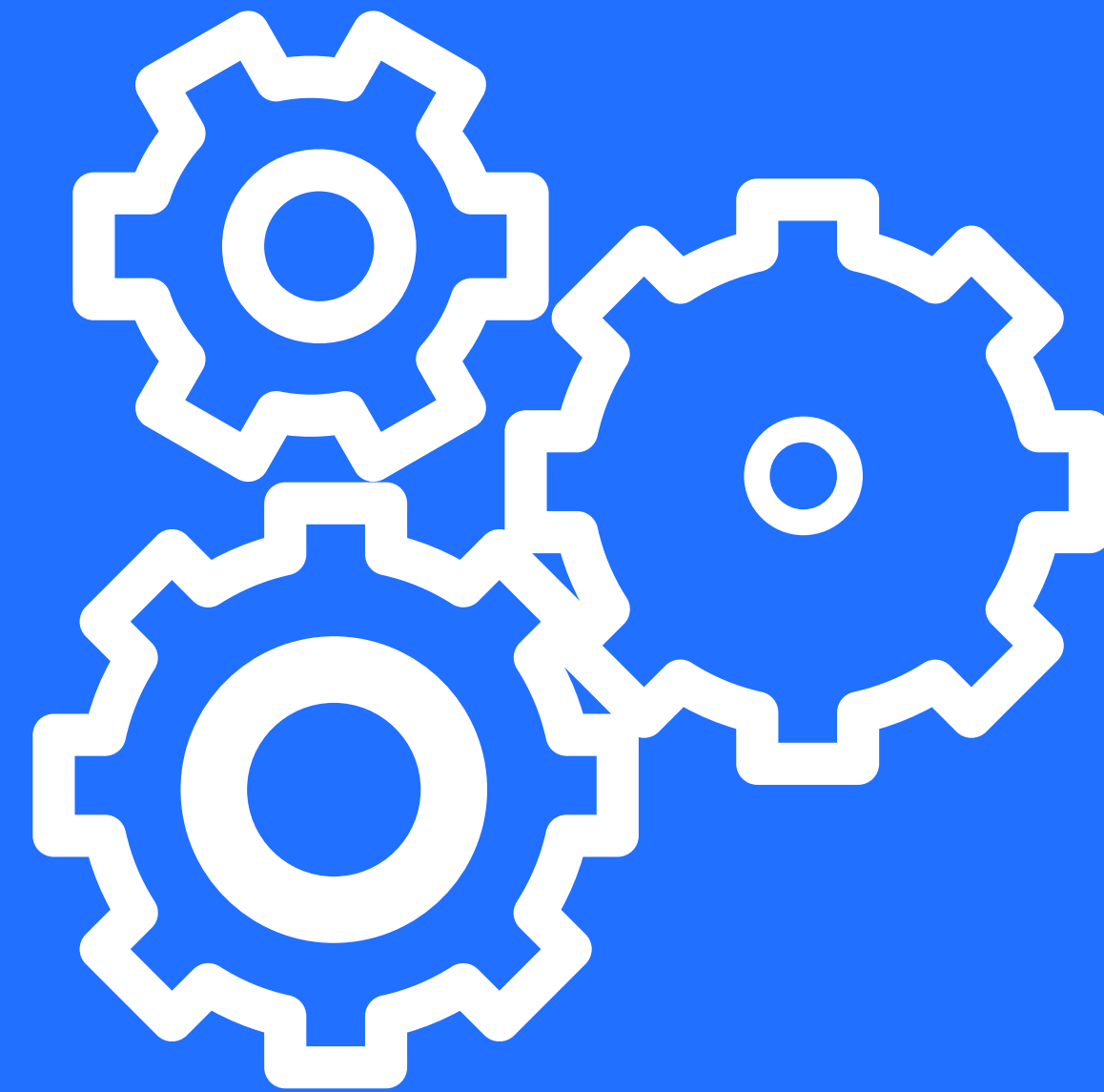
PENSIERO

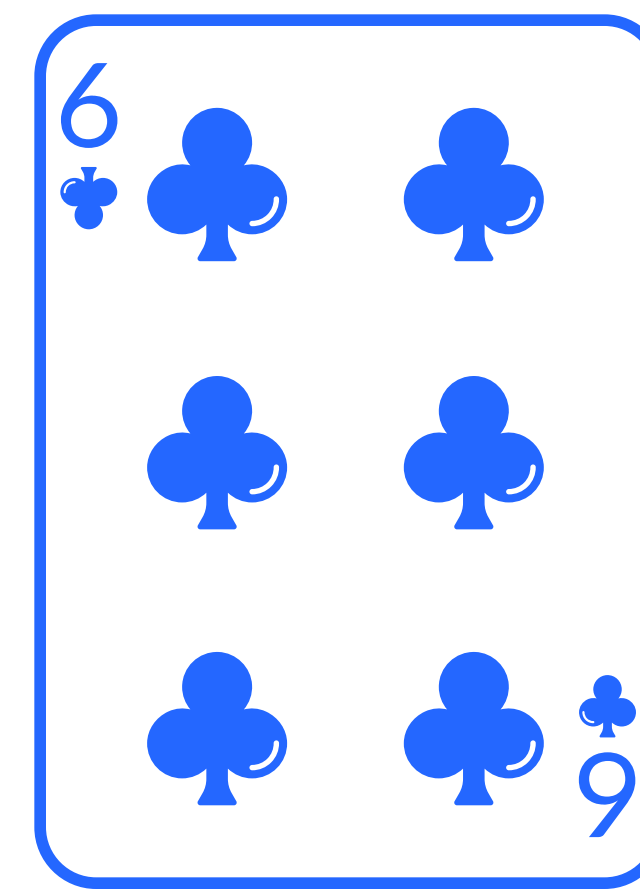
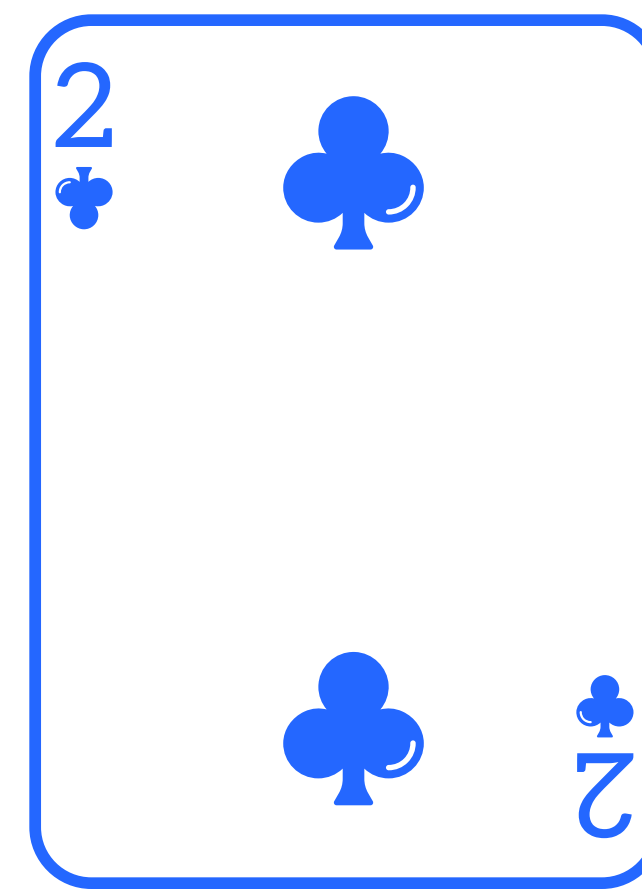
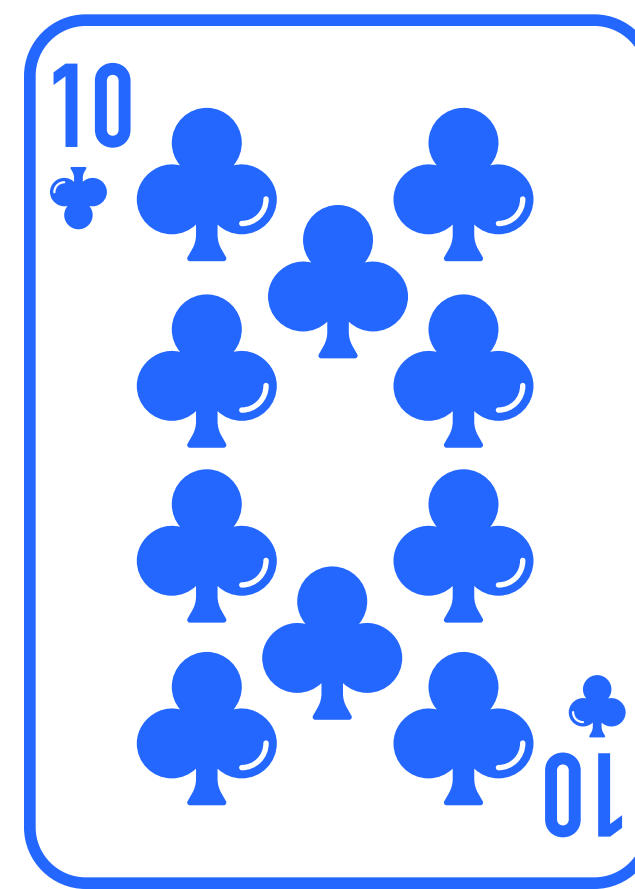
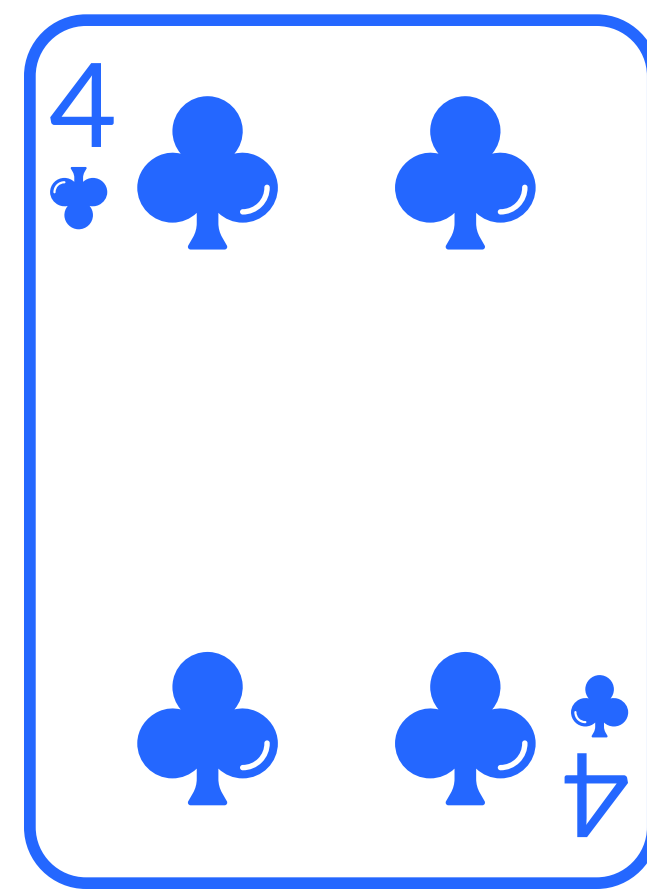
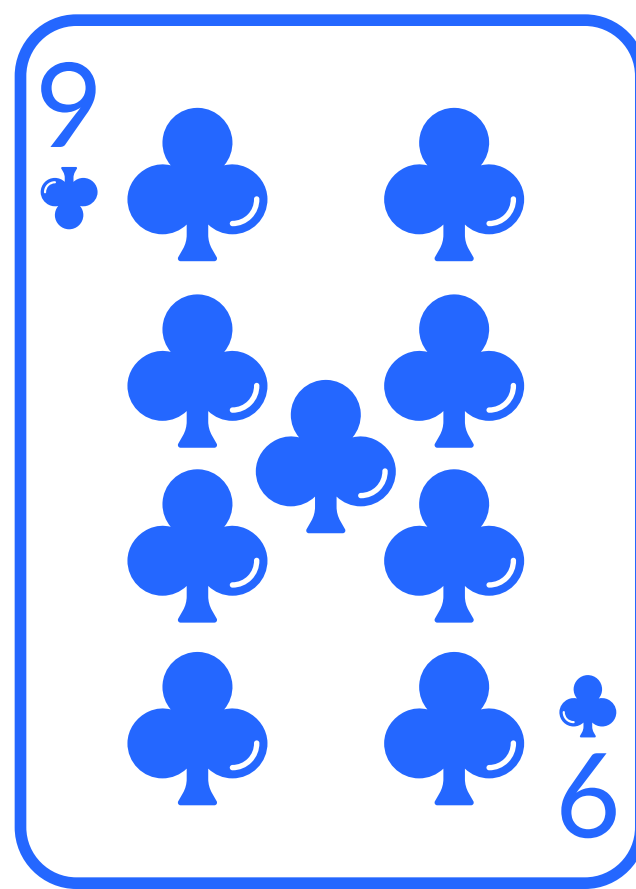
COMPUTAZIONALE

*L'insieme dei processi mentali coinvolti
nella formulazione di un problema e nella
sua soluzione*

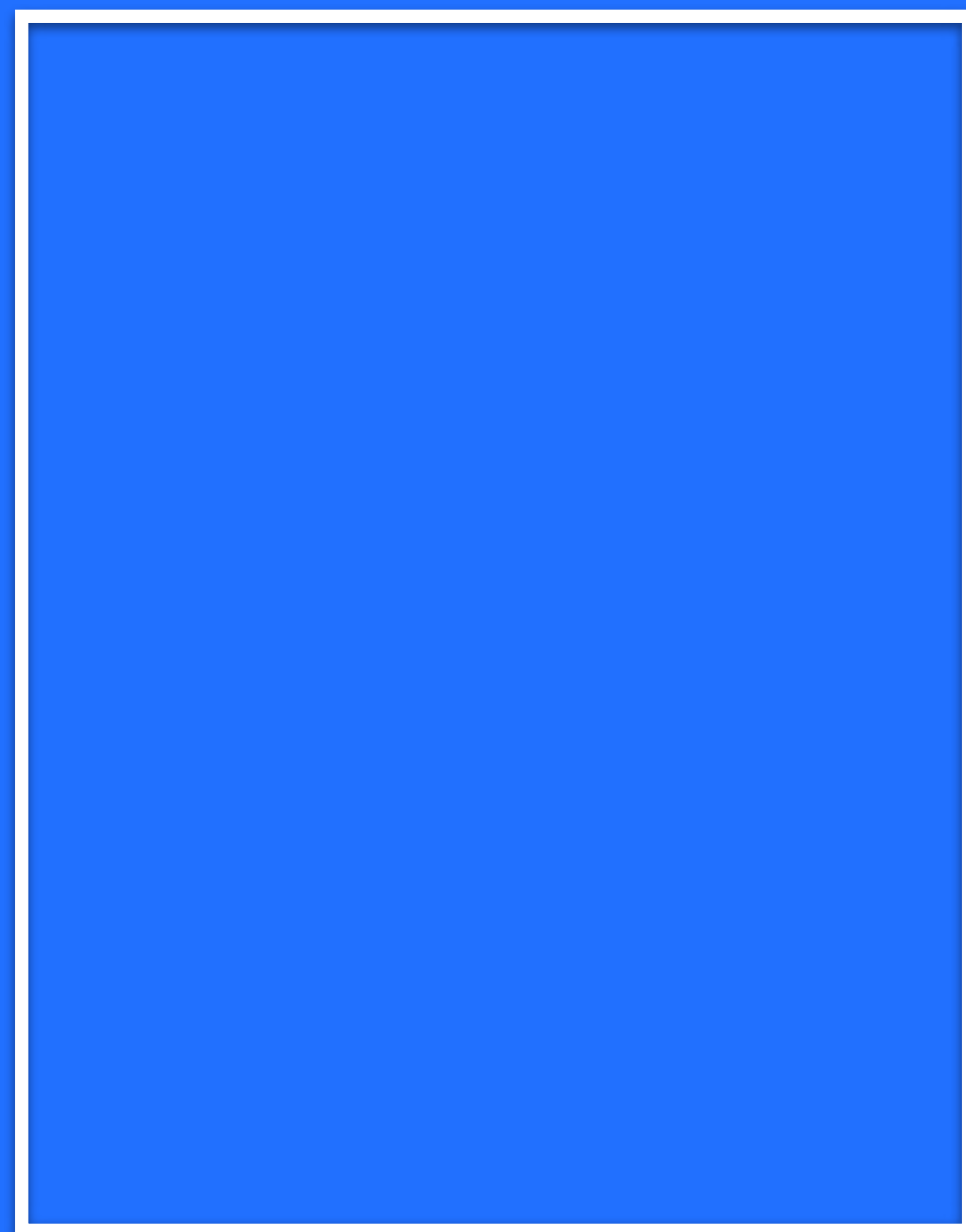
*Tale soluzione deve poter essere eseguita
da un essere umano o da una macchina*

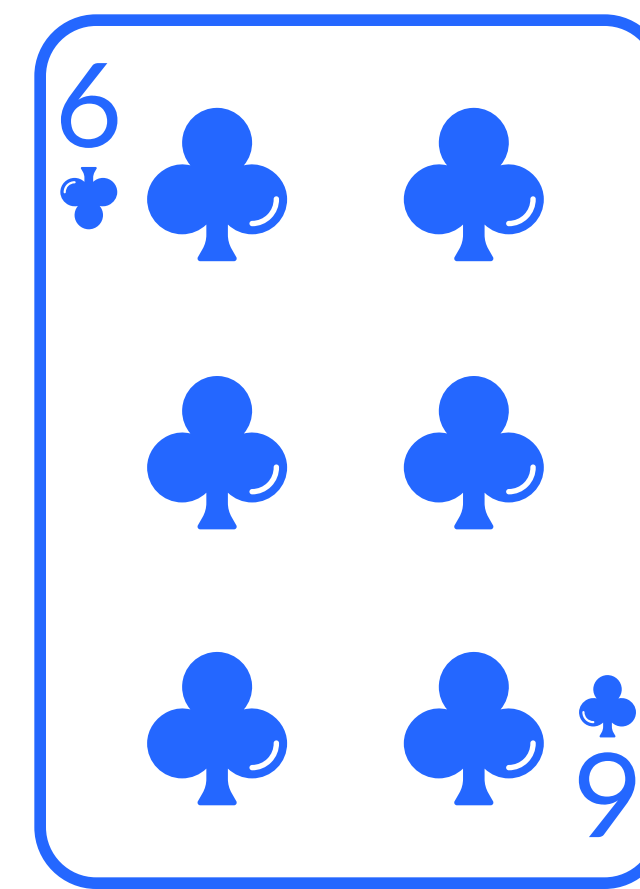
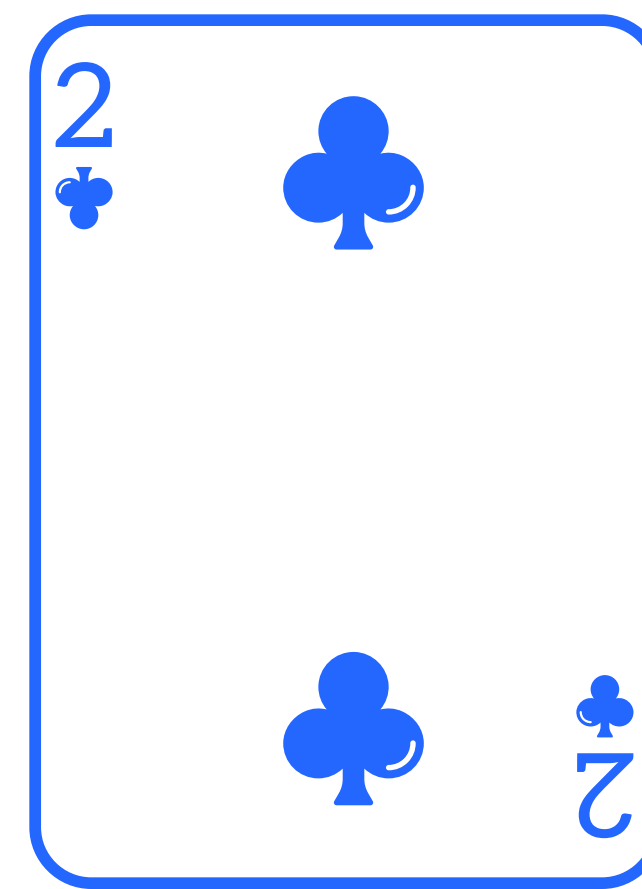
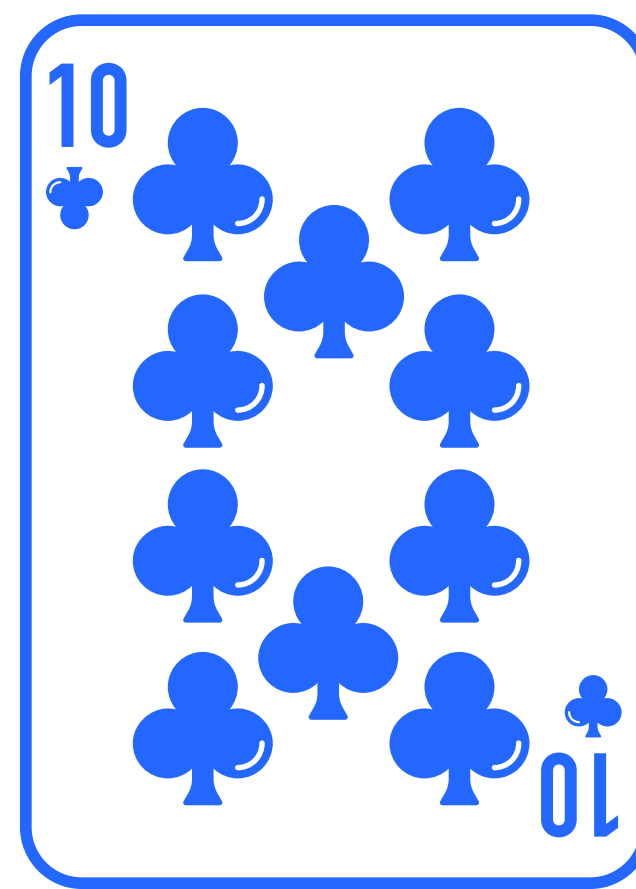
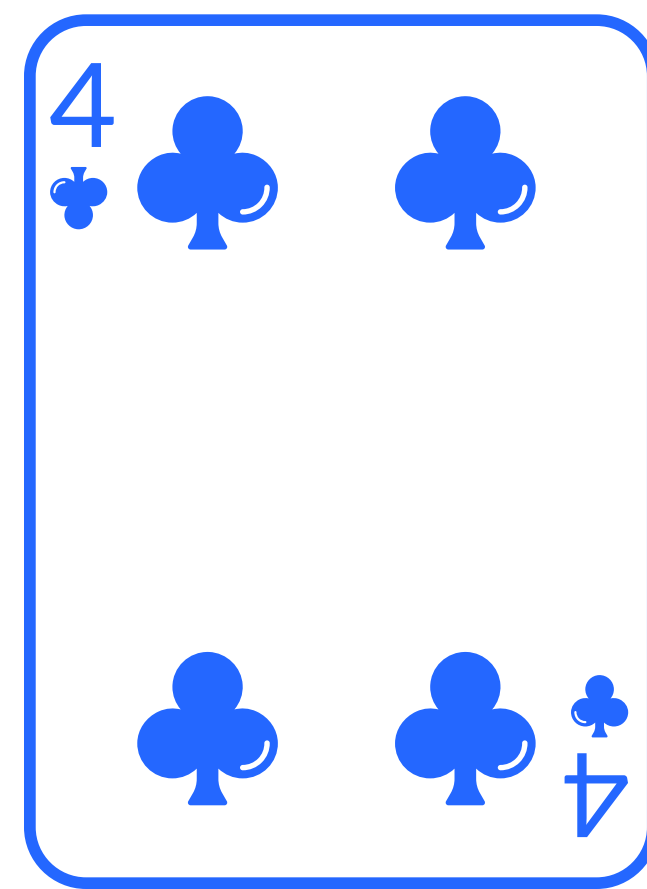
“diamo uno sguardo alle carte e prendiamo quella con il numero più piccolo”



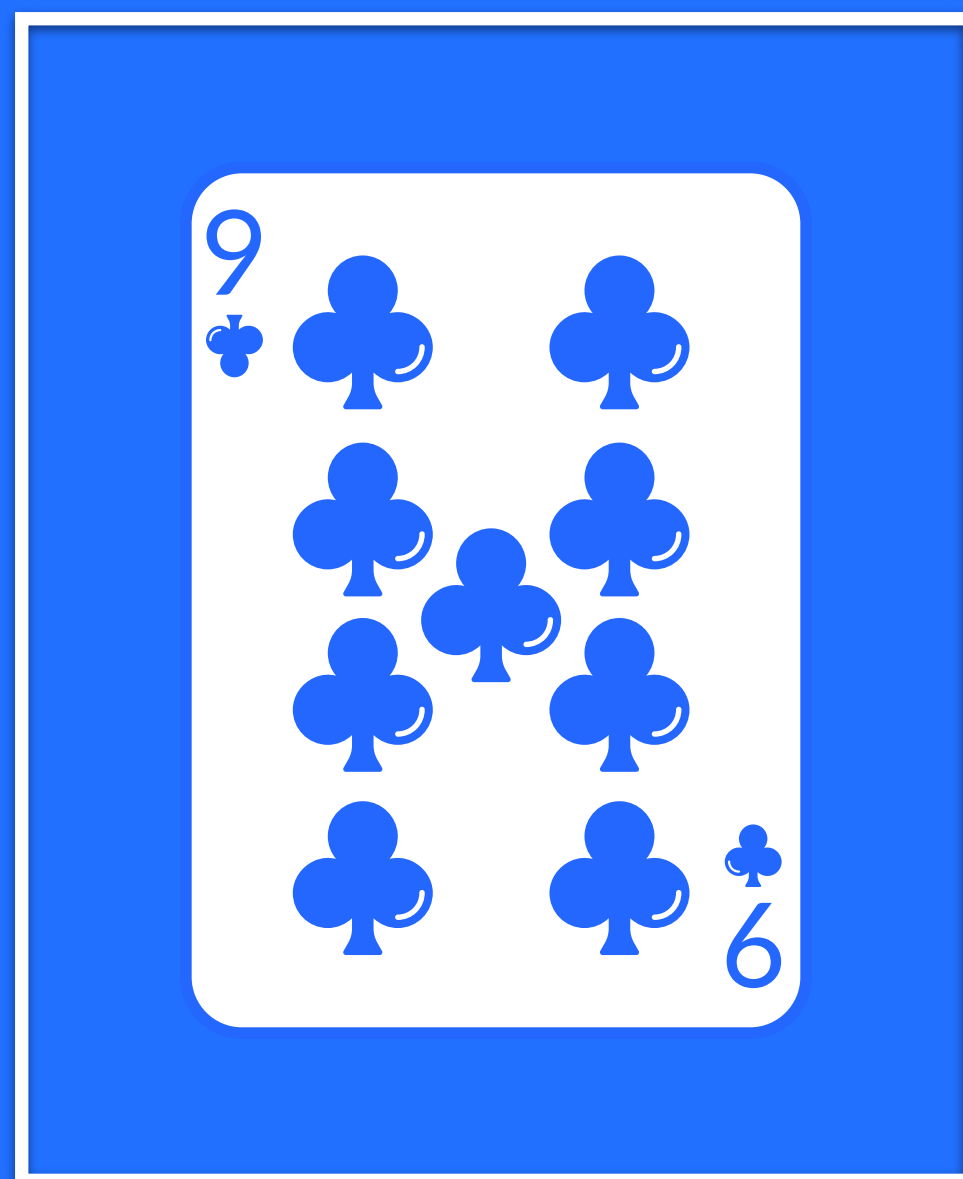


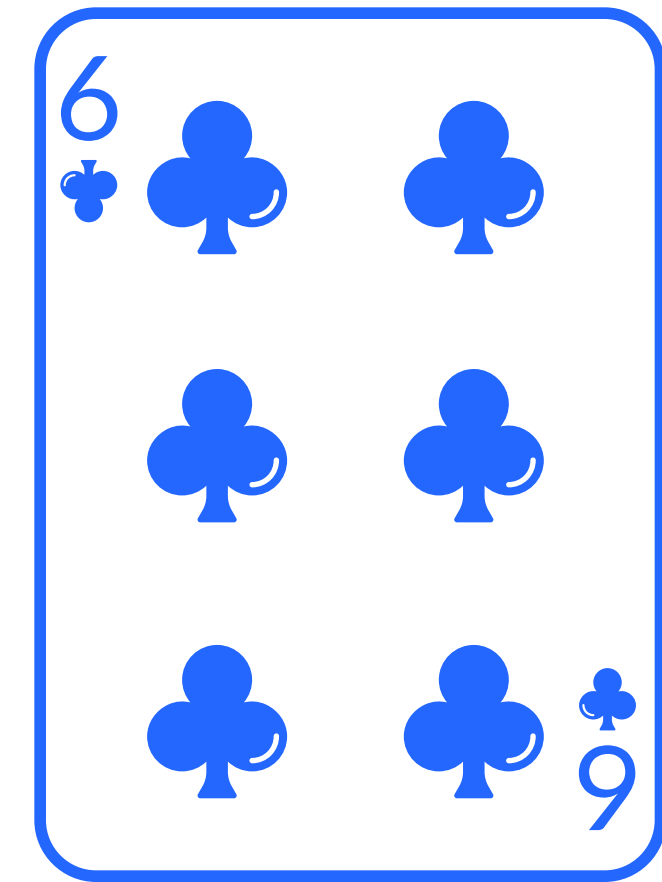
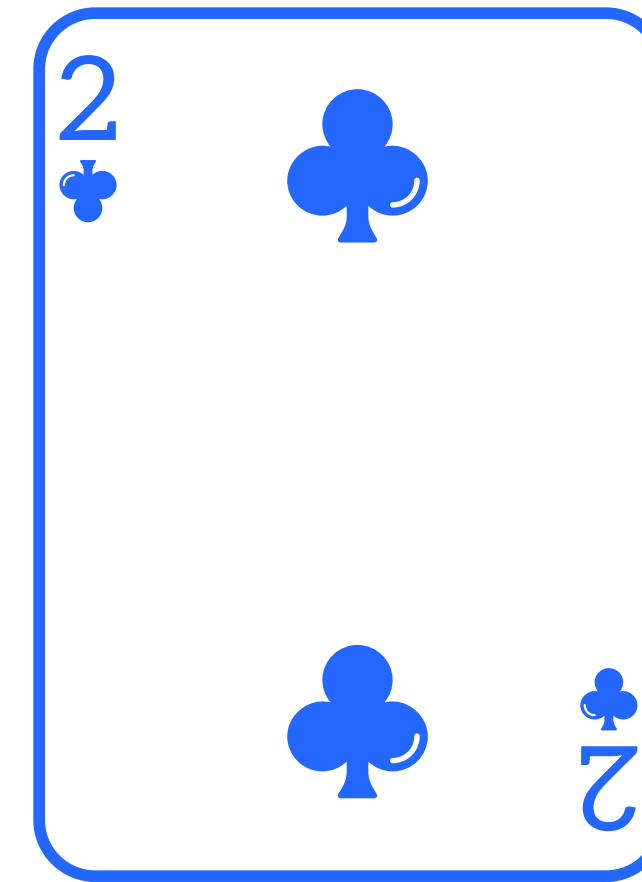
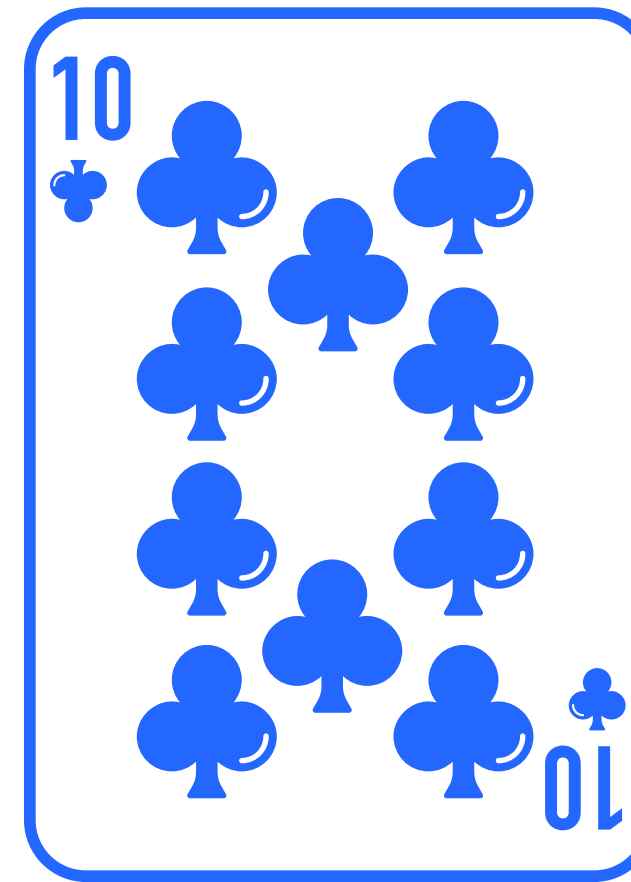
minimo



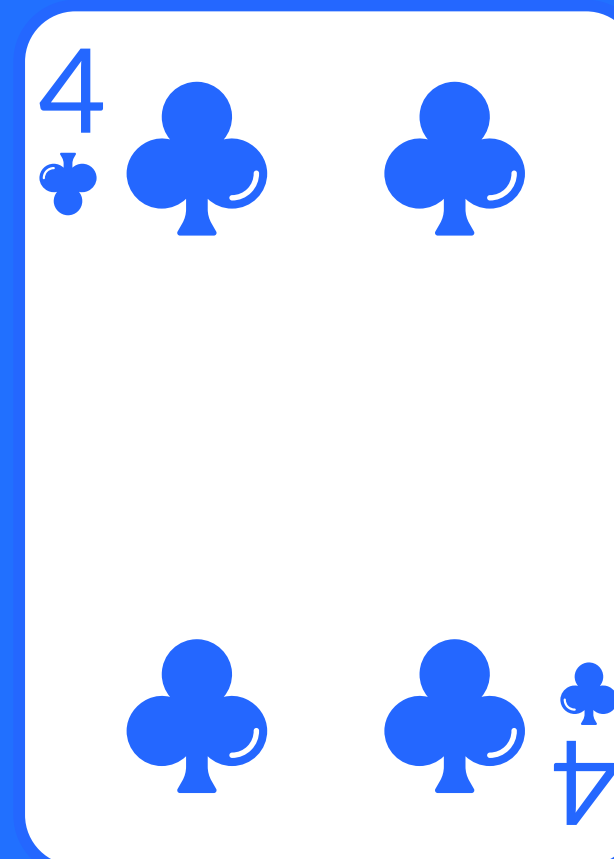
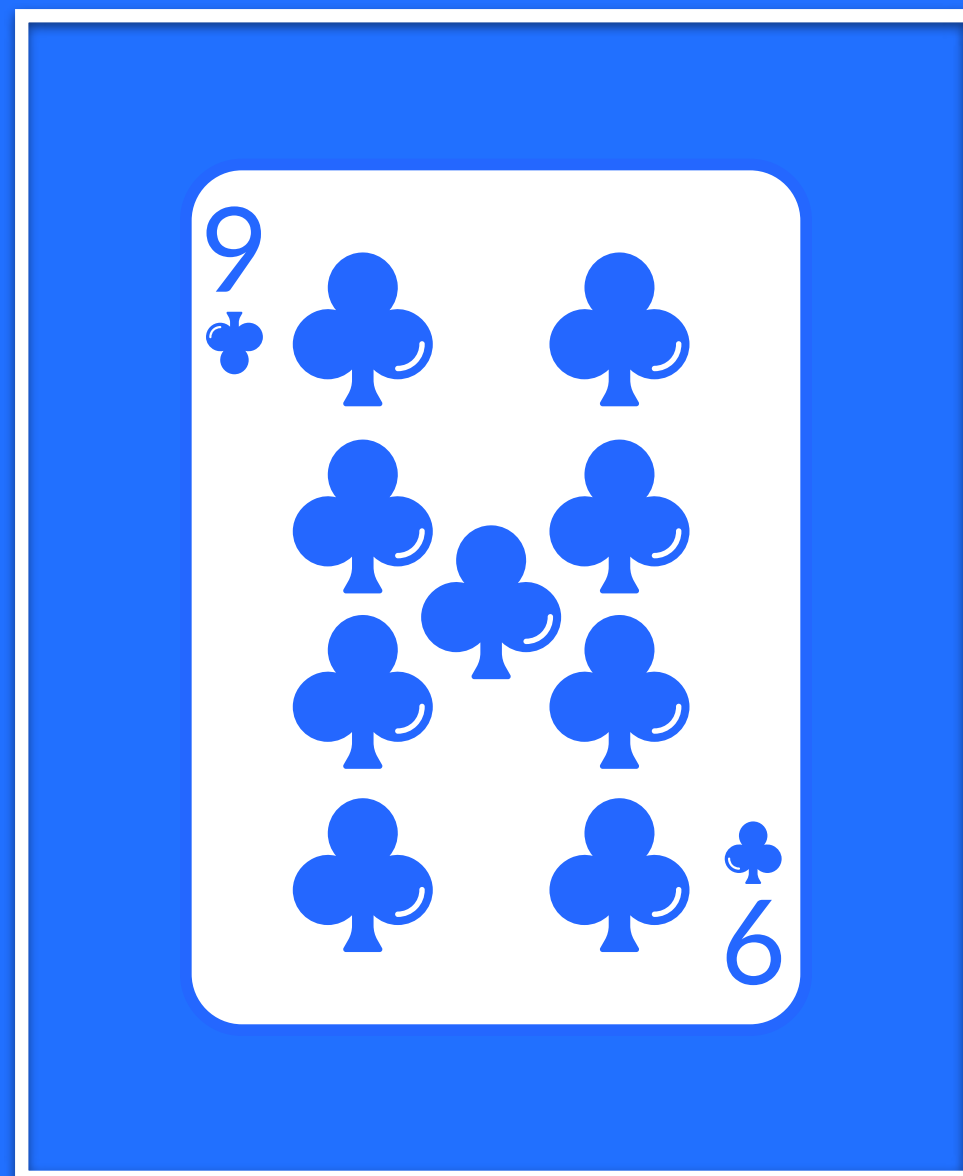


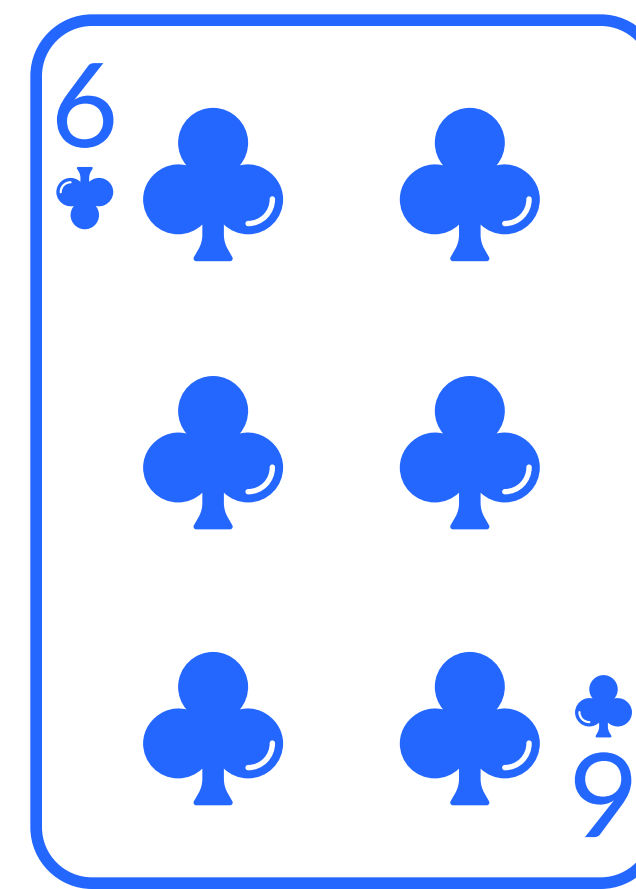
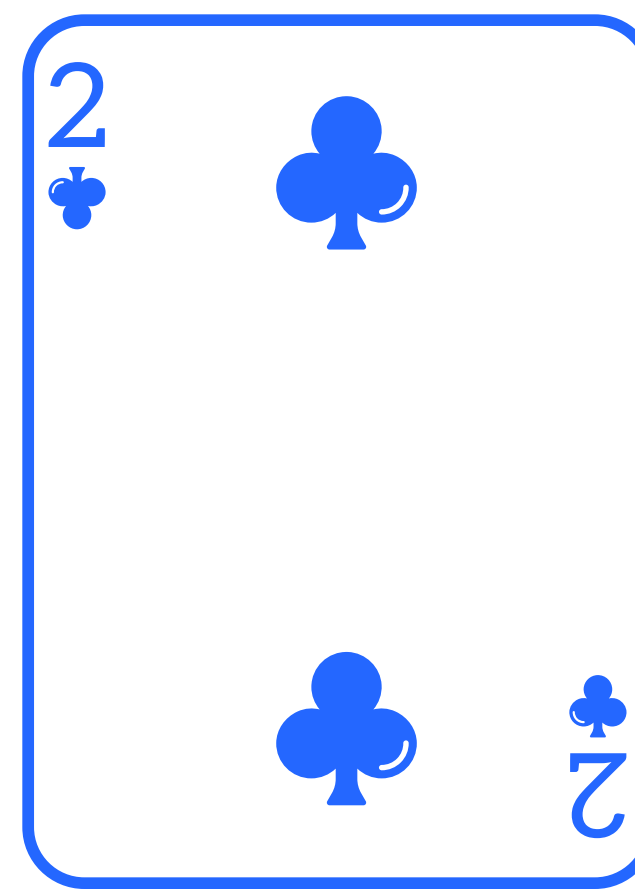
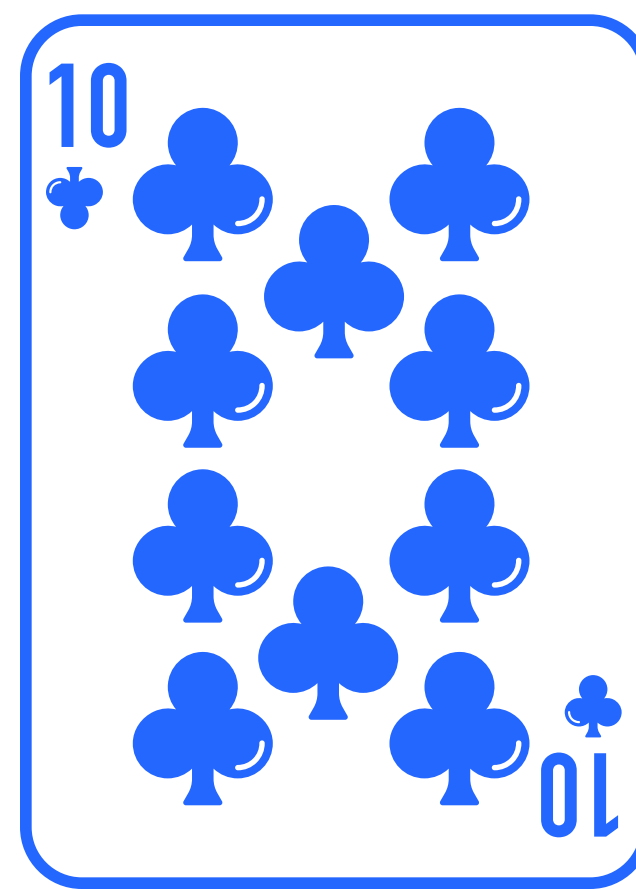
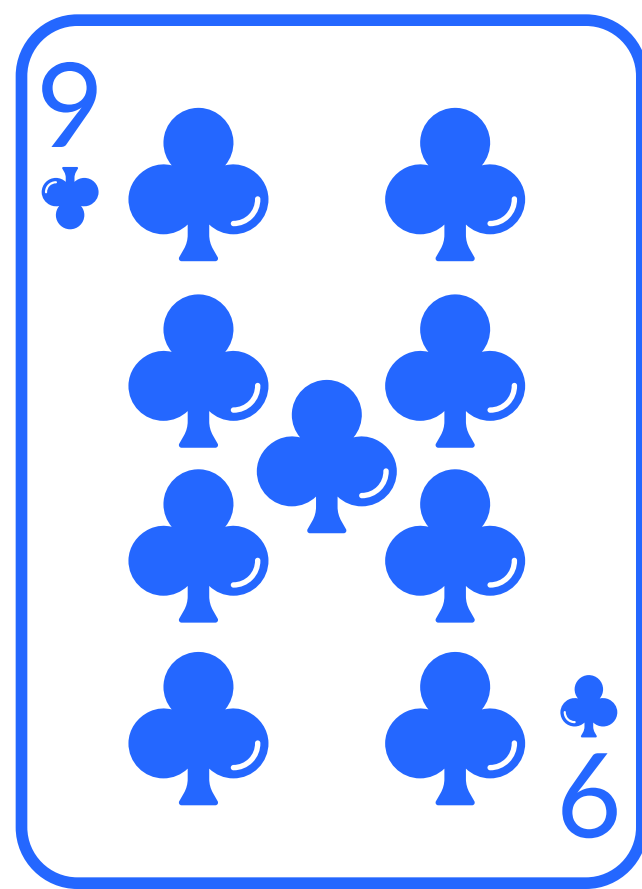
minimo



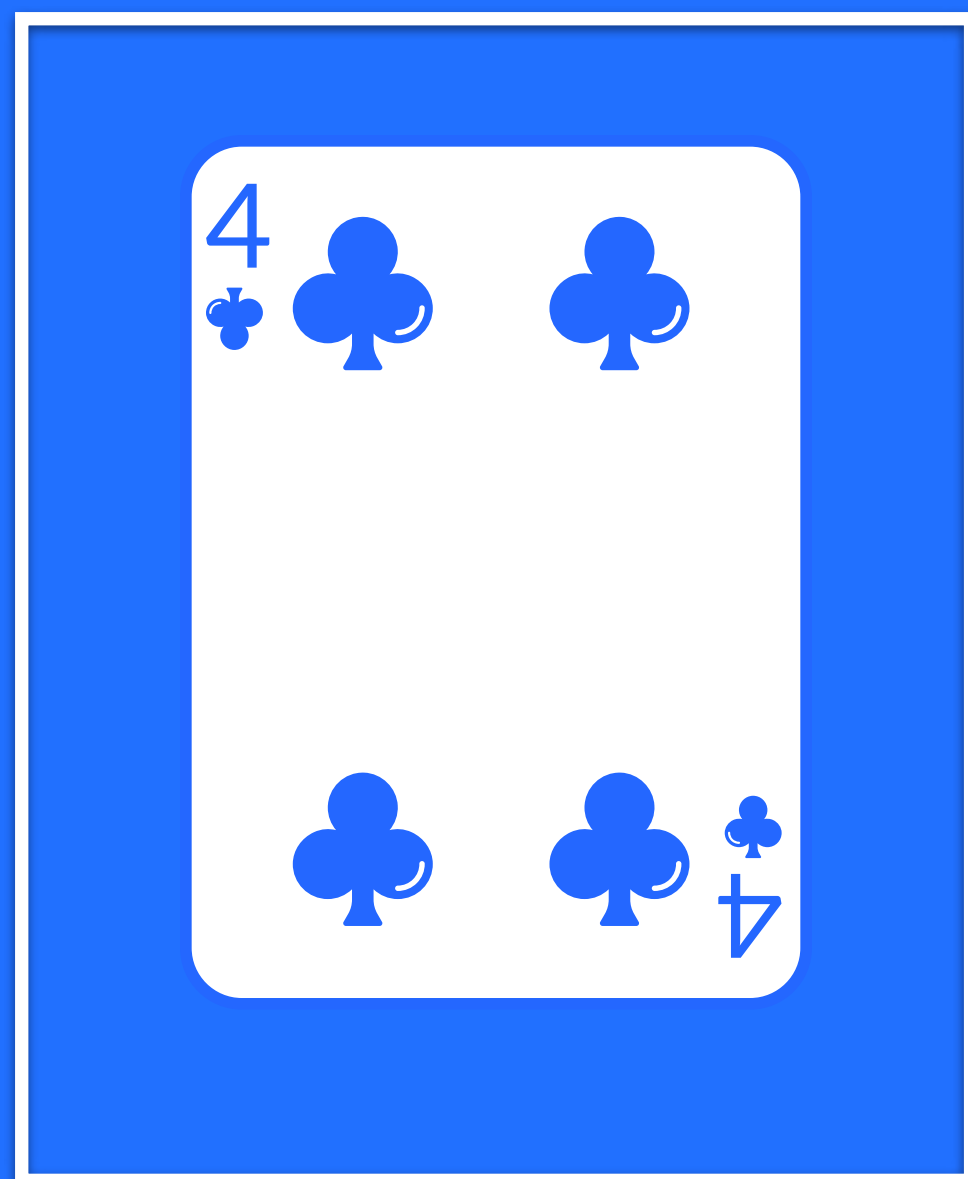


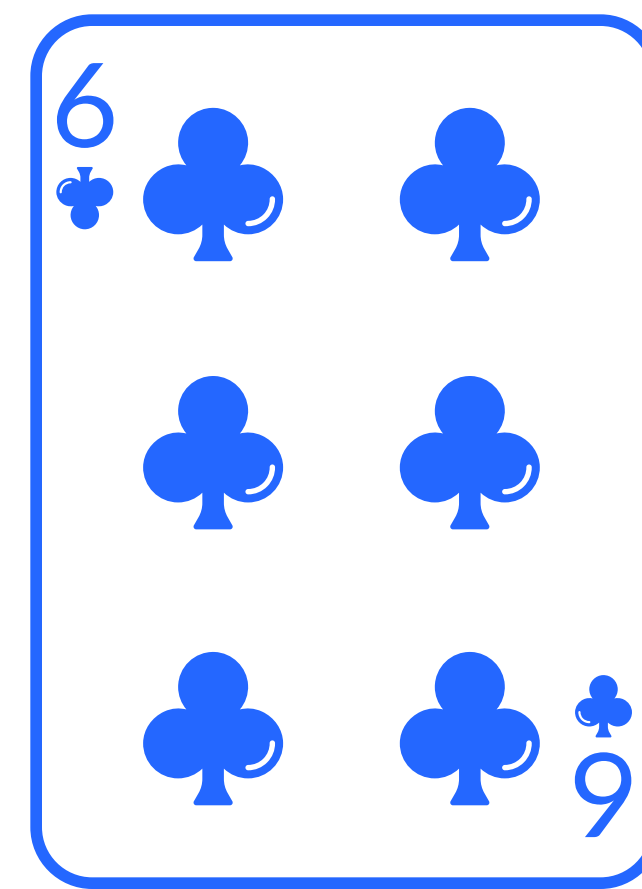
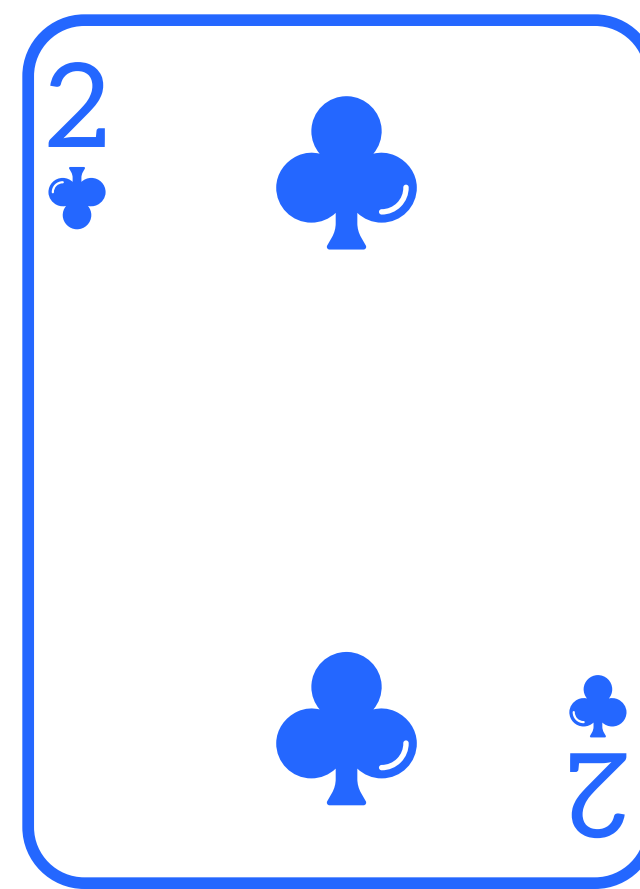
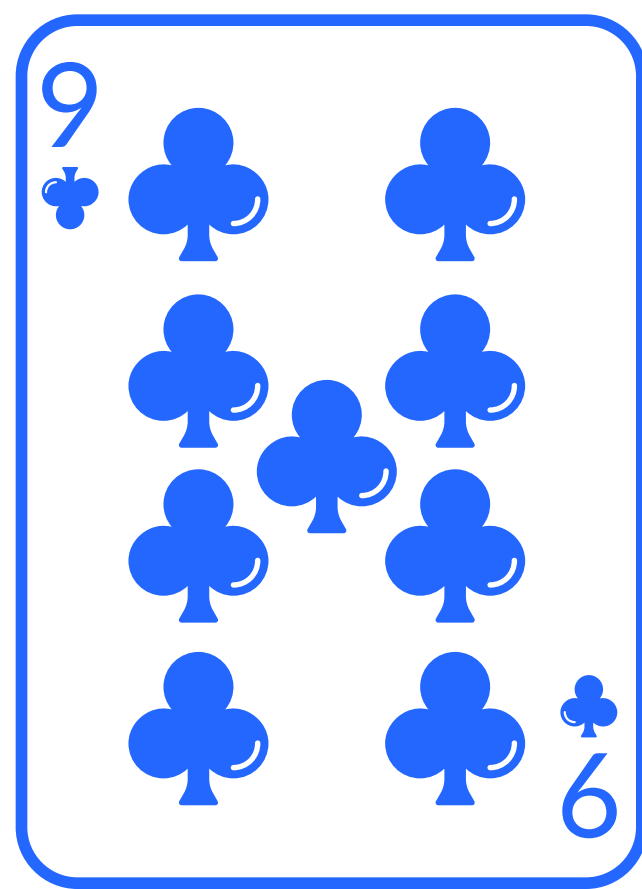
minimo



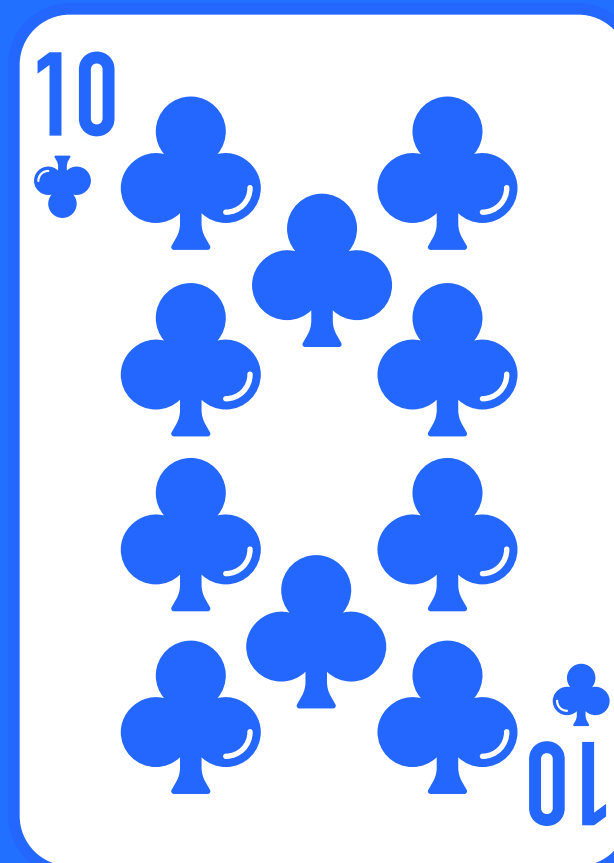
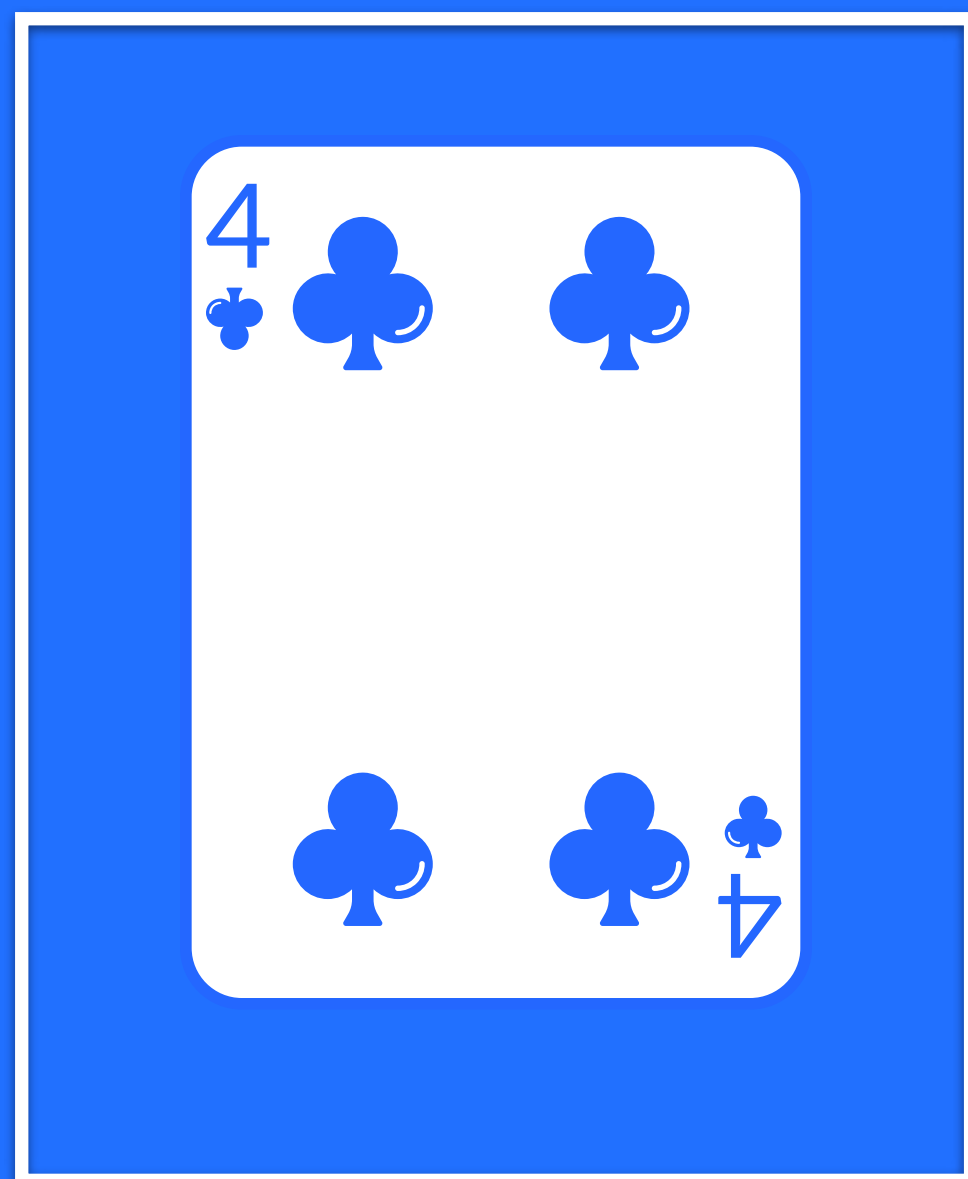


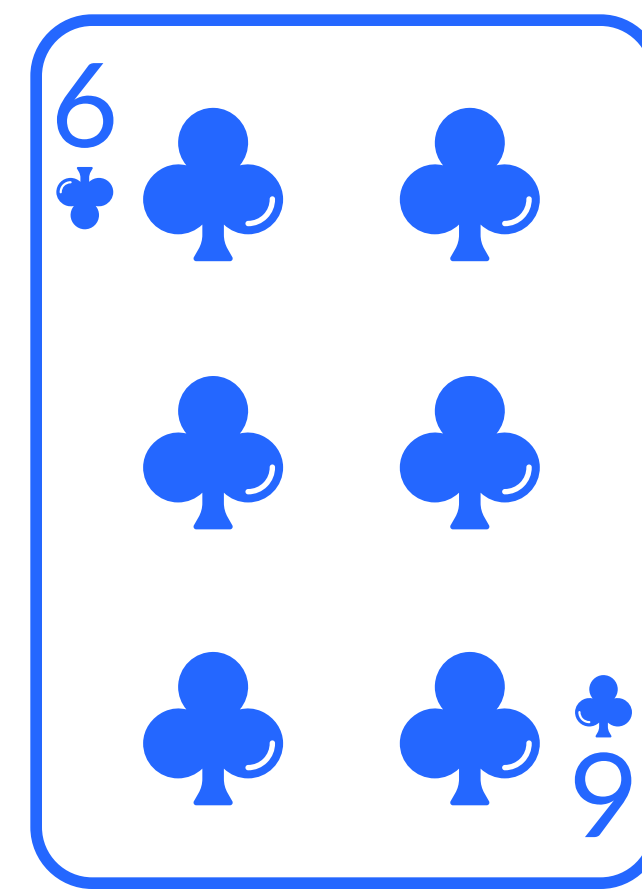
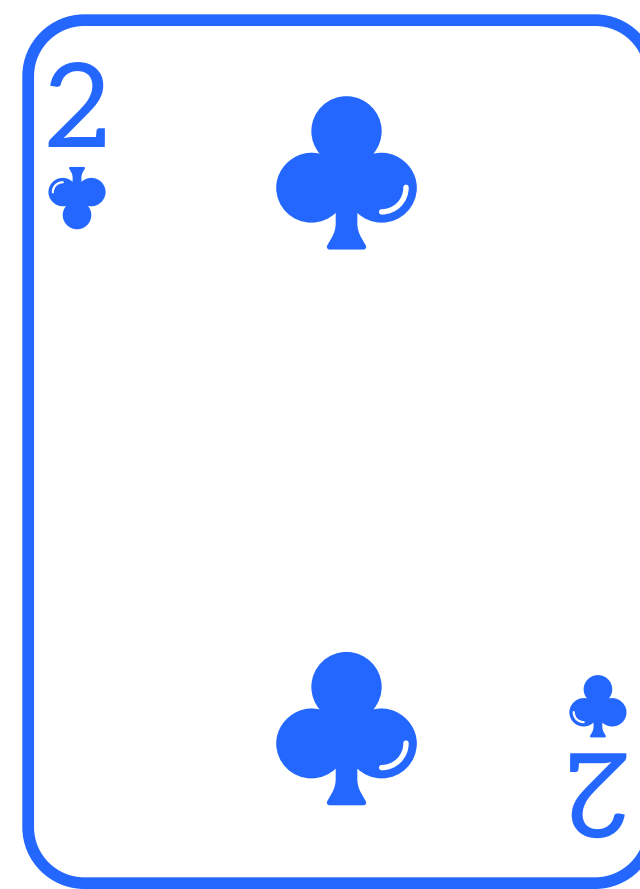
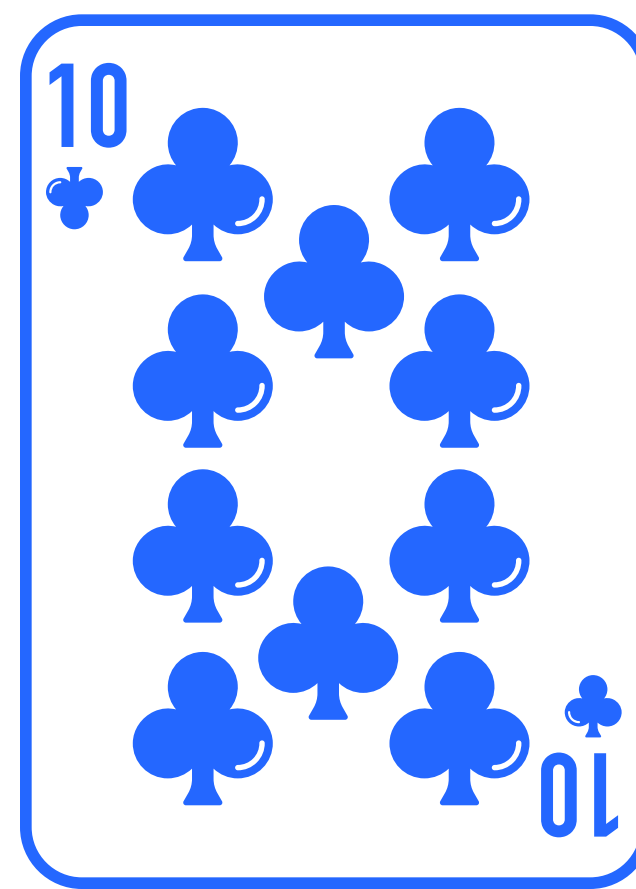
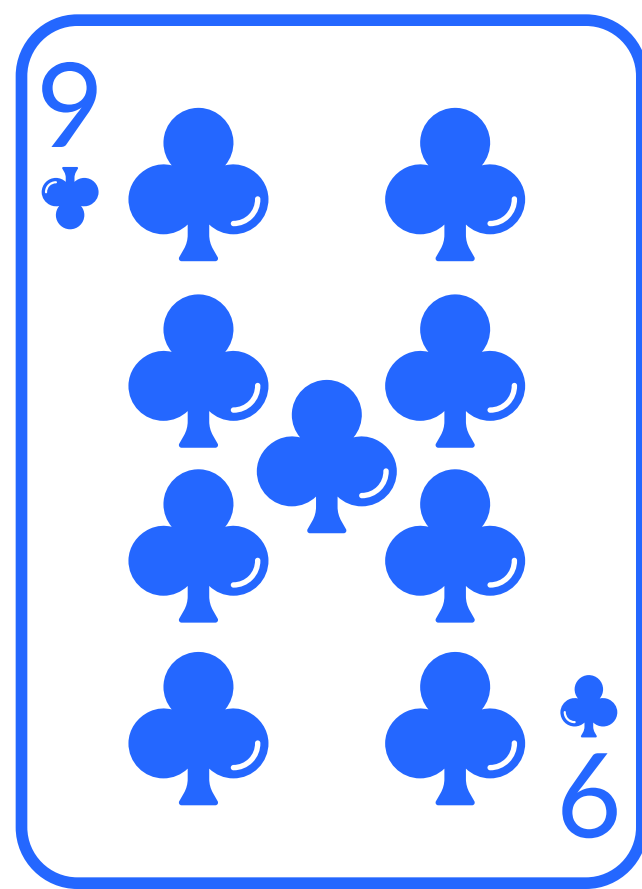
minimo



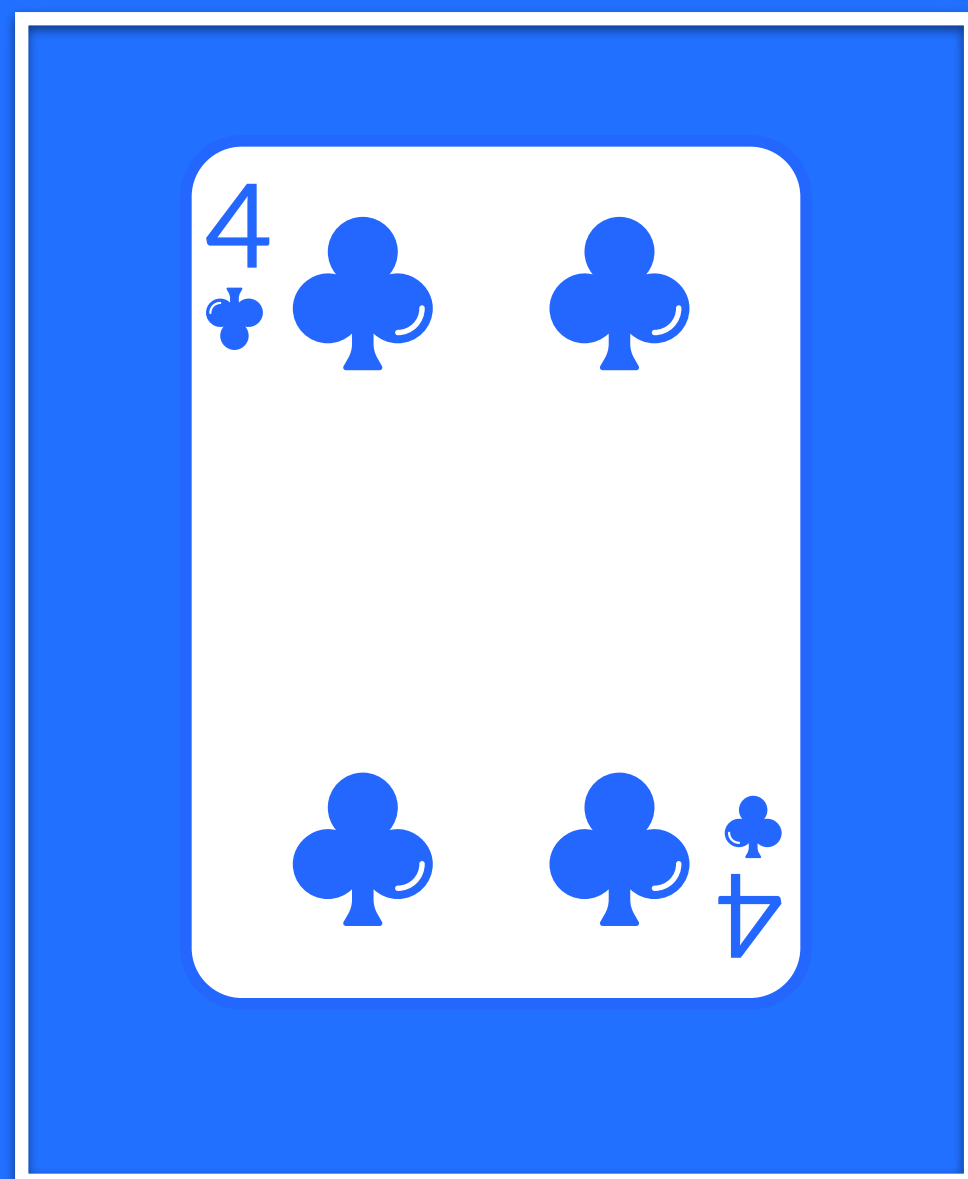


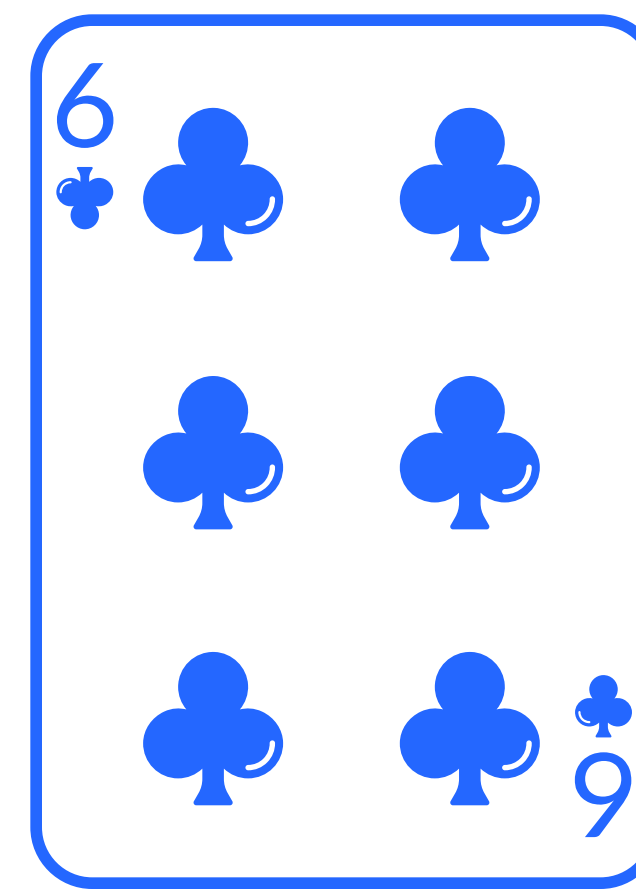
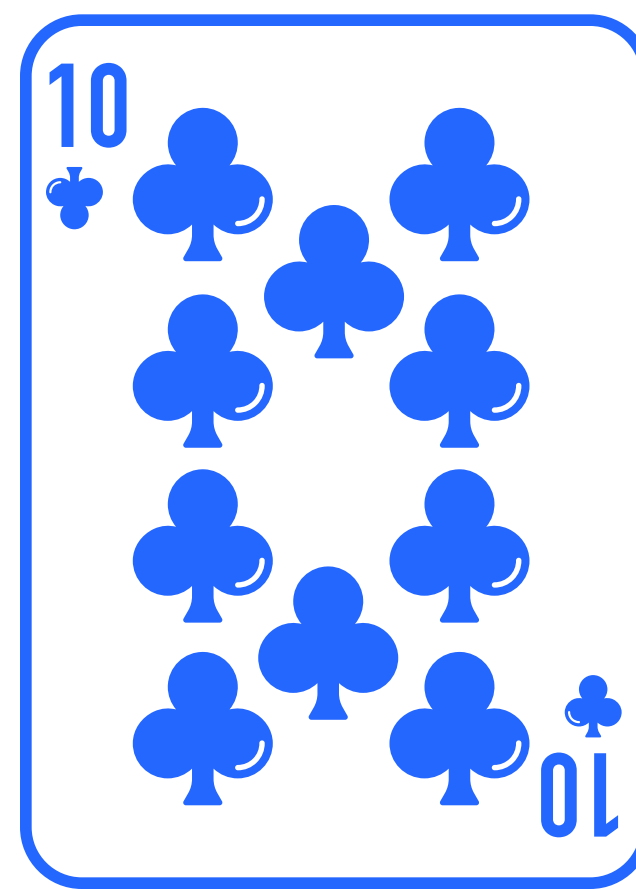
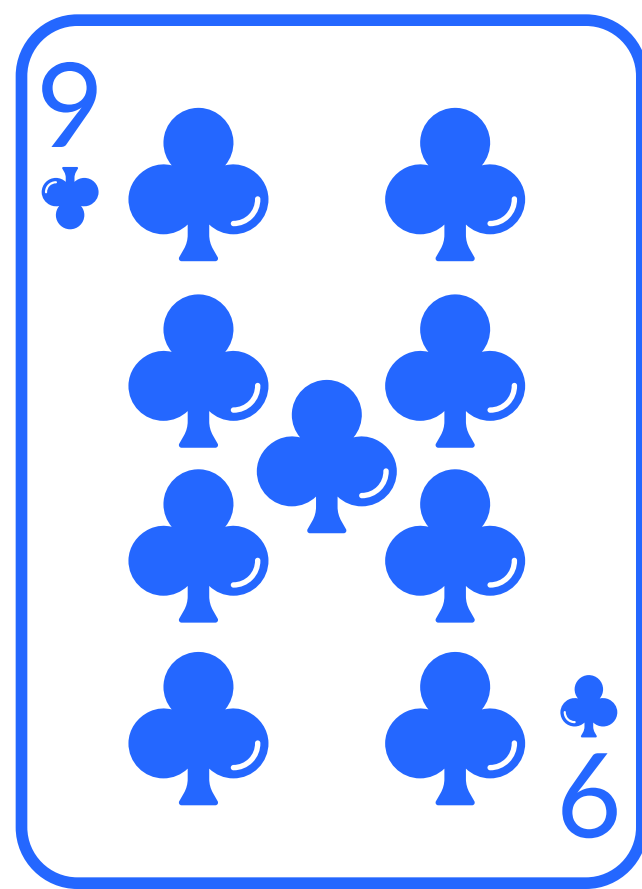
minimo



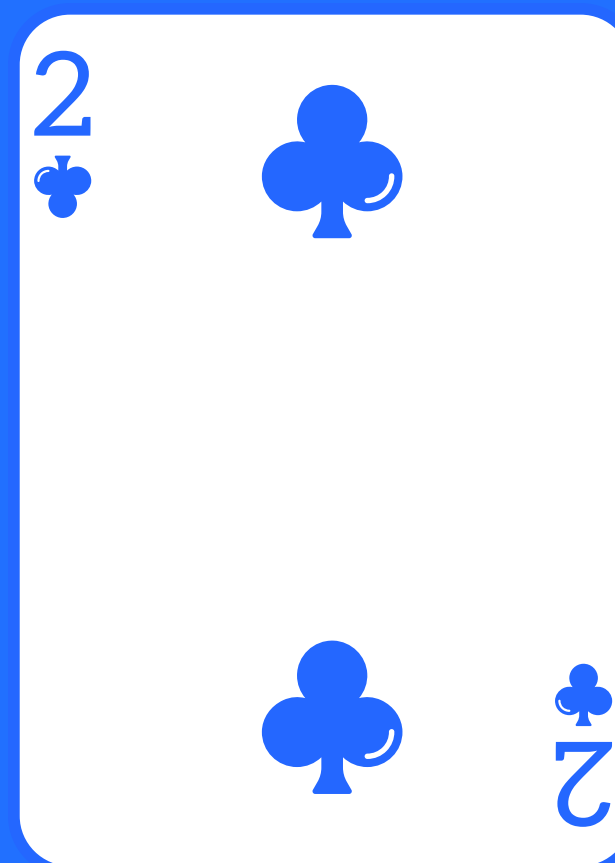
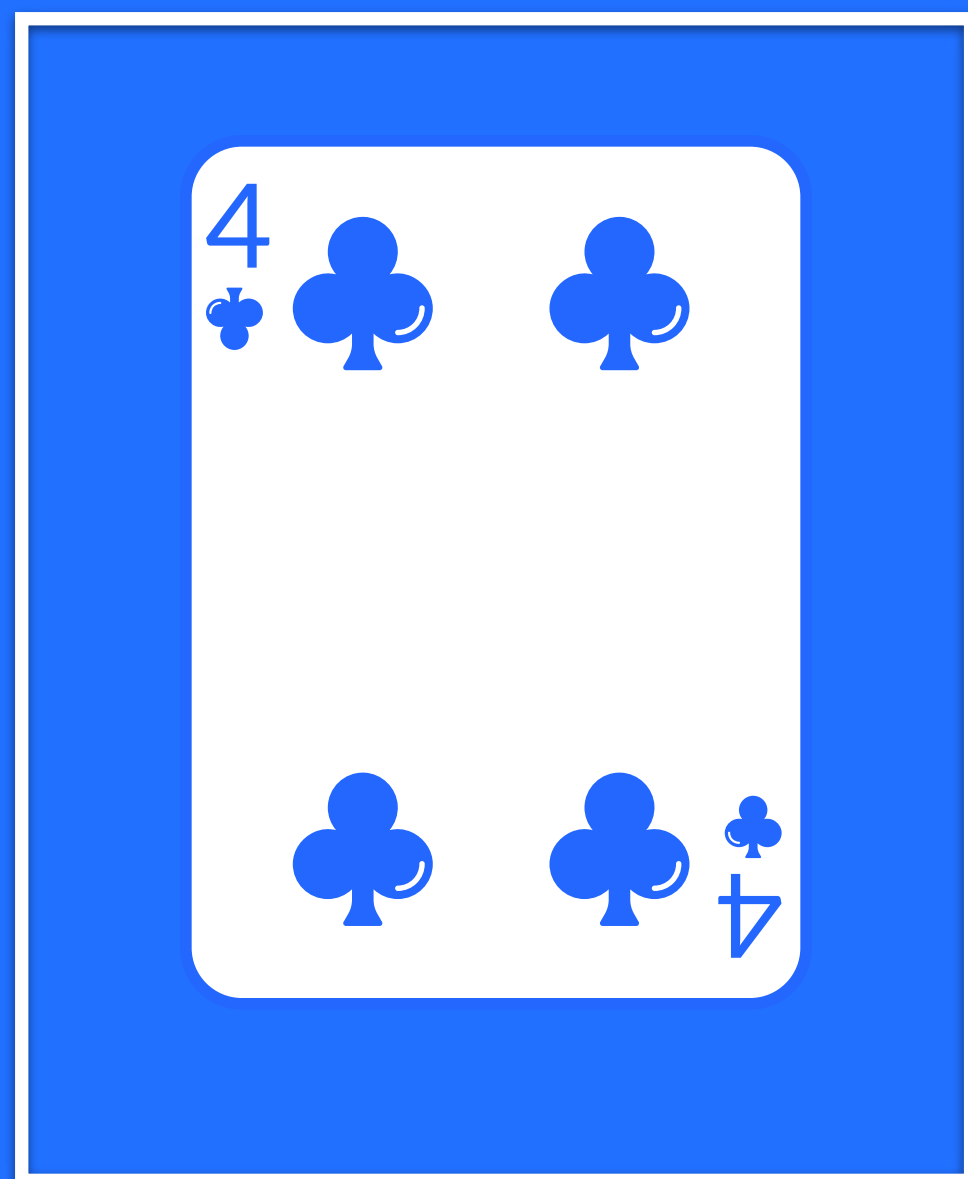


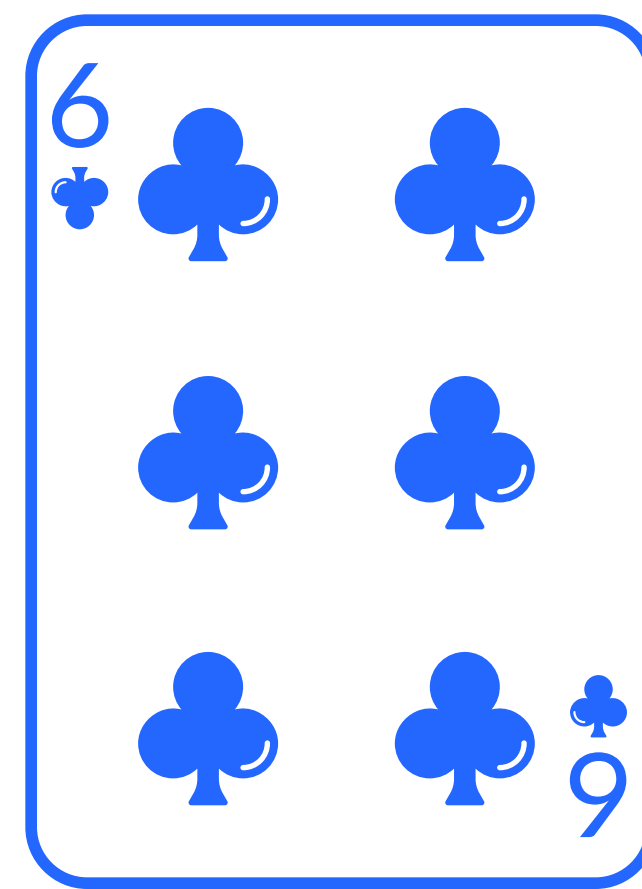
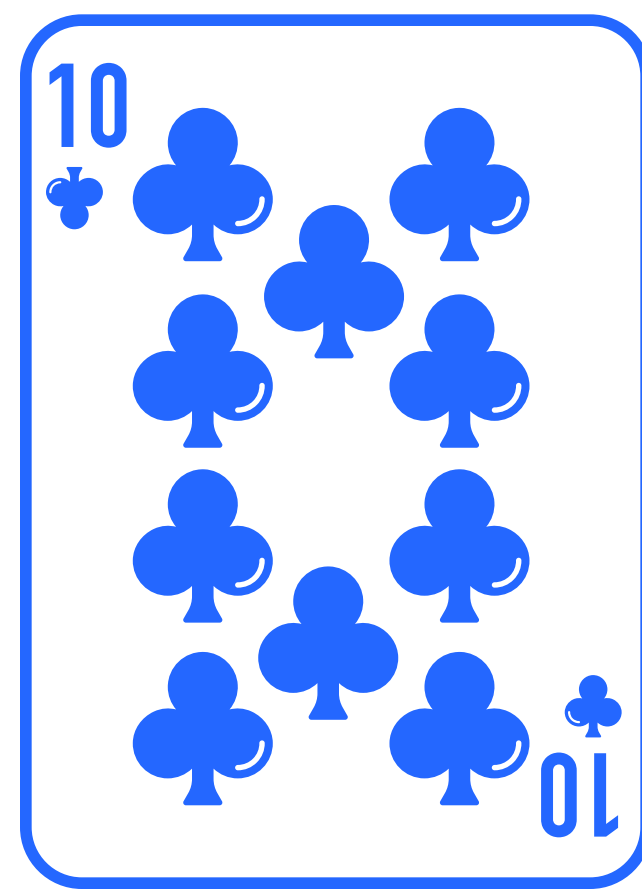
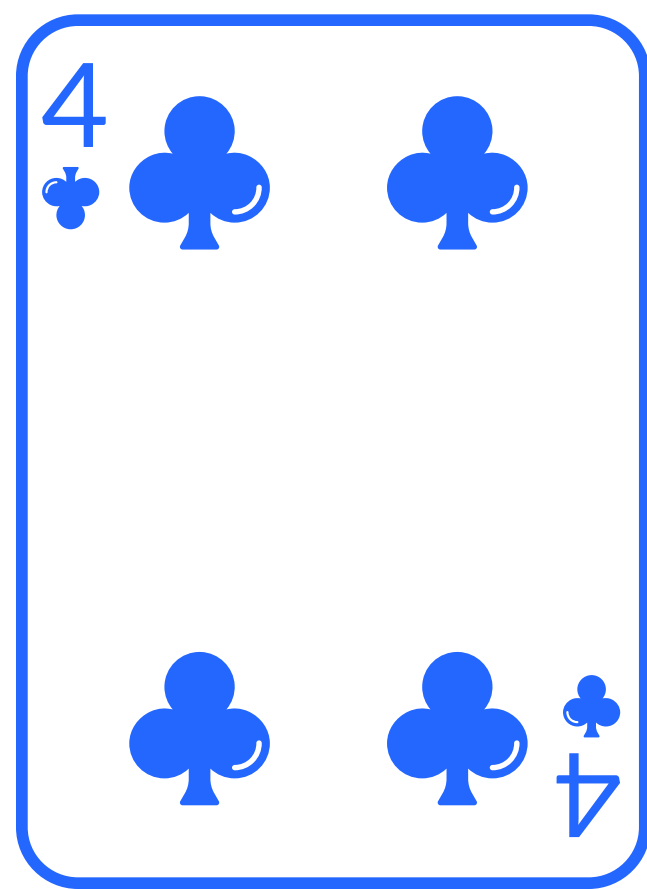
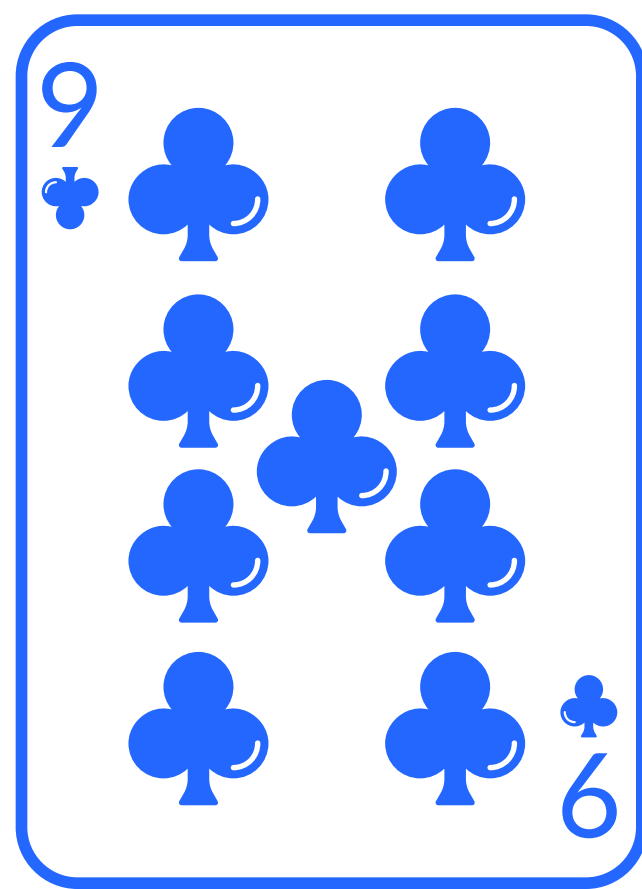
minimo



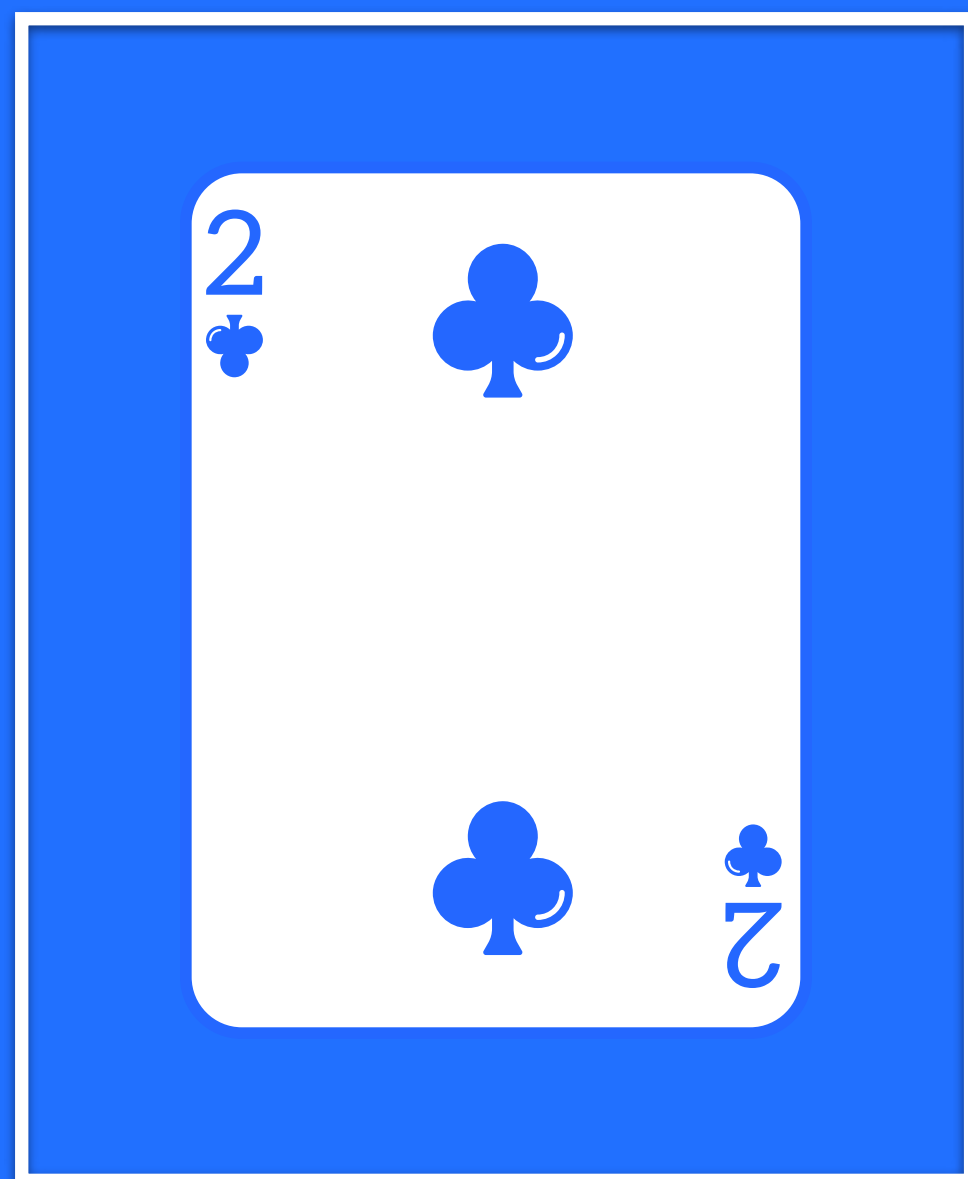


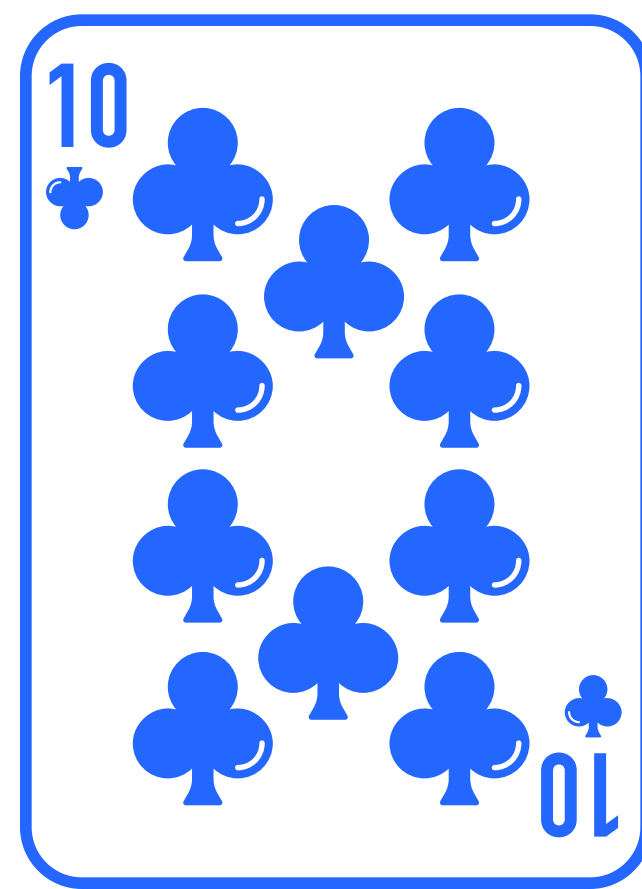
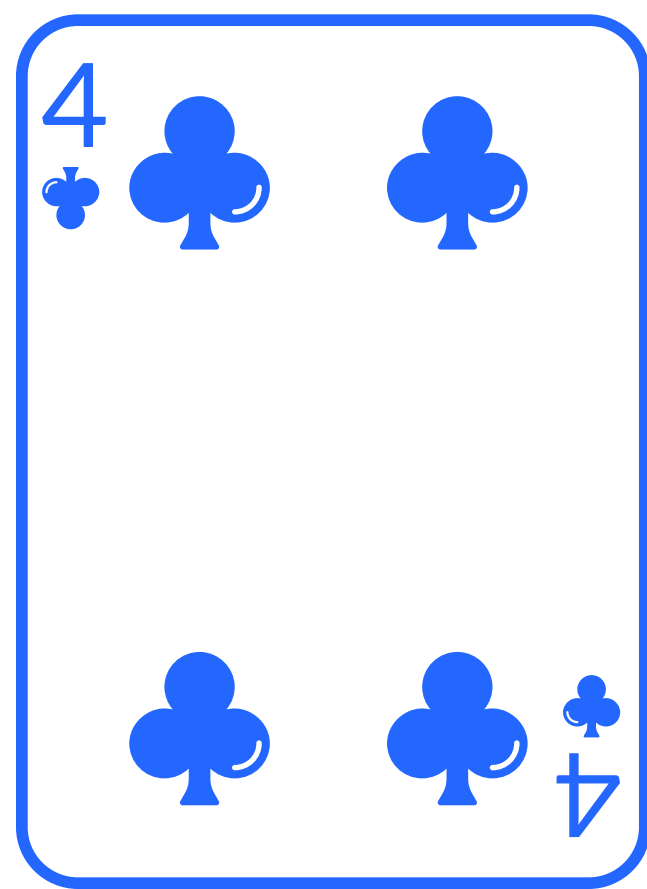
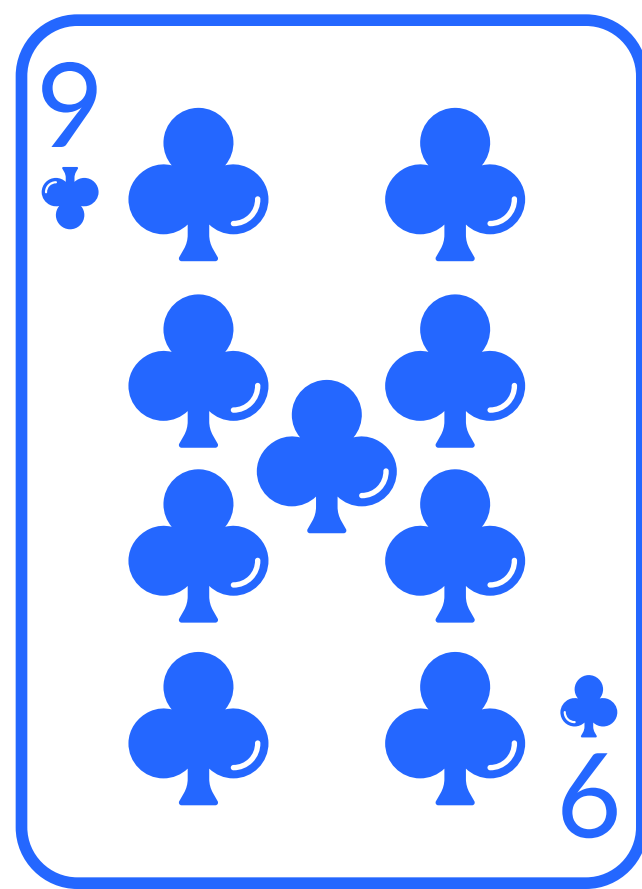
minimo



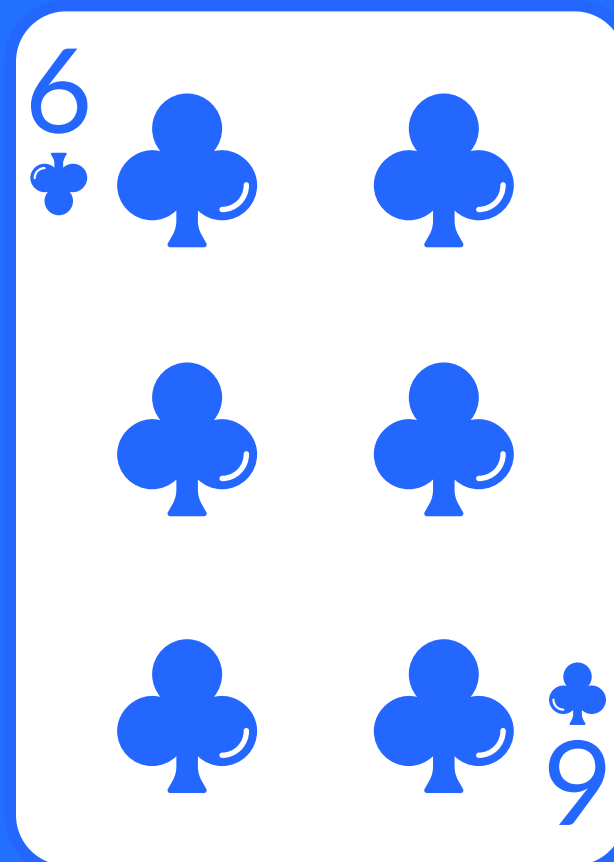
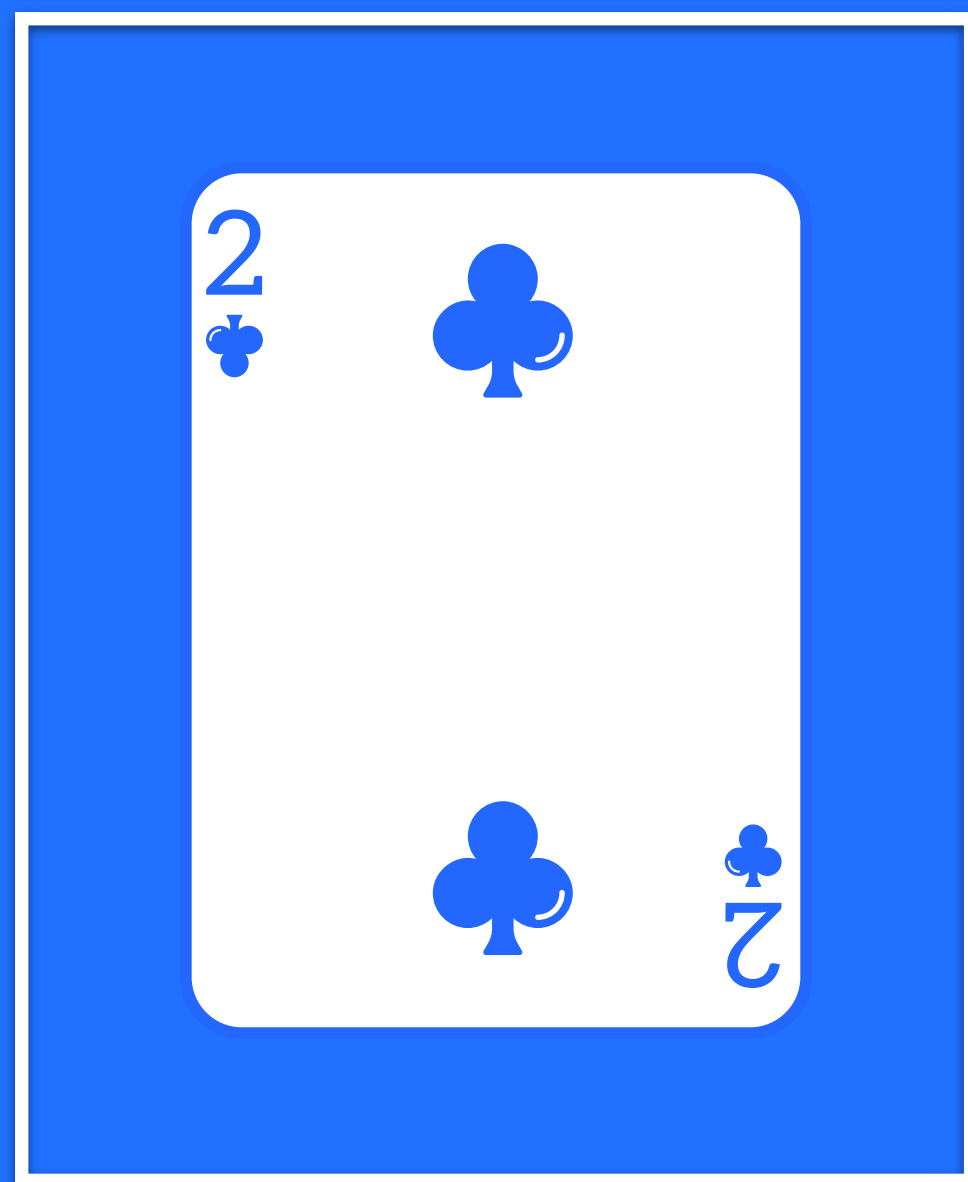


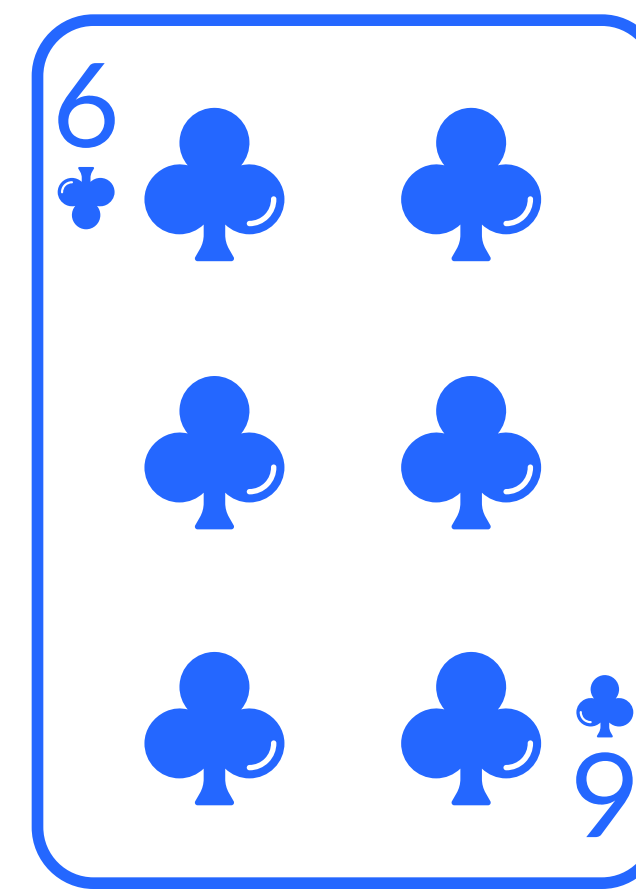
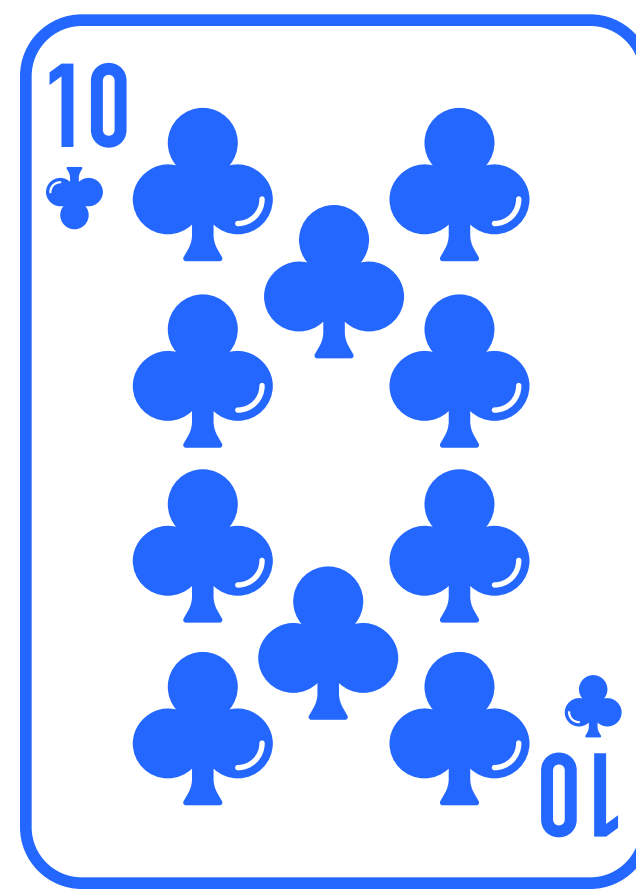
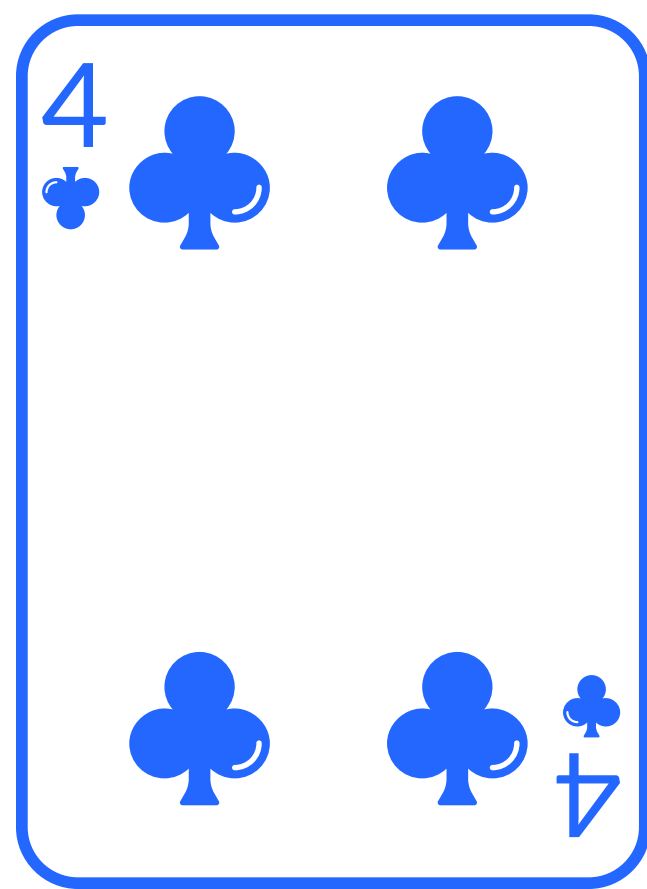
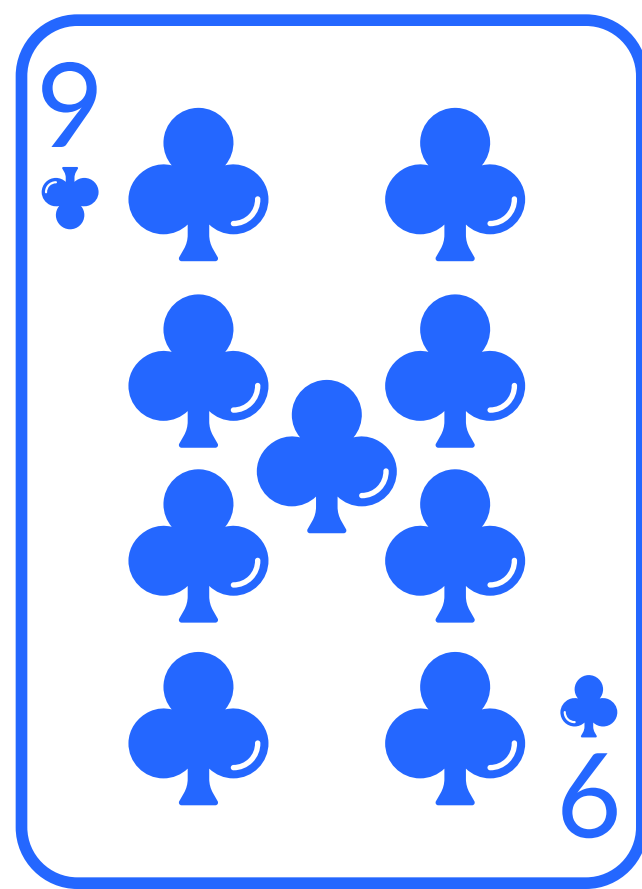
minimo



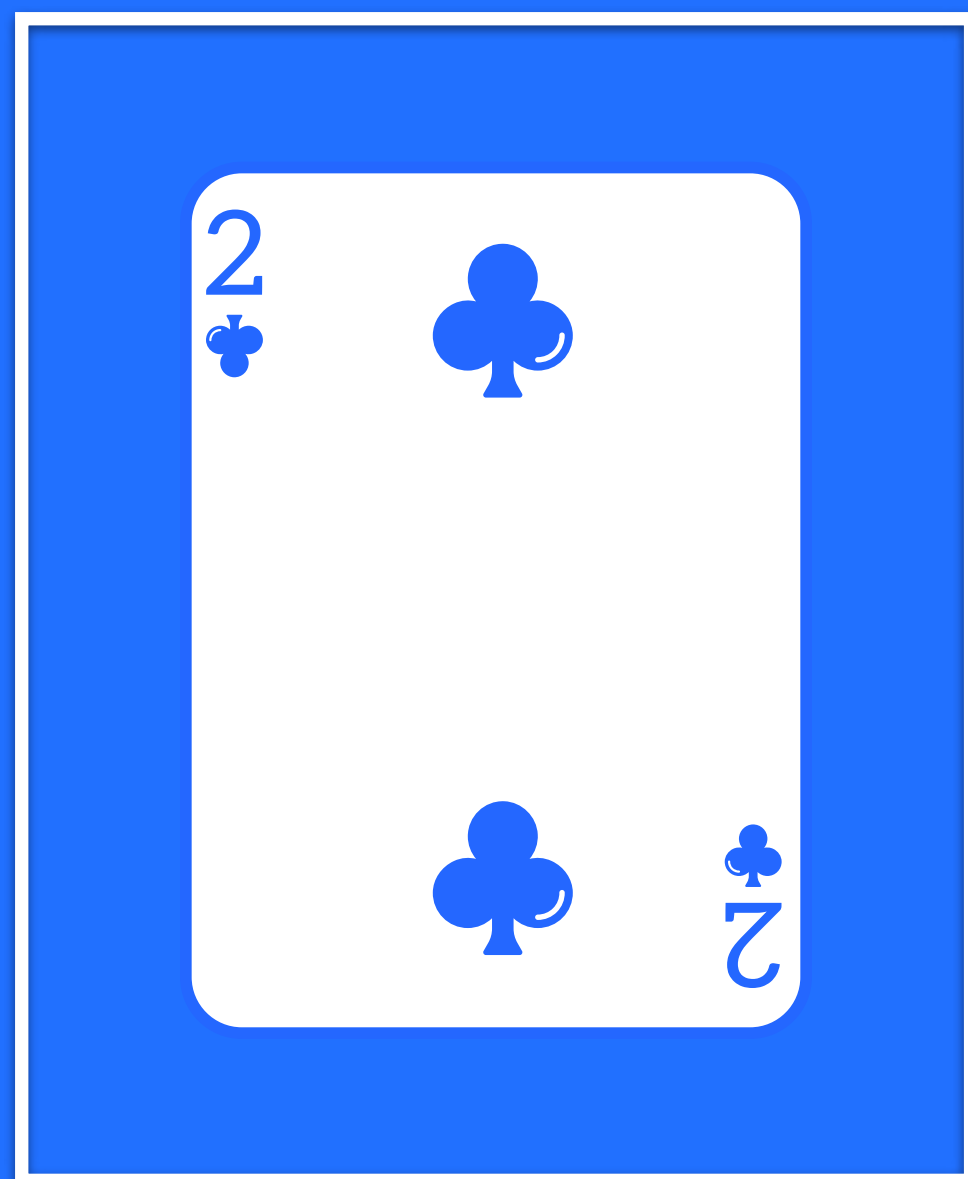


minimo





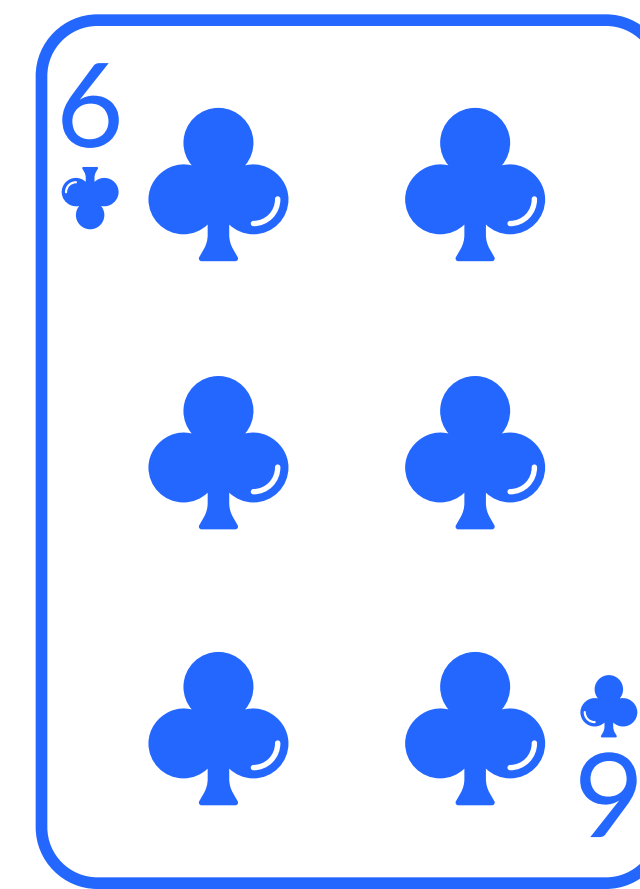
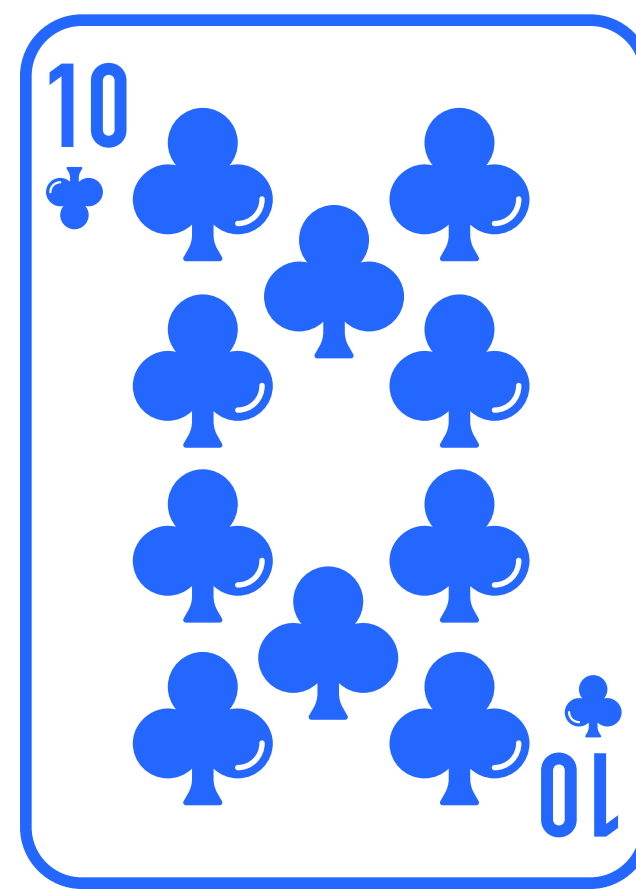
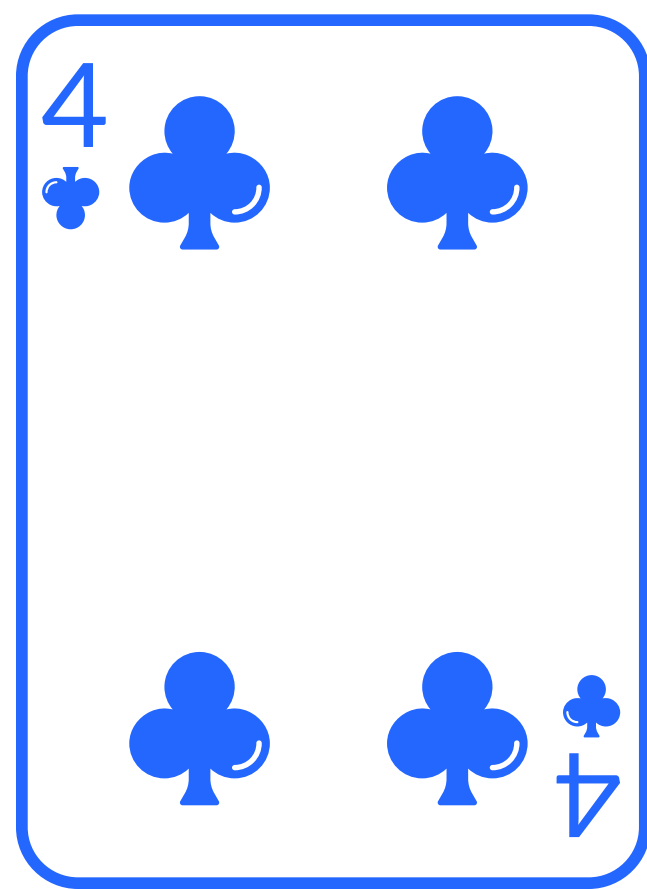
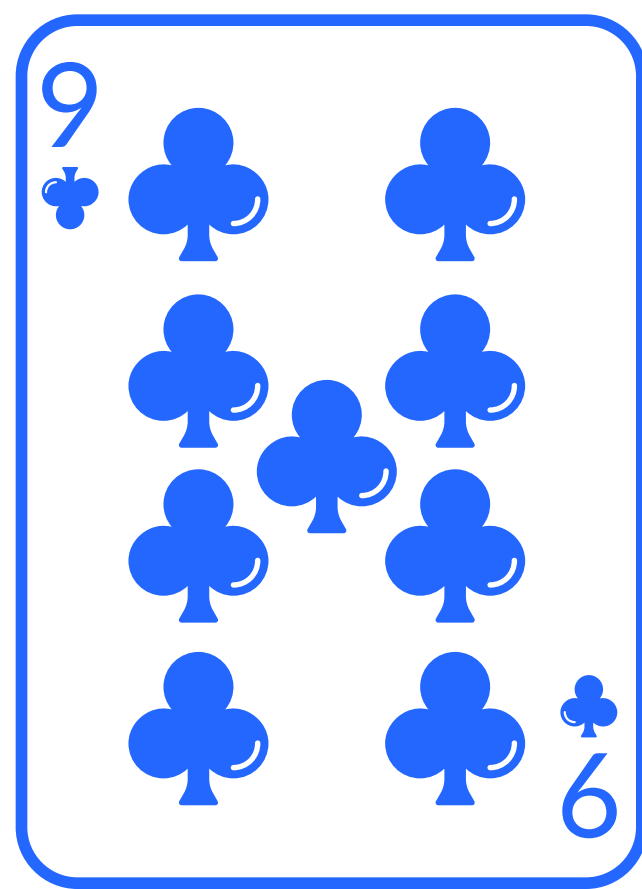
minimo



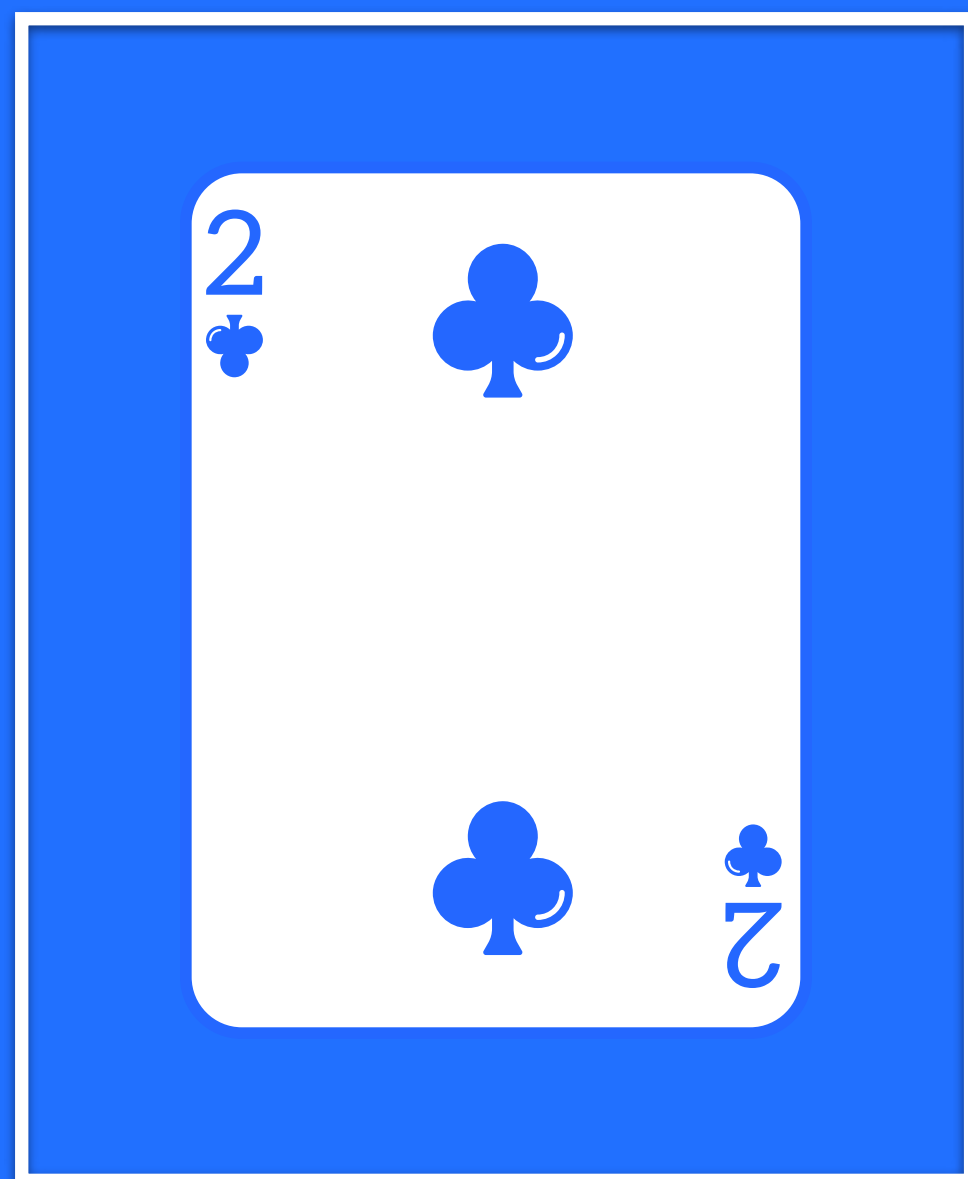
algoritmo

→TROVA il
MINIMO←

*implementabile con il
linguaggio di programmazione*



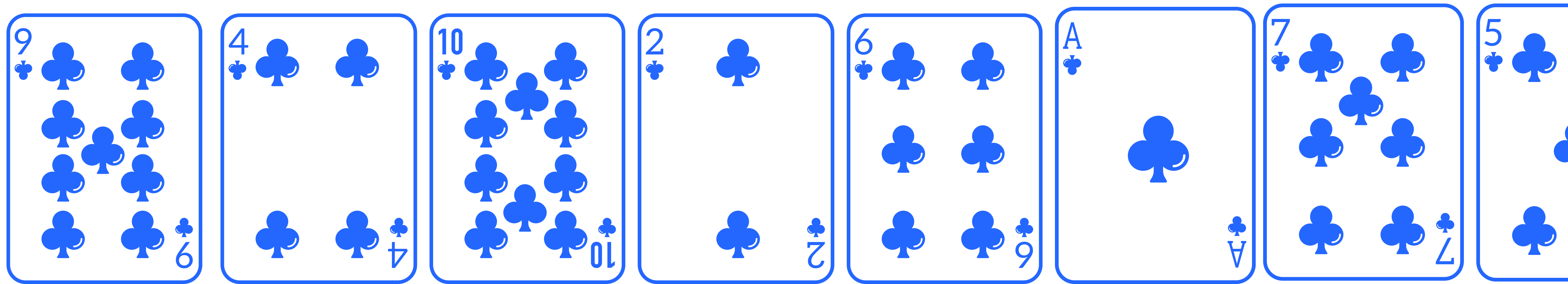
minimo



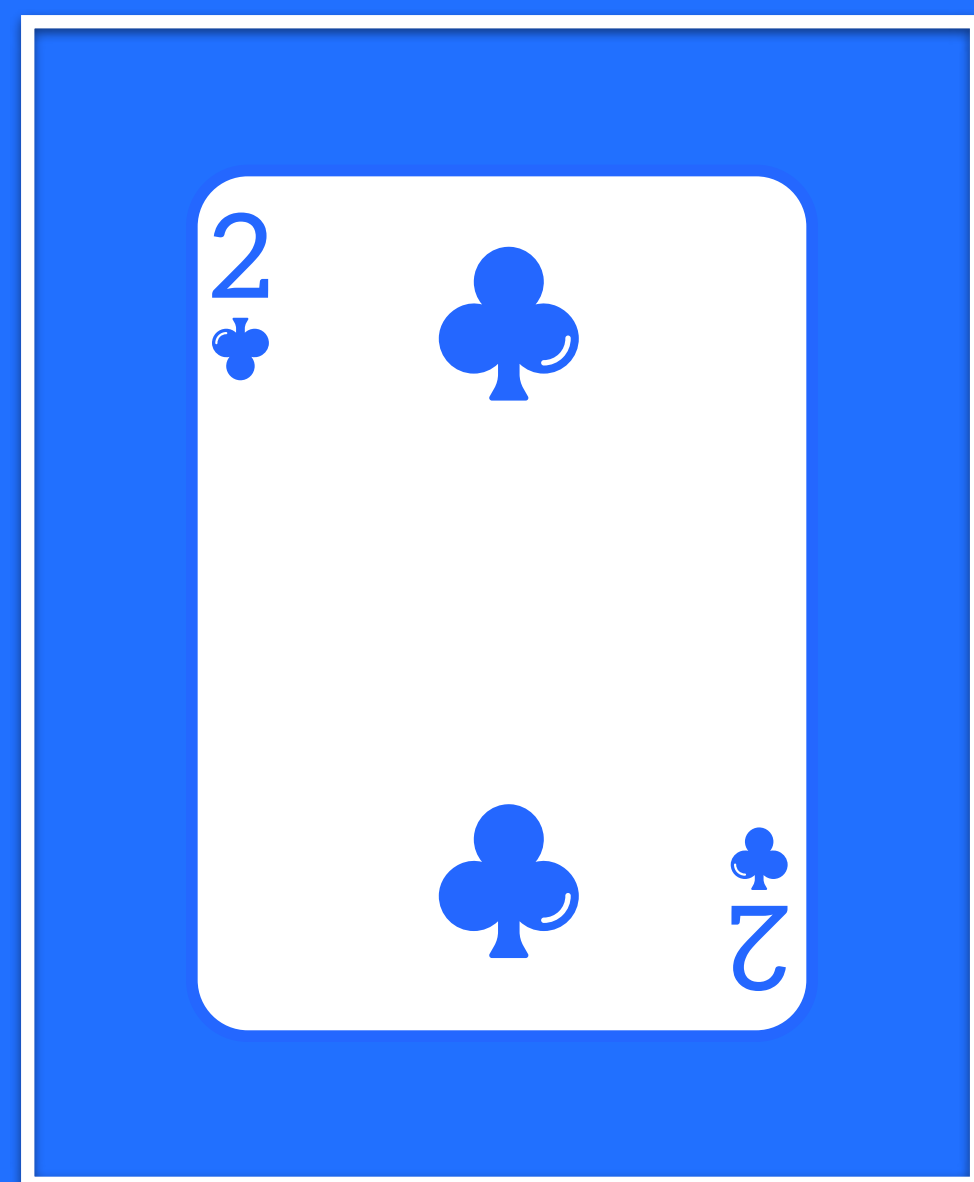
algoritmo

→TROVA il
MINIMO←

*implementabile con il
linguaggio di programmazione*



minimo



algoritmo

→ TROVA il
MINIMO ←

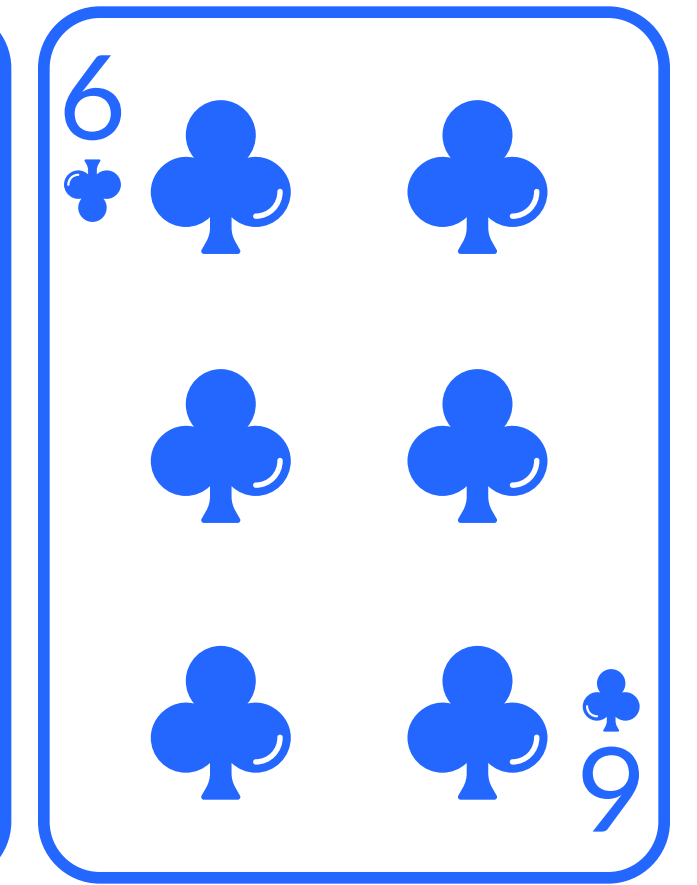
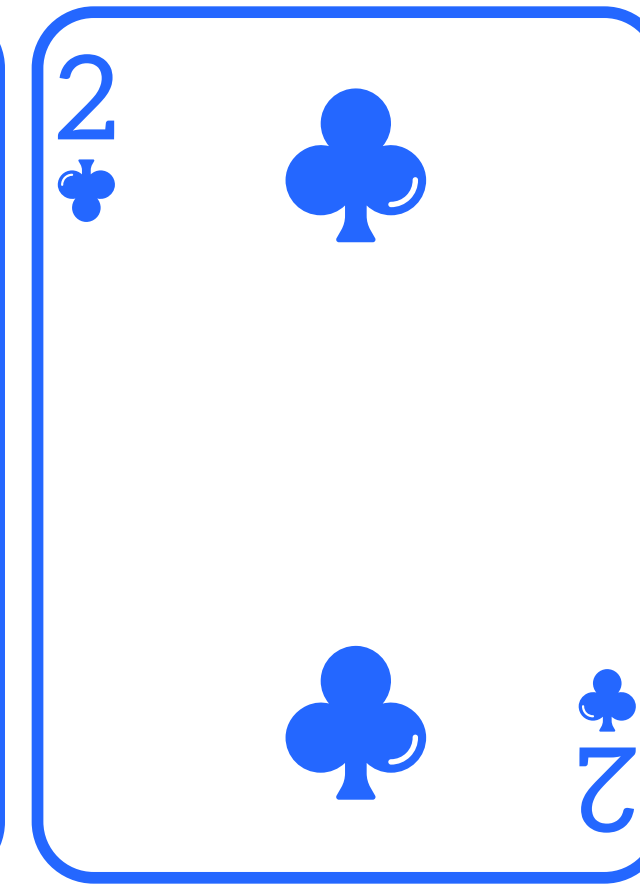
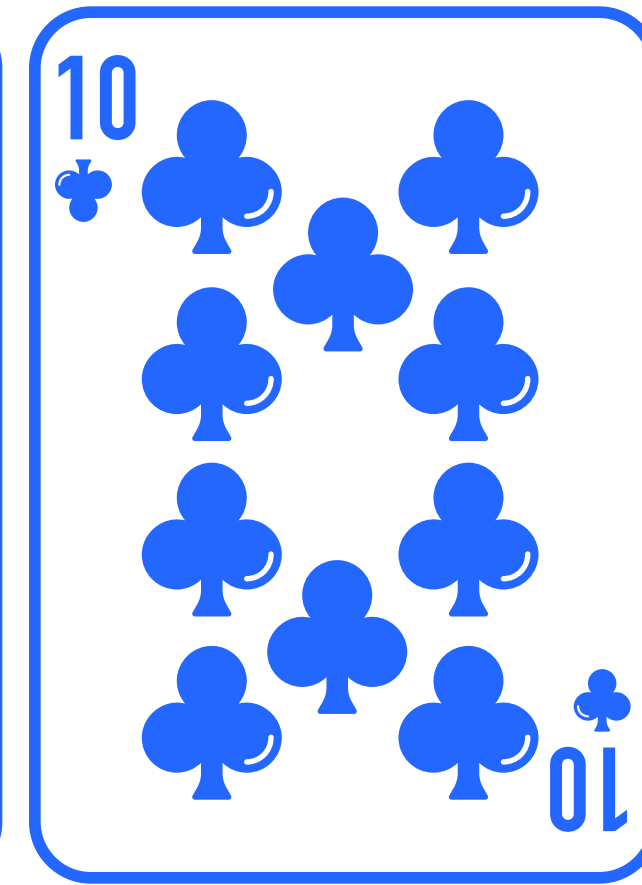
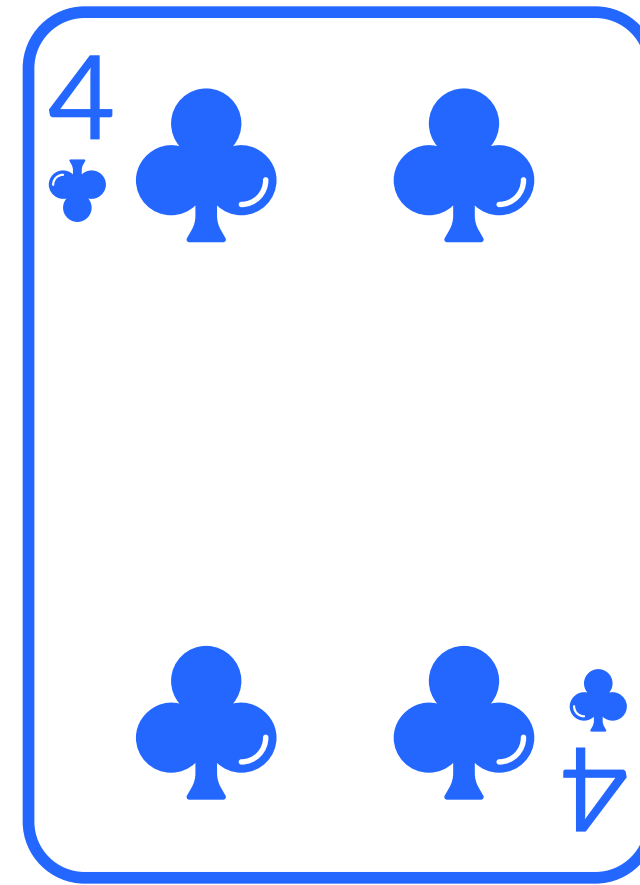
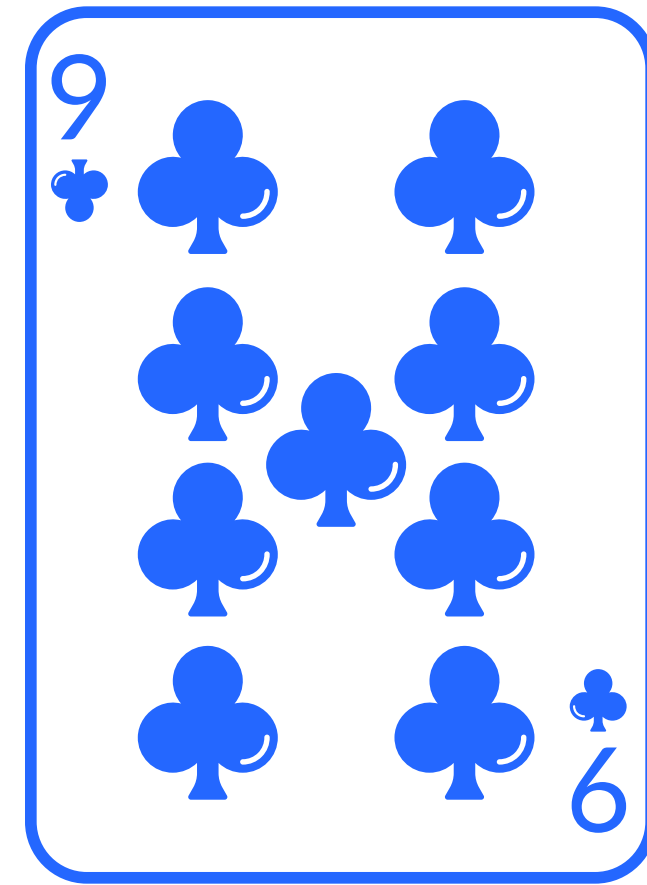
*Può risolvere un'intera
classe di problemi*

metti
in ordine

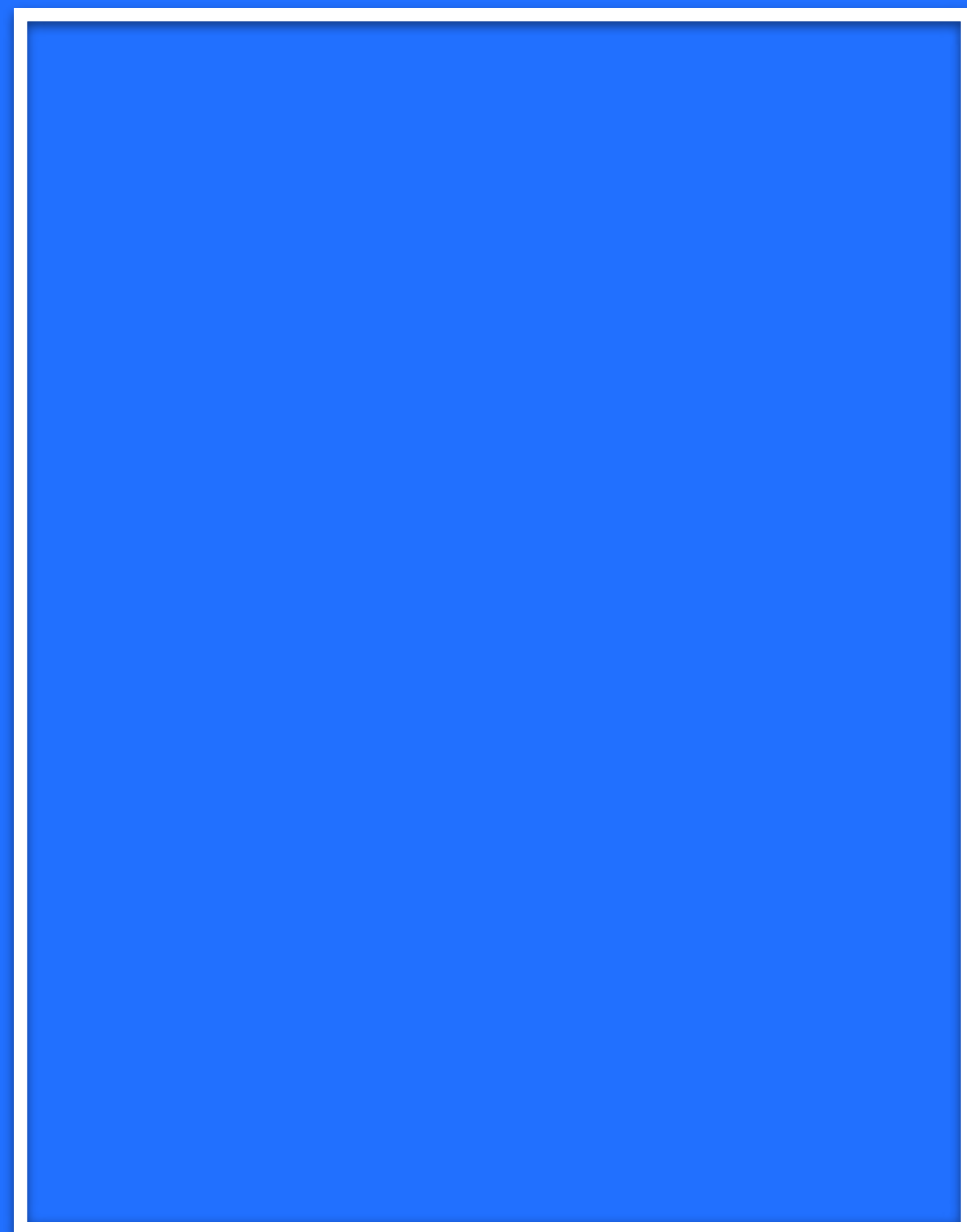
crescente

⇒ TROVA il
MINIMO ←

⇒ TROVA IL
MINIMO ←

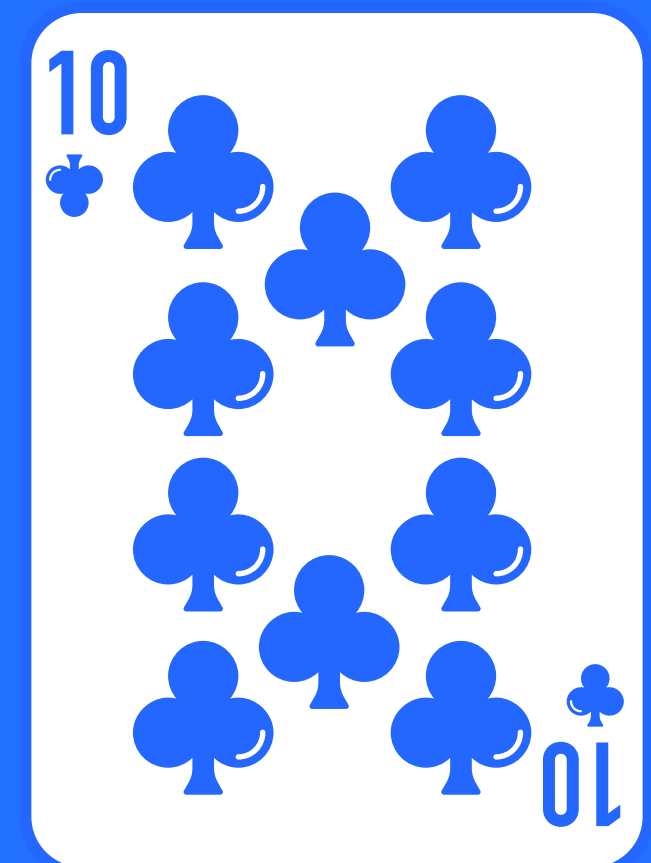
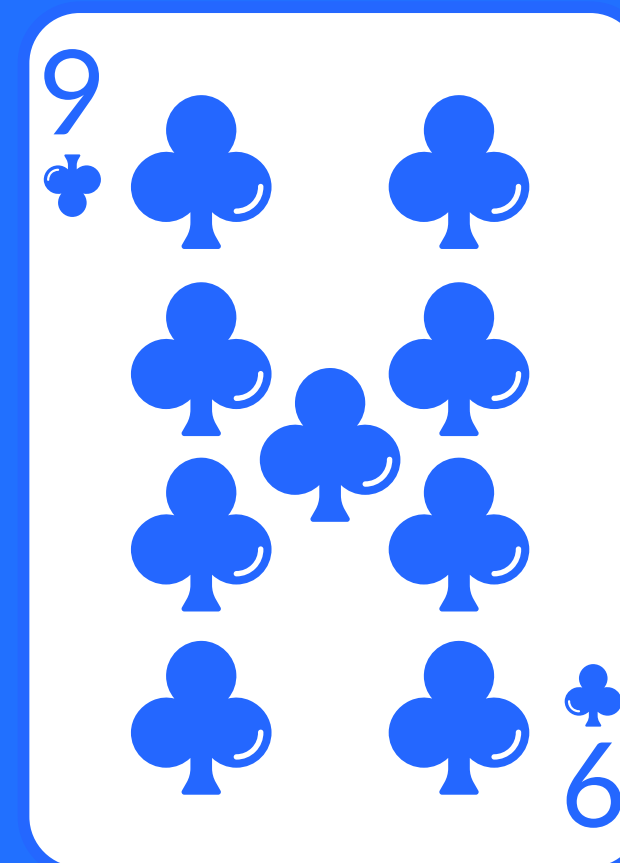
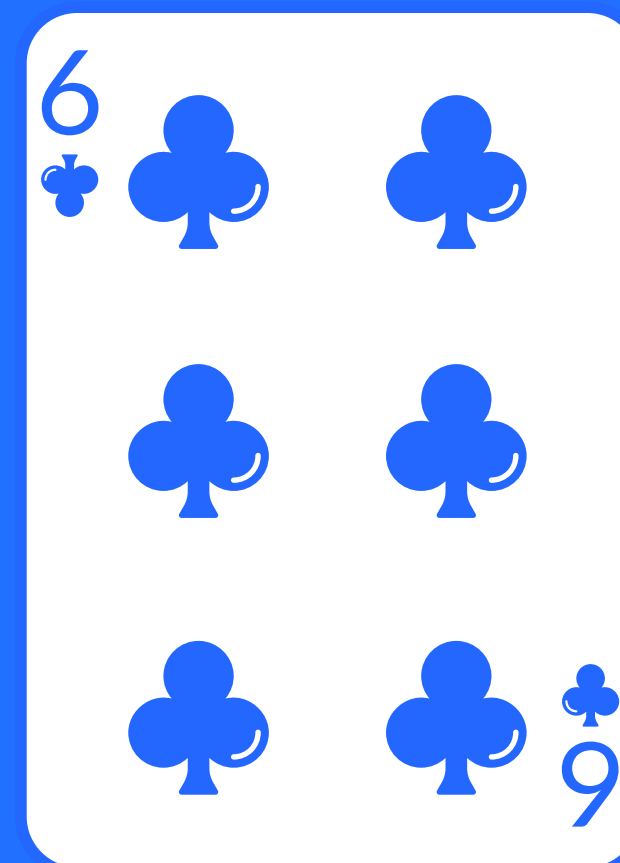
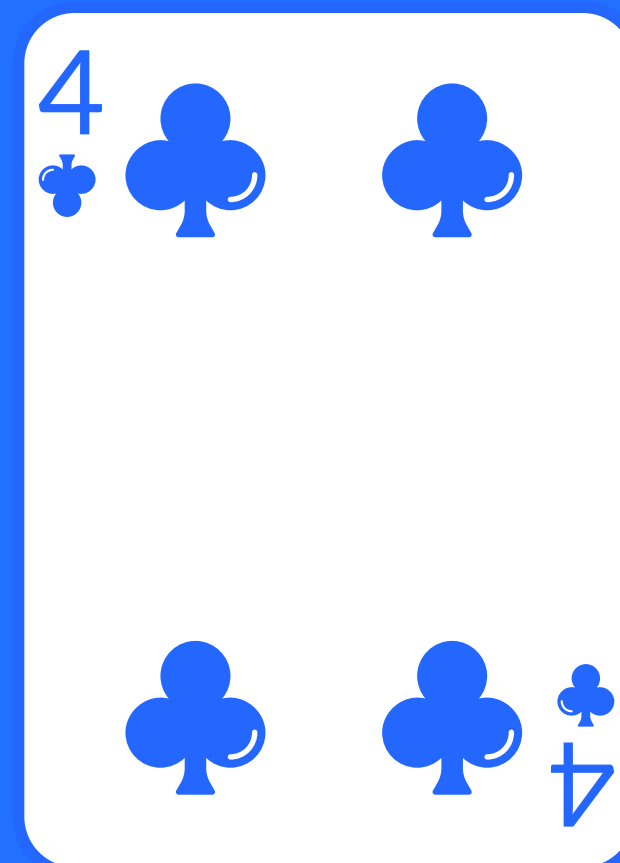
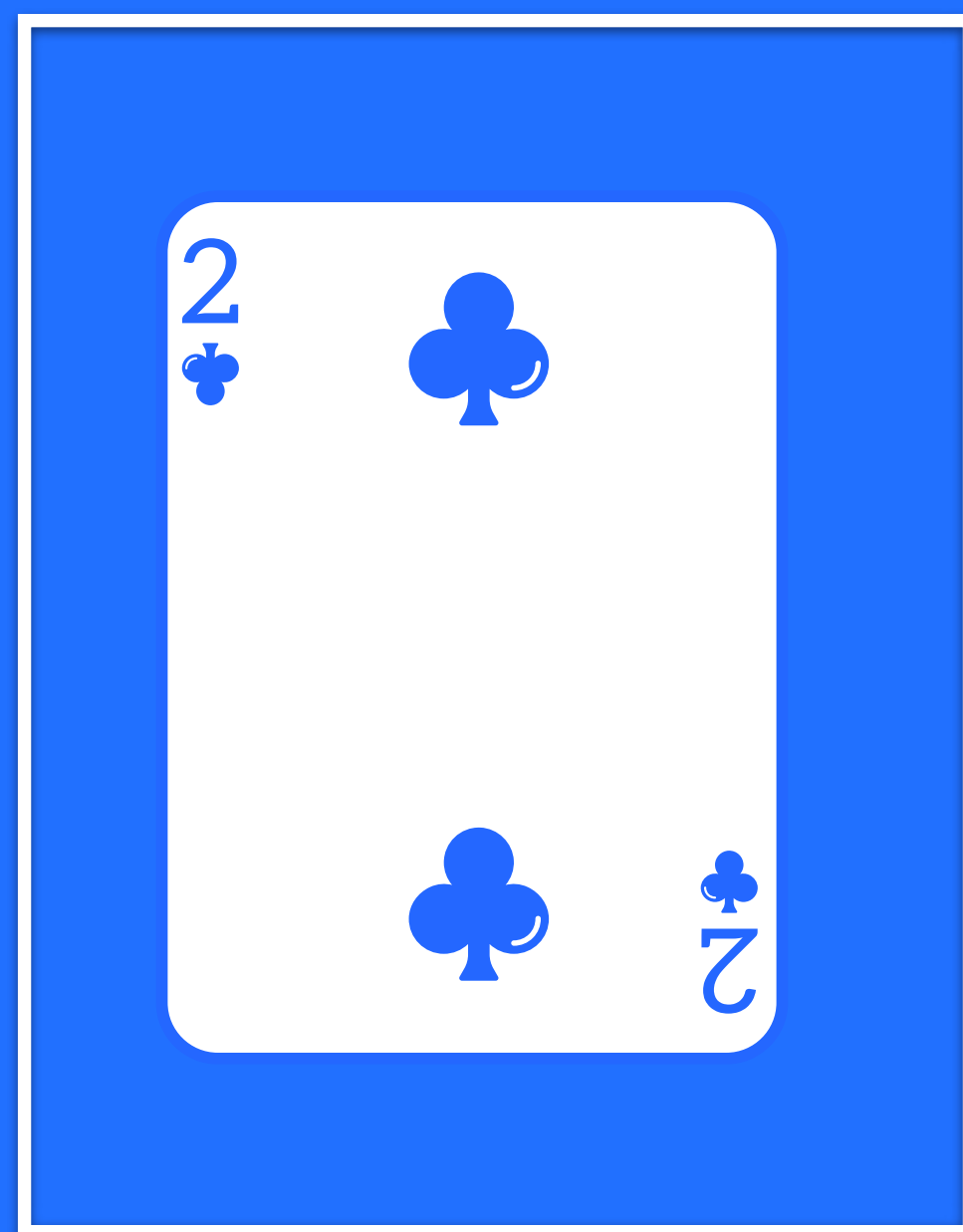


minimo



⇒ TROVA il
MINIMO ←

minimo

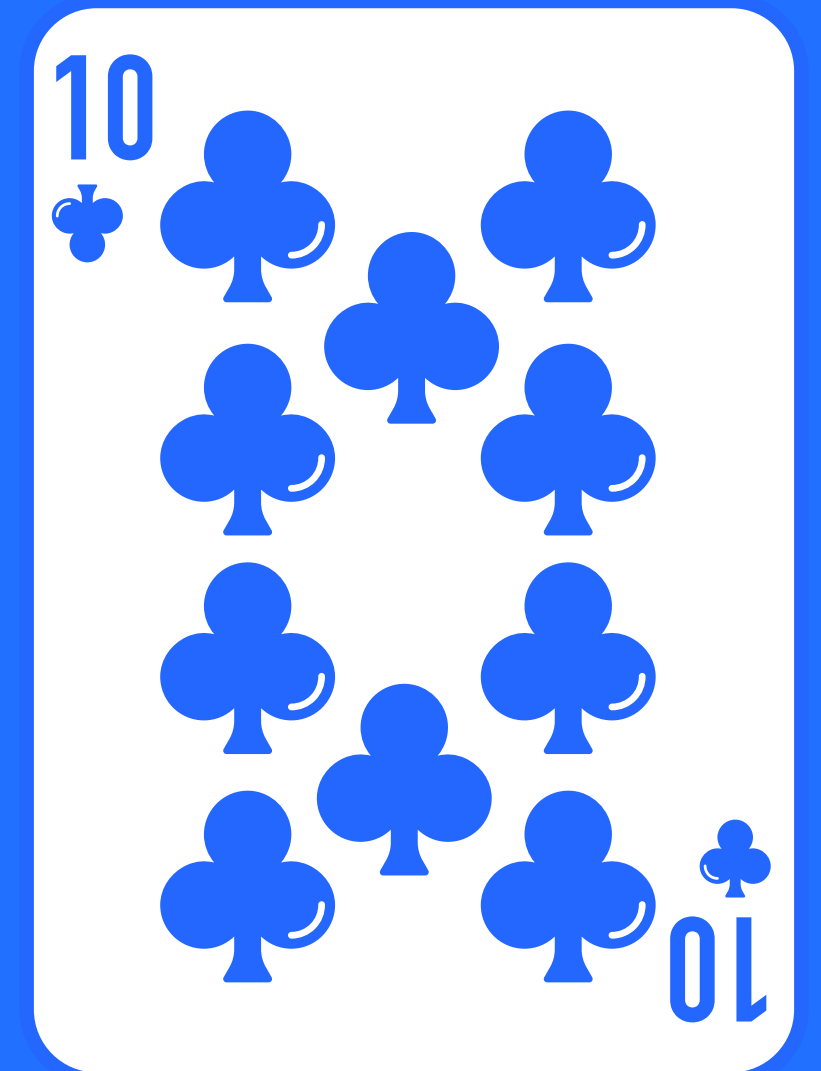
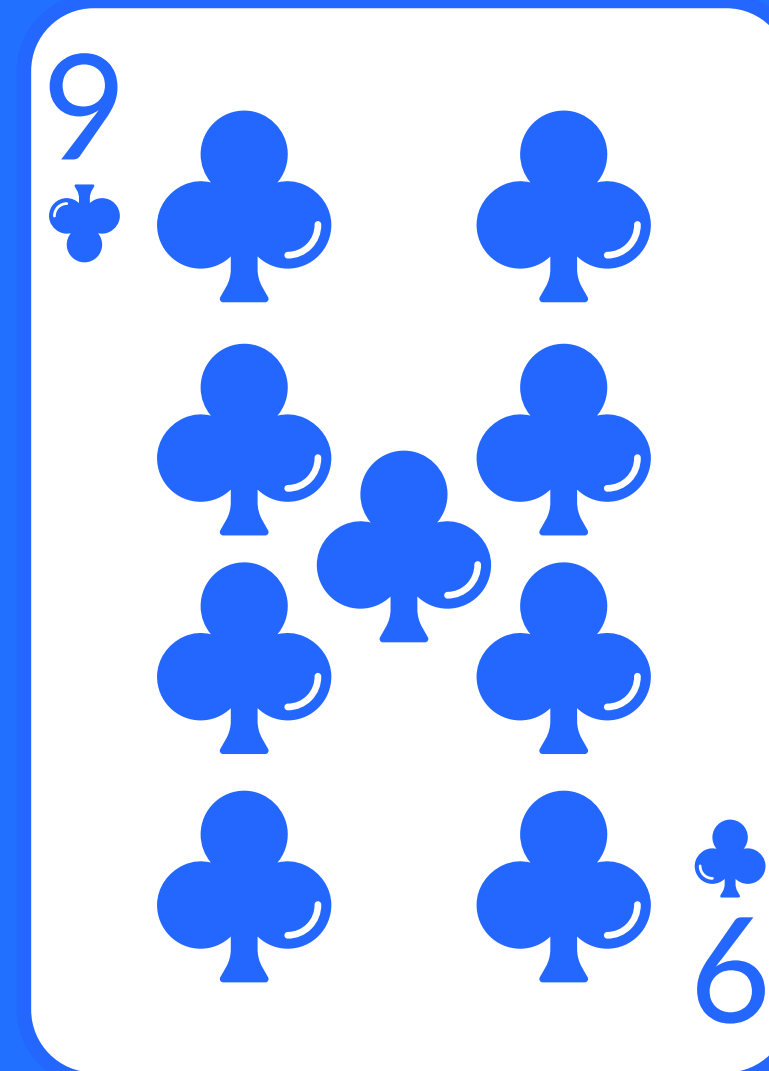
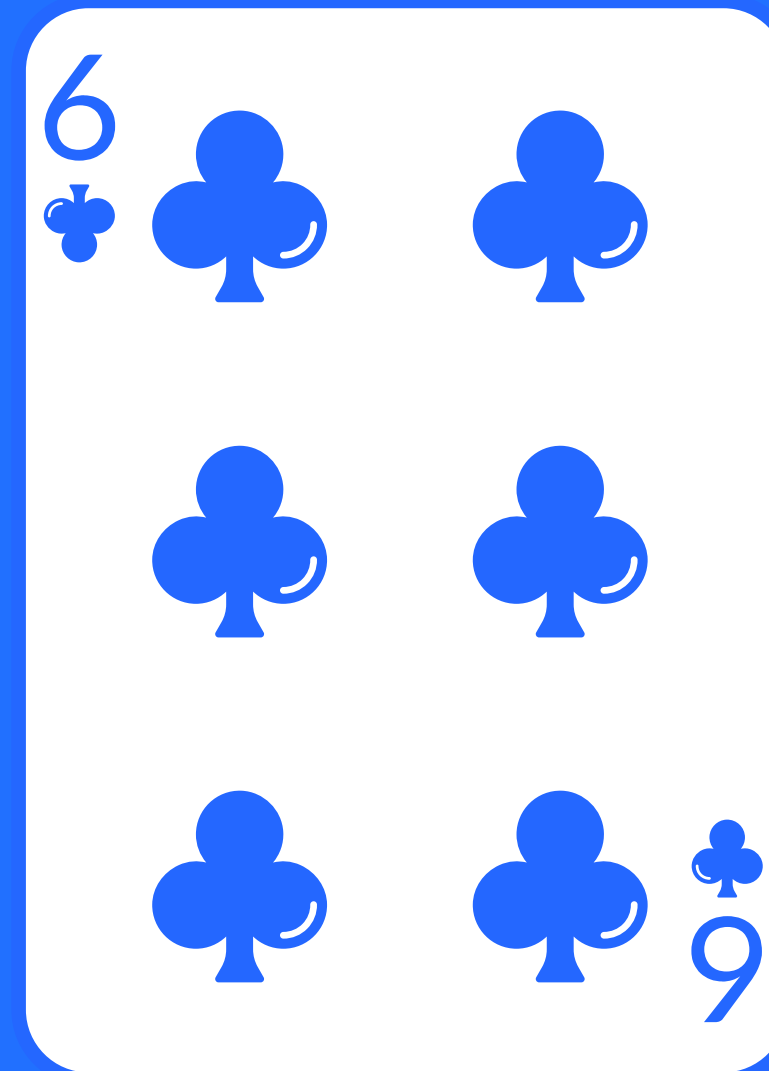
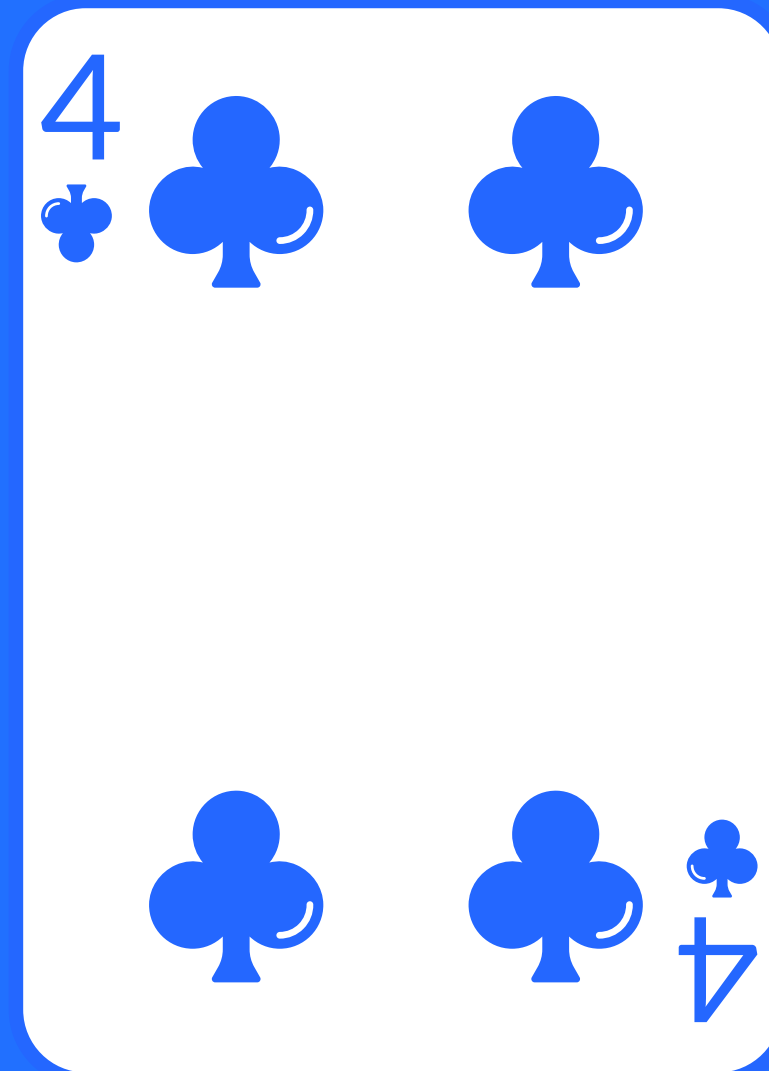
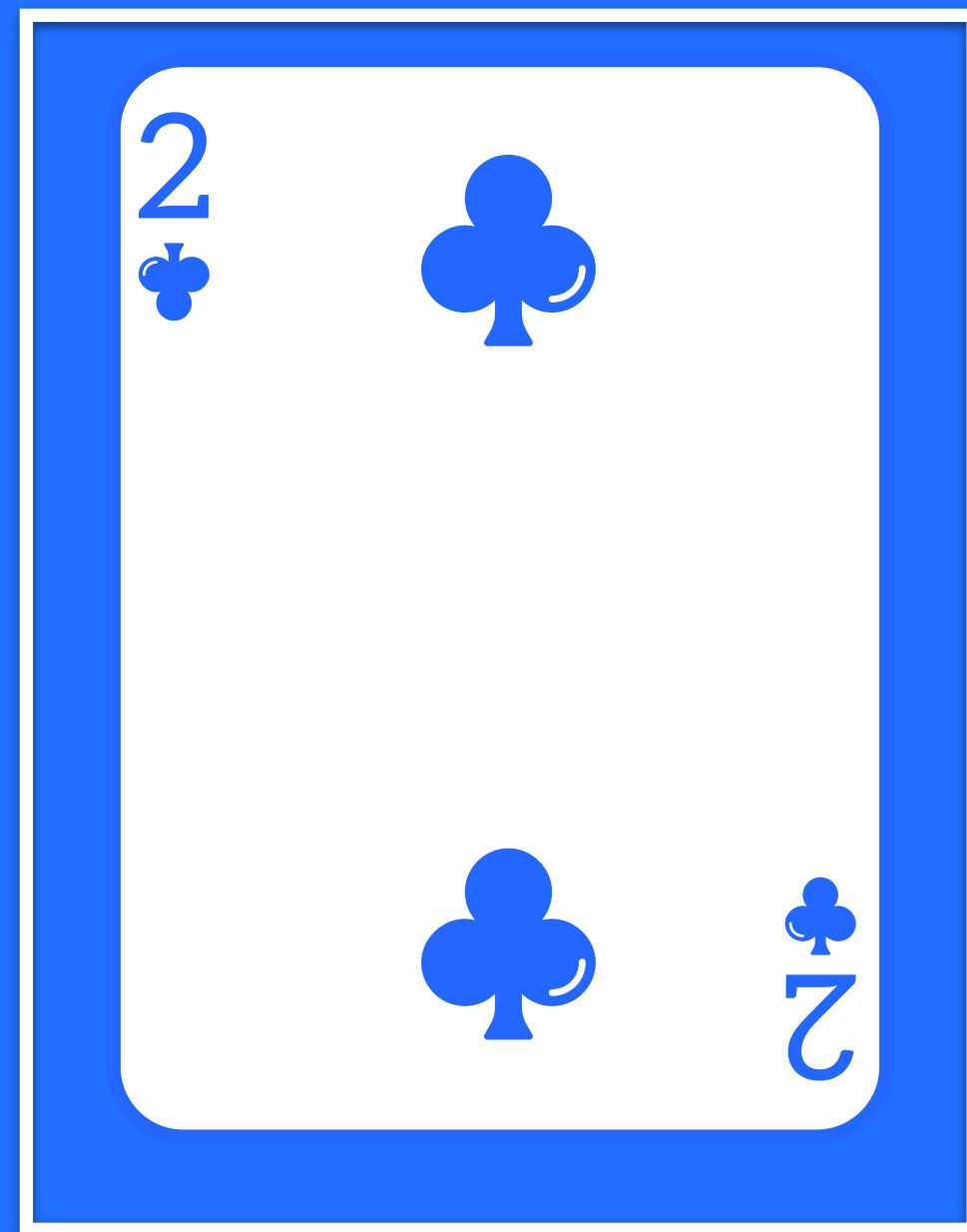


**Non tutti gli
algoritmi sono uguali**

metti
in ordine

crescente

minimo



Un algoritmo efficiente può farci
risparmiare molto tempo





Il perché degli
algoritmi

ALGORITMI

...al potere

ALGORITMI

...che cambiano il mondo



Papiro di Rhind

Kurt Gödel



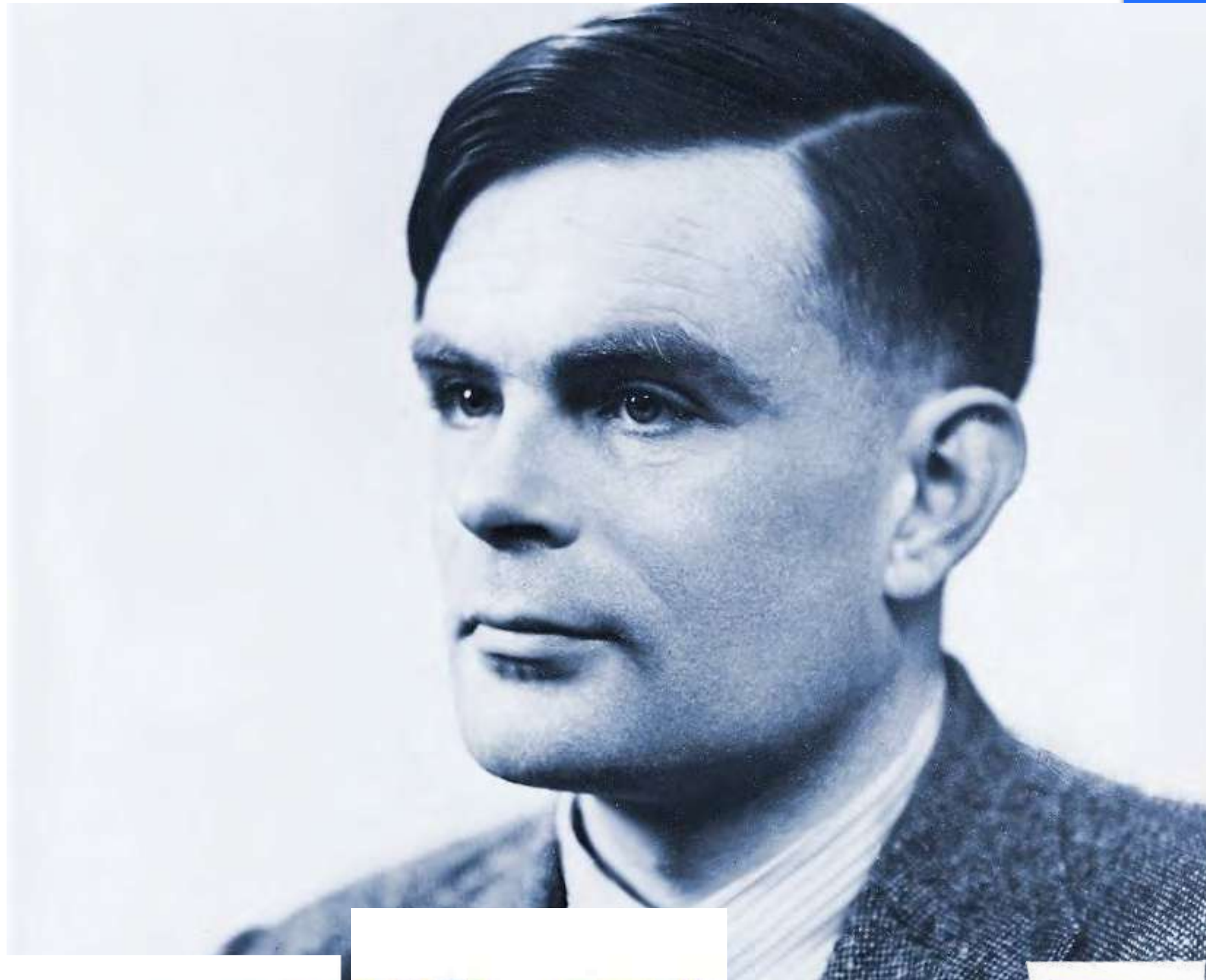
matematico, logico
e filosofo
austriaco
naturalizzato
statunitense

Gödel

Alan Turing

matematico e crittografo
inglese

decrittava i messaggi
che le forze armate
tedesche si scambiavano
durante la seconda
guerra mondiale

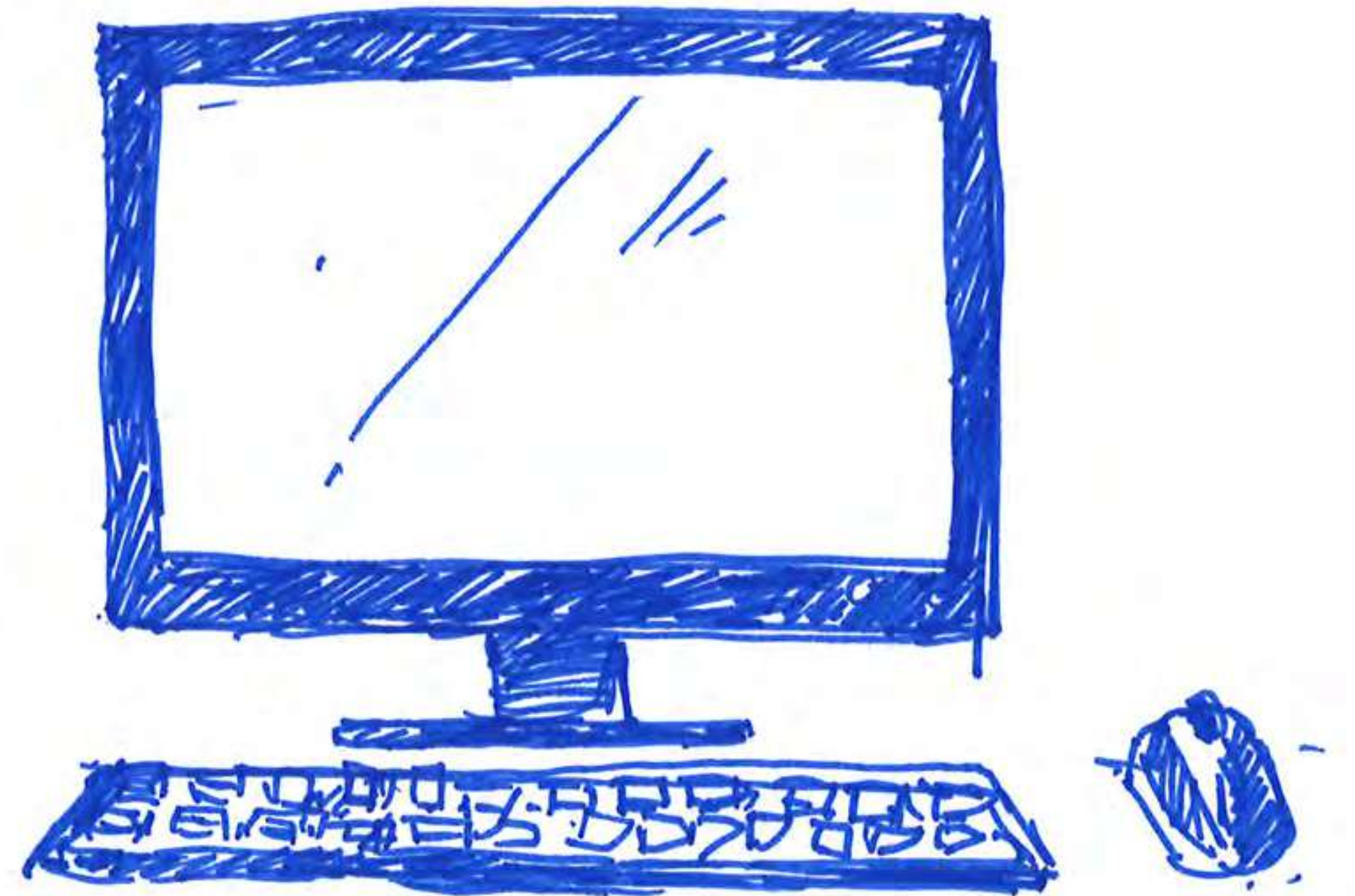


TURING

un moderno computer è in grado di
processare una quantità di dati
difficilmente immaginabile

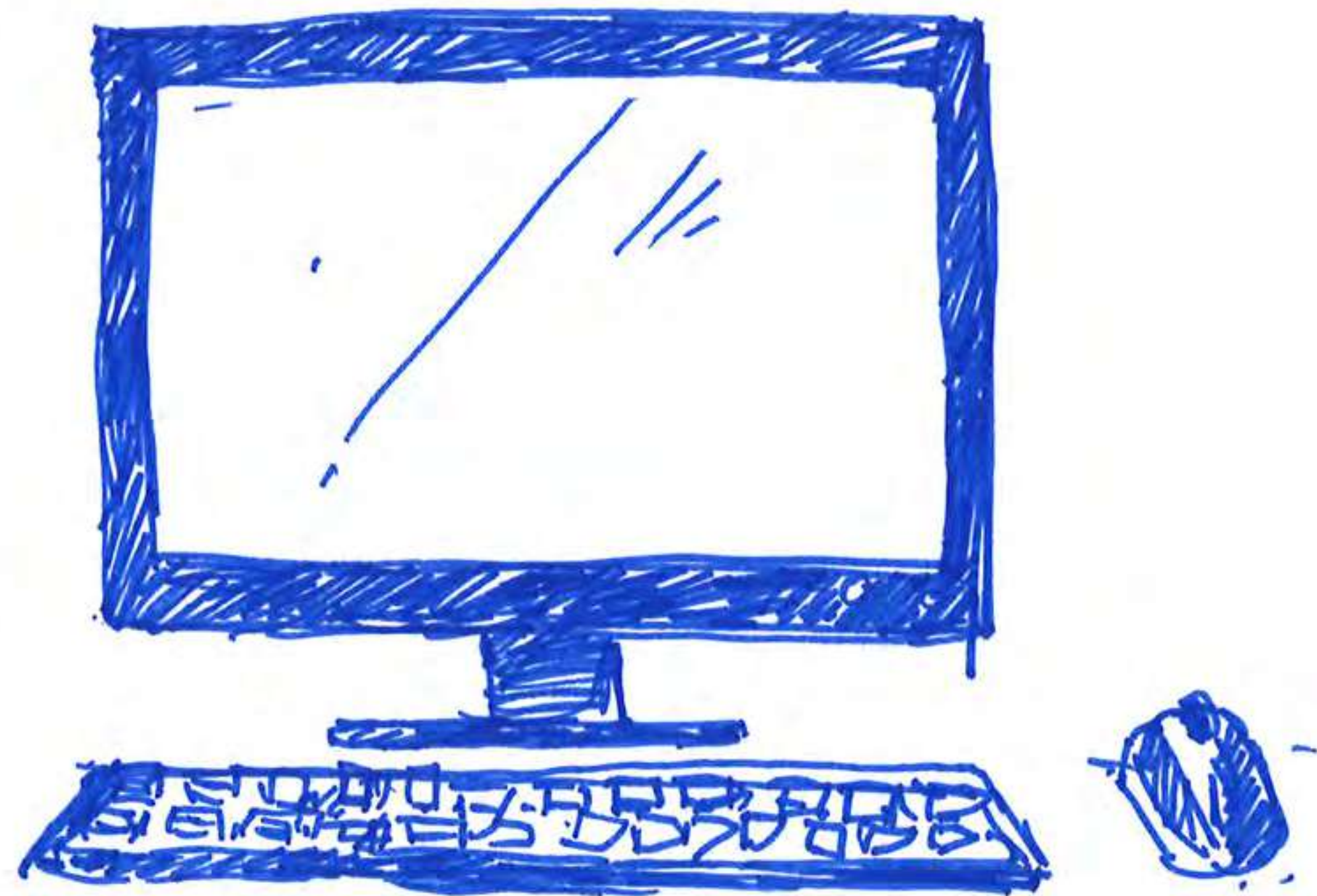
in pochissimo tempo

Può mettere in relazione i
dati tra loro e ottenere
informazioni del tutto nuove





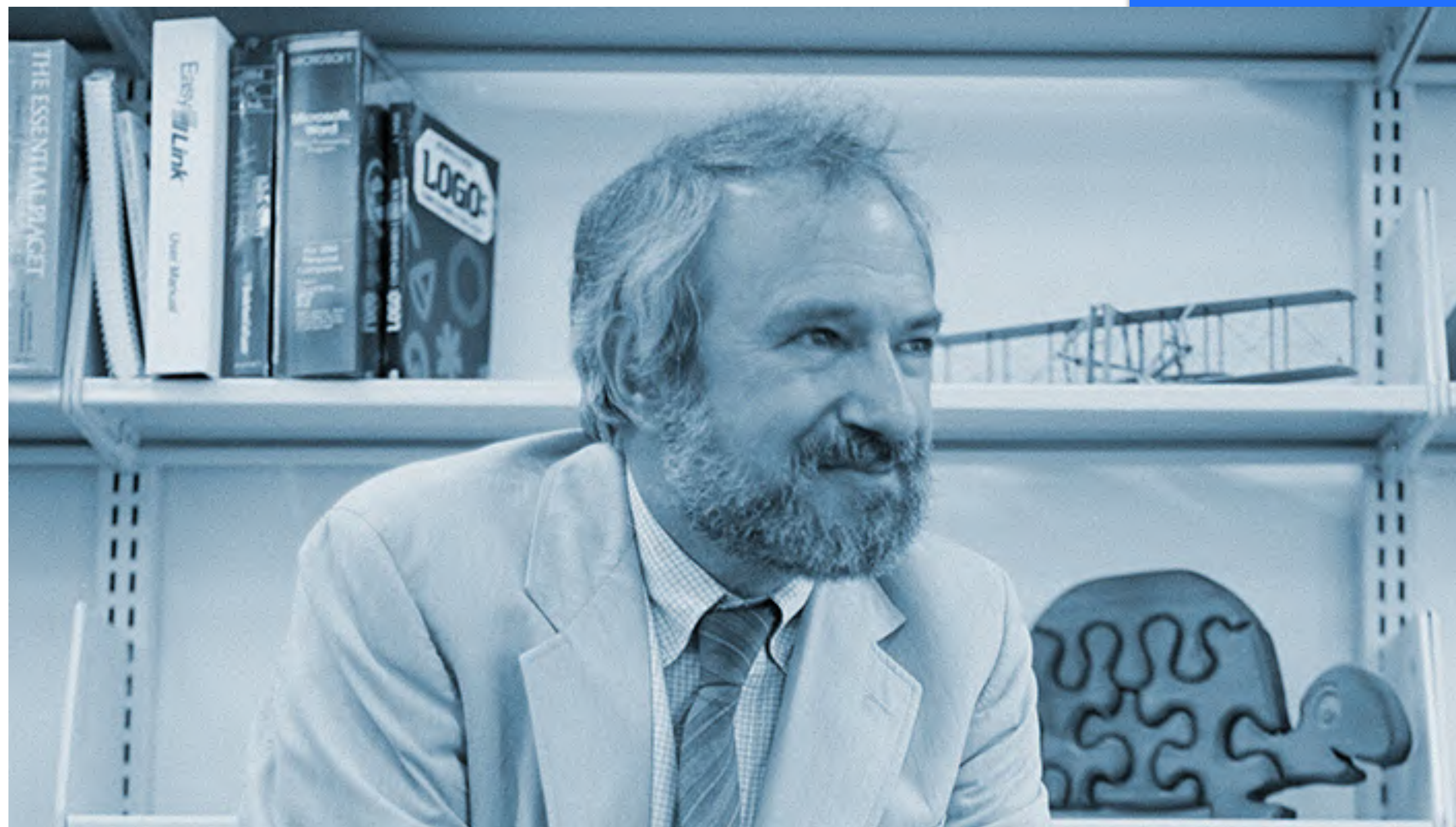
Una conoscenza almeno di base
dell' algoritmica è
fondamentale per i cittadini
del del 21° secolo





Papert e gli artefatti cognitivi

Seymour Papert



Matematico e
logico di origine
sudafricana

Principale autore
del **Logo**

PAPERT



Il bambino è un
“costruttore”

ha bisogno di manipolare
materiali reali

artefatti COGNITIVI

oggetti che facilitano l'apprendimento

TINKERING

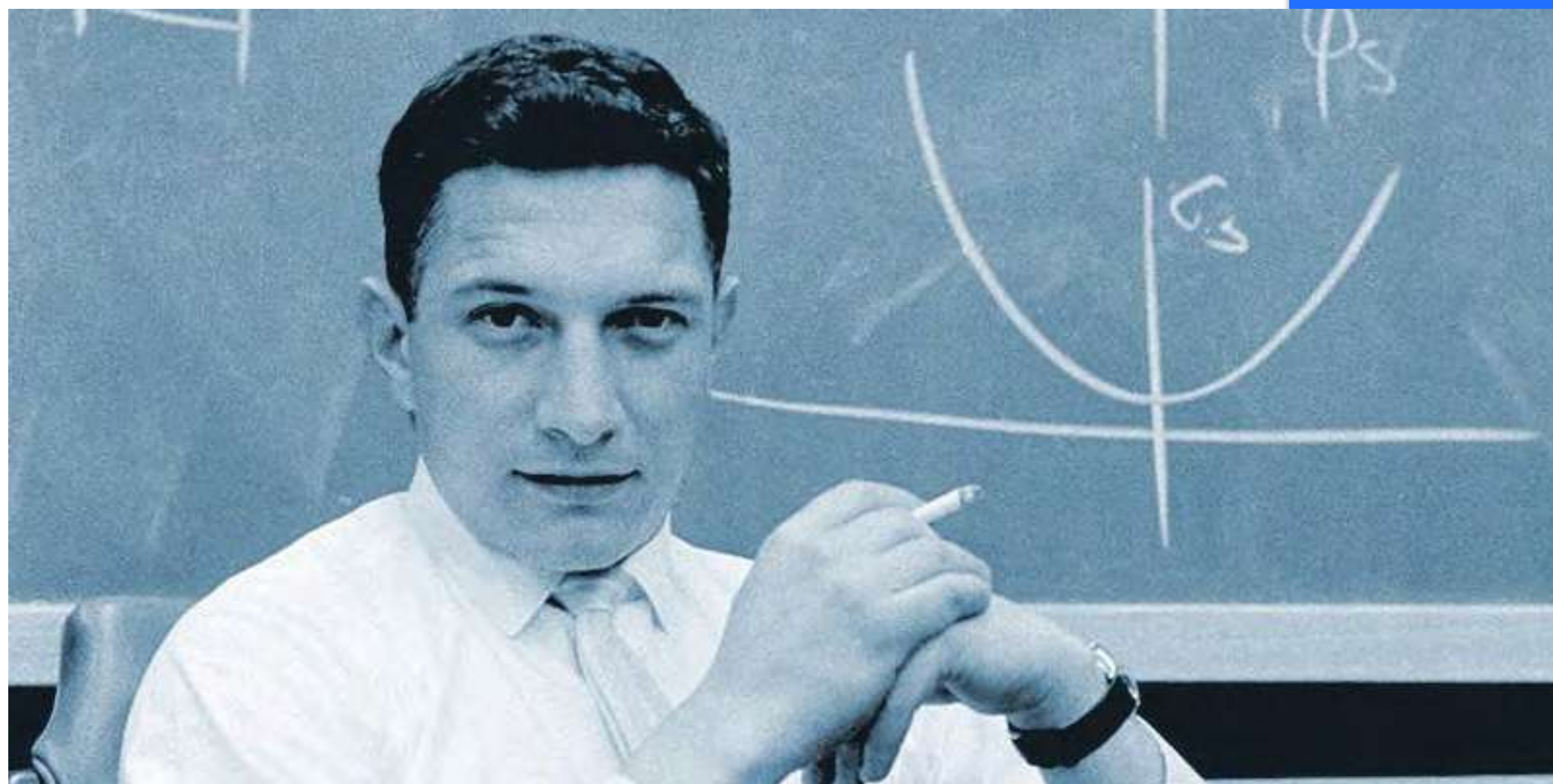
**Armeggiare per
apprendere**

TINKERING

“armeggiare”

“rattoppare”

Robert Noyce



Tra i fondatori
di **Intel**

NOYCE

TINKERING

TINKERING

Metodologia di
apprendimento



<https://www.exploratorium.edu/>

**MUSEO
NAZIONALE
DELLA SCIENZA
E DELLA
TECNOLOGIA
LEONARDO
DA VINCI**



<http://www.museoscienza.org/>

A large, blue, hand-drawn letter 'S' with a textured, sketchy appearance.

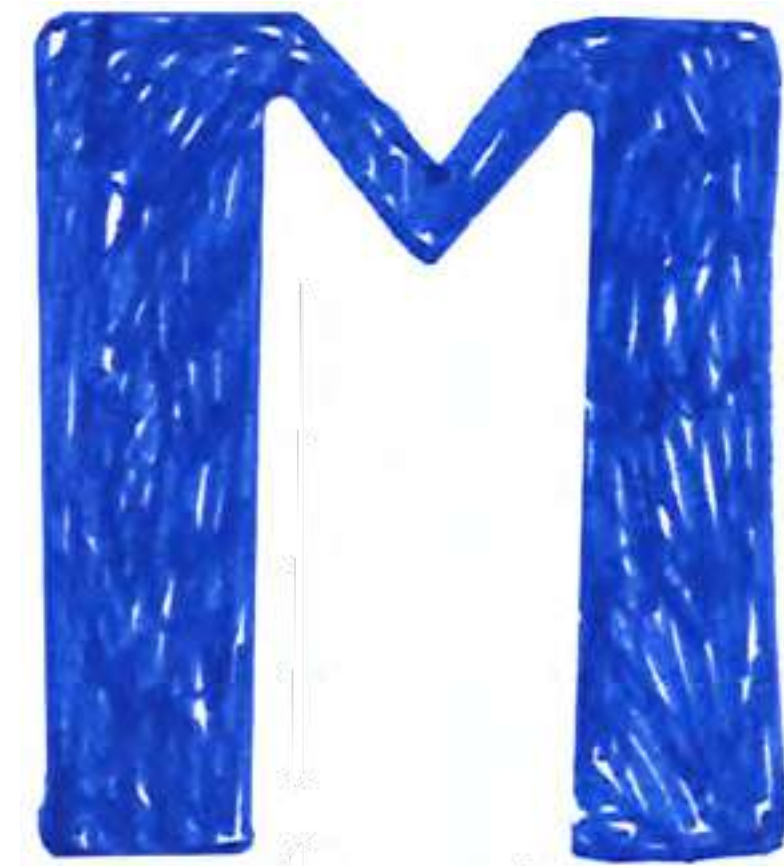
scienza

A large, blue, hand-drawn letter 'T' with a textured, sketchy appearance.


tecnologia

A large, blue, hand-drawn letter 'E' with a textured, sketchy appearance.

ingegneria

A large, blue, hand-drawn letter 'M' with a textured, sketchy appearance.

matematica

A large, hand-drawn blue letter 'S' with a textured, sketchy appearance, set against a white background.

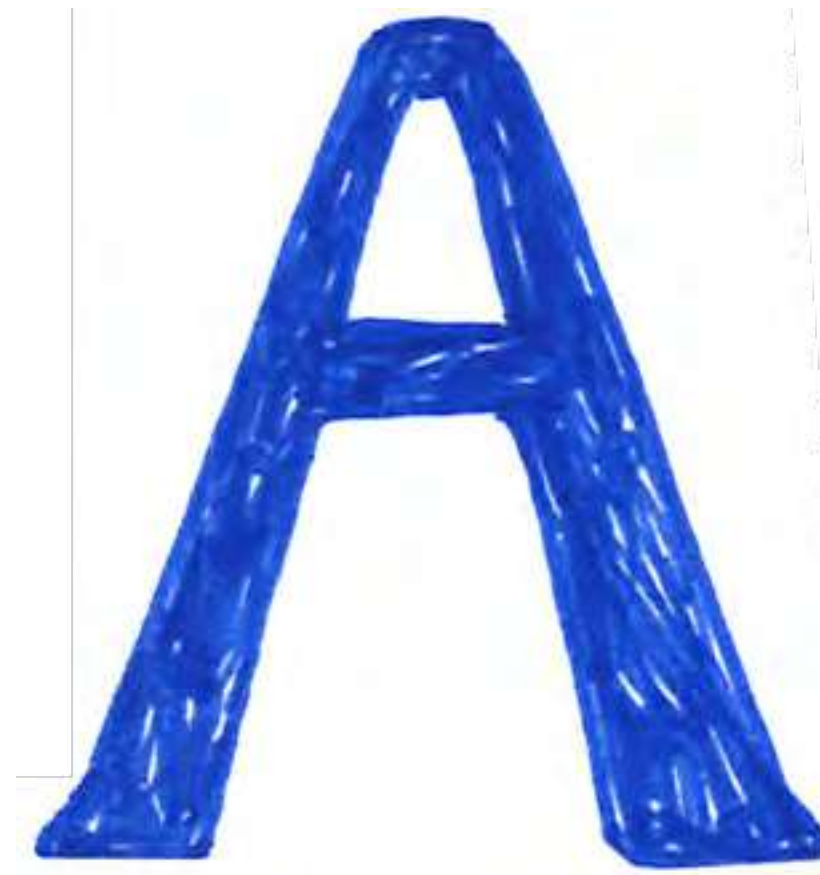
scienza

A large, hand-drawn blue letter 'T' with a textured, sketchy appearance, set against a white background.

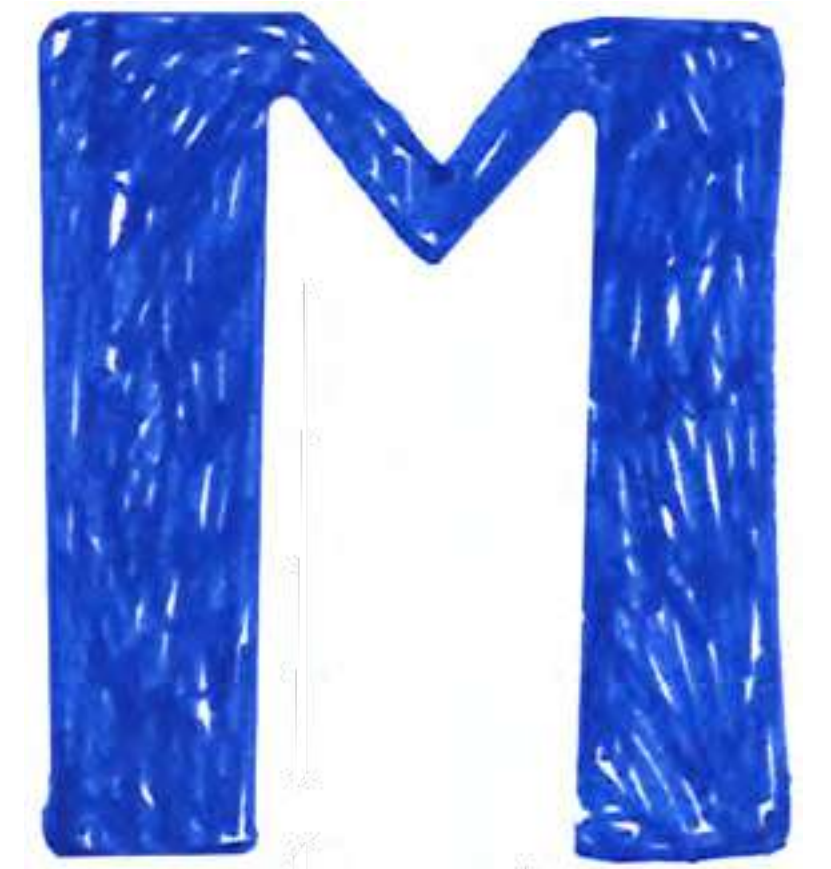
tecnologia

A large, hand-drawn blue letter 'E' with a textured, sketchy appearance, set against a white background.

ingegneria

A large, hand-drawn blue letter 'A' with a textured, sketchy appearance, set against a white background.

arte

A large, hand-drawn blue letter 'M' with a textured, sketchy appearance, set against a white background.

matematica

TINKERING

o making ?

forbici

pila a
bottone

nastro
isolante

pinza a
coccodrillo

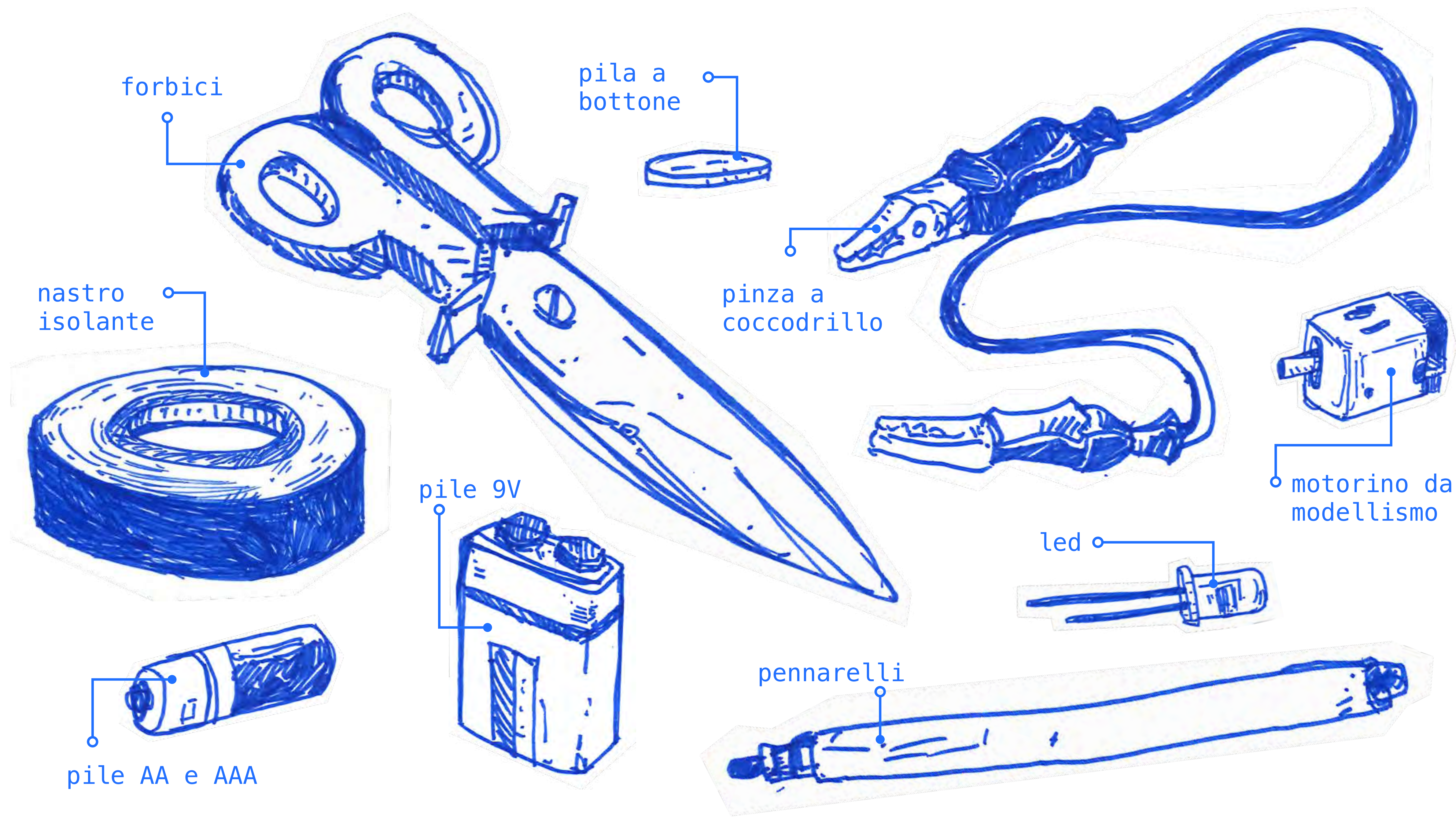
motorino da
modellismo

led

pennarelli

pila AA e AAA

pila 9V



materiali poveri

TINKERING



Attività focalizzata
sulla creatività e
sull'esplorazione



Il bambino lavora a un
progetto seguendo le
proprie inclinazioni e
i propri interessi



Non sono necessarie
conoscenze pregresse di
elettronica o di altre
discipline scientifiche

making

Attività più legata al
mondo della stampa 3d e
della prototipazione
rapida

Ci si pongono degli
obiettivi di produzione
ben precisi

Il ruolo dell'insegnante

esplorazione

realizzazione

apprendimento

l'insegnante può
essere definito come
un "facilitatore".

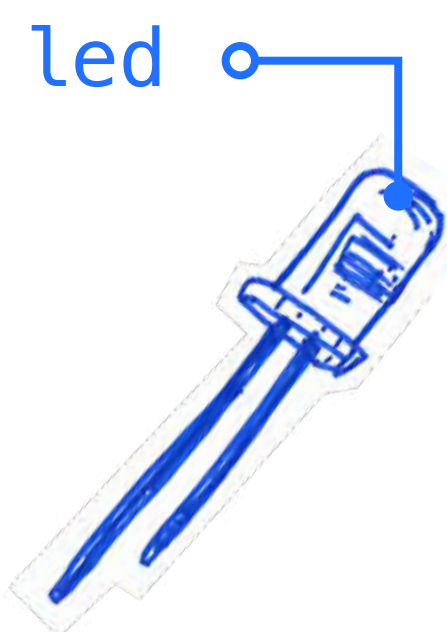
**Il tinkering è
anche un'attività
sociale**



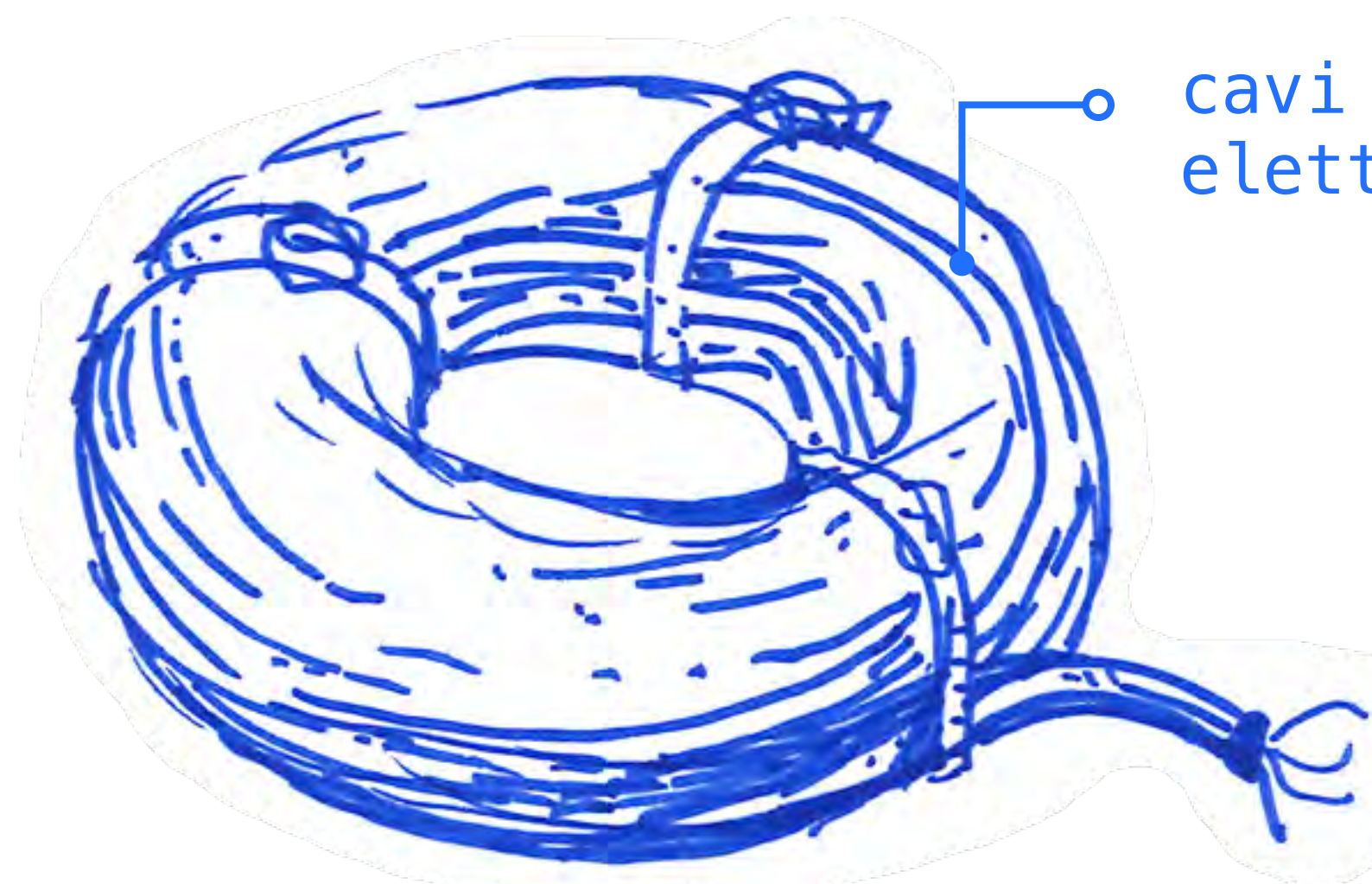
COMUNITÀ

di apprendimento

Che cosa può servire

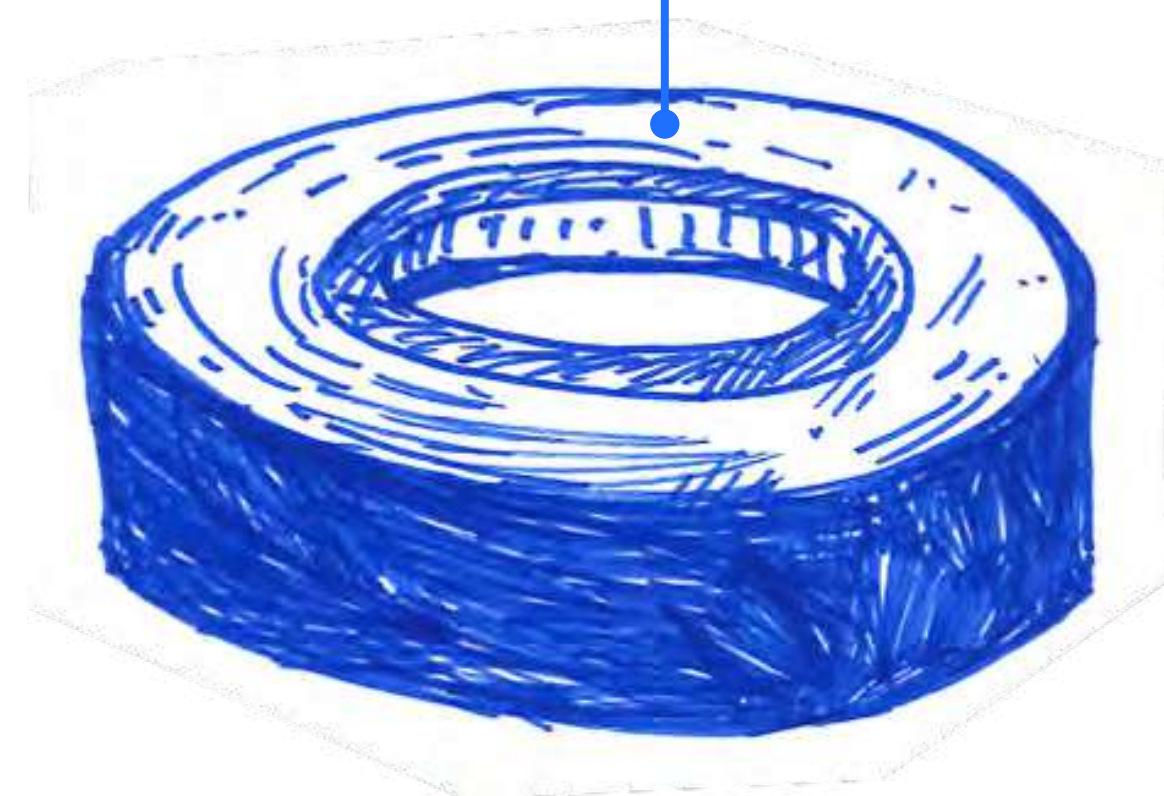


led

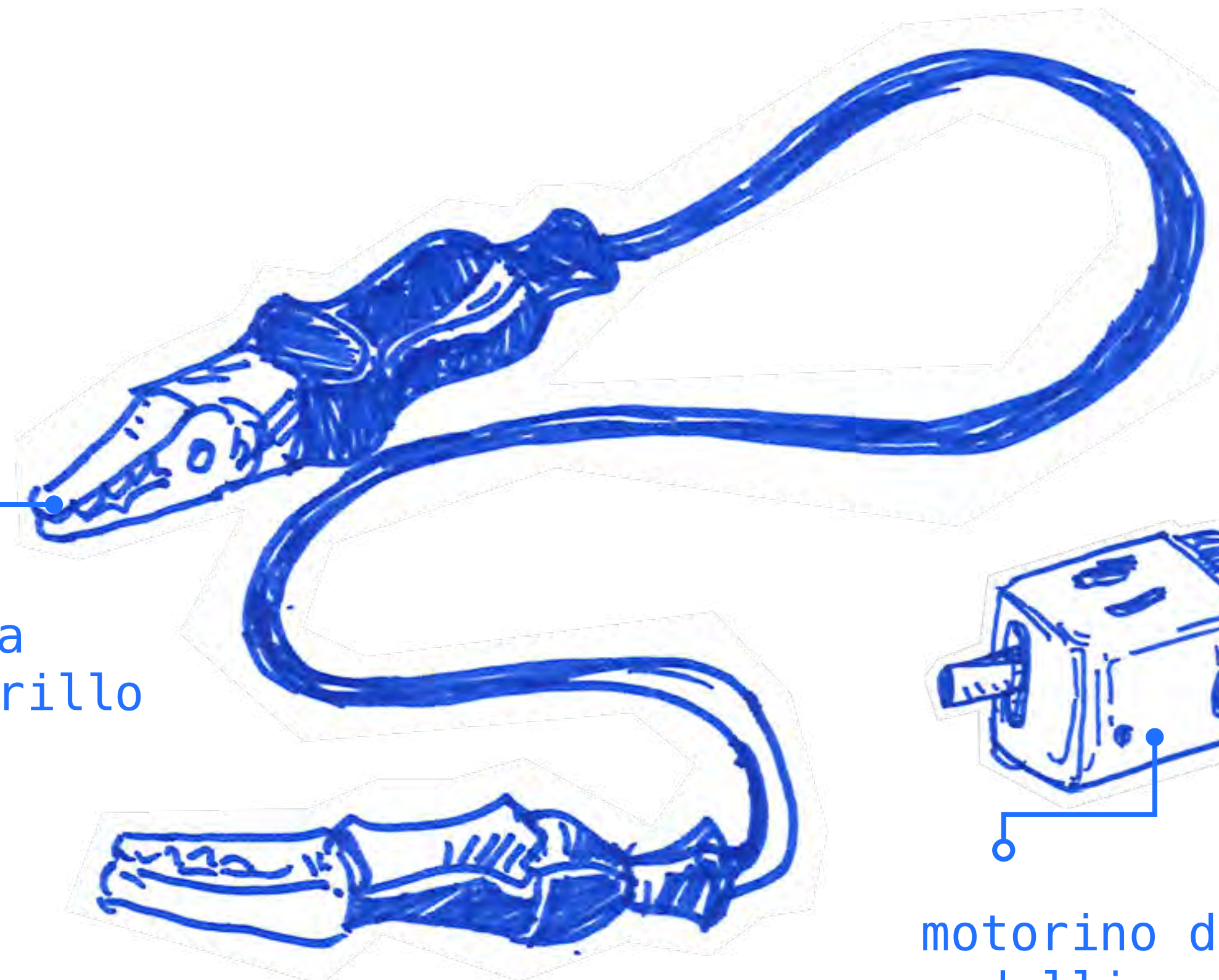


cavi
elettrici

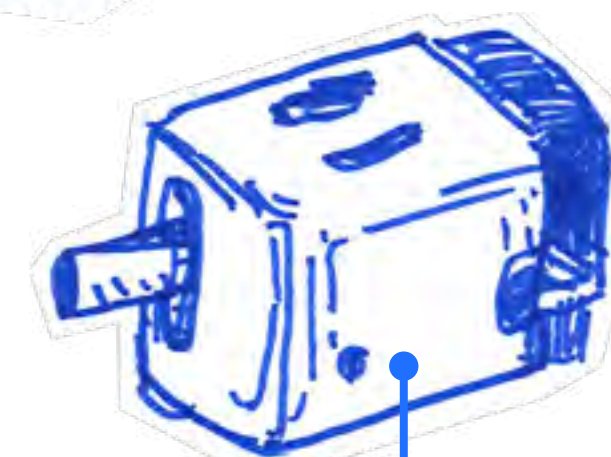
nastro
isolante



pinza a
coccodrillo



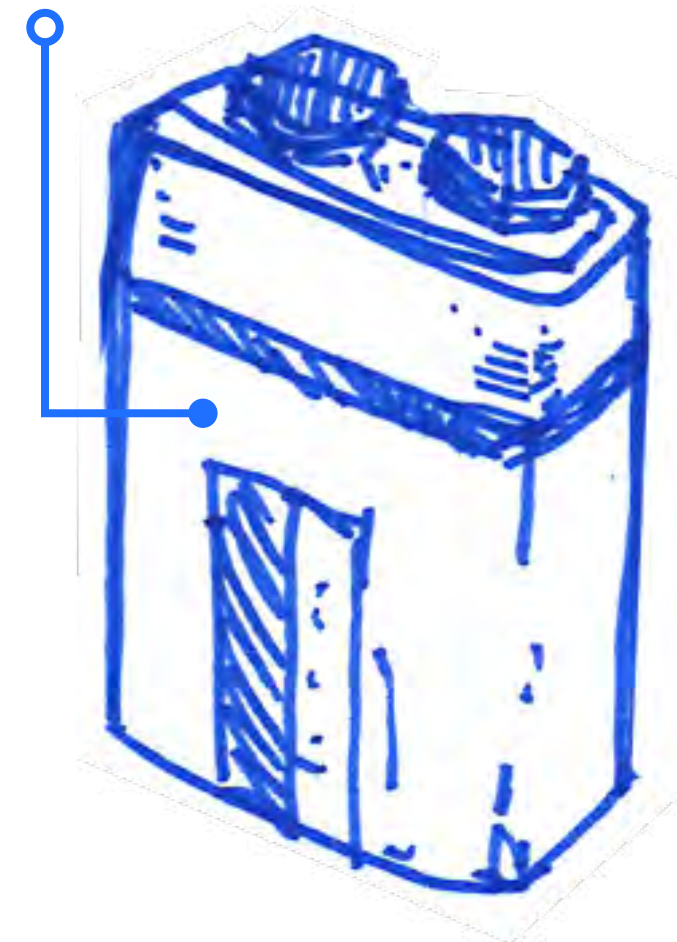
motorino da
modellismo



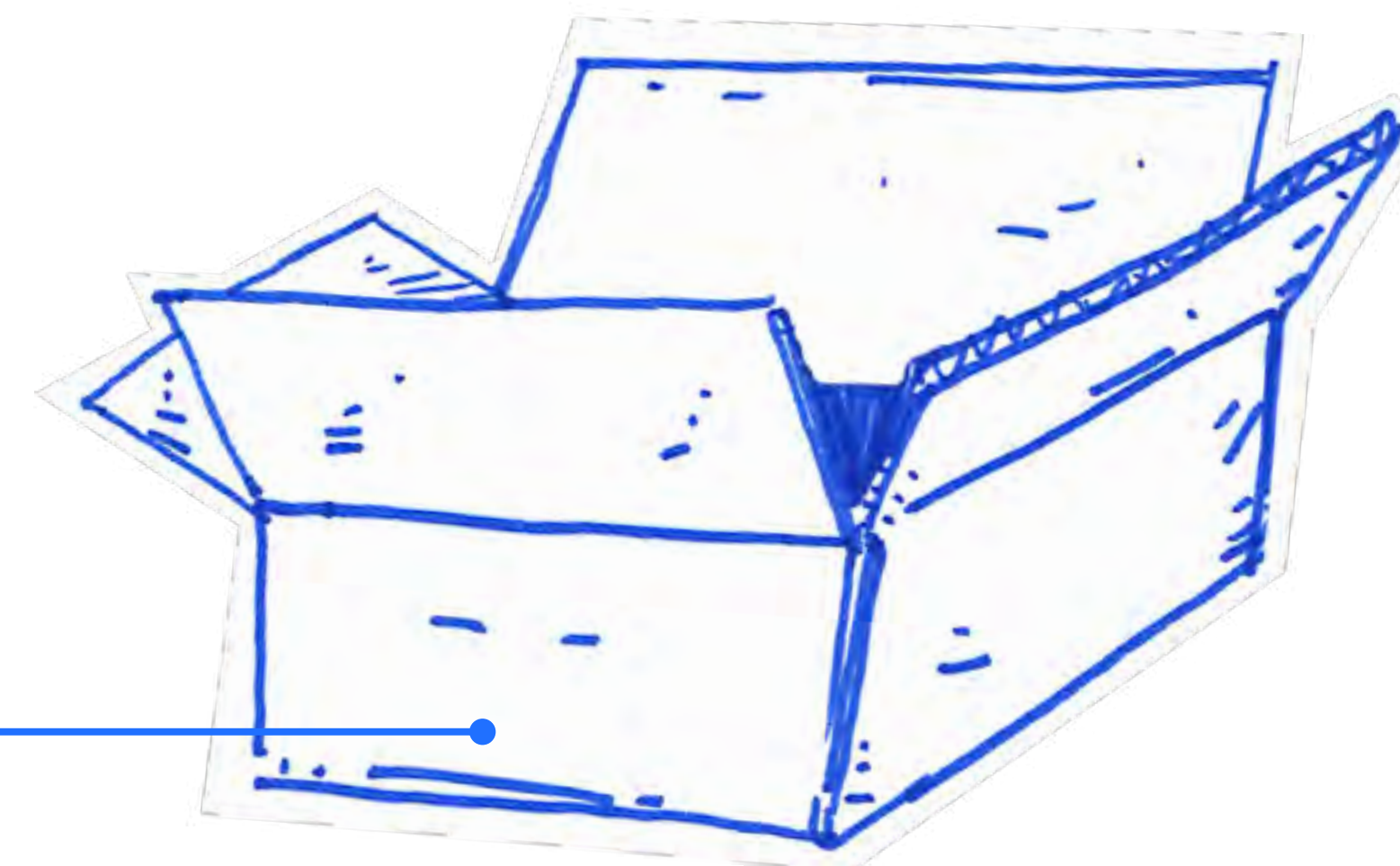
pila a
bottone



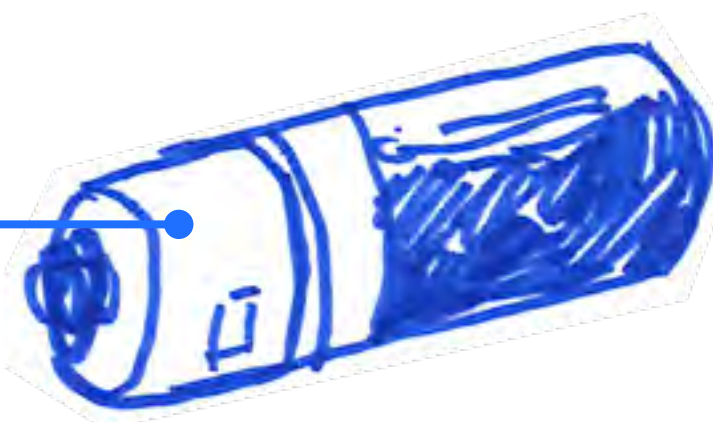
pila 9V

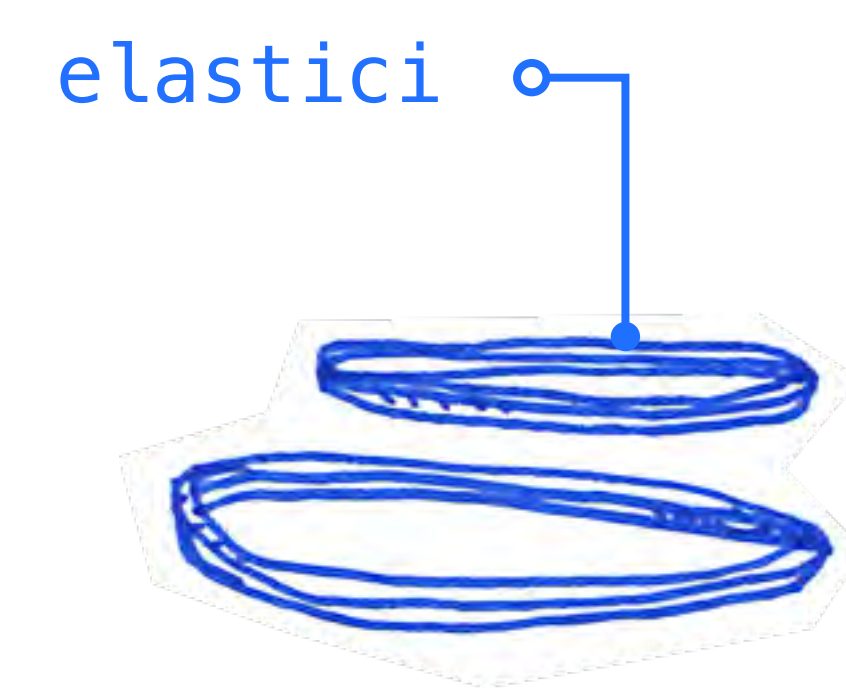
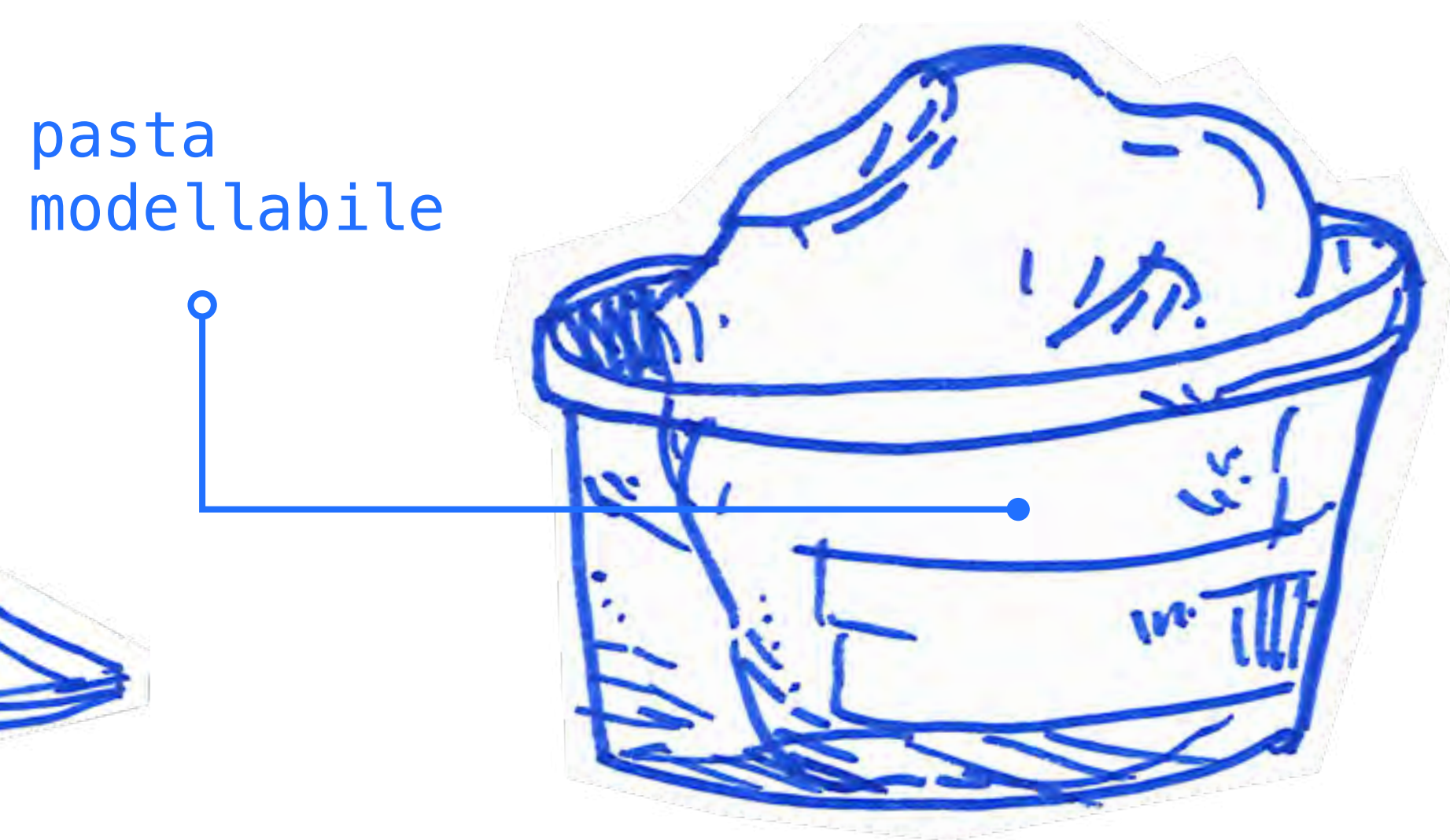
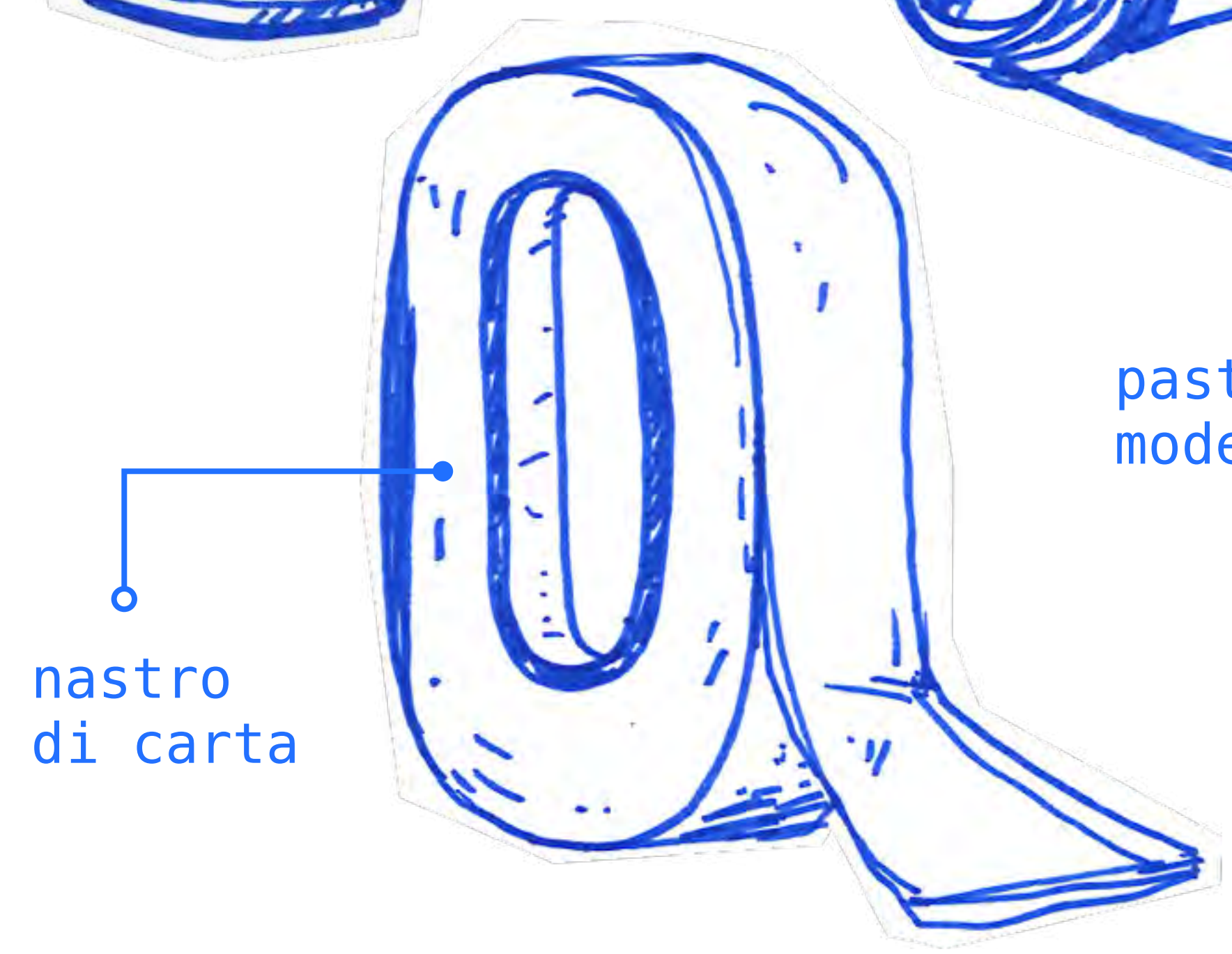
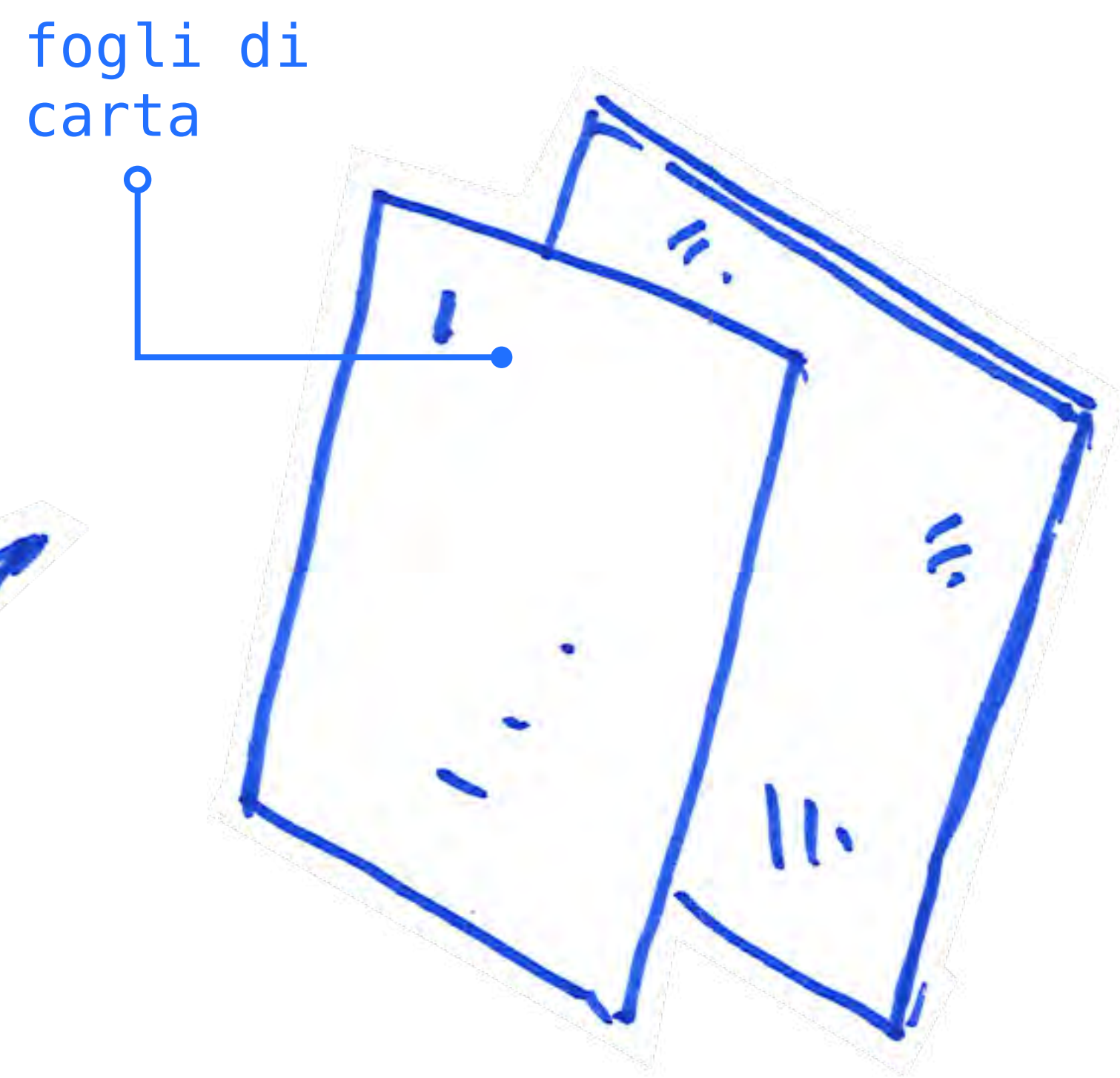
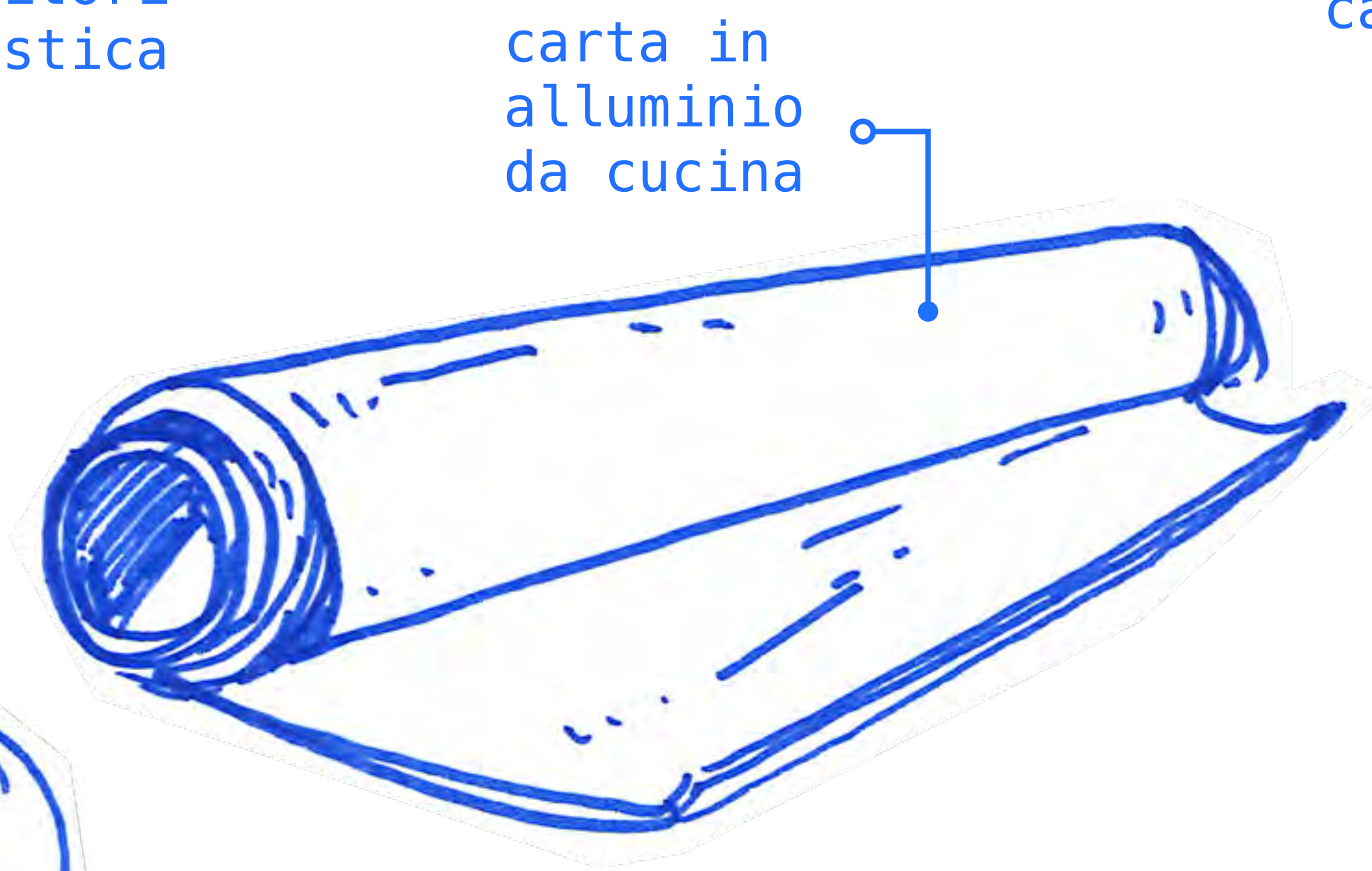
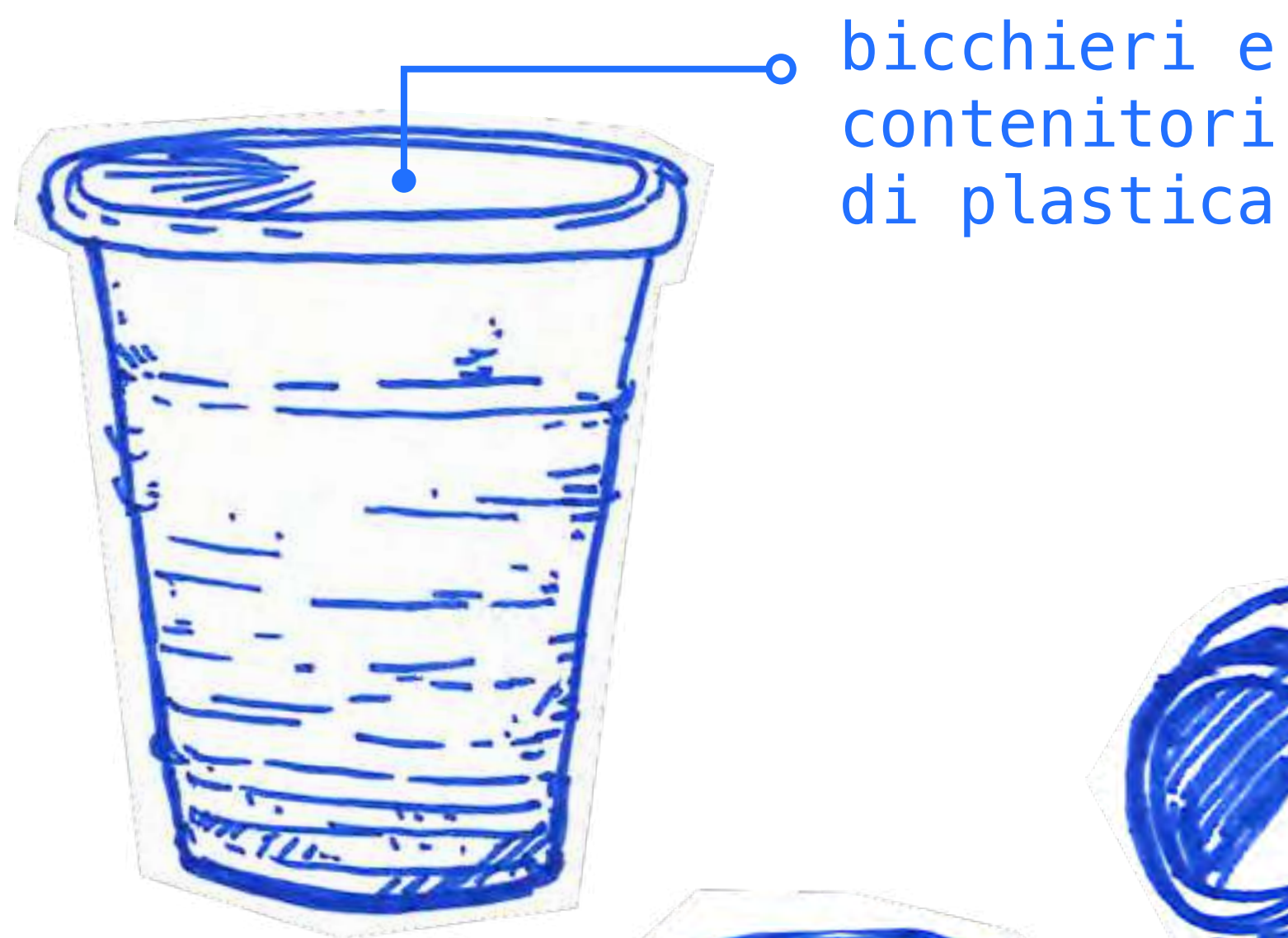


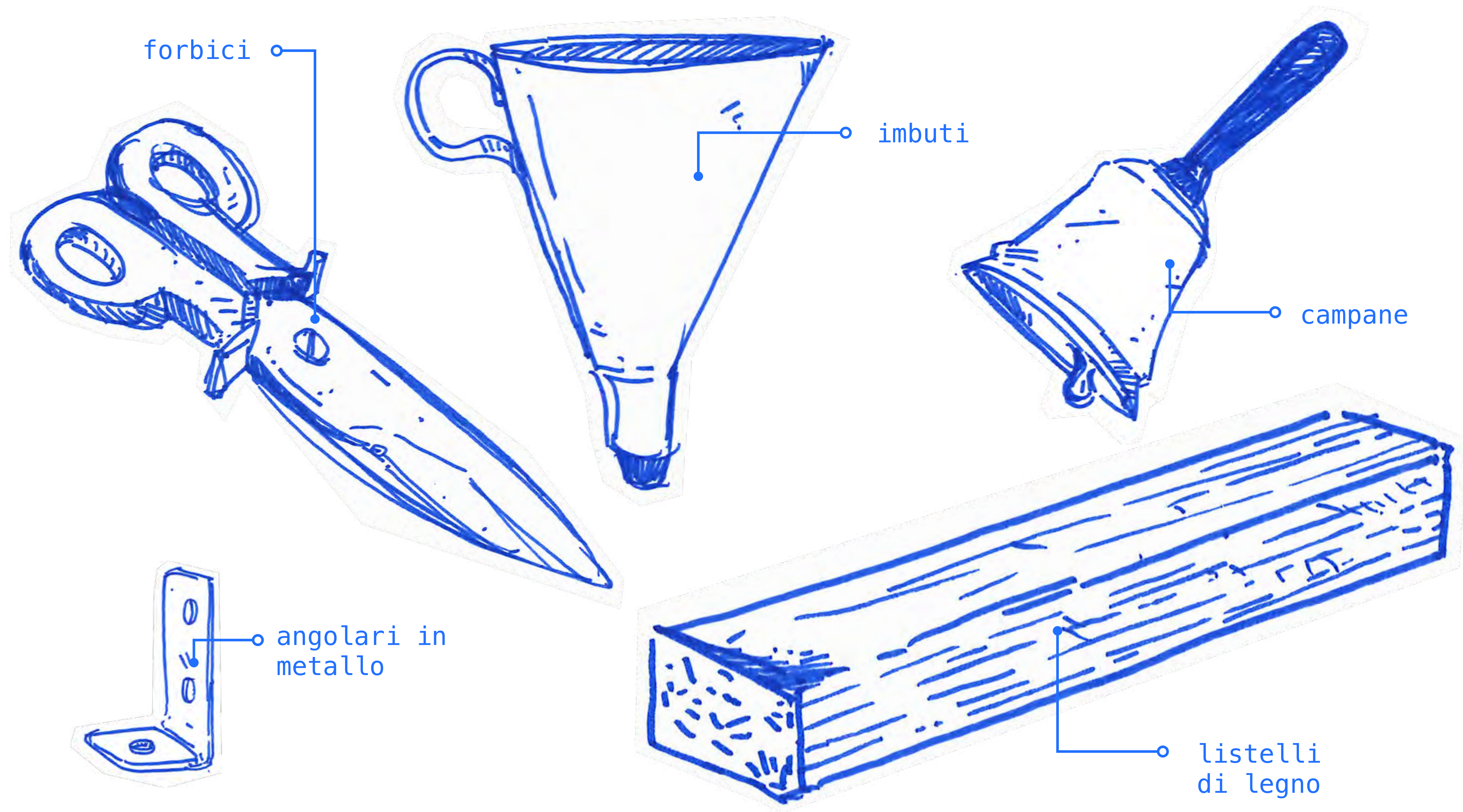
scatoloni
di cartone



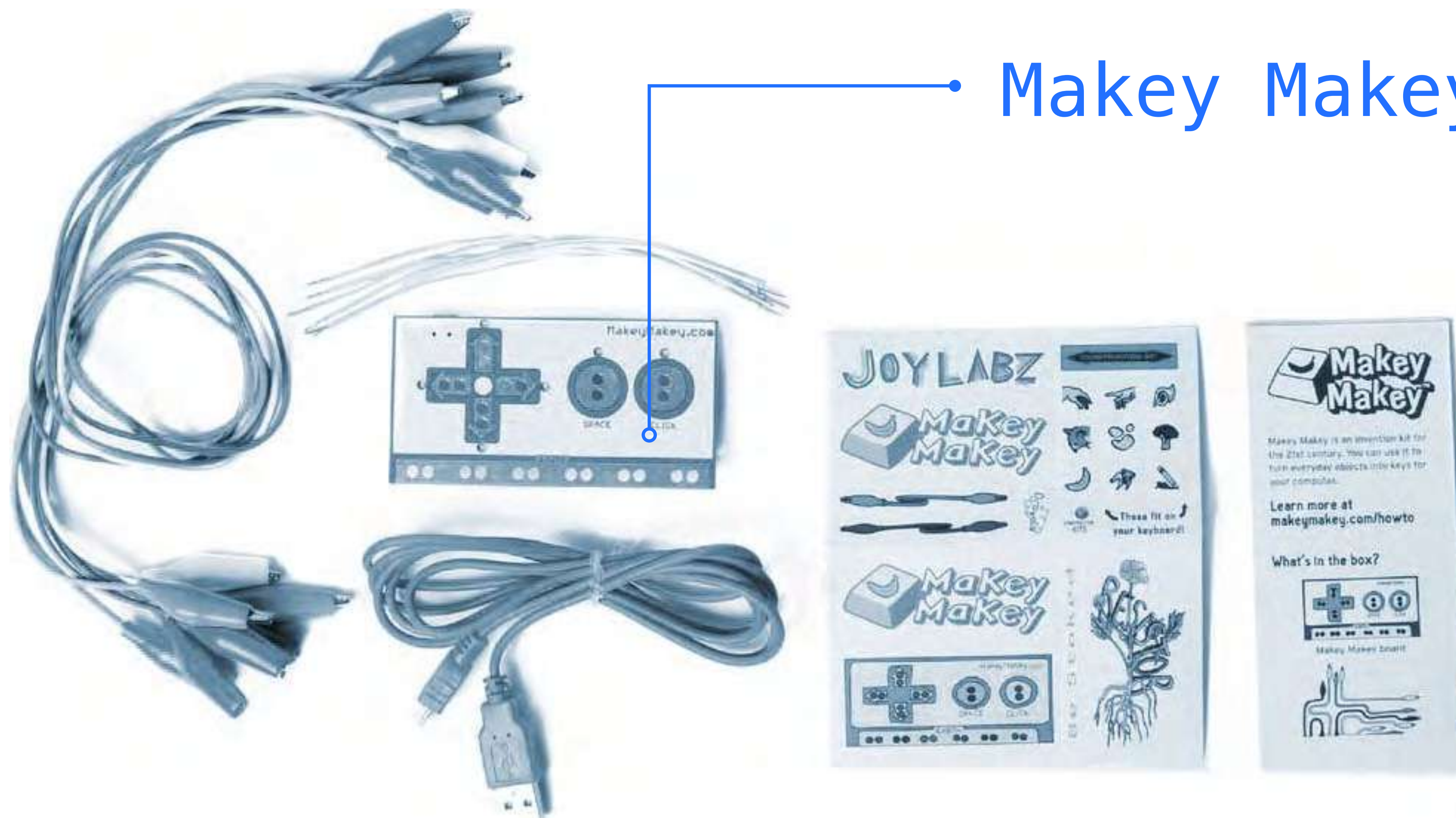
pila AA e AAA







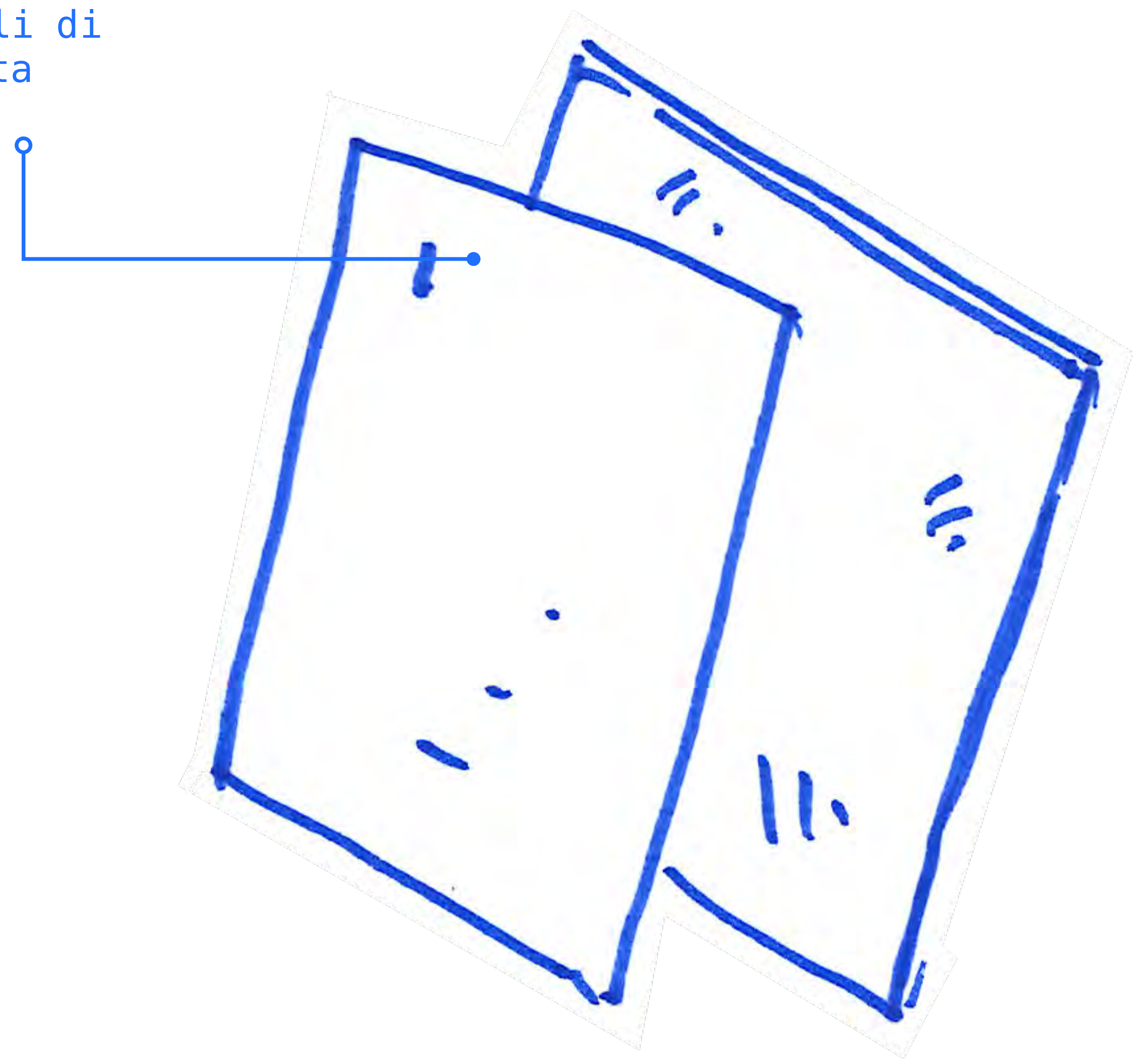
• Makey Makey



Come iniziare

é possibile iniziare
anche solamente con
la carta

fogli di
carta





**Costruire attività
disciplinari in classe**

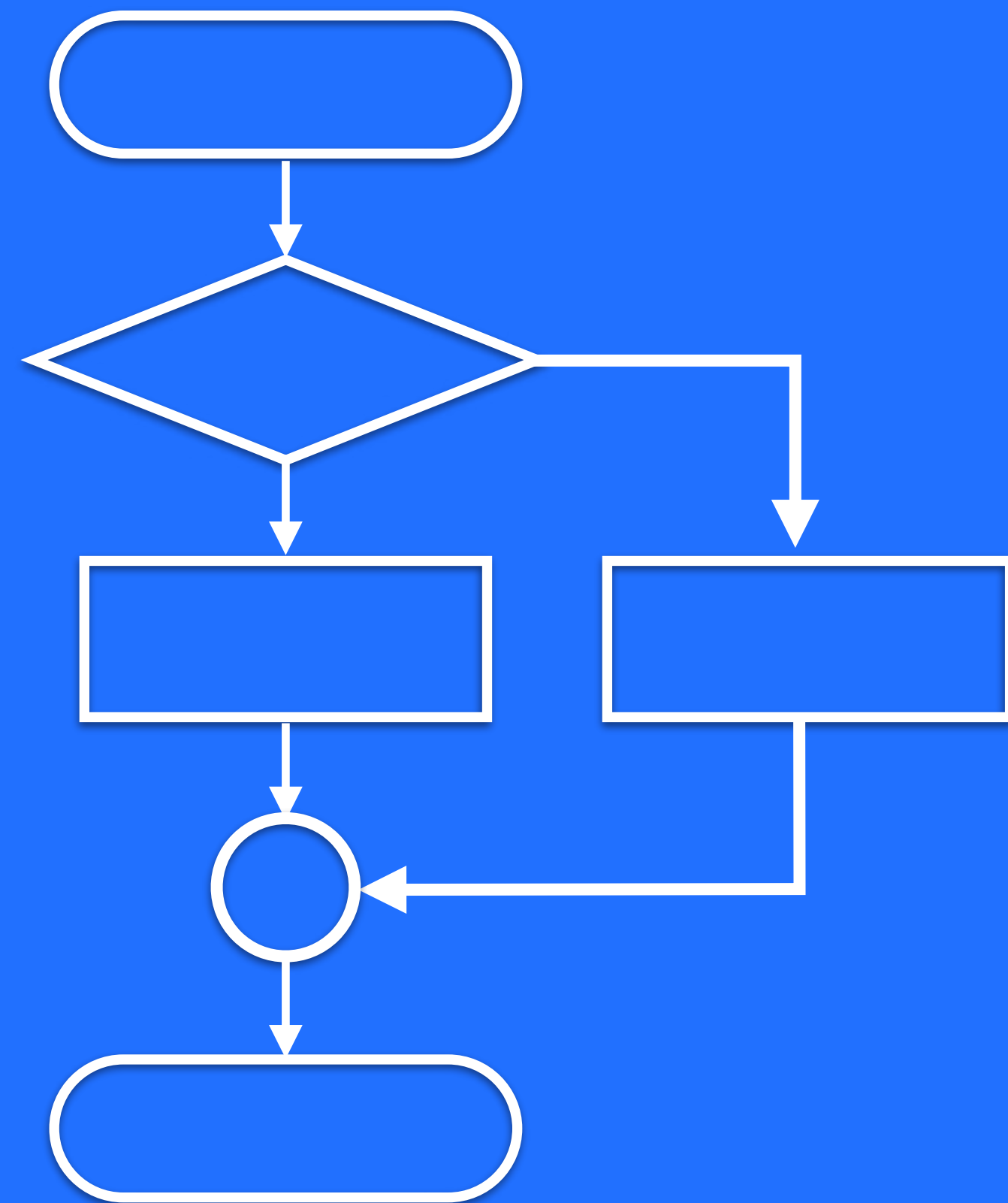
P
PENSIERO

COMPUTAZIONALE

“Indicazioni nazionali e nuovi scenari”

MIUR

ALGORITMI



procedure e algoritmi devono essere accompagnati da momenti di riflessione sulle scelte operate

Raccomandazione del Consiglio europeo relativa alle competenze chiave per l'apprendimento permanente

Importanza di abilità come:



capacità di
risoluzione di
problemi



creatività



pensiero
critico



pensiero
computazionale



capacità di
cooperare



autoregolamentazione

l'apprendimento





<http://www.coderdojoitalia.org/cose-coderdojo/>

Creative Learning

Lifelong Kindergarten Group del MIT



Project

lavorare per
progetti

play

giocare (suonare,
recitare...)

peers

condividere
tra pari

Passion

metterci
passione

Project



darsi un obiettivo
di massima da
raggiungere

lavorare per progetti

peers

condividere tra pari



lavorare in gruppo
condividendo
informazioni e
scoperte rende
l'apprendimento
molto più rapido



impostare un
ambiente giocoso

play

giocare
(suonare,
recitare...)



lavorare a progetti
che appassionino i
bambini

Passion

metterci
passione

**Imparando dalle
maestre**

Mitchel Resnick



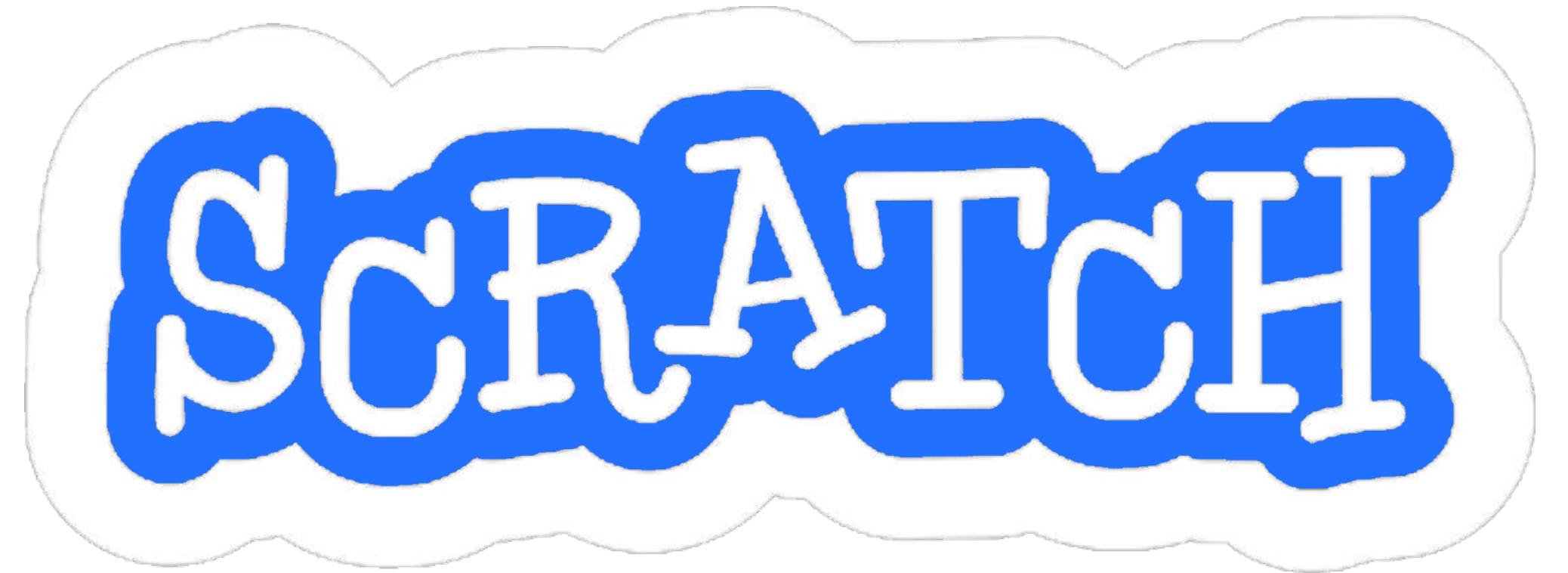
Professore del MIT
a capo del progetto
Scratch

Resnick

Il coding rappresenta un nuovo
tipo di alfabetizzazione e una
forma di espressione personale,
proprio come imparare a scrivere

L'insegnante riesce ad integrare
con estrema facilità il lavoro
digitale con quello su carta

tecniche
di PROGRAMMAZIONE
Avanzata con



➡ tutto quello che si può fare con gli sfondi e gli sprite,

➡ il parallelismo

➡ costruire storie partendo su carta

➡ realizzazione di un curriculum verticale di matematica

remixando programmi già presenti nel sito web di
Scratch appositamente caricati da DeA Scuola

