

UCSF Intro To Programming

(AKA: Introduction to Computing for Biophysicists / Programming Fundamentals)

Practical stuff:

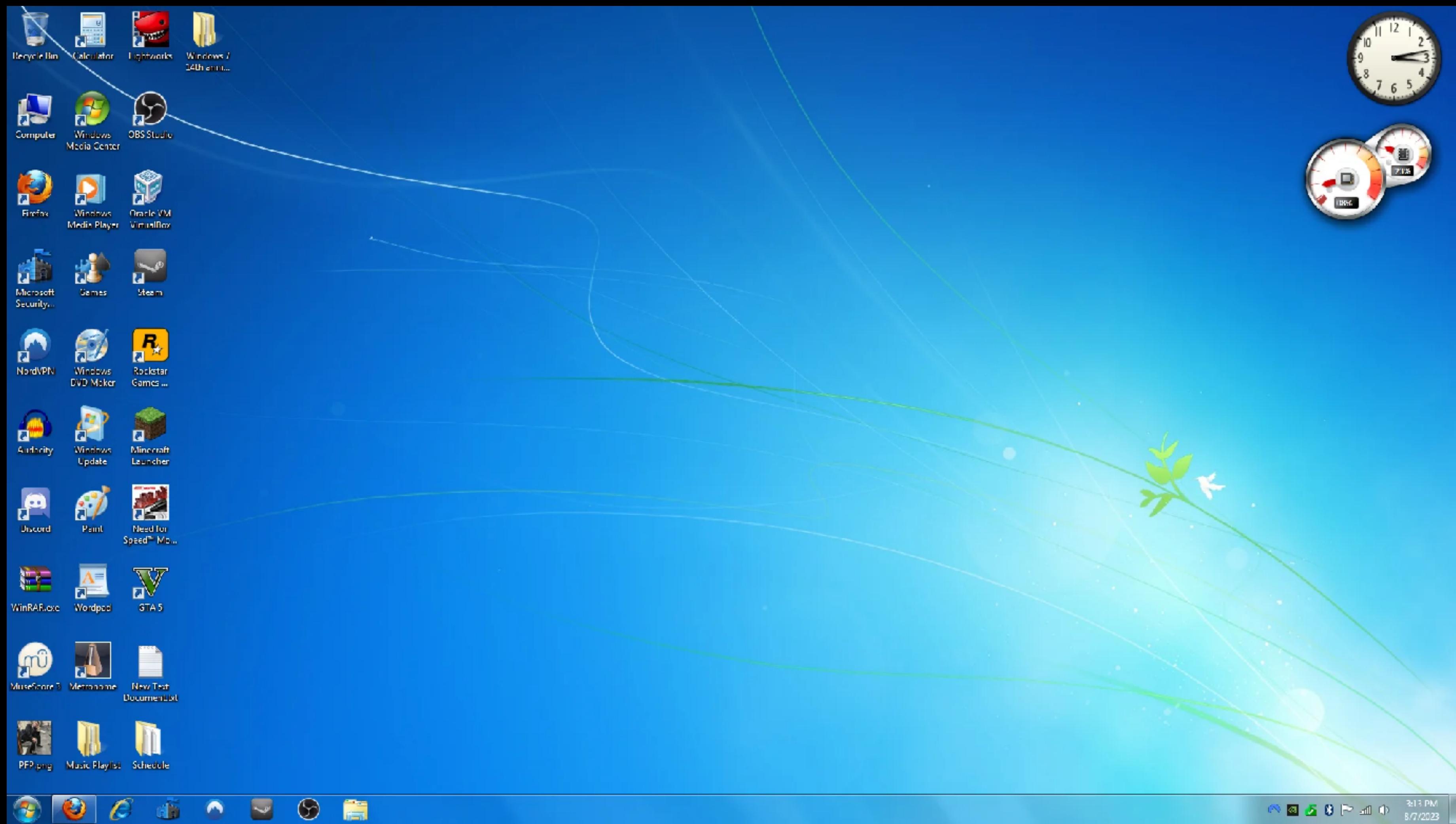
- We meet everyday, except this Friday (9/13), until next Friday (9/20) 9-11AM.
- Format: Mixture of conceptual slides, and hands on application.
- Course website: github.com/zackmawaldi/intro_to_programming
- I am available after class for questions, office hours etc. Just let me know (ideally in advance).
- My email: zack.mawaldi@ucsf.edu

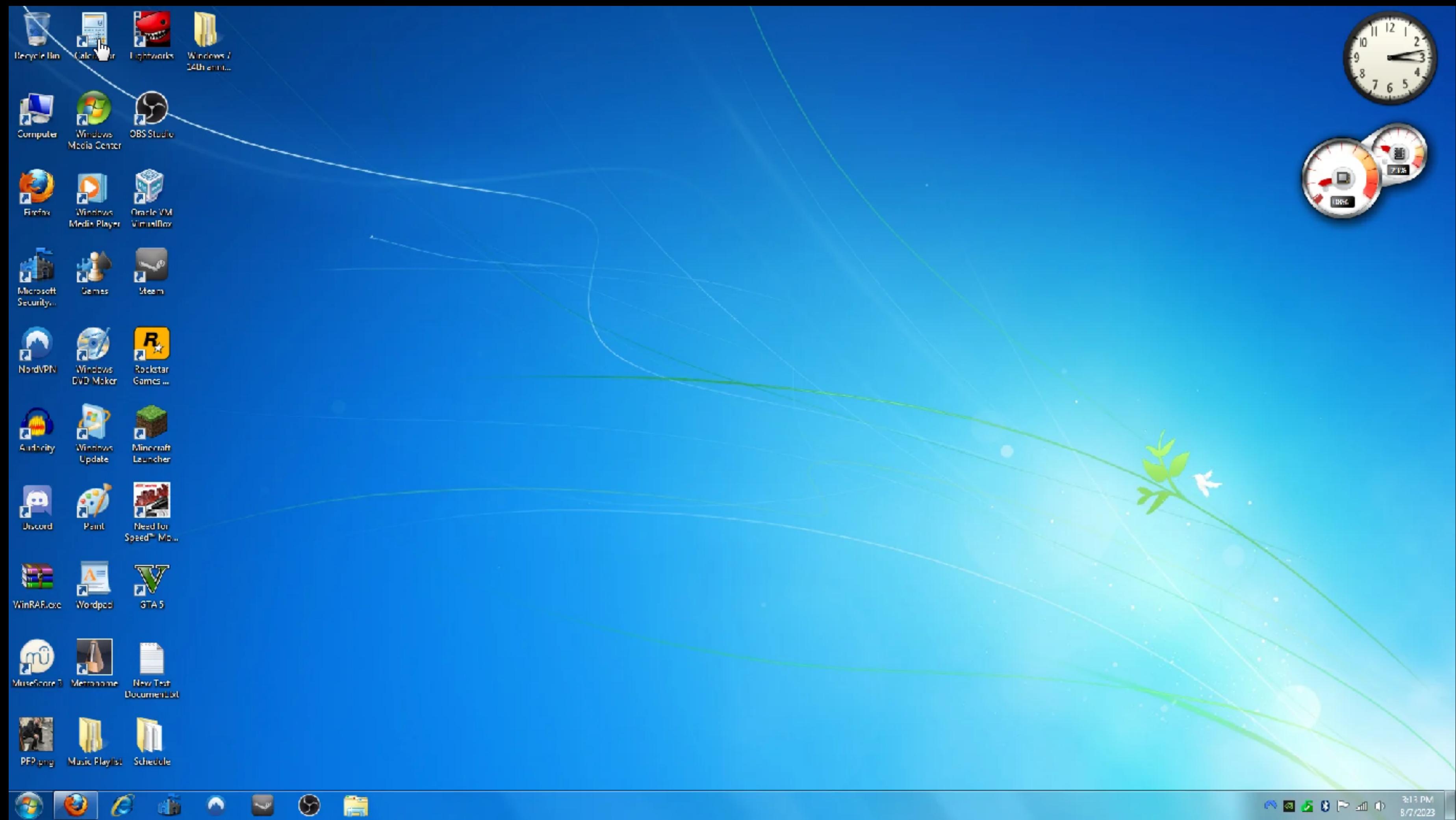
What you'll learn:

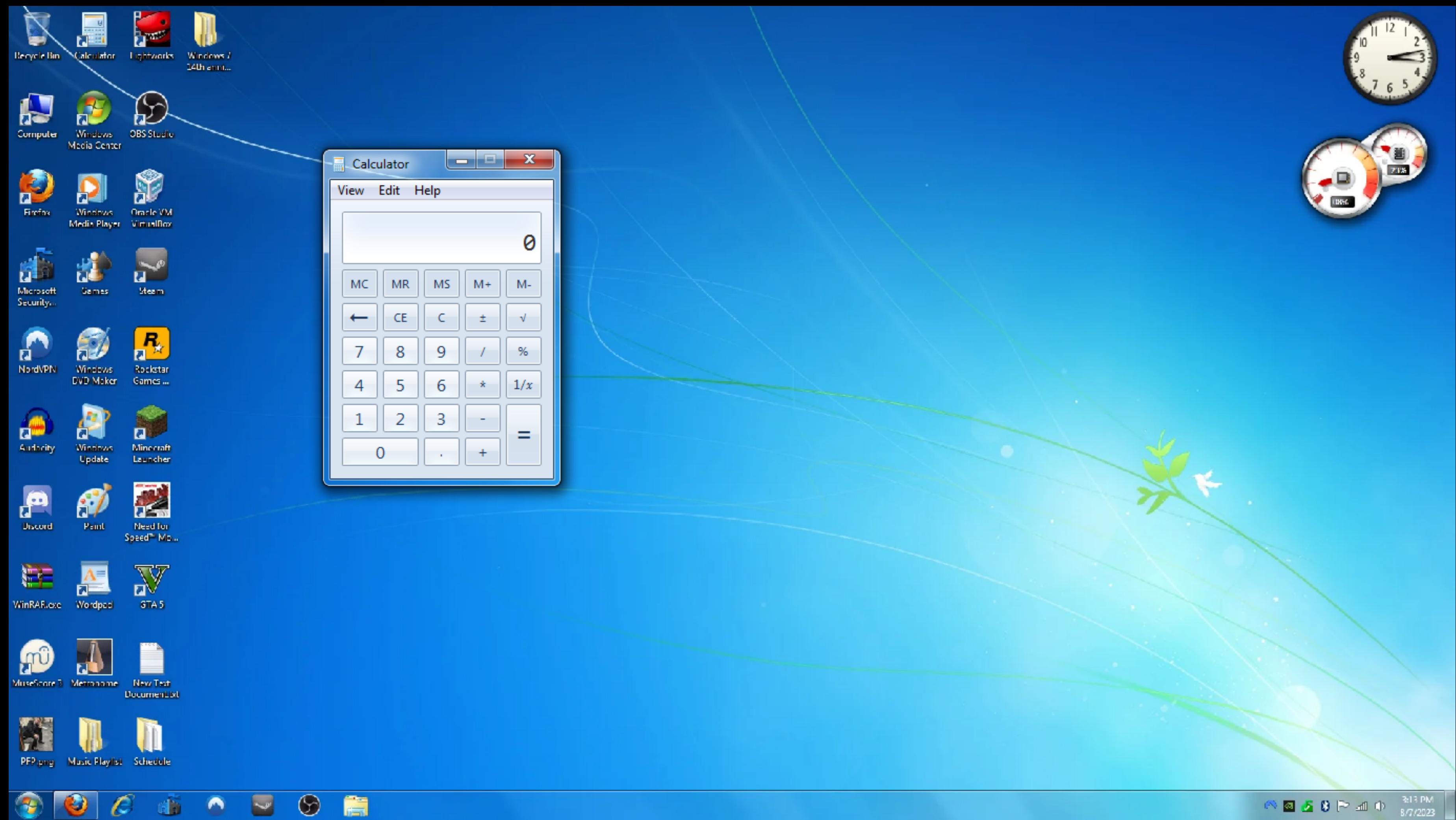
- How to operate a computer from the terminal.
- How to think / solve problems algorithmically (using Python).
- Practical data science.

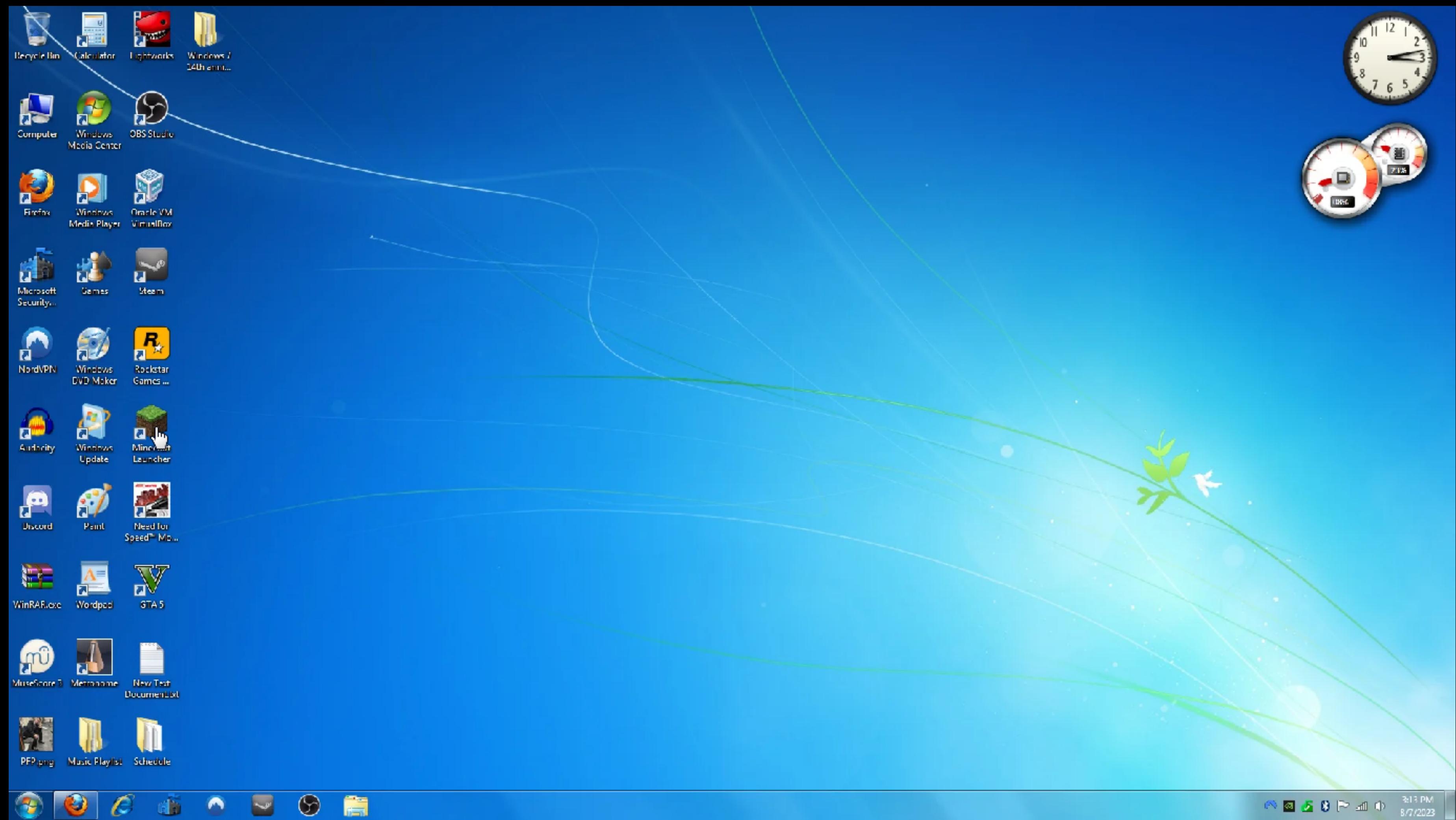
What you'll learn:

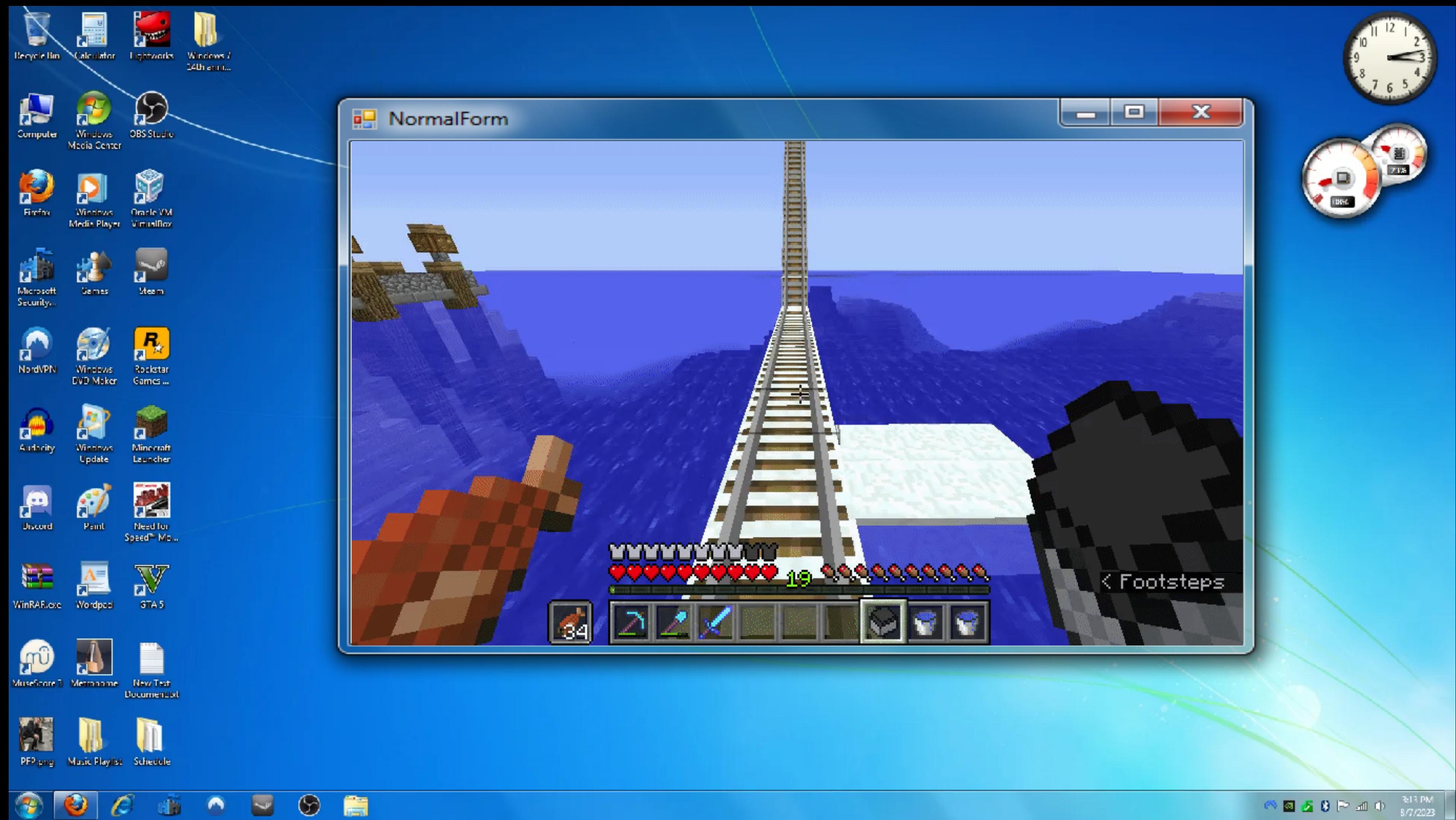
- How to operate a computer from the terminal.
- How to think / solve problems algorithmically (using Python).
- Practical data science.



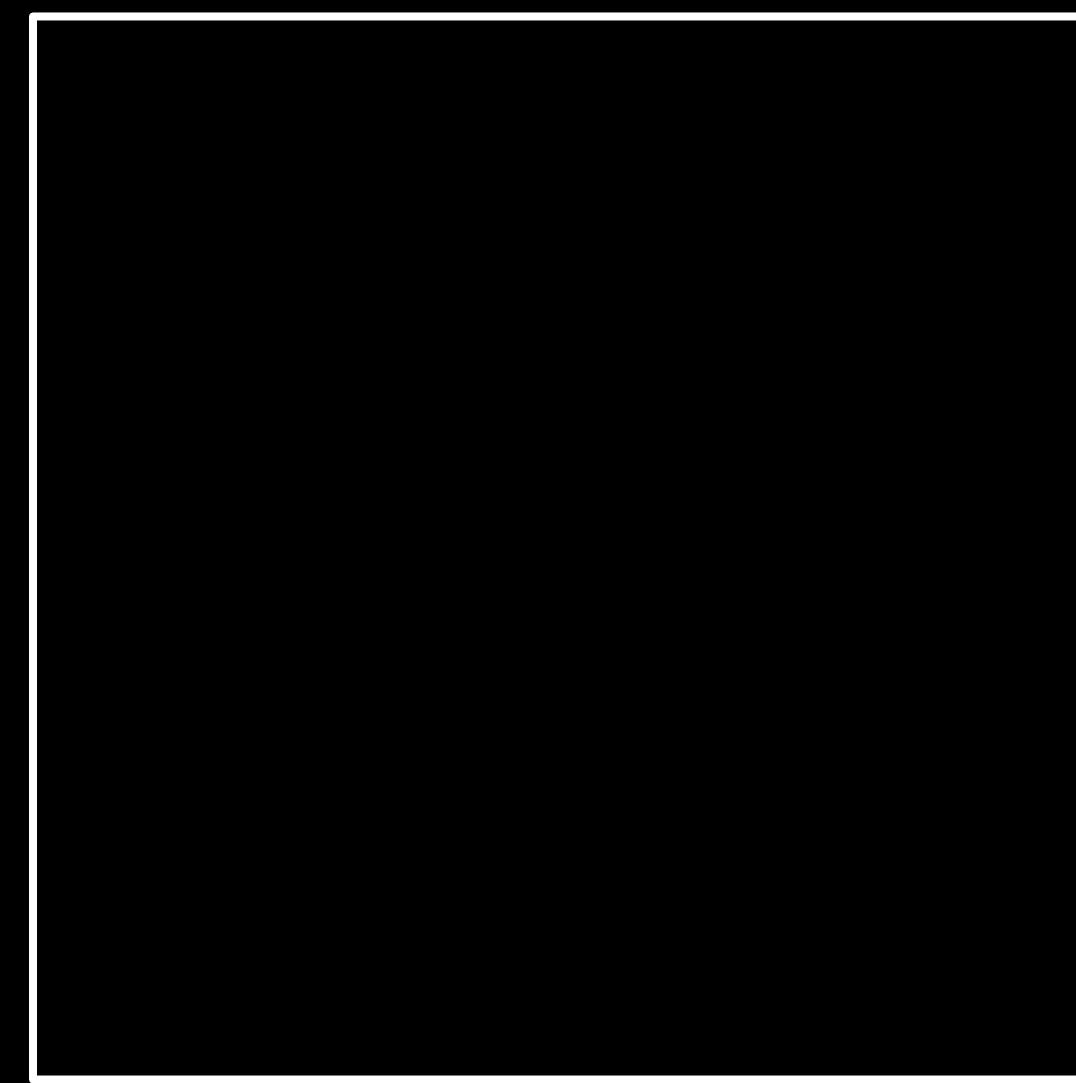






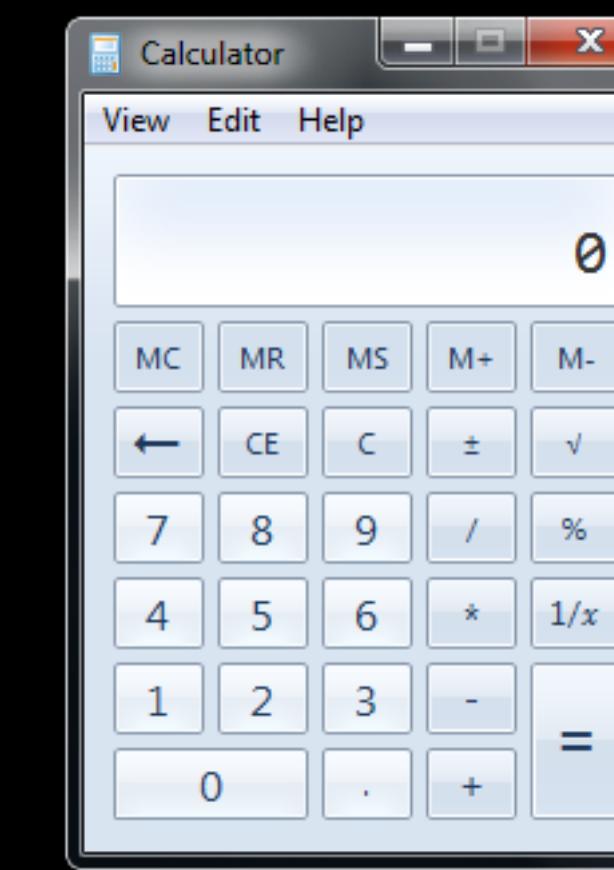


input →



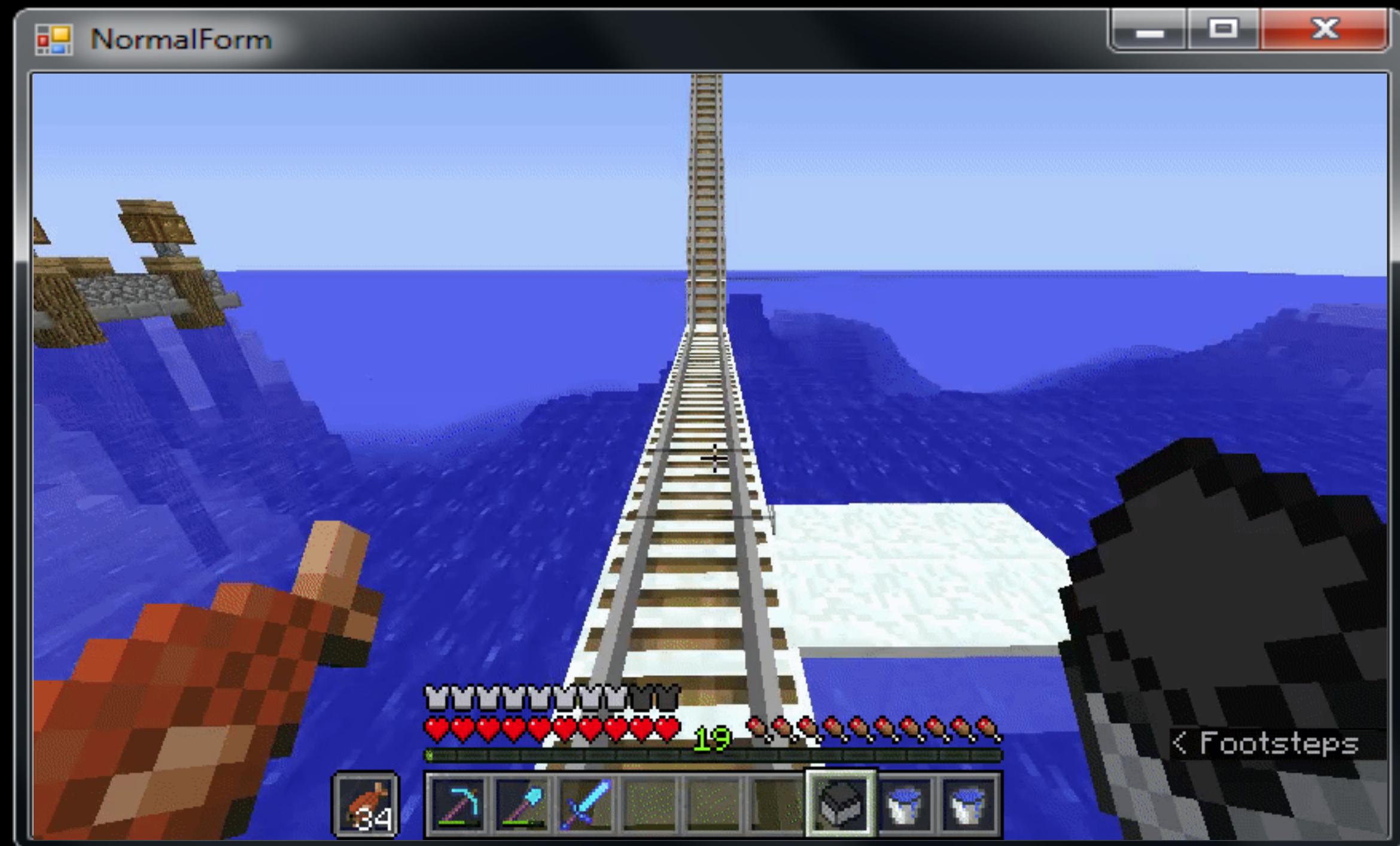
→ output

input →



→ output

input →



→ output

$1+1$
input →

```
if 1+1  
show 2
```

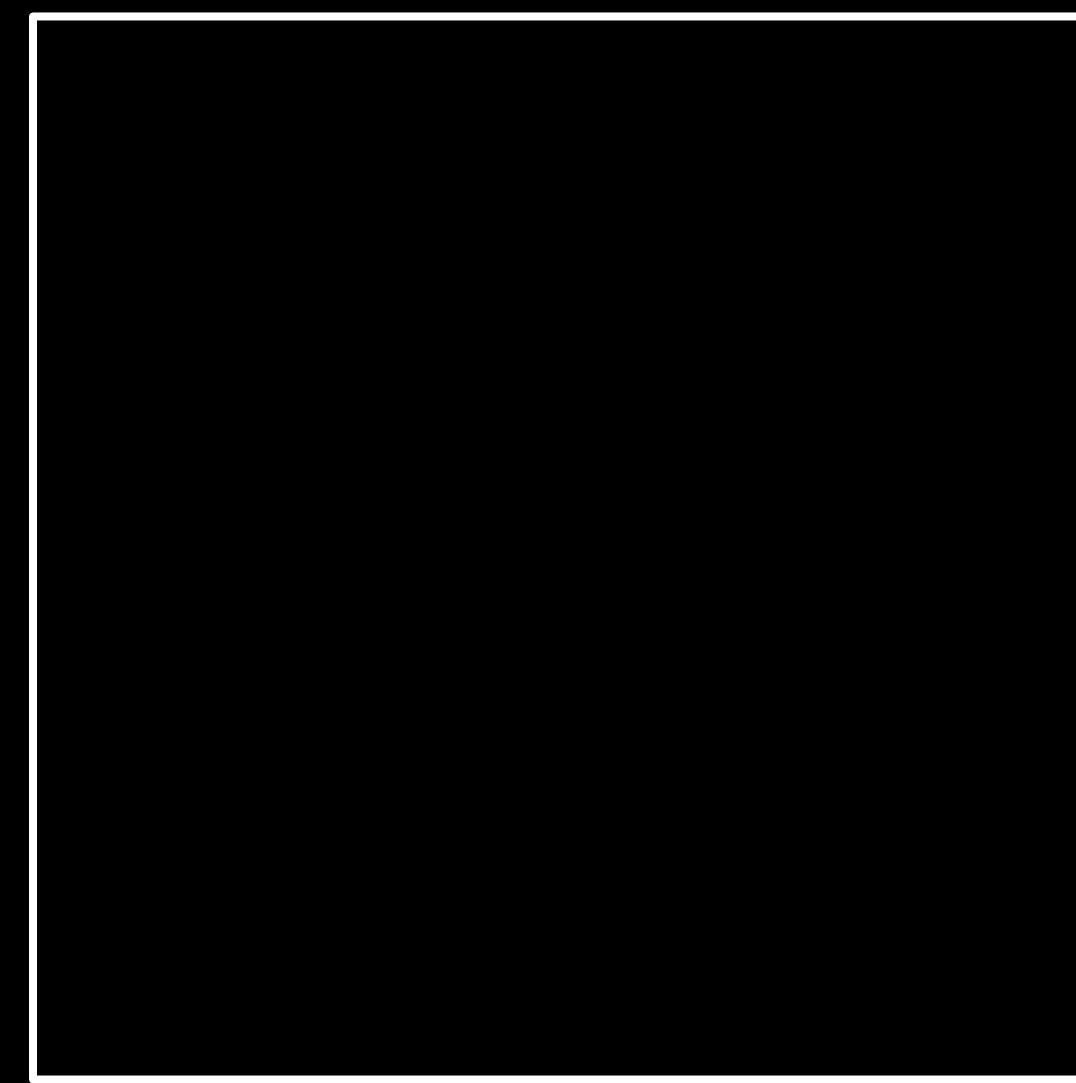
2
→ output

Press ↑
input →

if ↑ is
pressed
move play
forward

Show new
position
→ output

input →



→ output

input →

instructions

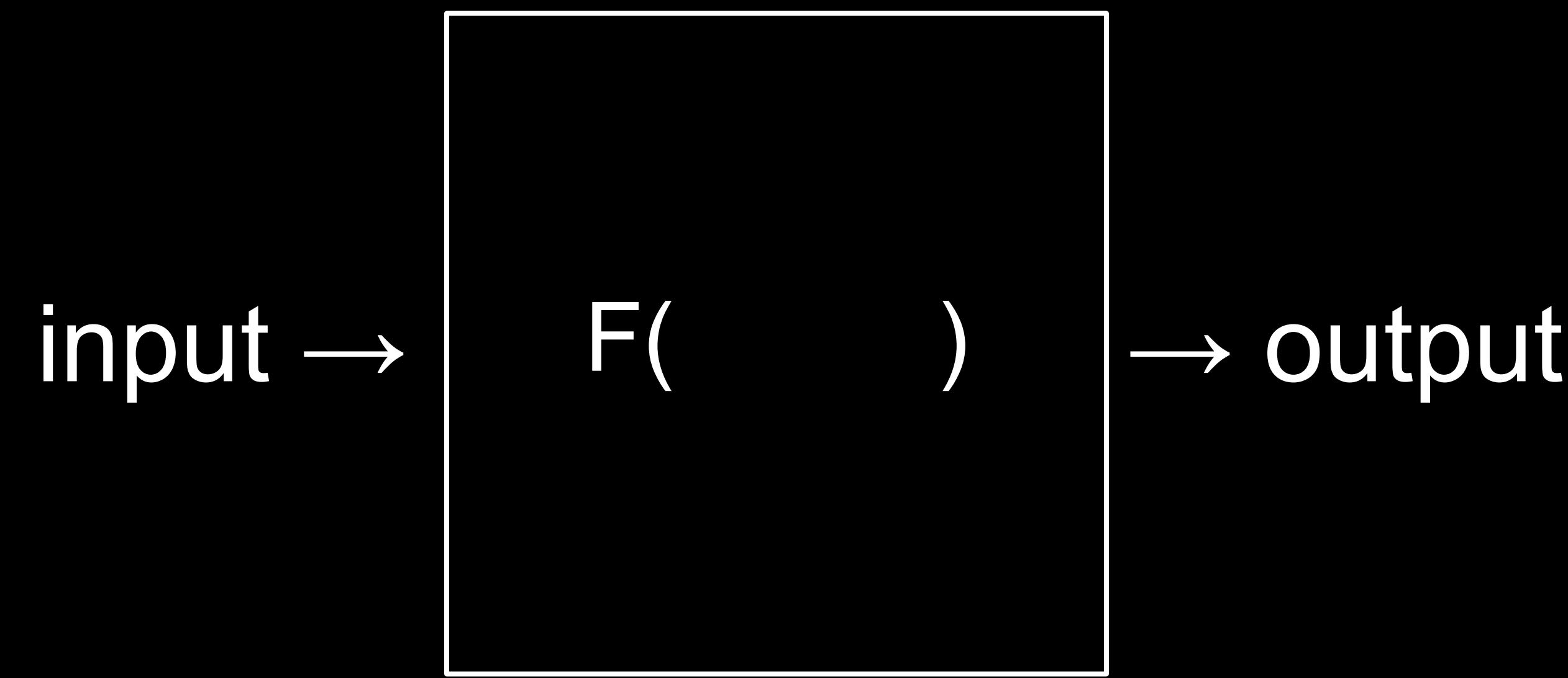
→ output

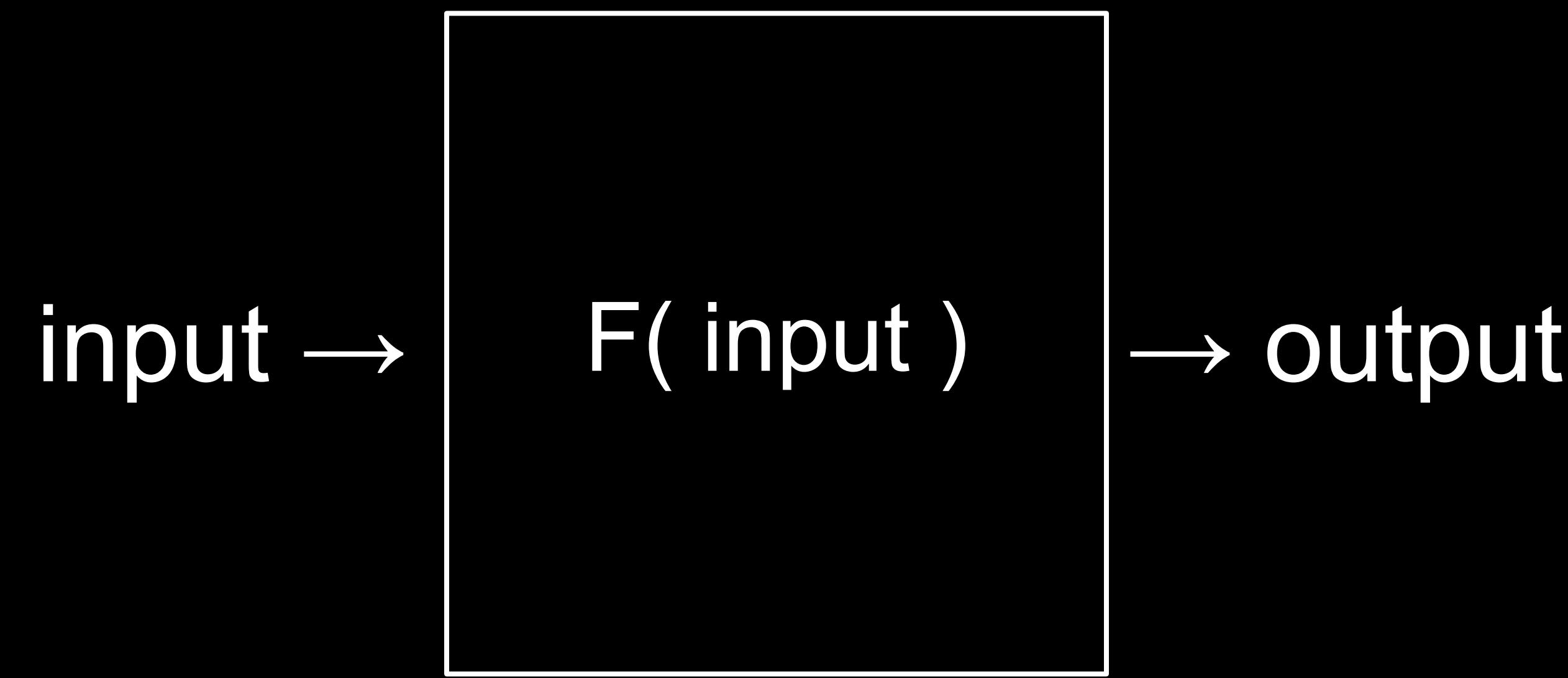


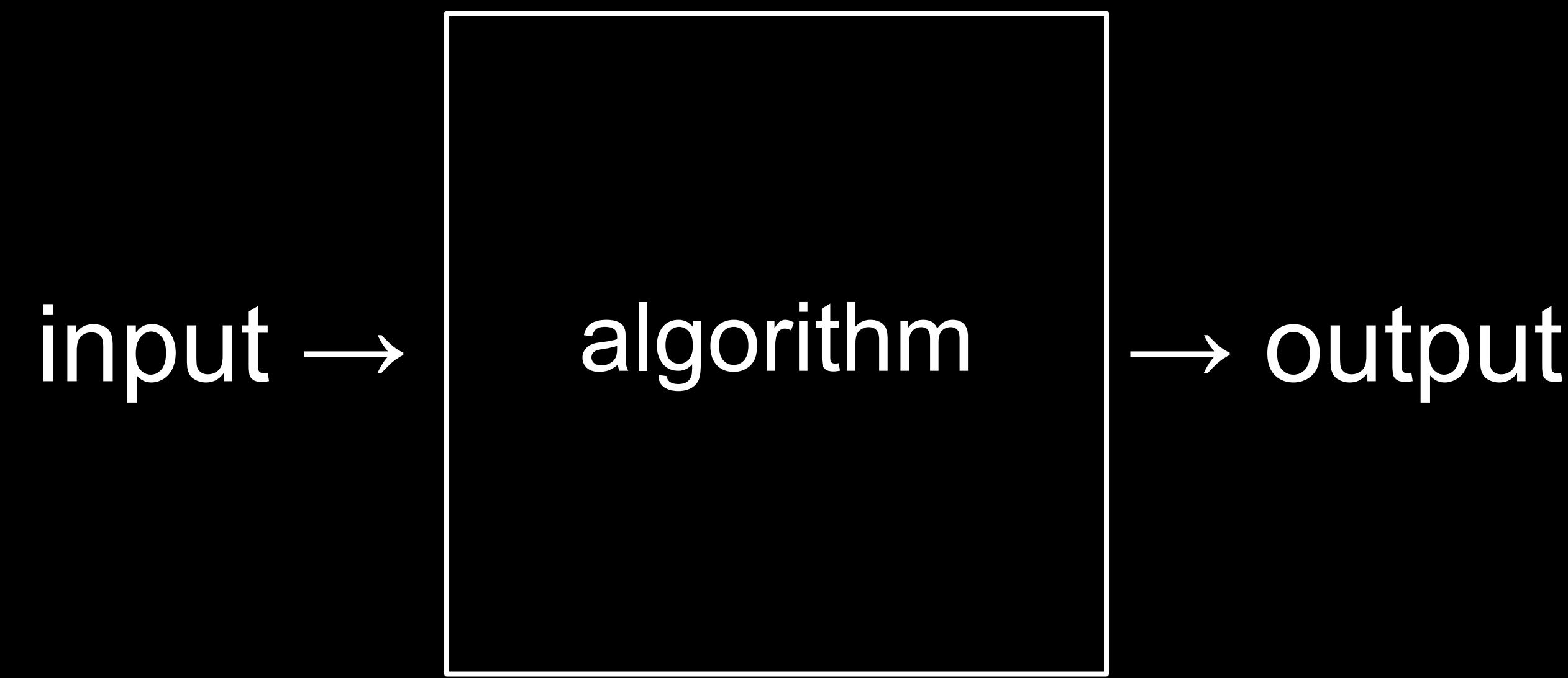
input →

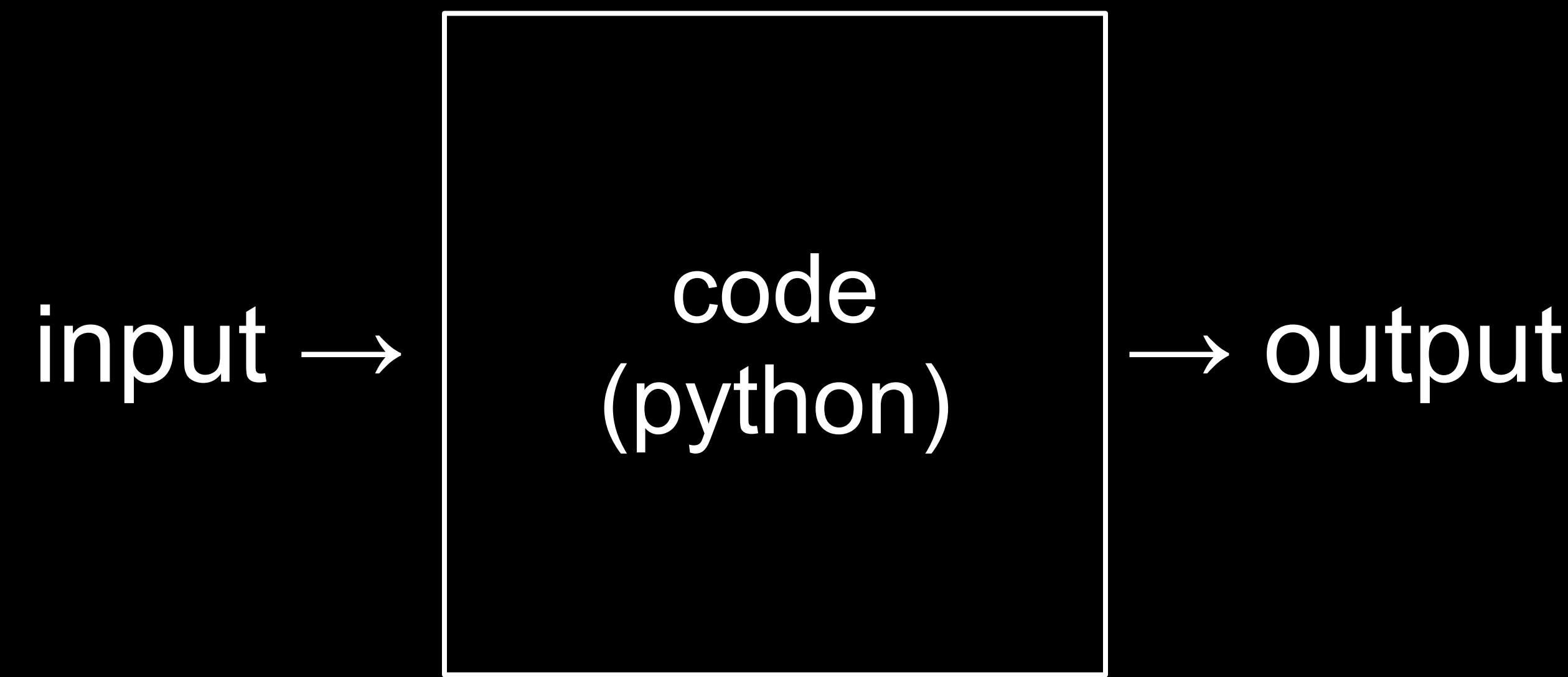
steps

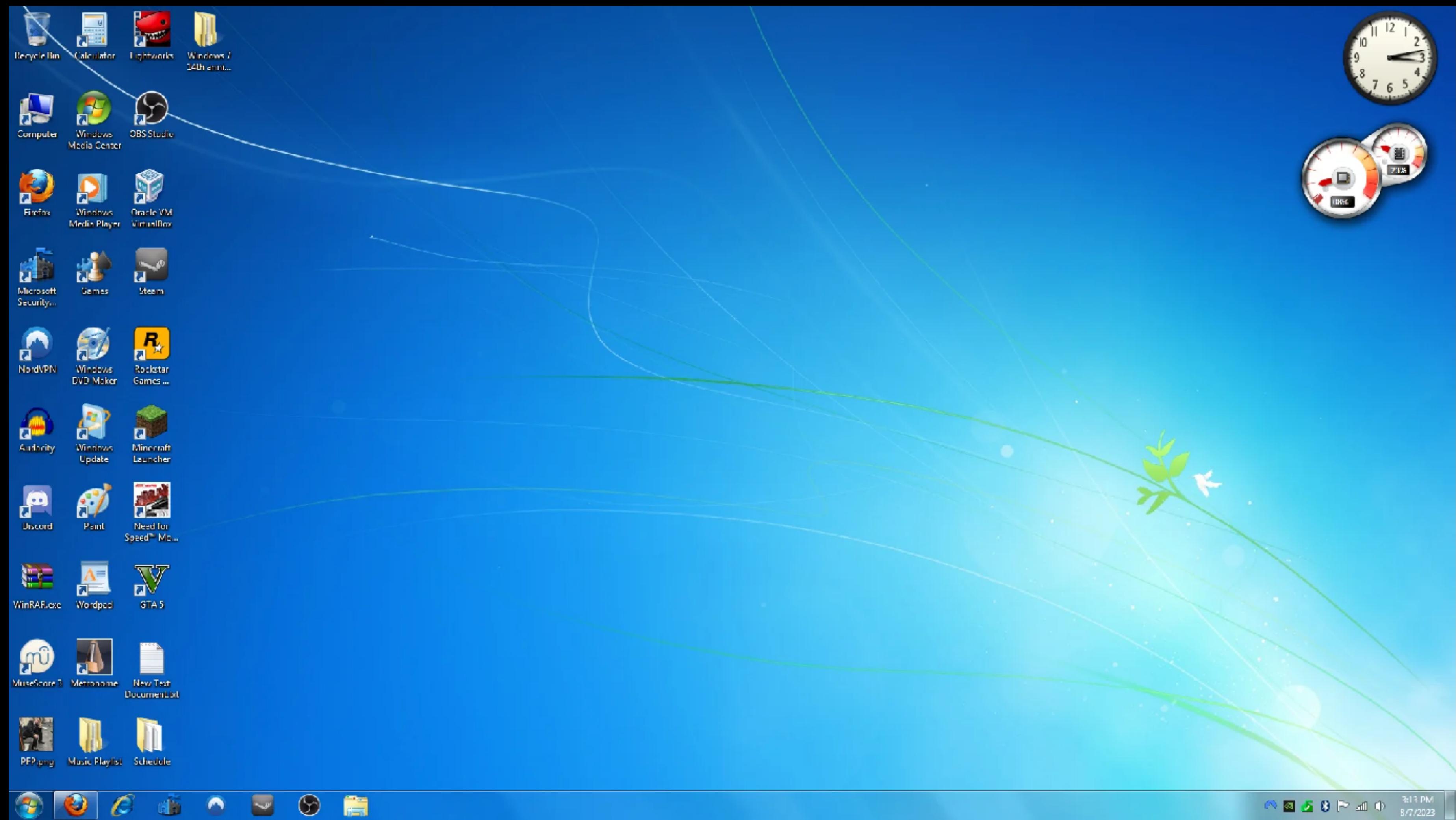
→ output



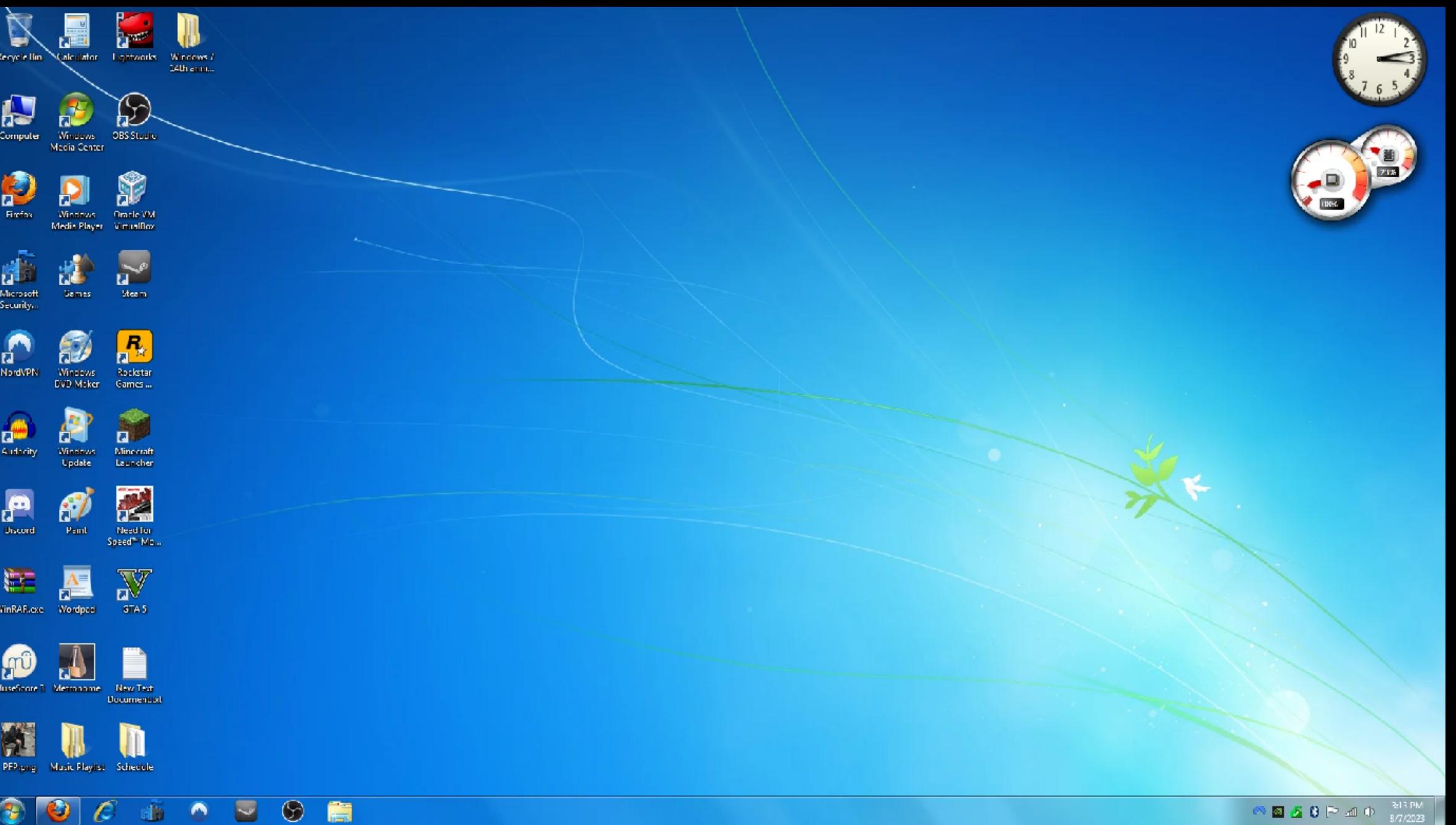








input →

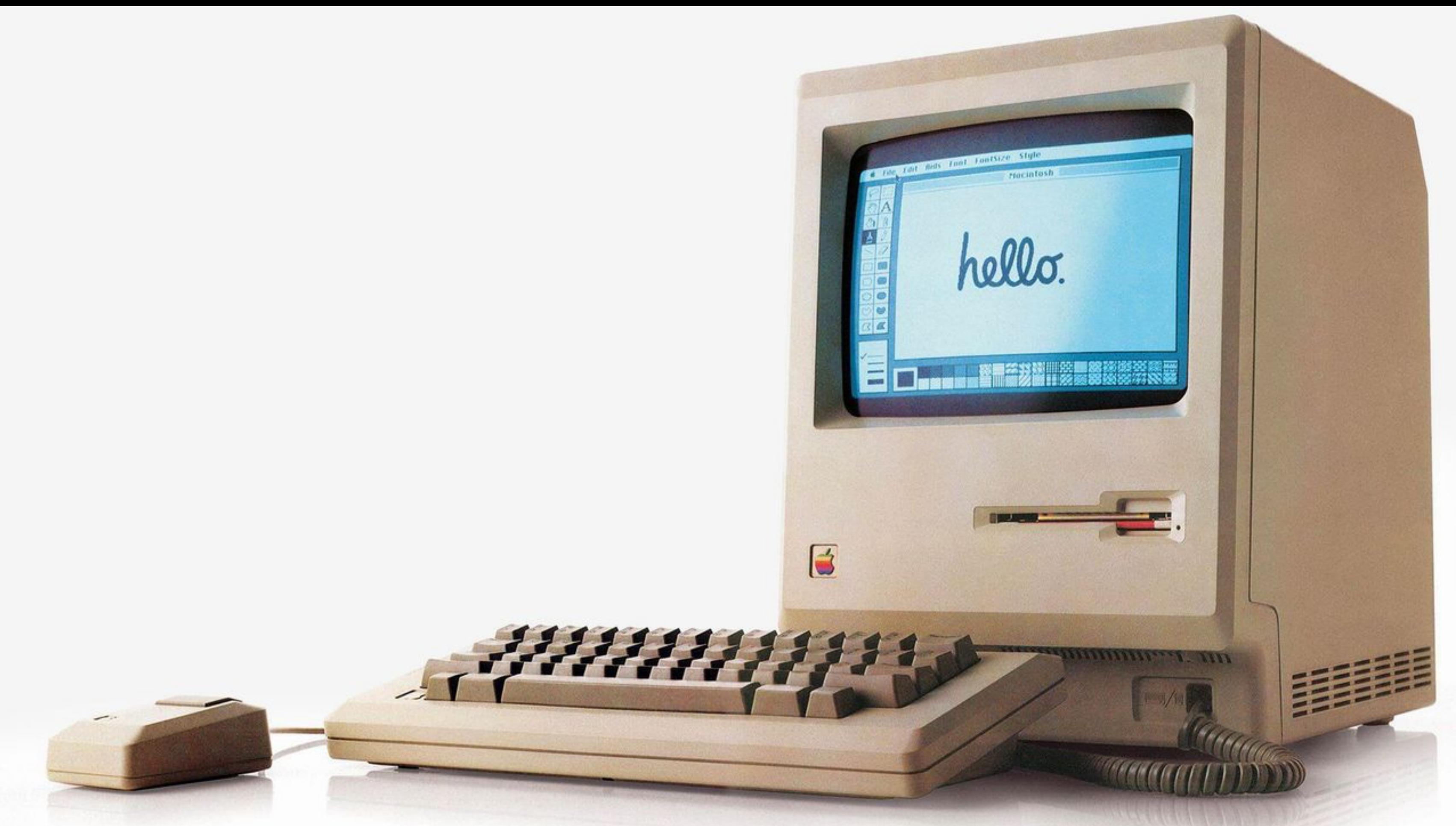


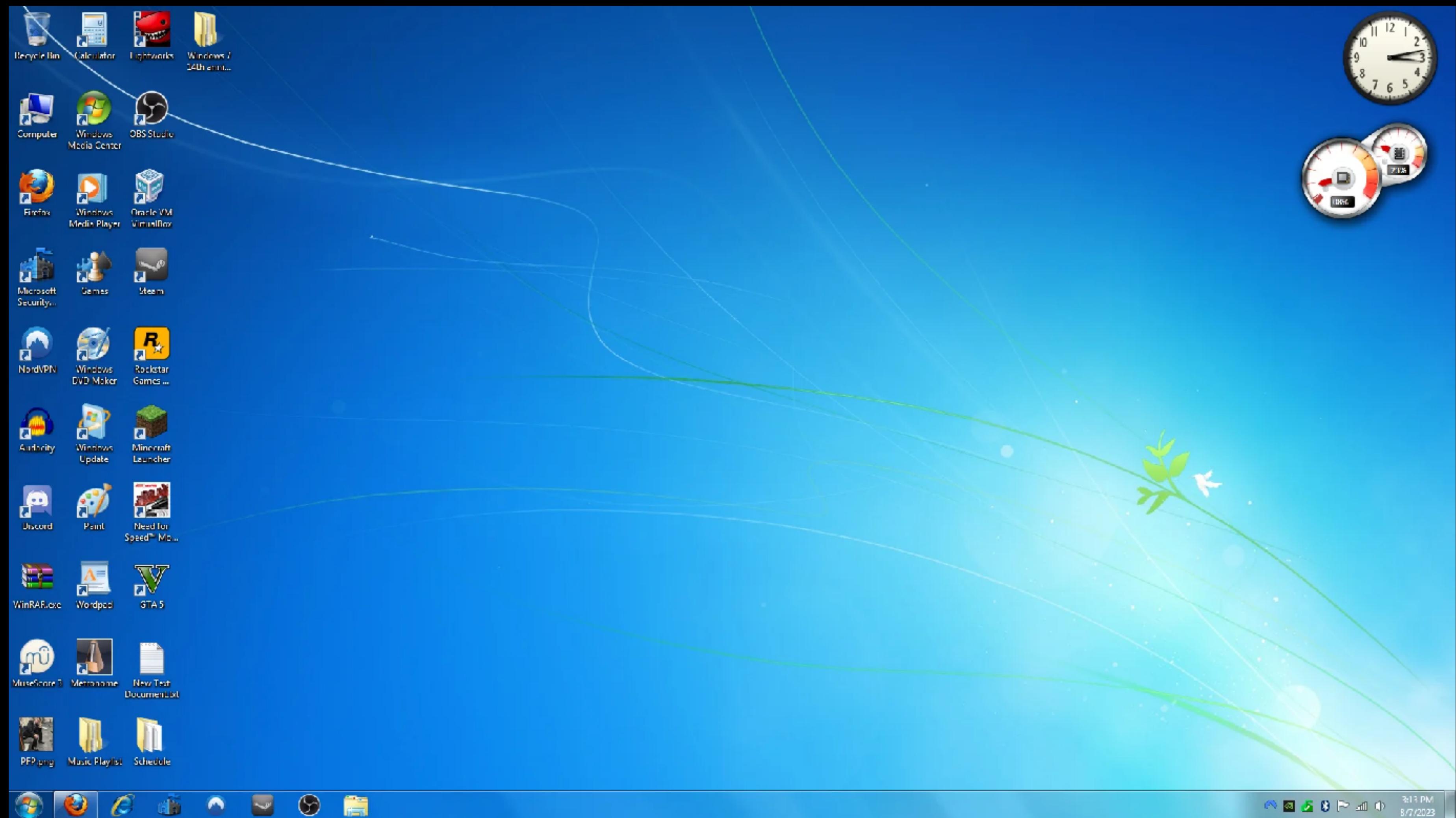
→ output

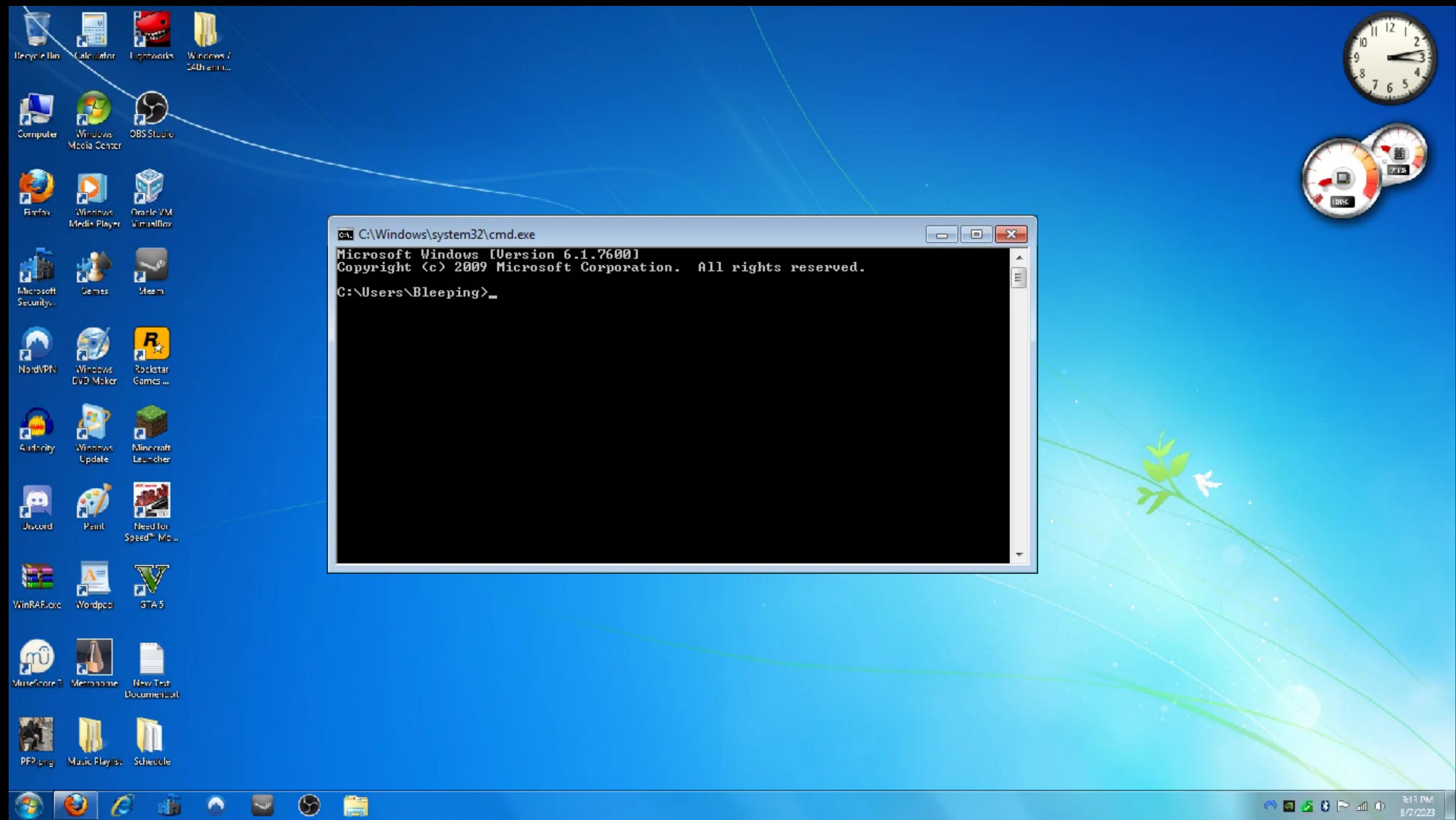
input →

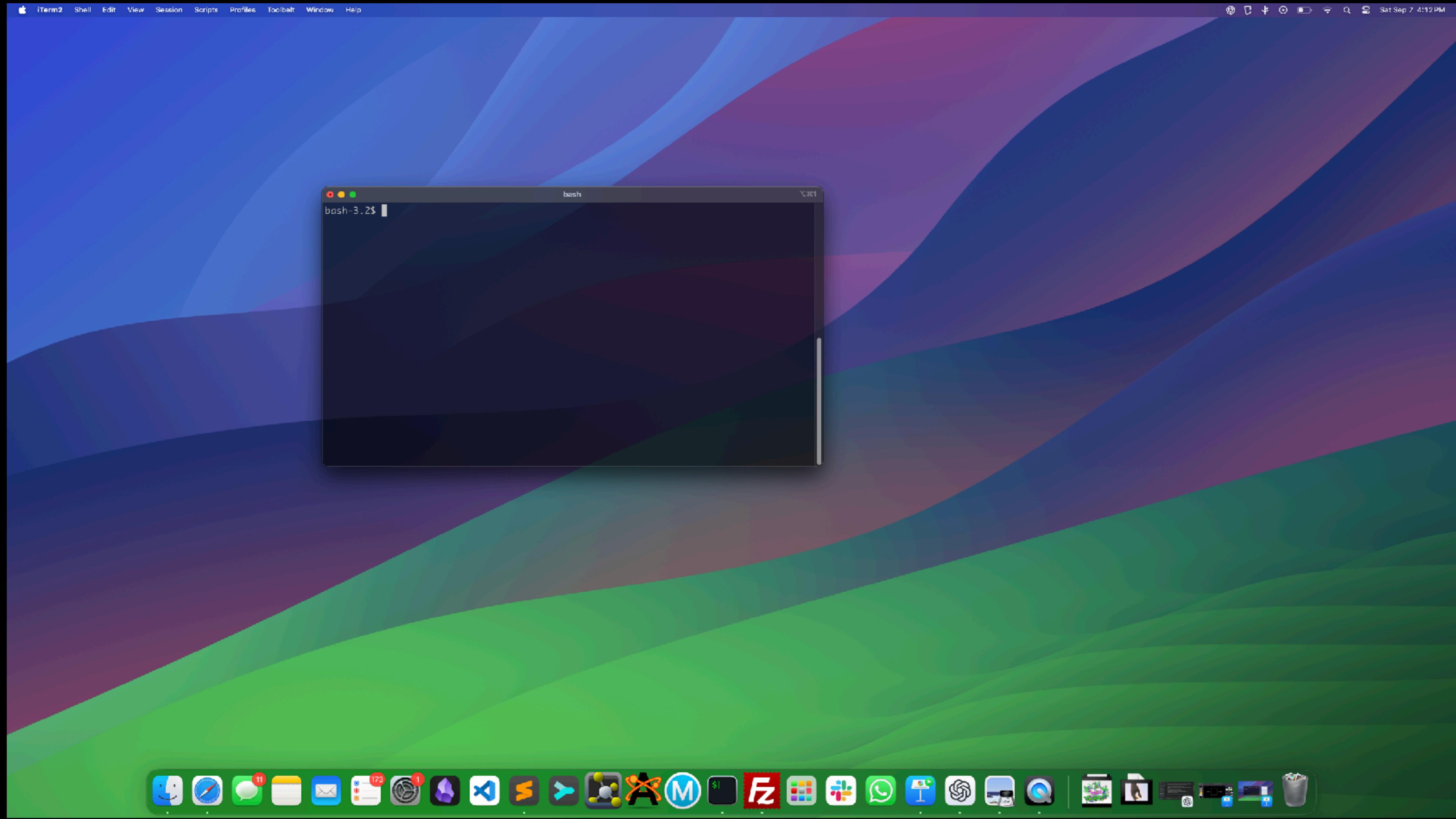


→ output

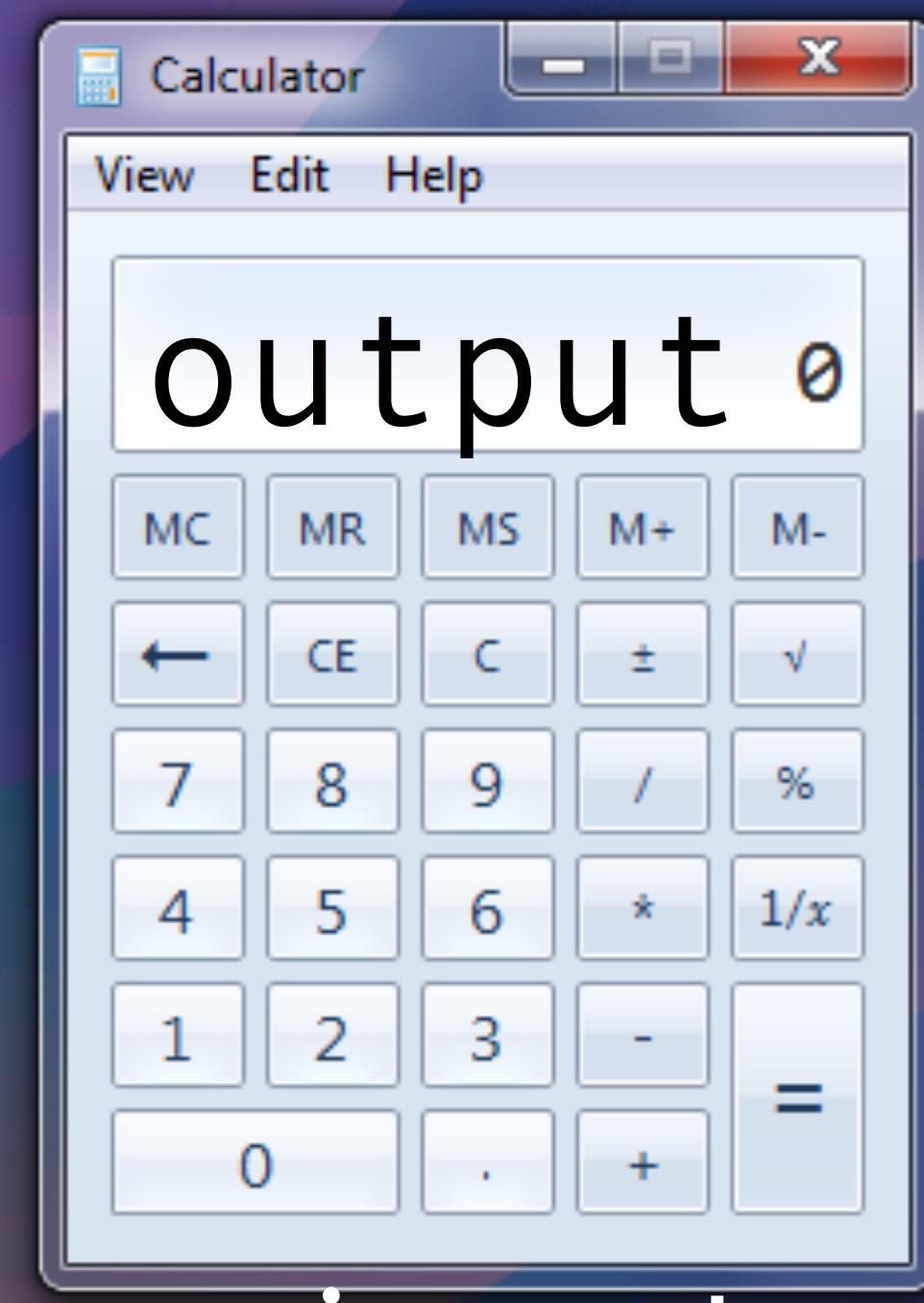
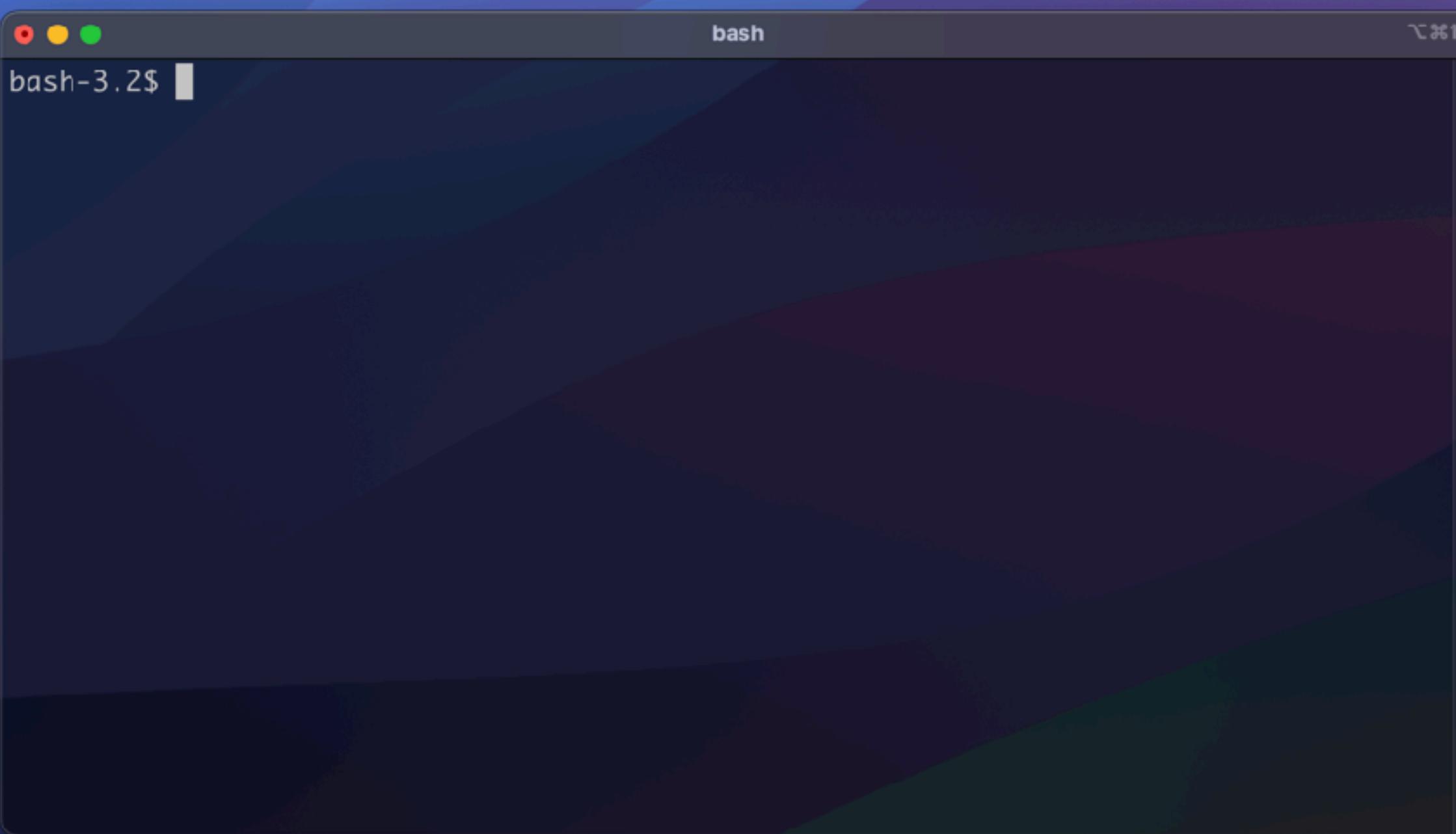




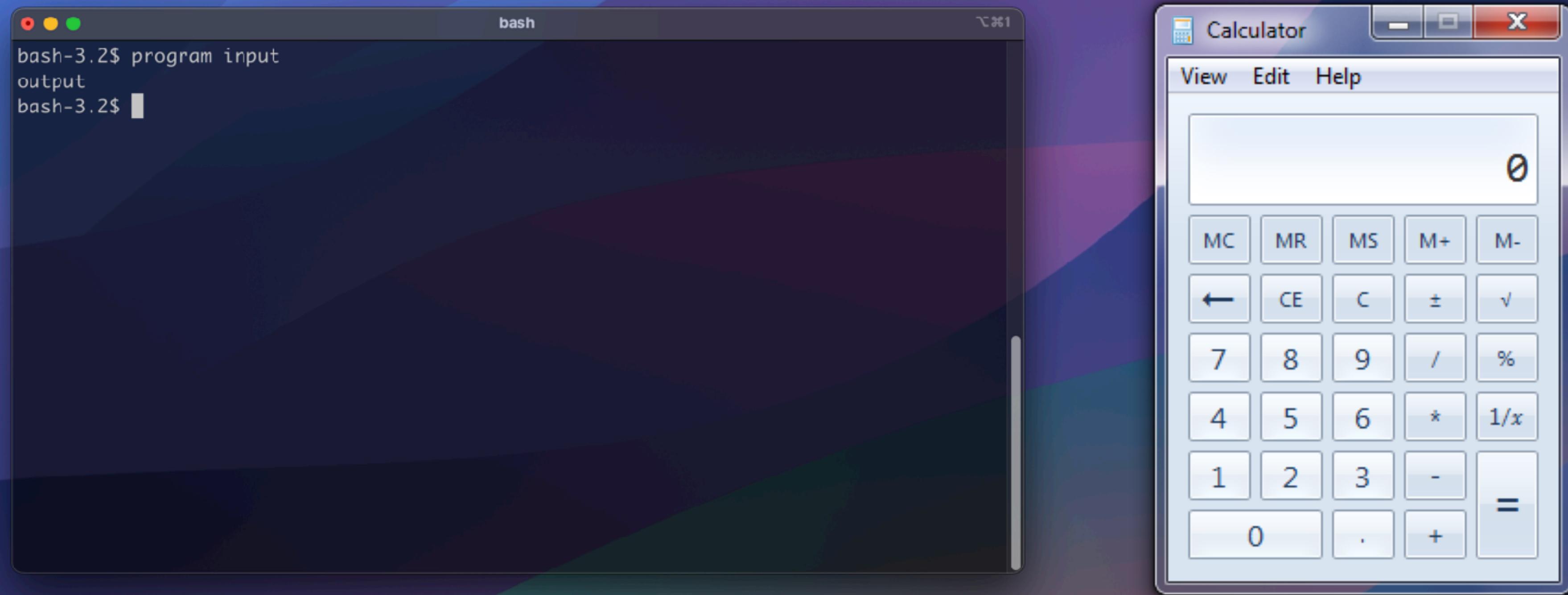




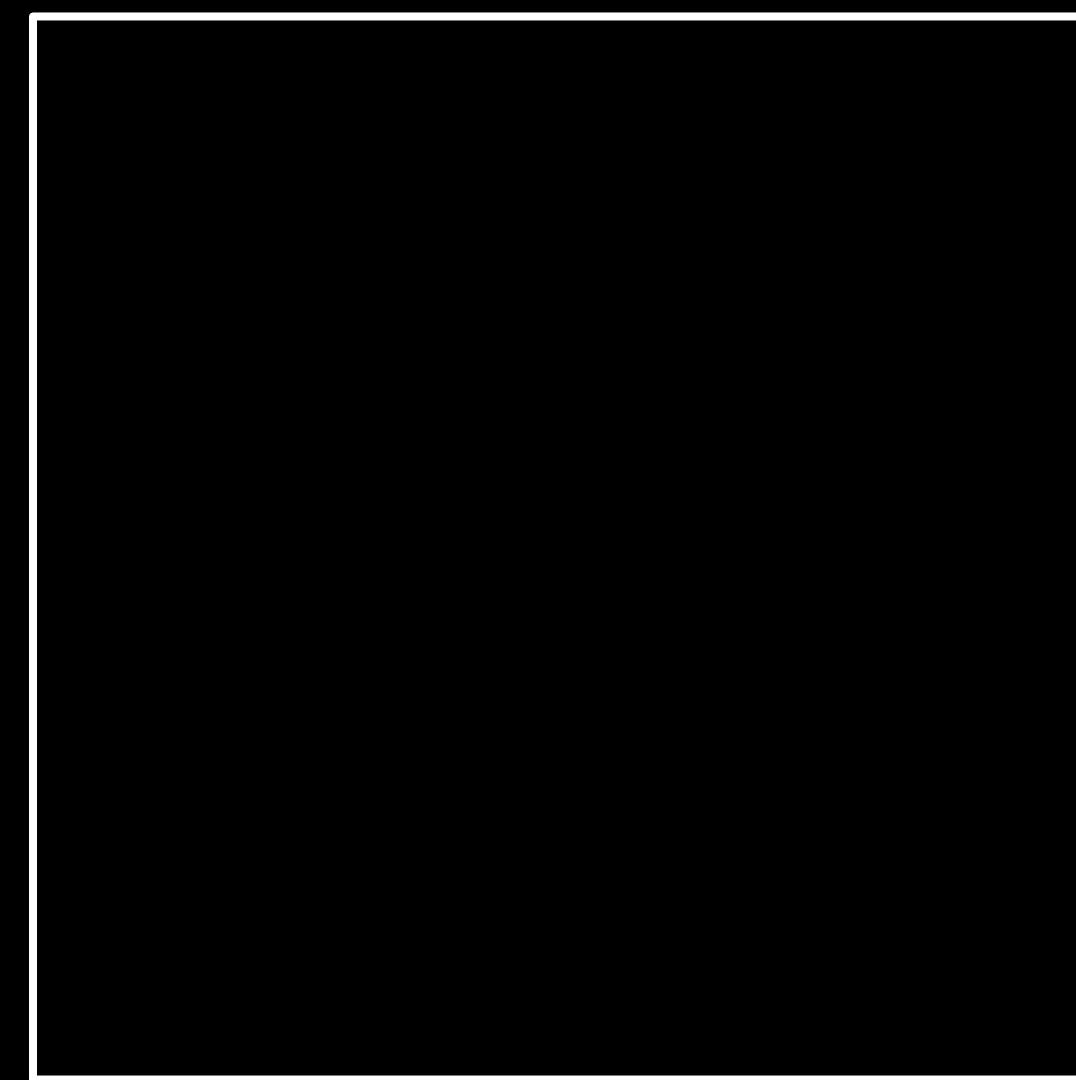
program



input



input →



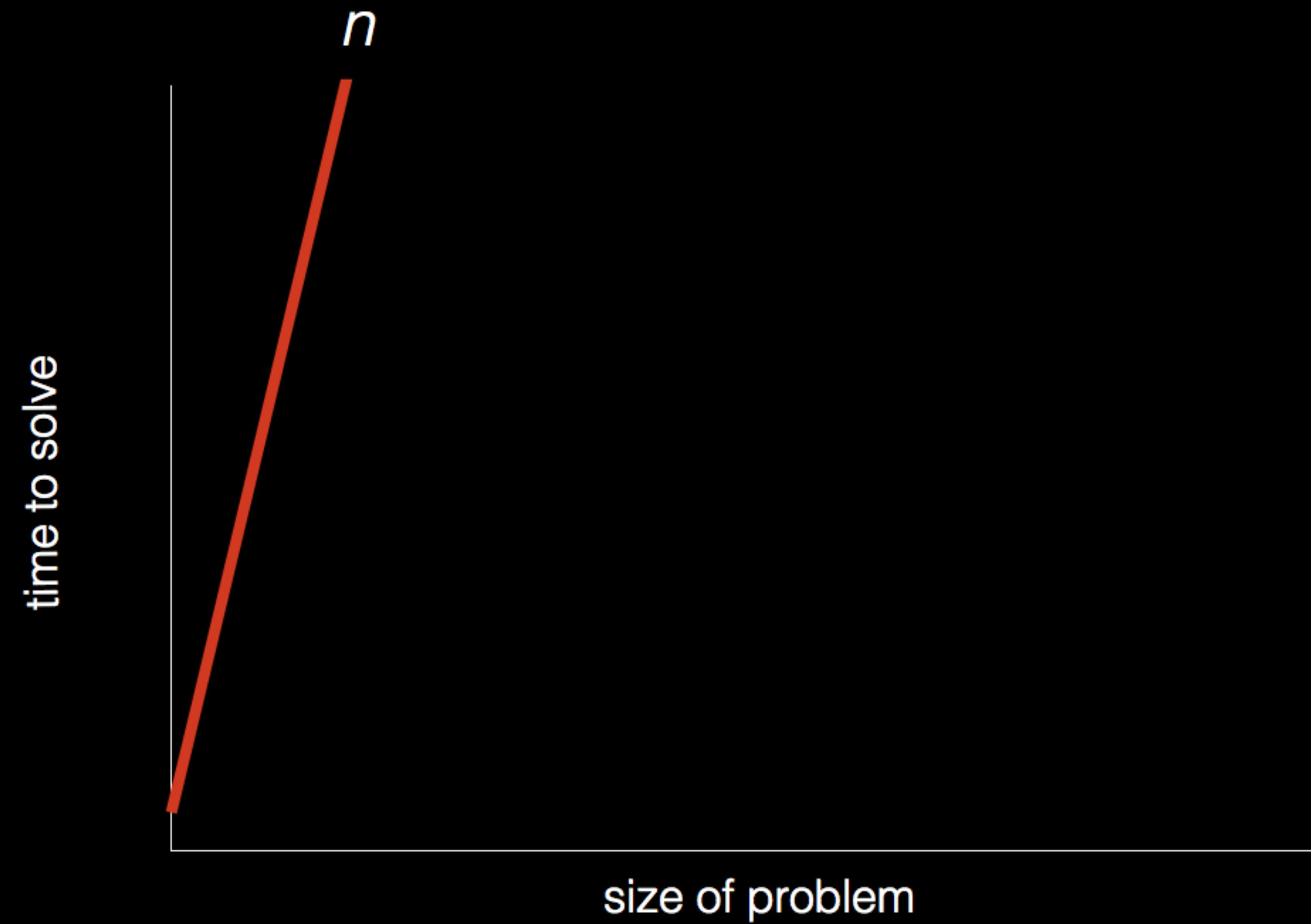
→ output

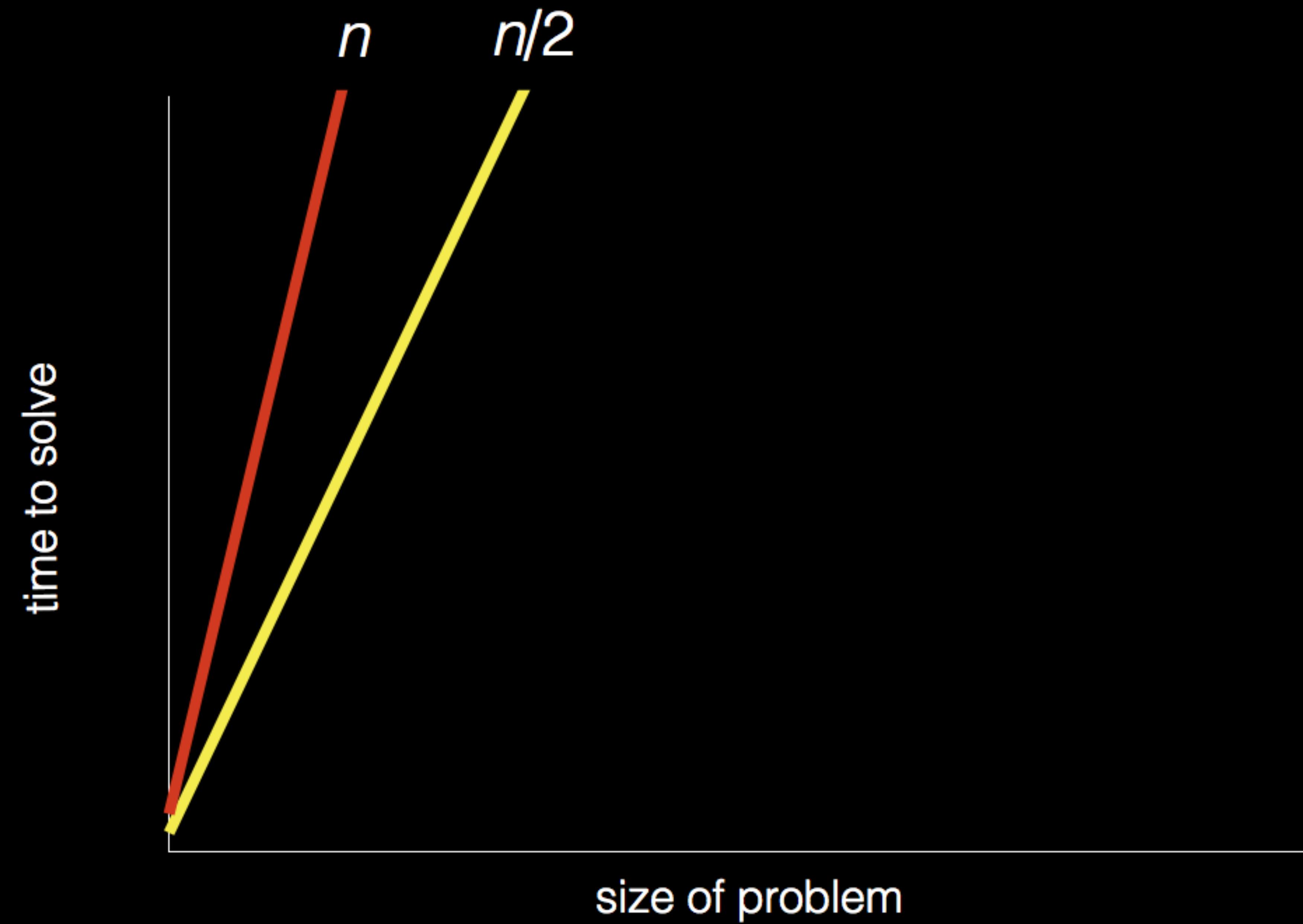
Algorithm

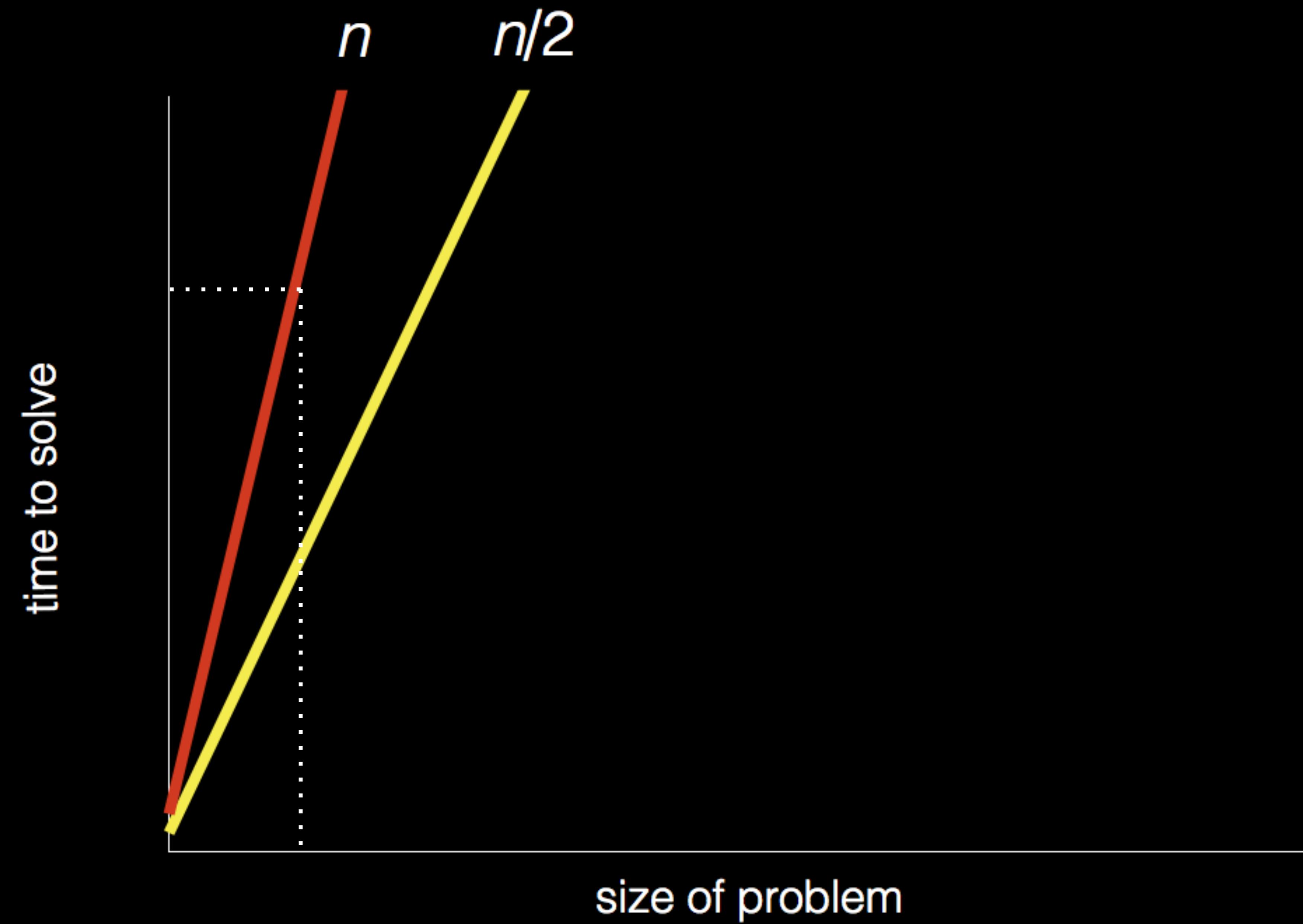
```
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20]
```

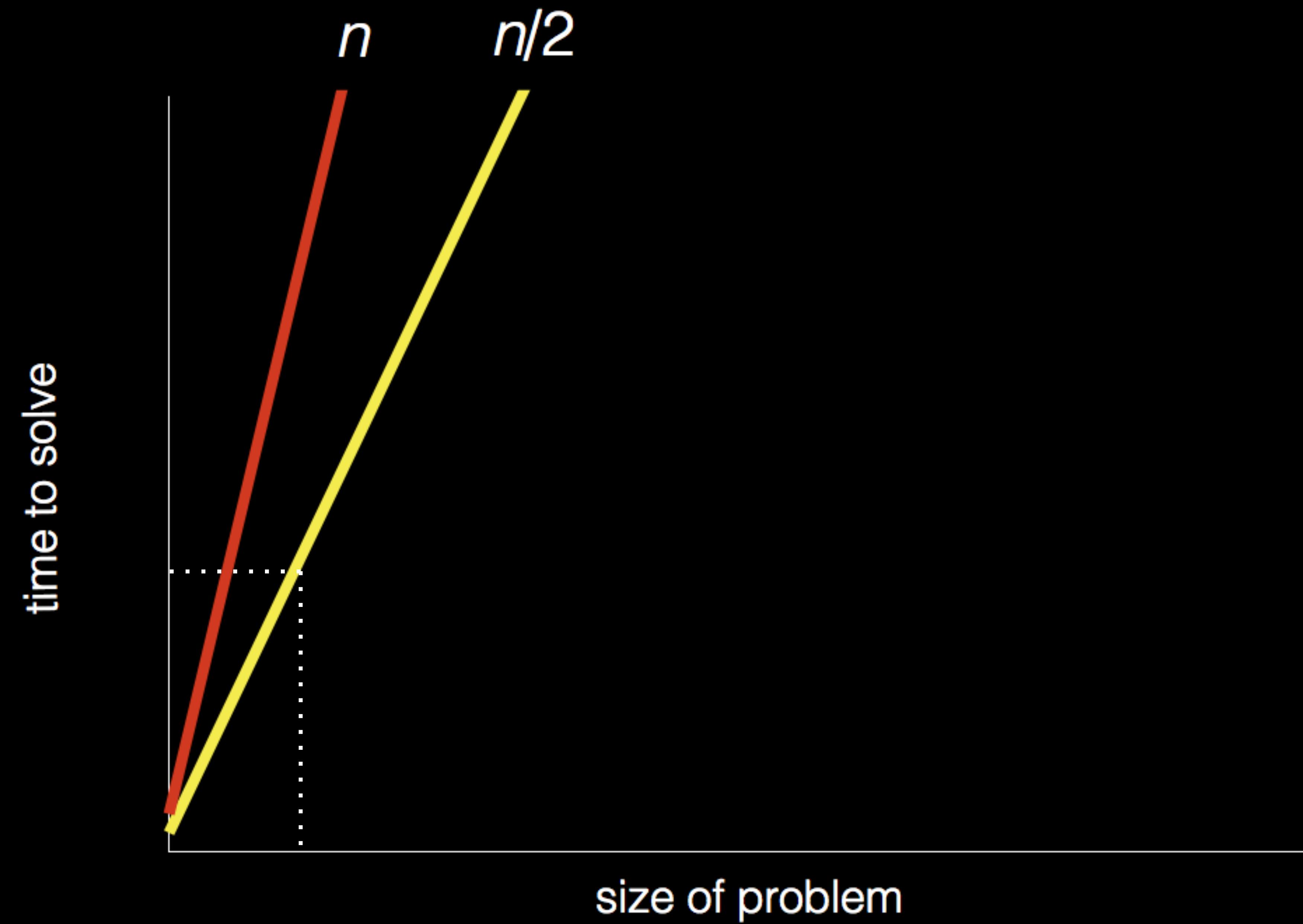
time to solve

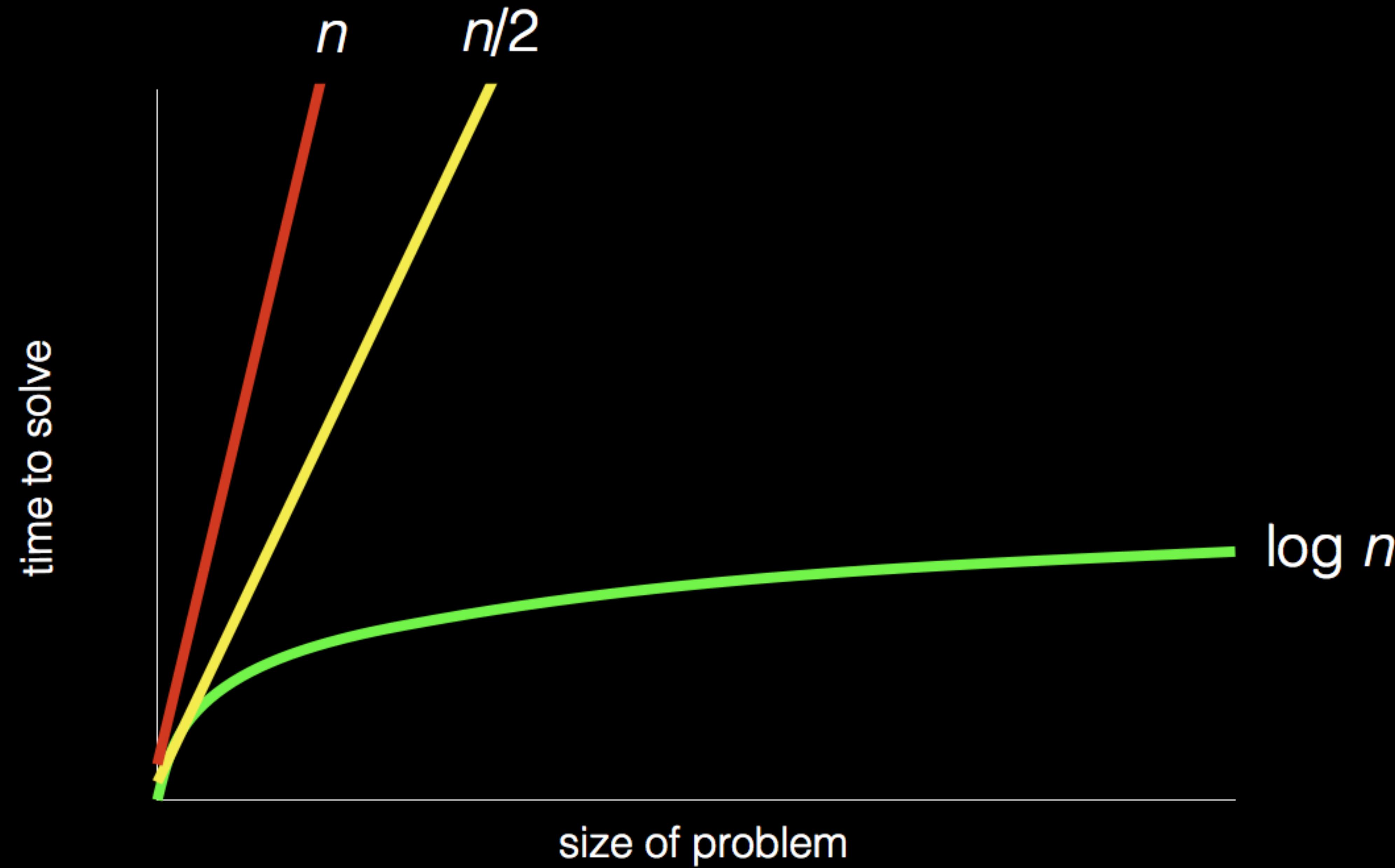
size of problem











pseudocode

```
1 Write 1 to 20
2 Select middle number
3 Enter number
4 If number is correct
5     Quit
6 Else if number is lower
7     Select middle of left half of list
8     Go back to line 3
9 Else if number is higher
10    Select middle of right half of list
11    Go back to line 3
12 Else
13     Quit
```

functions

```
1 Write 1 to 20
2 Select middle number
3 Enter number
4 If number is correct
5     Quit
6 Else if number is lower
7     Select middle of left half of list
8     Go back to line 3
9 Else if number is higher
10    Select middle of right half of list
11    Go back to line 3
12 Else
13     Quit
```

conditionals

```
1 Write 1 to 20
2 Select middle number
3 Enter number
4 If number is correct
5     Quit
6 Else if number is lower
7     Select middle of left half of list
8     Go back to line 3
9 Else if number is higher
10    Select middle of right half of list
11    Go back to line 3
12 Else
13     Quit
```

1 Write 1 to 20
2 Select middle number
3 Enter number
4 If **number** is correct
5 Quit
6 Else if **number** is lower
7 Select middle of left half of list
8 Go back to line 3
9 Else if **number** is higher
10 Select middle of right half of list
11 Go back to line 3
12 Else
13 Quit

boolean expression

loops

```
1 Write 1 to 20
2 Select middle number
3 Enter number
4 If number is correct
5     Quit
6 Else if number is lower
7     Select middle of left half of list
8     Go back to line 3
9 Else if number is higher
10    Select middle of right half of list
11    Go back to line 3
12 Else
13     Quit
```

functions
conditionals
boolean expressions

...

functions
conditionals
boolean expressions

...



Scratch

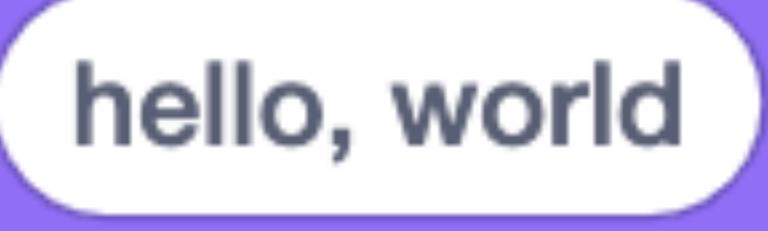
scratch.mit.edu

functions
conditionals
boolean expressions

...



when  clicked

say  hello, world



Code

Costumes

Sounds

 Motion**Motion**

move (10) steps

turn (15) degrees

turn (15) degrees

go to [random position]

go to x: (0) y: (0)

glide (1) secs to [random position]

glide (1) secs to x: (0) y: (0)

point in direction (90)

point towards [mouse-pointer]

change x by (10)

set x to (0)

change y by (10)



Sprite **Sprite1** x: (0) y: (0)

Show

Size (100) Direction (90)

Sprite1

Stage

Backdrops

1



Code

Costumes

Sounds

Motion

Motion

move 10 steps

turn 15 degrees

turn 15 degrees

go to random position ▾

go to x: 0 y: 0

glide 1 secs to random position ▾

glide 1 secs to x: 0 y: 0

point in direction 90

point towards mouse-pointer ▾

change x by 10

set x to 0

change y by 10

Looks

Sound

Events

Control

Sensing

Operators

Variables

My Blocks



Integrated Development Environment (IDE)

Sprite Sprite1 Stage

Show Size Direction

x: 0 y: 0 90

Backdrops 1

Sprite1

Operations

Control

Sensing

Variables

Operators

Events

Looks

Motion

Sound

Costumes

Code

Code Costumes Sounds

Motion

move 10 steps

turn 15 degrees

turn 15 degrees

go to random position

go to x: 0 y: 0

glide 1 secs to random position

glide 1 secs to x: 0 y: 0

point in direction 90

point towards mouse-pointer

change x by 10

set x to 0

change y by 10

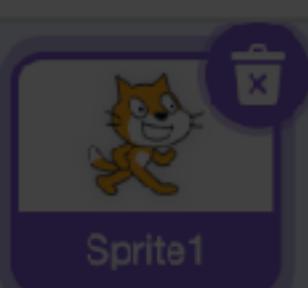


Sprite Sprite1 ↔ x 0 ↔ y 0

Show [] []

Size 100

Direction 90



Stage

Backdrops

1



Code

Costumes

Sounds

Motion

Looks

Sound

Events

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Sensing

Operators

Variables

My Blocks

Motion

move (10) steps

turn (15) degrees

turn (15) degrees

go to [random position]

go to x: (0) y: (0)

glide (1) secs to [random position]

glide (1) secs to x: (0) y: (0)

point in direction (90)

point towards [mouse-pointer]

change x by (10)

set x to (0)

change y by (10)



Sprite Sprite1 ↔ x (0) ↔ y (0)
Show Size (100) Direction (90)



Stage

Backdrops

1

Code Costumes Sounds

Motion

move 10 steps

turn 15 degrees

turn 15 degrees

go to random position

go to x: 0 y: 0

glide 1 secs to random position

glide 1 secs to x: 0 y: 0

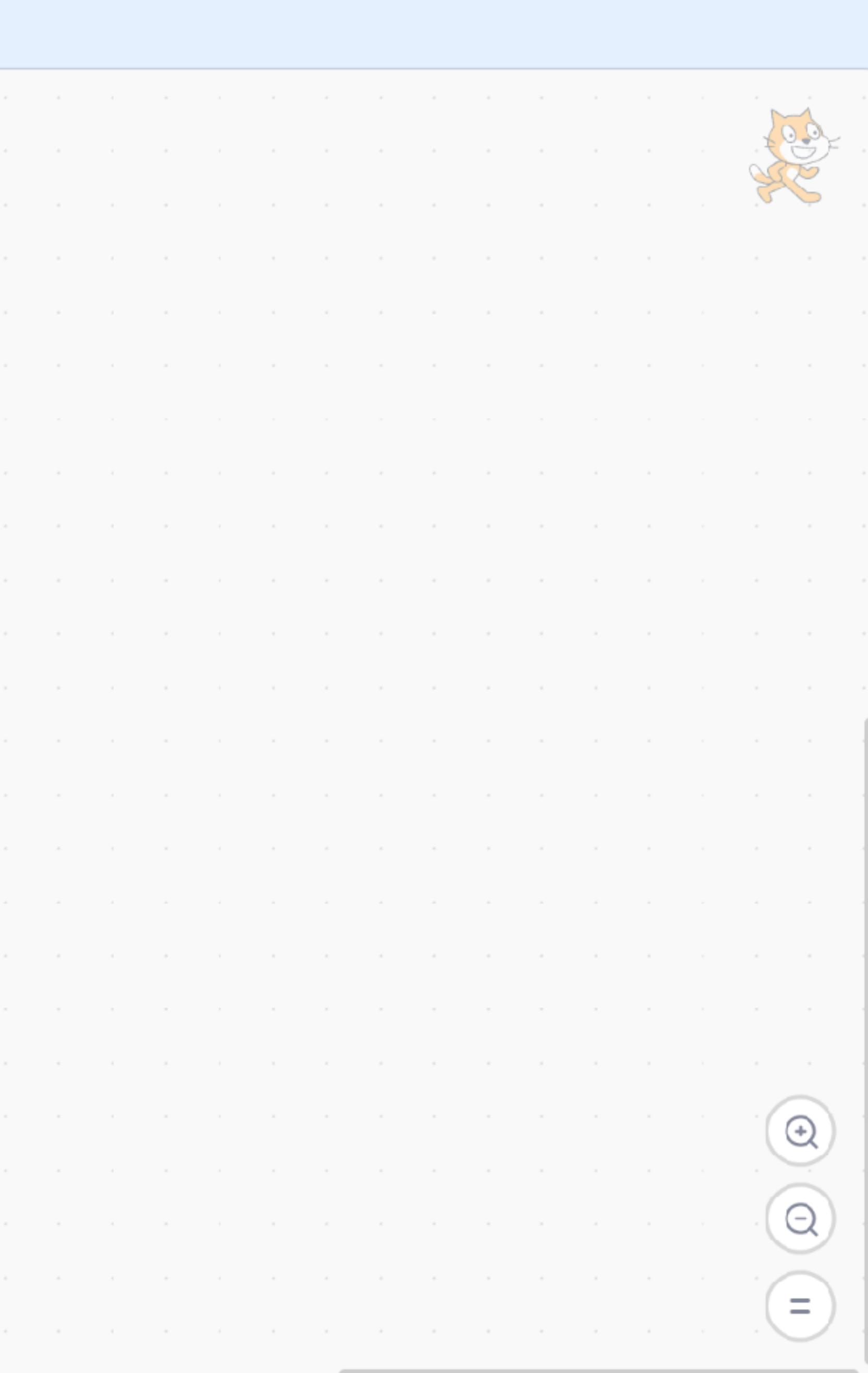
point in direction 90

point towards mouse-pointer

change x by 10

set x to 0

change y by 10



Green flag Red hat

Sprite

Sprite1

x 0

y 0

Show



Size

100

Direction

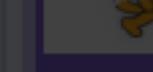
90

Backdrops

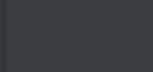
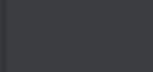
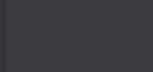
Stage

1

1



Sprite1



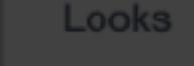
Code Costumes Sounds



Motion

Motion

move (10) steps



Sound



Events



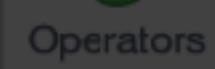
Control



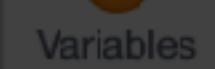
Sensing



Operators



Variables



My Blocks

Motion

move (10) steps

turn (15) degrees

turn (15) degrees

go to [random position]

go to x: (0) y: (0)

glide (1) secs to [random position]

glide (1) secs to x: (0) y: (0)

point in direction (90)

point towards [mouse-pointer]

change x by (10)

set x to (0)

change y by (10)



Sprite Sprite1 x: 0 y: 0

Show [Target v] [No backdrop v] Size 100 Direction 90

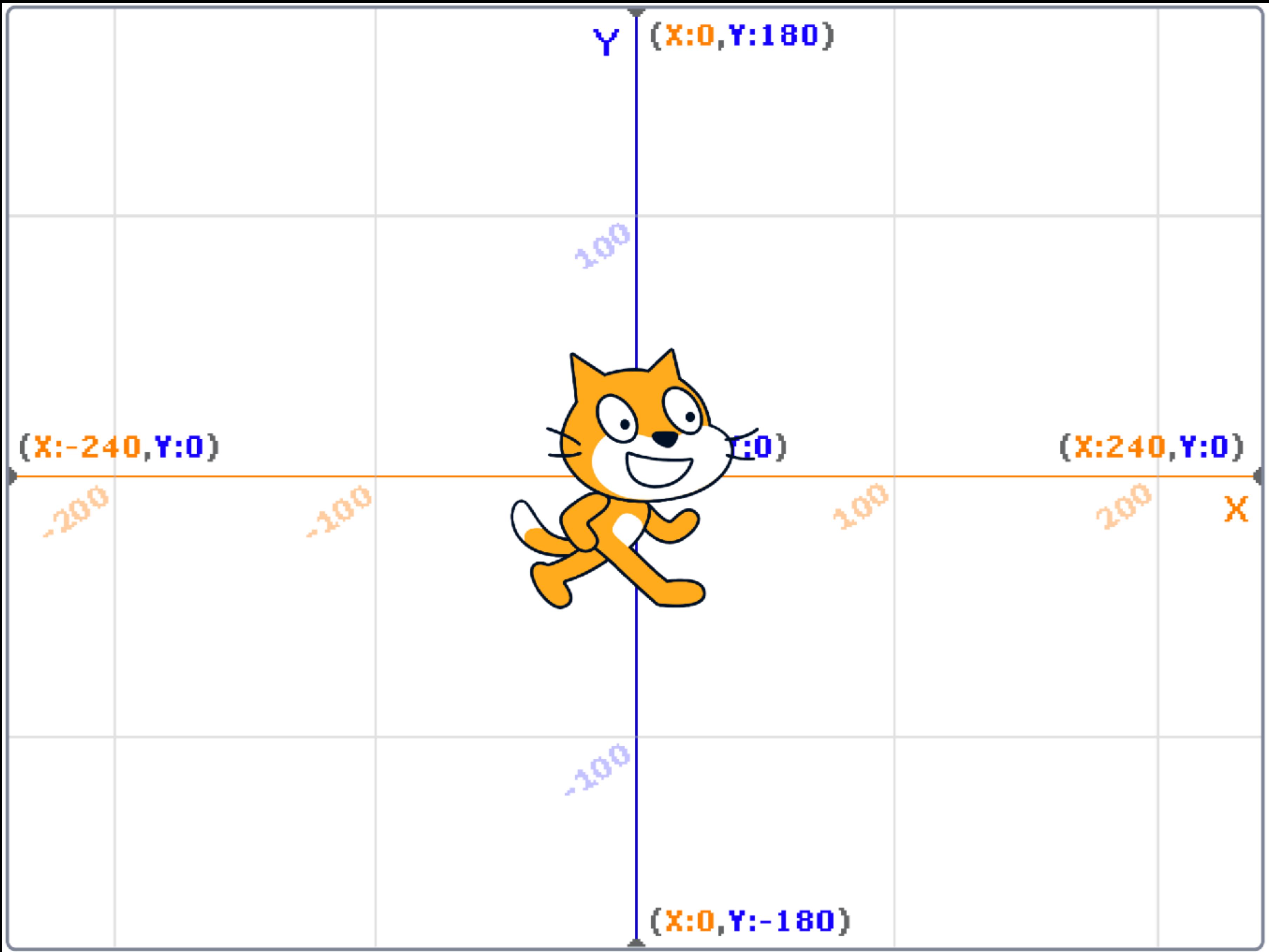
Sprite1

Stage

Backdrops

1





say

hello, world

input → algorithm → output

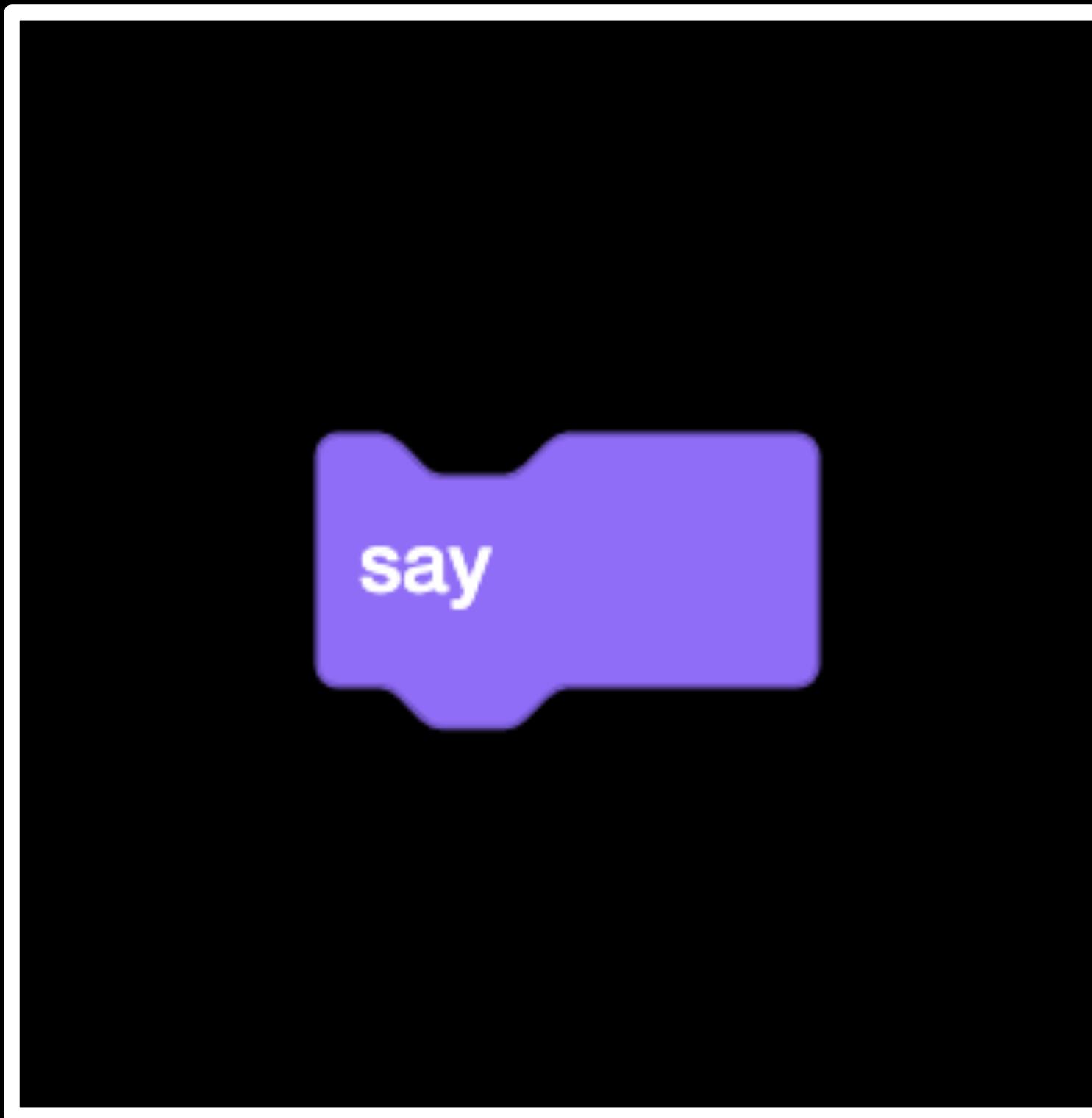
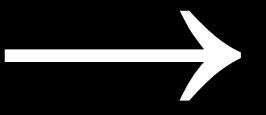
hello, world



algorithm

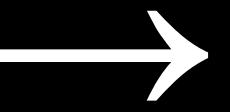
→ output

hello, world



→ output

hello, world



ask

What's your name?

and wait

input → algorithm → output

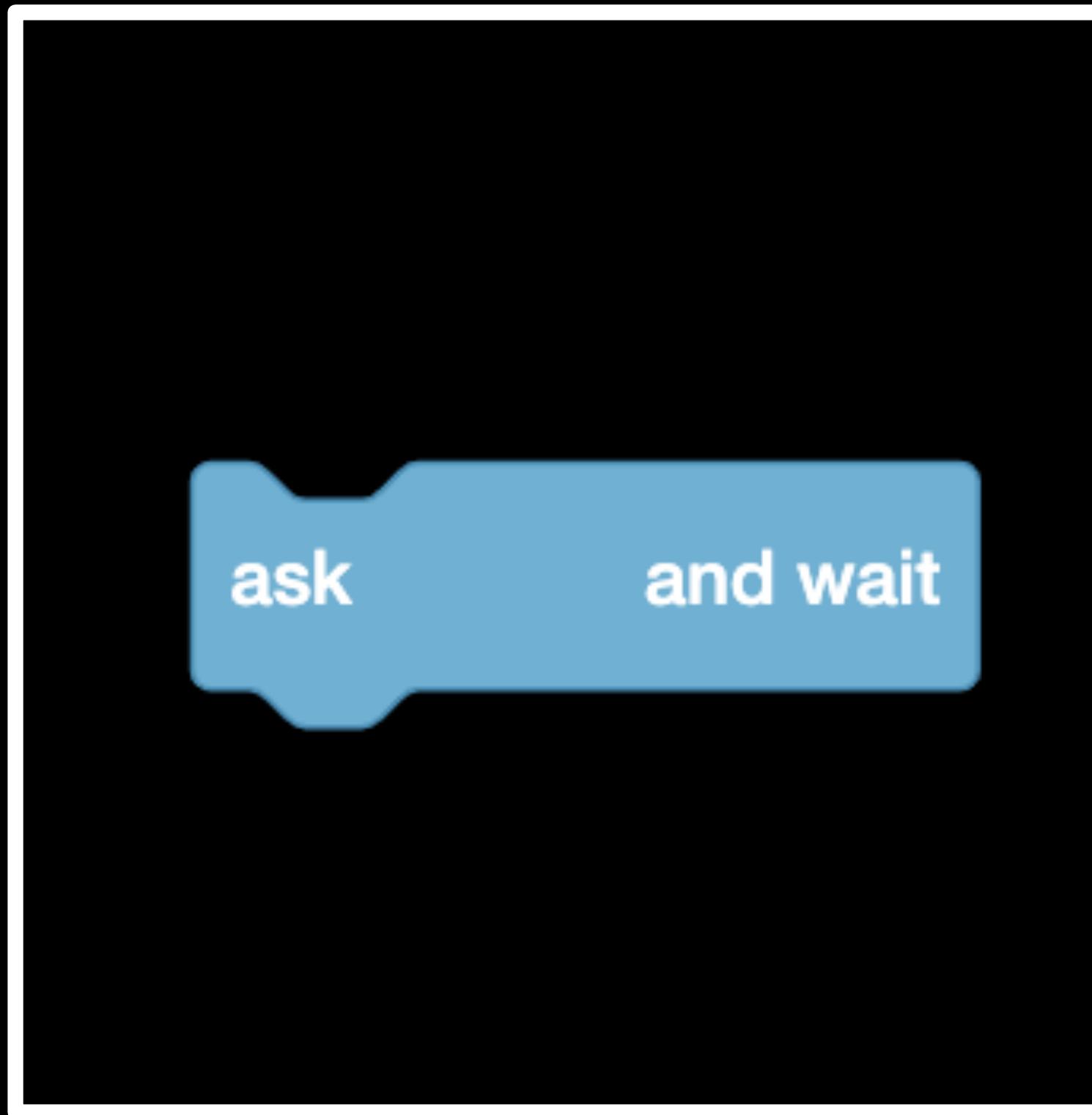
What's your name?



algorithm

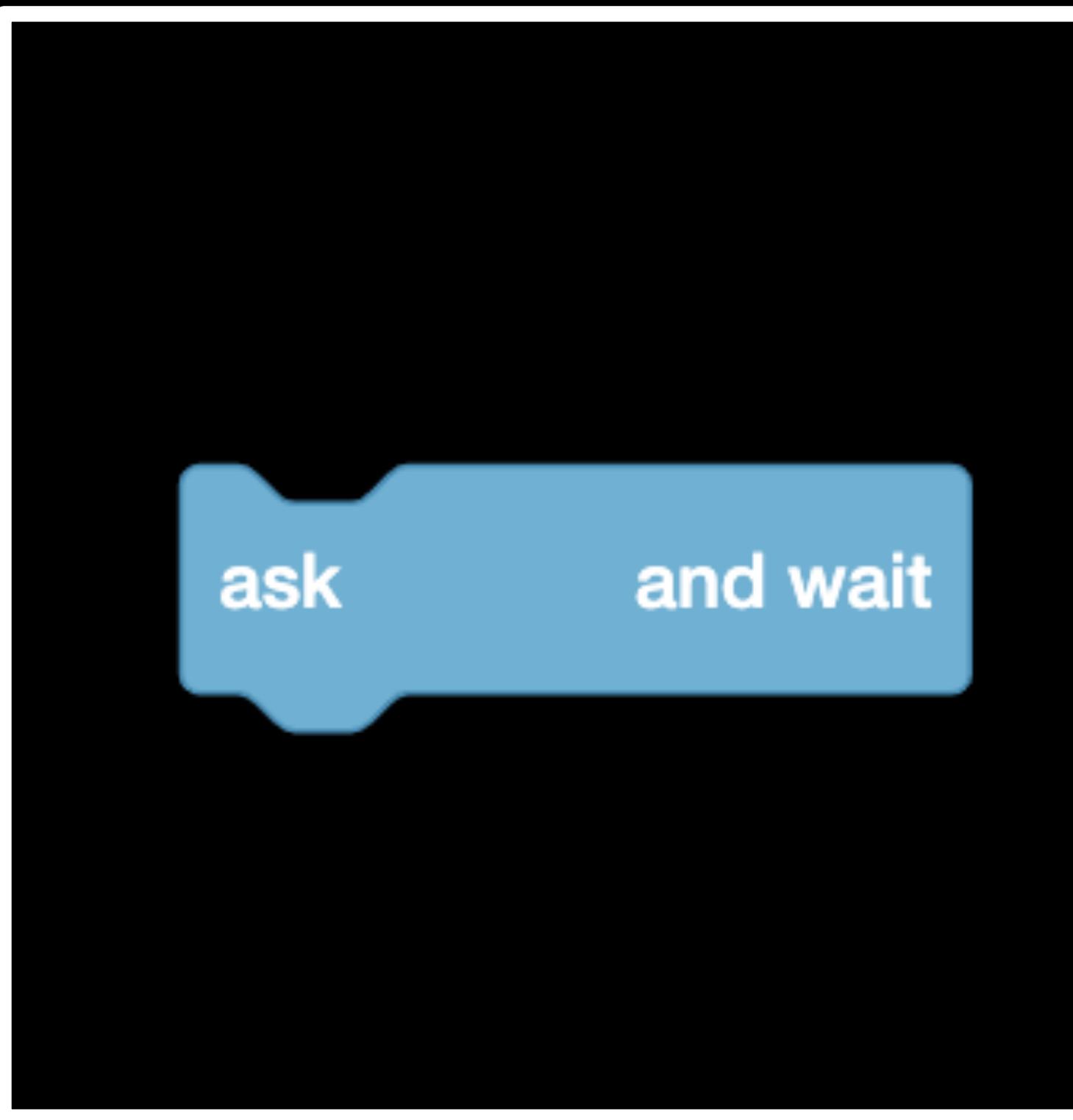
→ output

What's your name?



→ output

What's your name?



answer

say

join

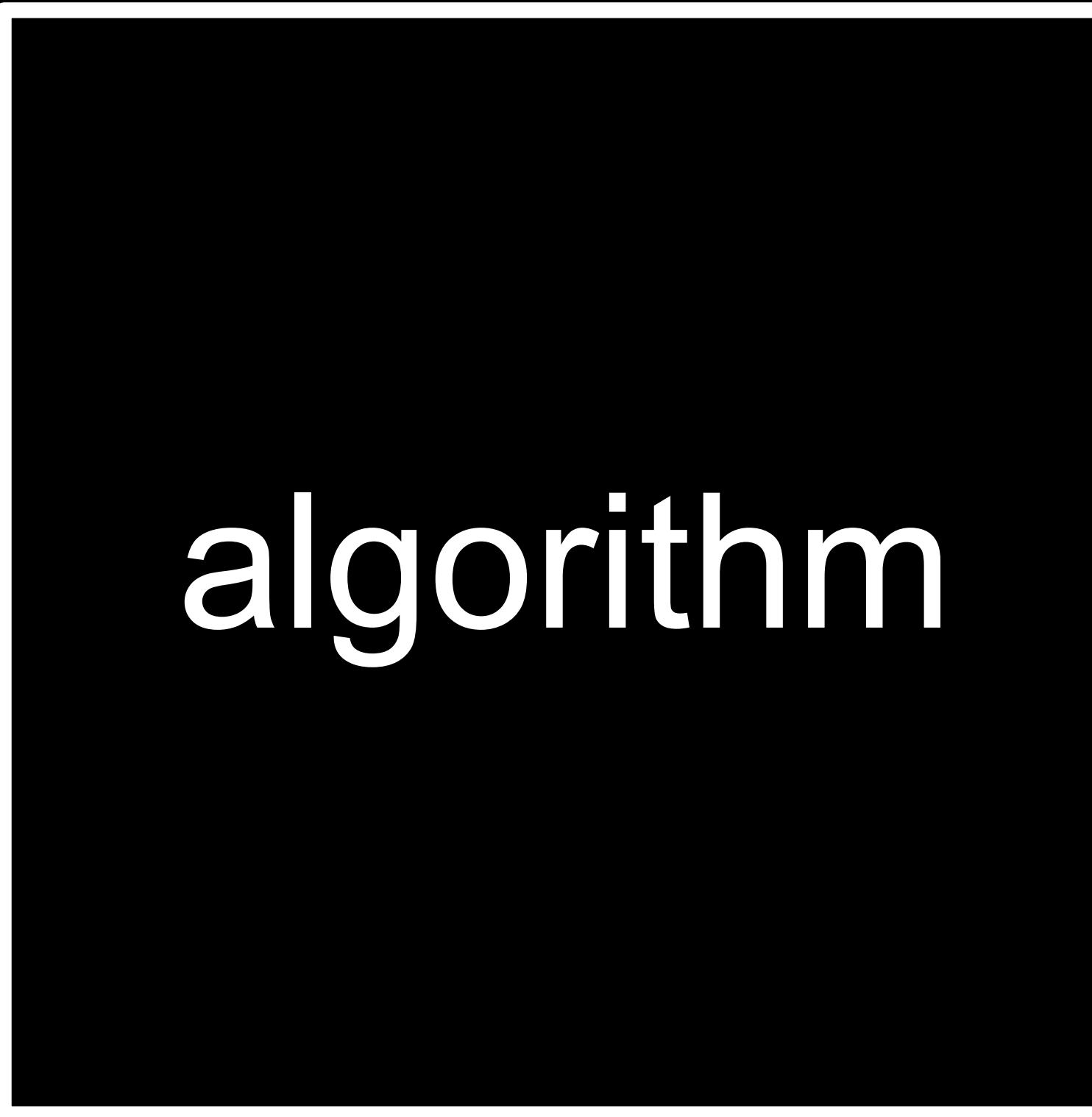
hello,

answer

input → algorithm → output

hello,

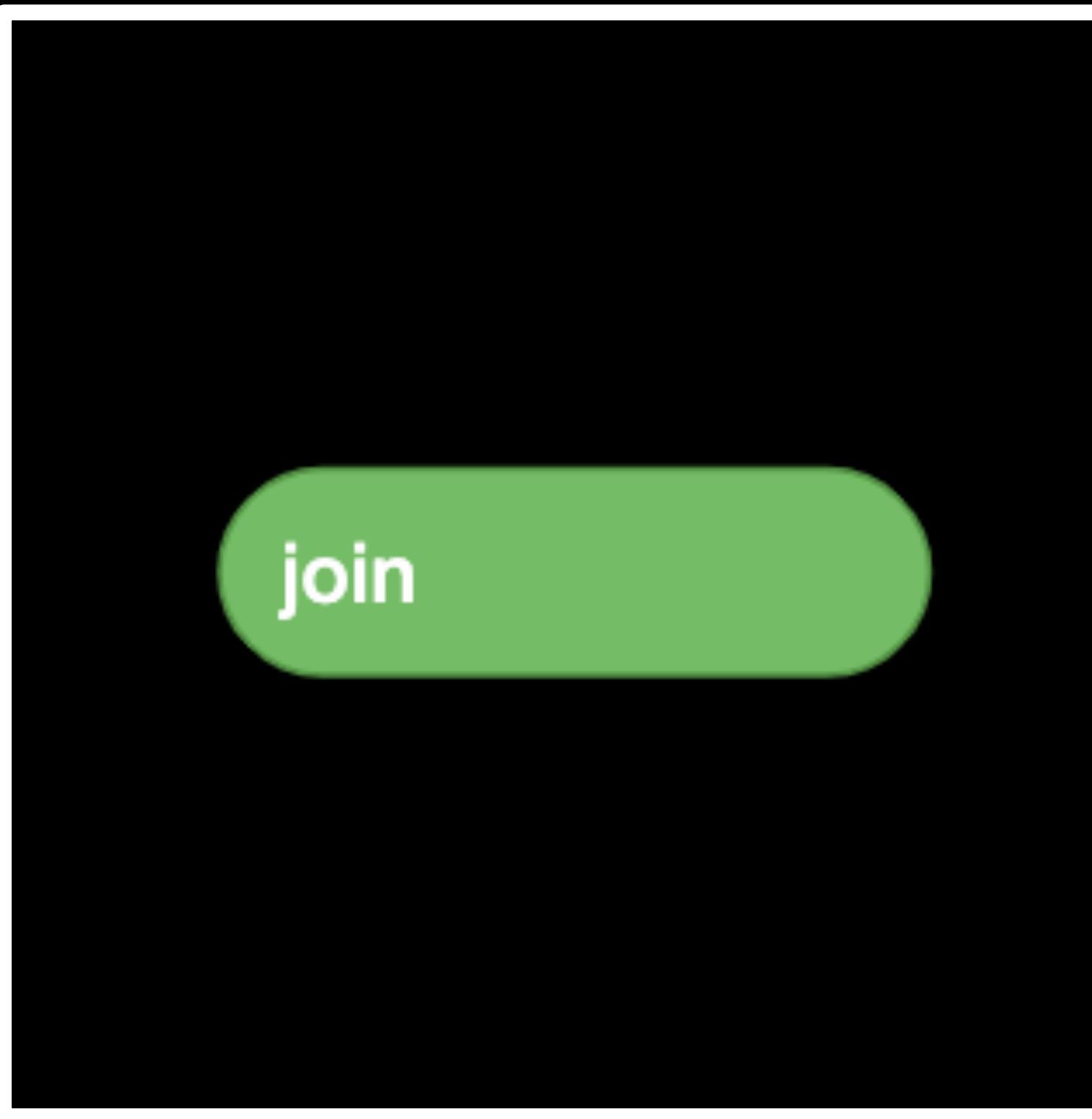
answer



→ output

hello,

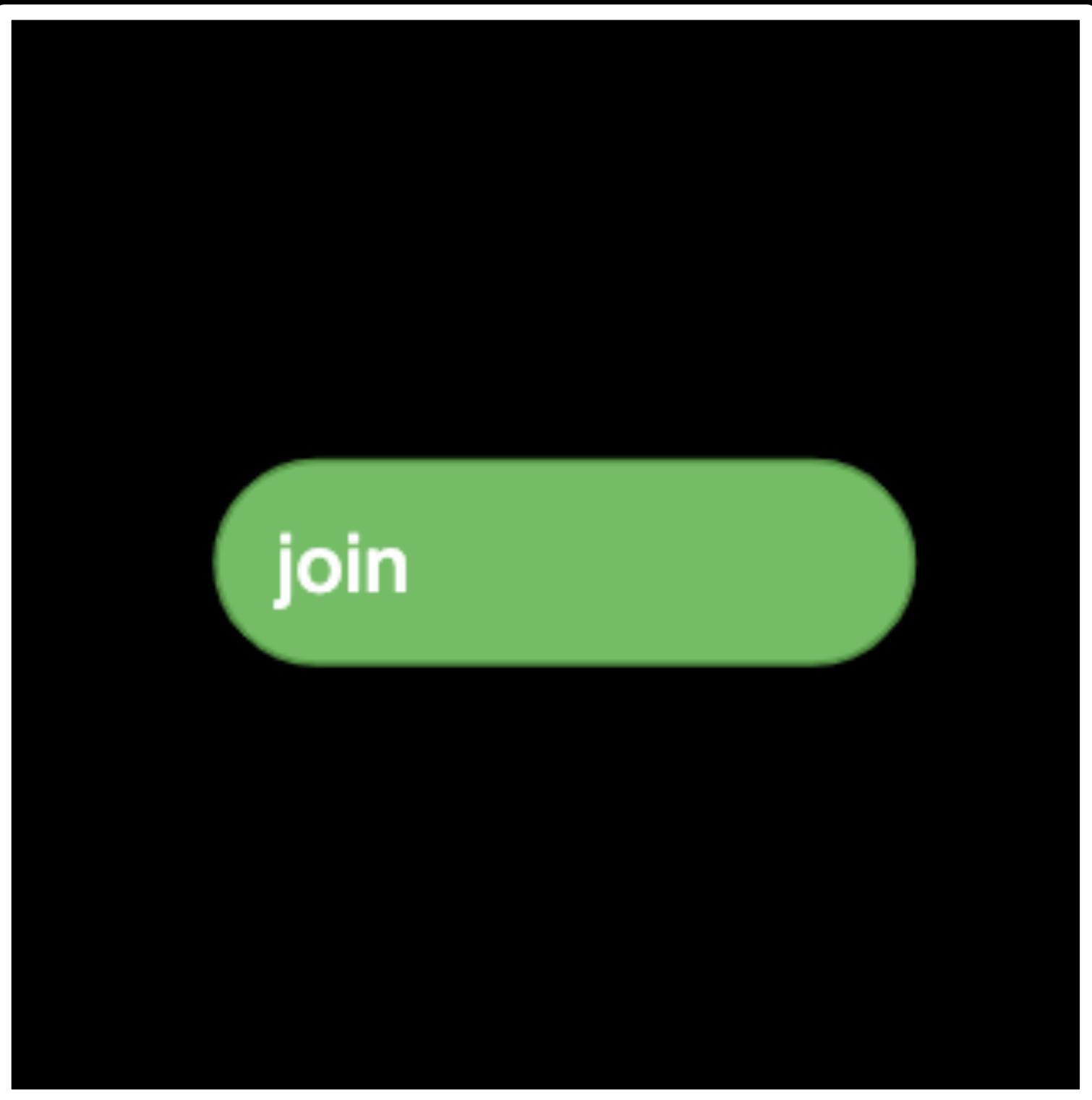
answer



→ output

hello,

answer



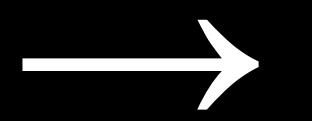
join



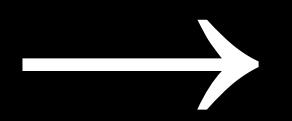
hello, Zack



hello, Zack



hello, Zack



hello, Zack

