# This is CS50

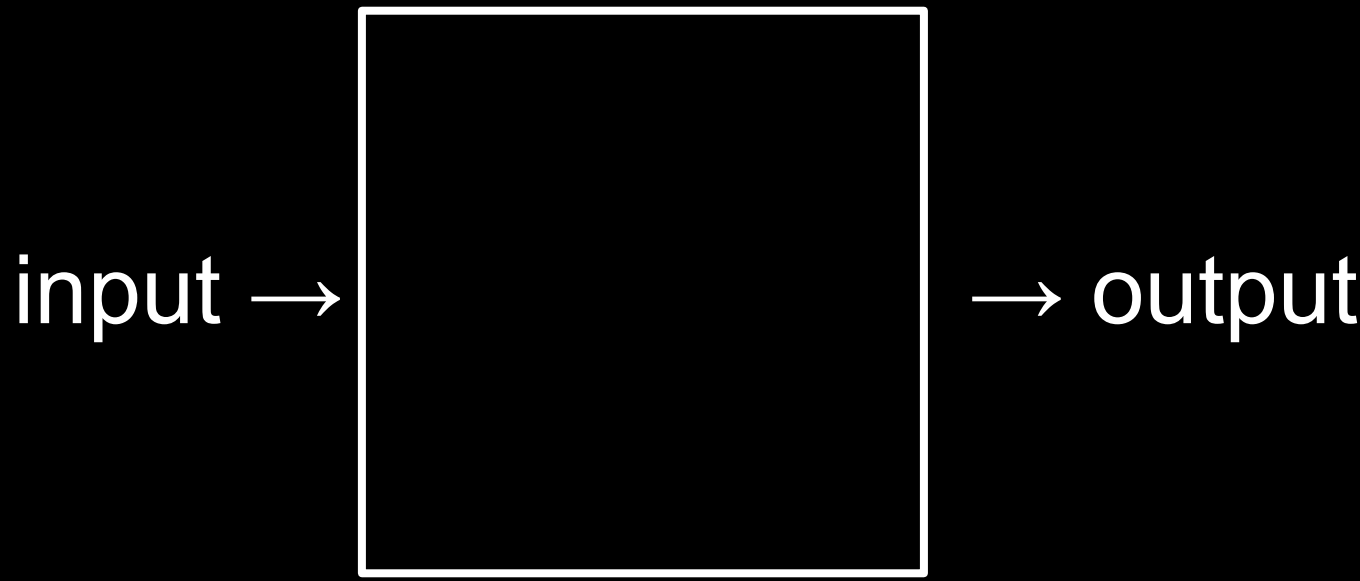
```
/*
 * hello.c
 *
 * Assignment: Assignment 1
 *
 * Name: David Malan
 *
 * A program to print "Hello, CS50!" on the screen.
 */

#include    <stdio.h>

/*
 * main
 */

void        main ()
{

      printf ("Hello, CS50!\n");

      exit (0);
}

/*
 * end of hello.c
 */
```

(-2) for hello.out, we wanted output of hello, not of make.

what ultimately matters in this course is not so much where you end up relative to your classmates but where you end up relative to yourself when you began

# 2/3

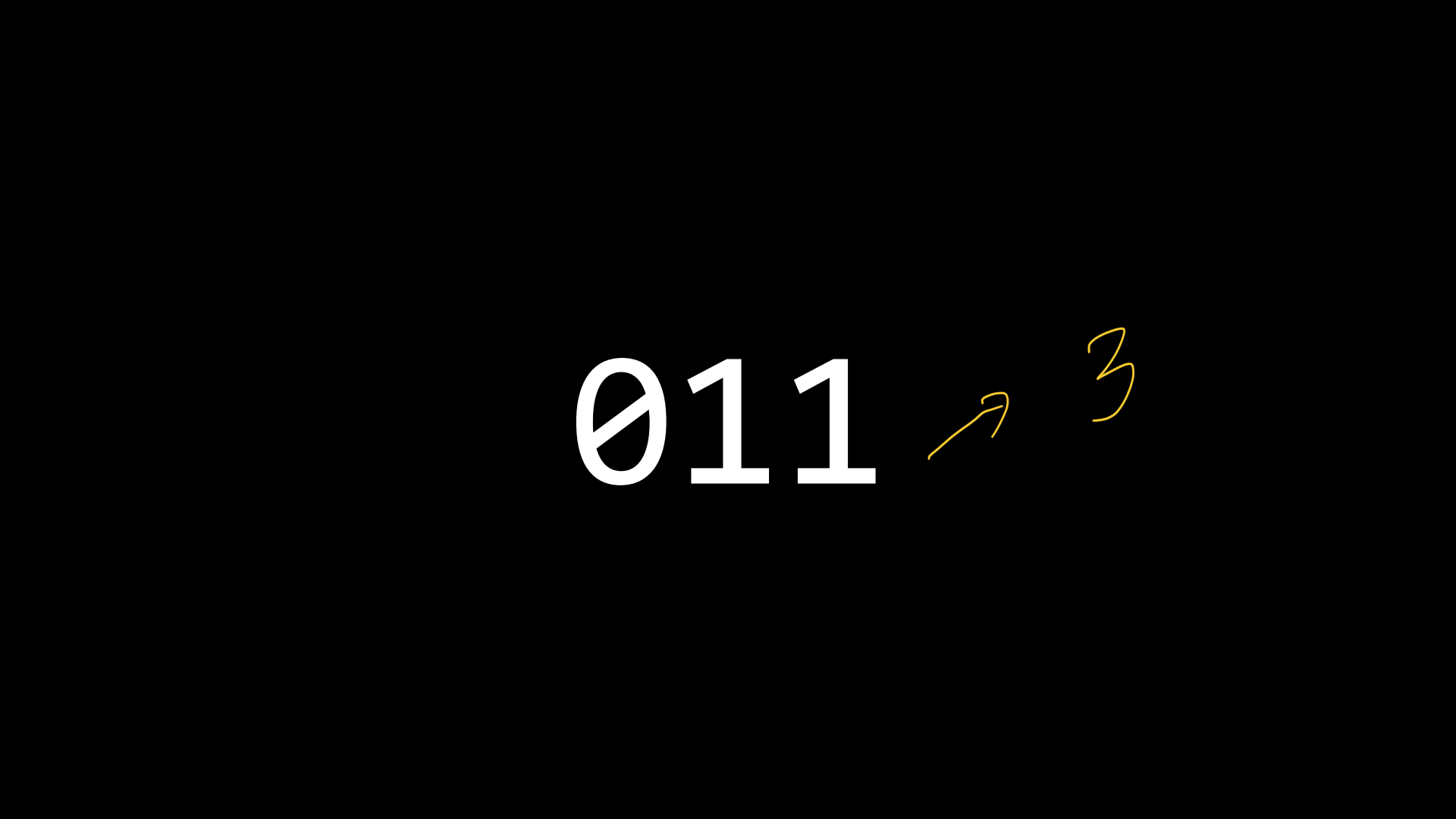
of CS50 students have never taken CS before


input →
→ output

000

001

010 → 2


011
3

100

# 101

110

6

111

123

# 123

10 1

# 123

100 10 1

# 123

100 10 1

# 123

100 × 1

100 10 1

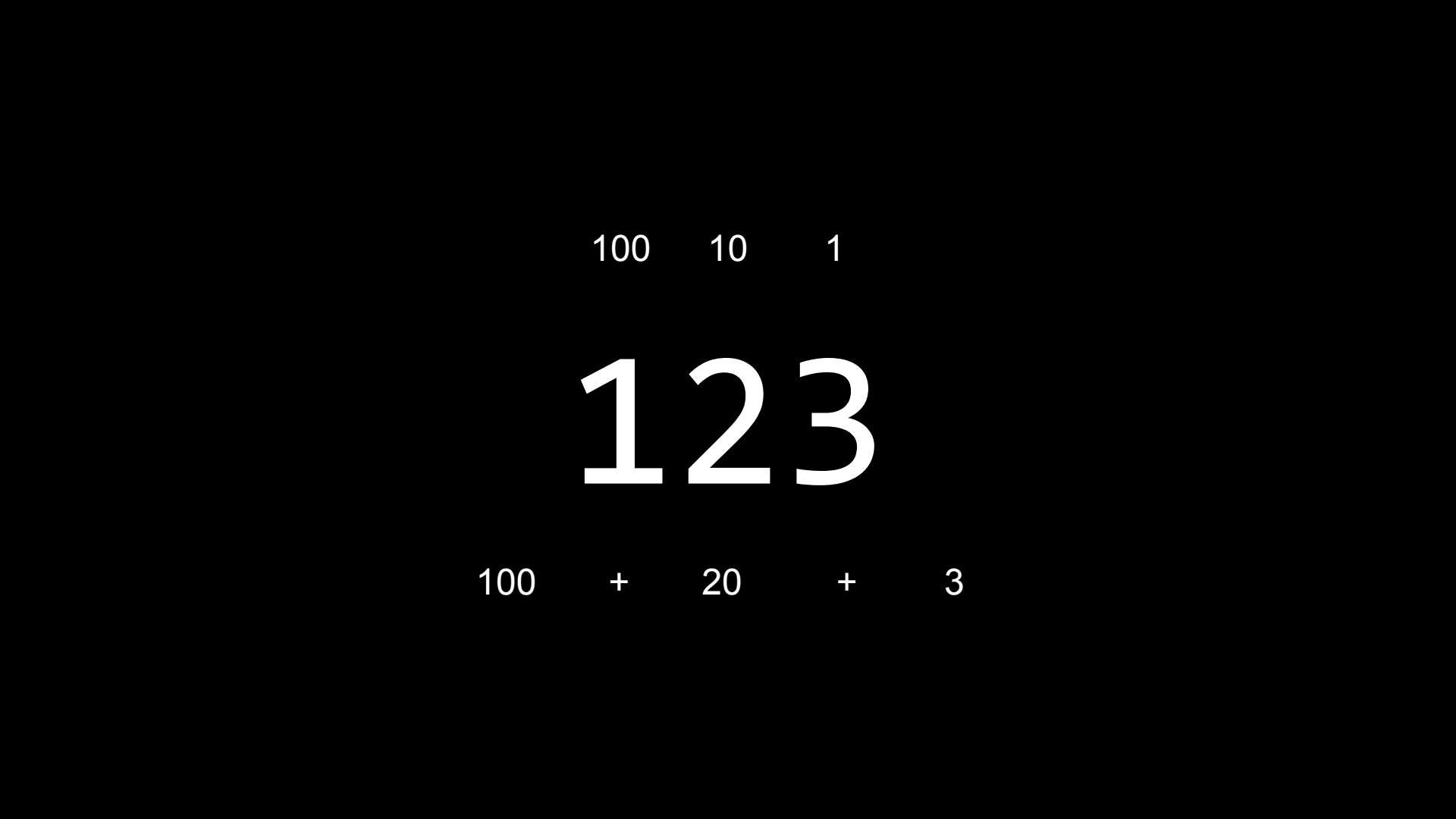
# 123

100 × 1 + 10 × 2

100 10 1

# 123

100 × 1 + 10 × 2 + 1 × 3


100 10 1
123
100 + 20 + 3

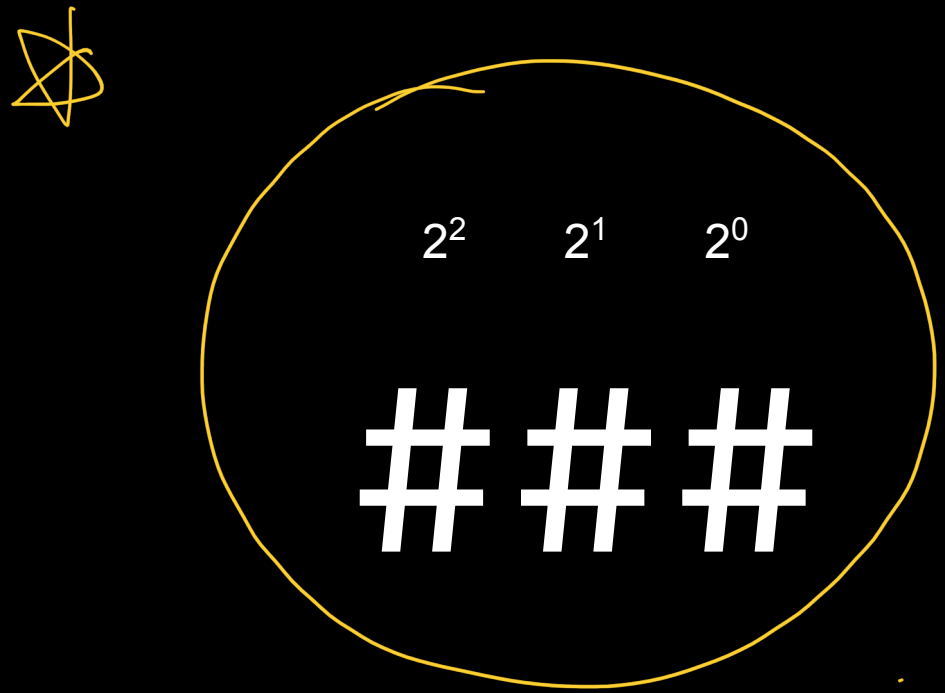
123

100 10 1

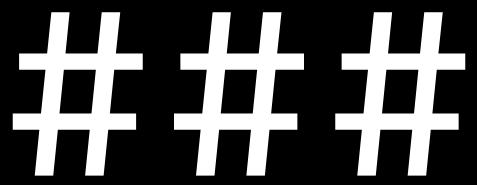
###

$10^2$ $10^1$ $10^0$

###


$2^2$ $2^1$ $2^0$
###
binary

4 2 1




4 2 1
000

4 2 1

# 001

4 2 1

# 010

4 2 1

# 011

4 2 1

100

4 2 1

# 101

4 2 1

110

4 2 1

# 111

A

65

01000001

# ASCII

| ... | A | B | C | D | E | F | G | H | I | ... |
|---|---|---|---|---|---|---|---|---|---|---|
| ... | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | ... |

72 73 33

| H | I | |
|---|---|---|
| 72 | 73 | 33 |

| H | I | ! |
| --- | --- | --- |
| 72 | 73 | 33 |

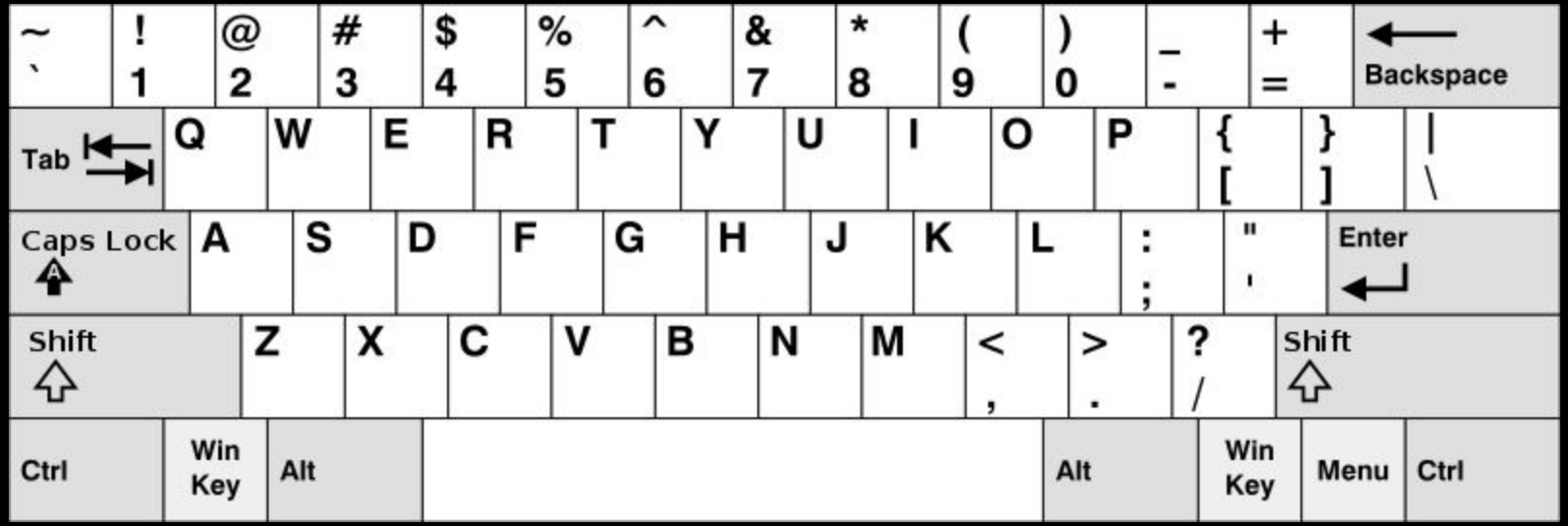
| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | NUL | 16 | DLE | 32 | SP | 48 | 0 | 64 | @ | 80 | P | 96 | ` | 112 | p |
| 1 | SOH | 17 | DC1 | 33 | ! | 49 | 1 | 65 | A | 81 | Q | 97 | a | 113 | q |
| 2 | STX | 18 | DC2 | 34 | " | 50 | 2 | 66 | B | 82 | R | 98 | b | 114 | r |
| 3 | ETX | 19 | DC3 | 35 | # | 51 | 3 | 67 | C | 83 | S | 99 | c | 115 | s |
| 4 | EOT | 20 | DC4 | 36 | $ | 52 | 4 | 68 | D | 84 | T | 100 | d | 116 | t |
| 5 | ENQ | 21 | NAK | 37 | % | 53 | 5 | 69 | E | 85 | U | 101 | e | 117 | u |
| 6 | ACK | 22 | SYN | 38 | & | 54 | 6 | 70 | F | 86 | V | 102 | f | 118 | v |
| 7 | BEL | 23 | ETB | 39 | ' | 55 | 7 | 71 | G | 87 | W | 103 | g | 119 | w |
| 8 | BS | 24 | CAN | 40 | ( | 56 | 8 | 72 | H | 88 | X | 104 | h | 120 | x |
| 9 | HT | 25 | EM | 41 | ) | 57 | 9 | 73 | I | 89 | Y | 105 | i | 121 | y |
| 10 | LF | 26 | SUB | 42 | * | 58 | : | 74 | J | 90 | Z | 106 | j | 122 | z |
| 11 | VT | 27 | ESC | 43 | + | 59 | ; | 75 | K | 91 | [ | 107 | k | 123 | { |
| 12 | FF | 28 | FS | 44 | , | 60 | < | 76 | L | 92 | \ | 108 | l | 124 | \| |
| 13 | CR | 29 | GS | 45 | - | 61 | = | 77 | M | 93 | ] | 109 | m | 125 | } |
| 14 | SO | 30 | RS | 46 | . | 62 | > | 78 | N | 94 | ^ | 110 | n | 126 | ~ |
| 15 | SI | 31 | US | 47 | / | 63 | ? | 79 | O | 95 | _ | 111 | o | 127 | DEL |

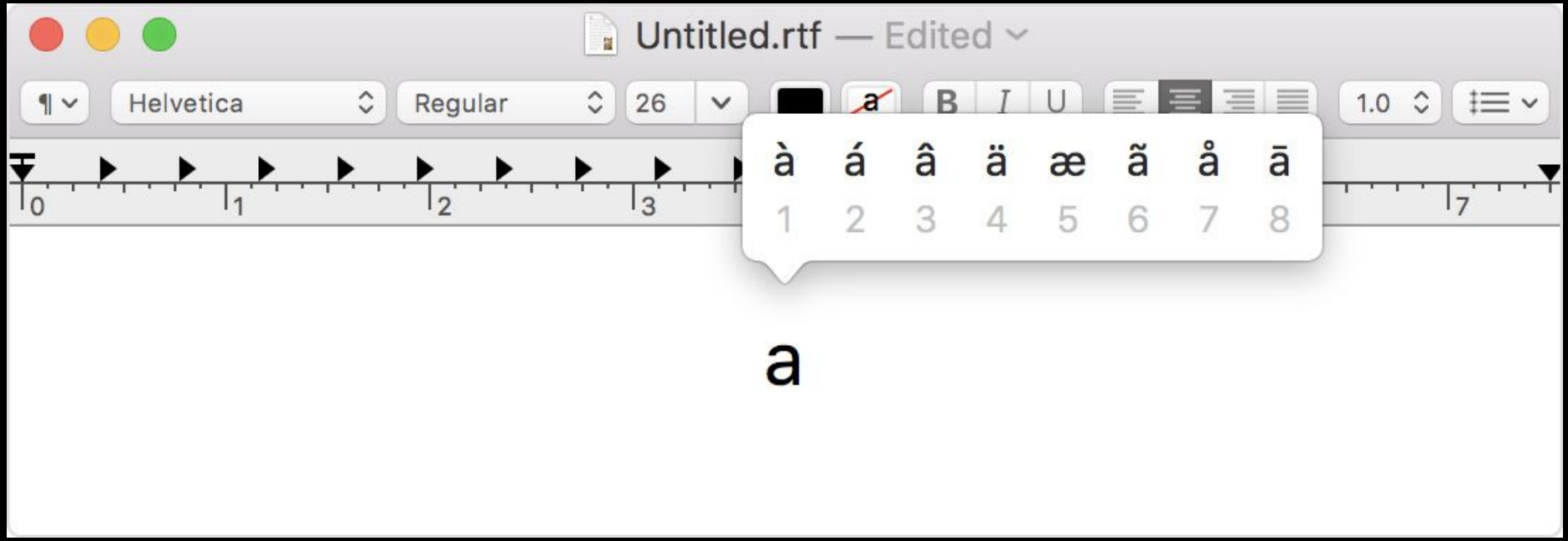
| H | I | ! |
| --- | --- | --- |
| 72 | 73 | 33 |

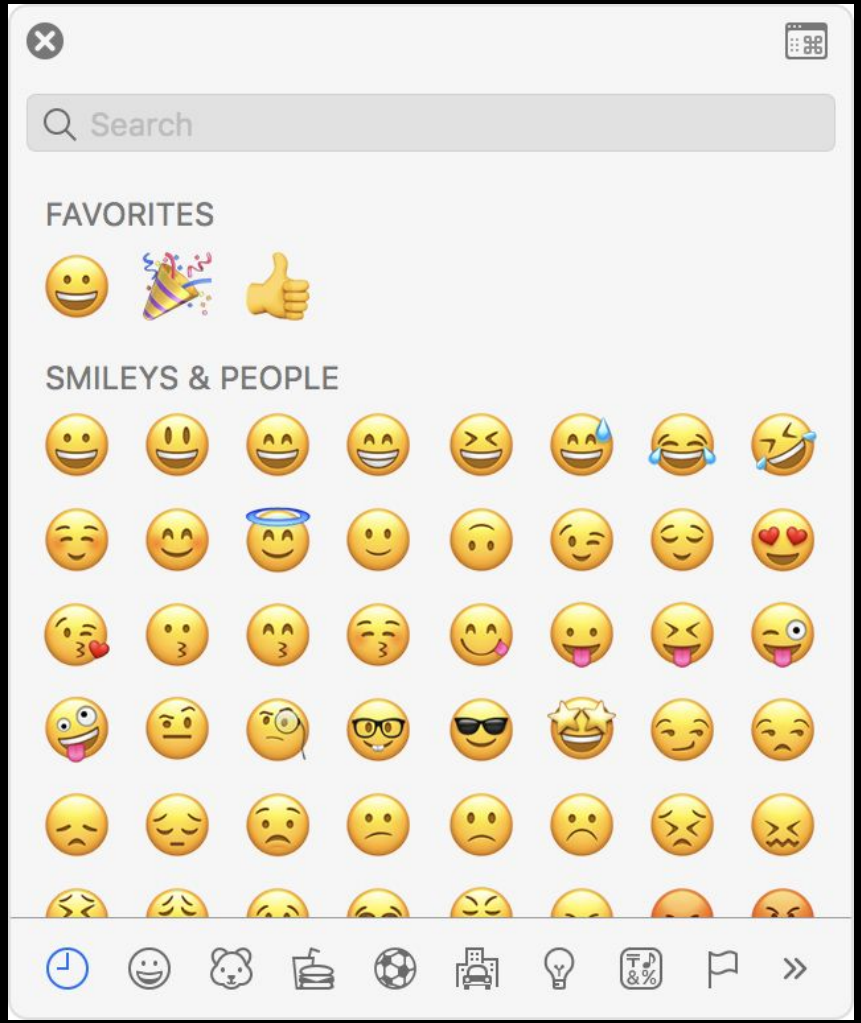
| H | I | ! |
| --- | --- | --- |
| 01001000 | 01001001 | 00100001 |

bit = binary digit.

8 bits


~ `
! 1
@ 2
# 3
$ 4
% 5
^ 6
& 7
* 8
( 9
) 0
_ -
+ =
Backspace
Tab
Q
W
E
R
T
Y
U
I
O
P
{ [
} ]
| \
Caps Lock
A
S
D
F
G
H
J
K
L
: ;
" '
Enter
Shift
Z
X
C
V
B
N
M
< ,
> .
? /
Shift
Ctrl
Win Key
Alt
Alt
Win Key
Menu
Ctrl


Untitled.rtf — Edited
Helvetica
Regular
26
1.0
à á â ä æ ã å ā
1 2 3 4 5 6 7 8
a


Search
FAVORITES
SMILEYS & PEOPLE

# Unicode

many more numbers

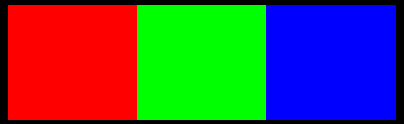
32-bits

4,036,991,159

11110000 10011111 10011000 10110111

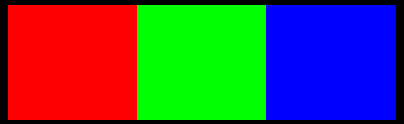
Android

RGB



72 73 33


72
73
33

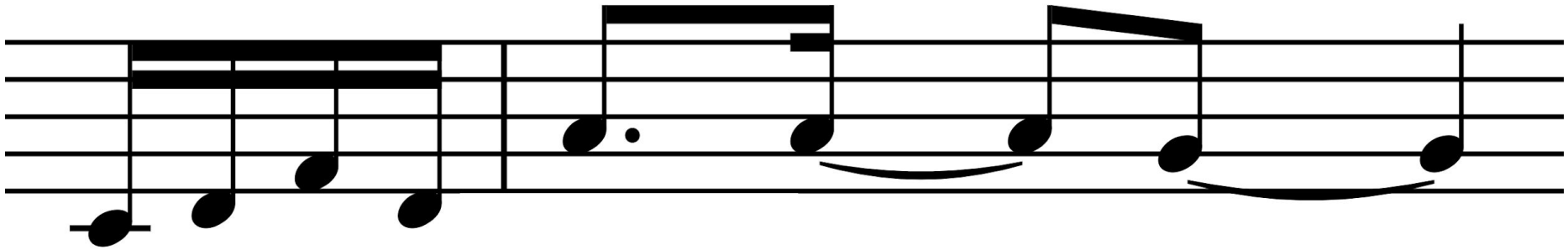


face-with-medical-mask_1f637.png

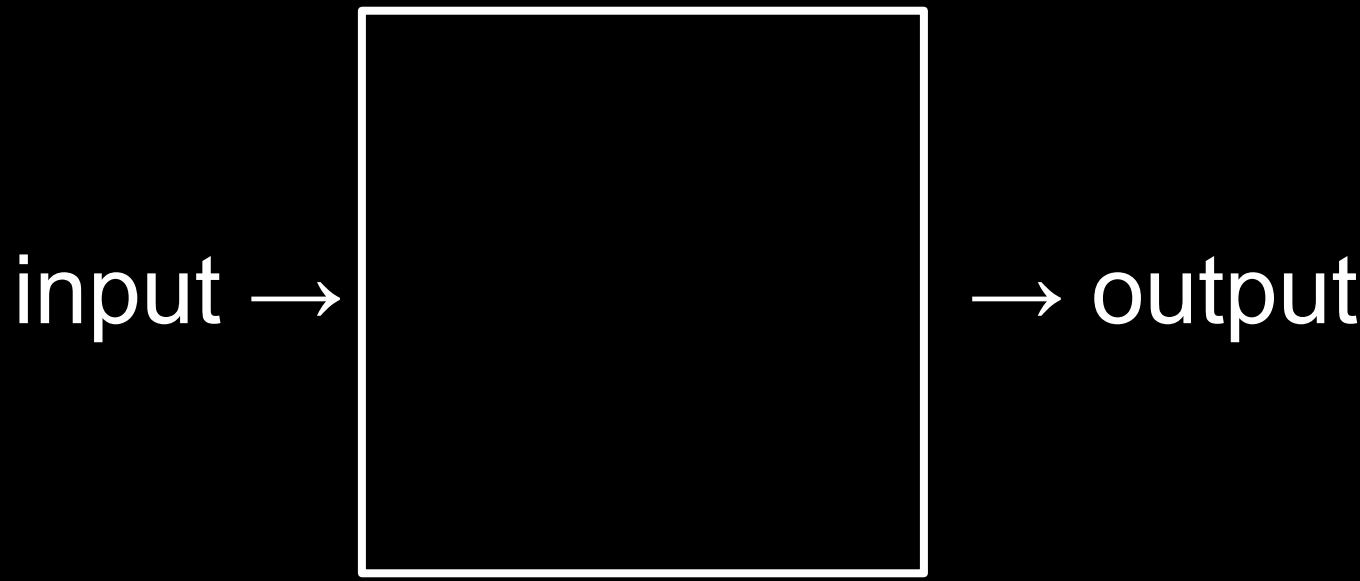
Search

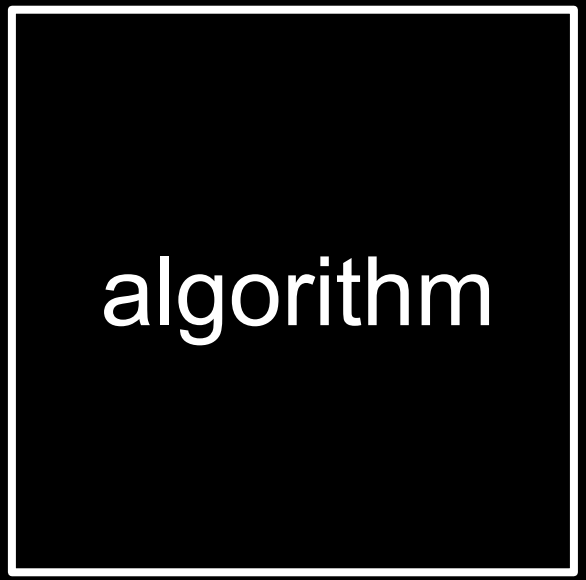
face-with-medical-mask_1f637.png

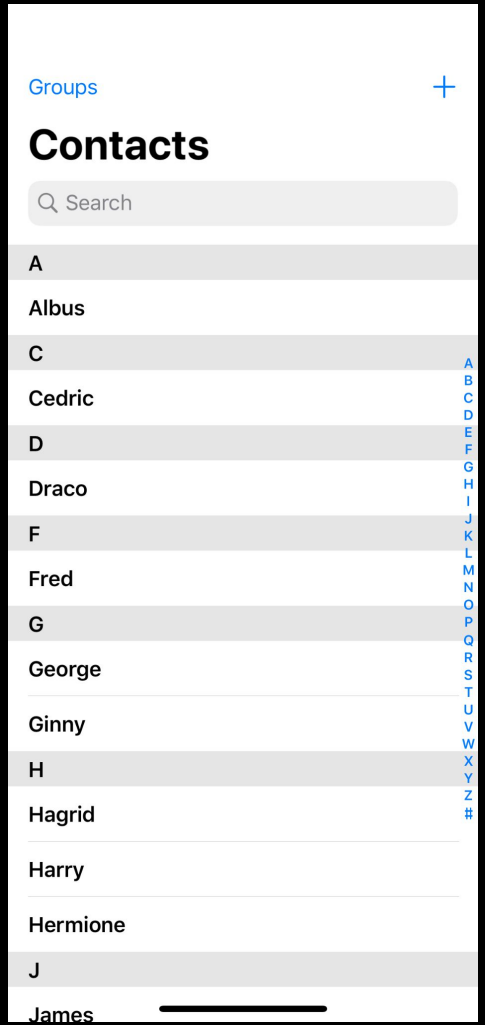

face-with-medical-mask_1f637.png
Search

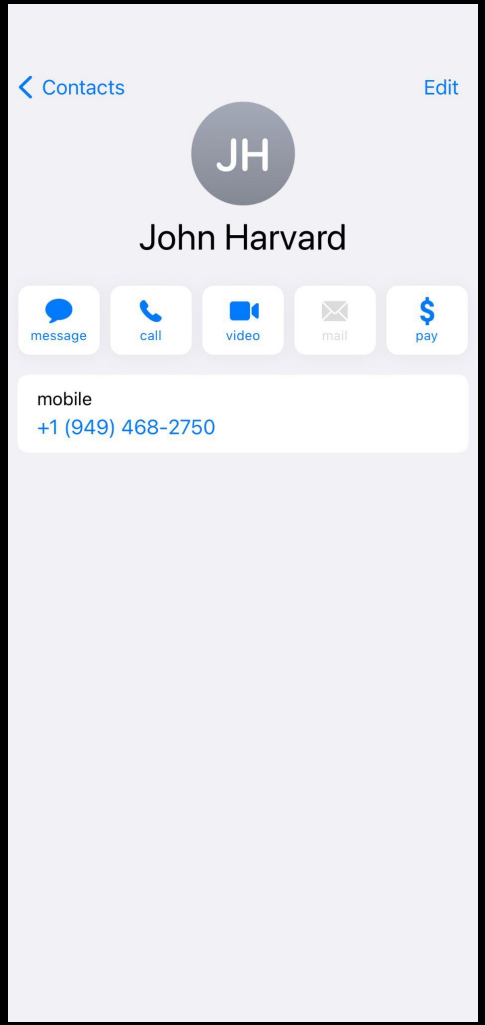


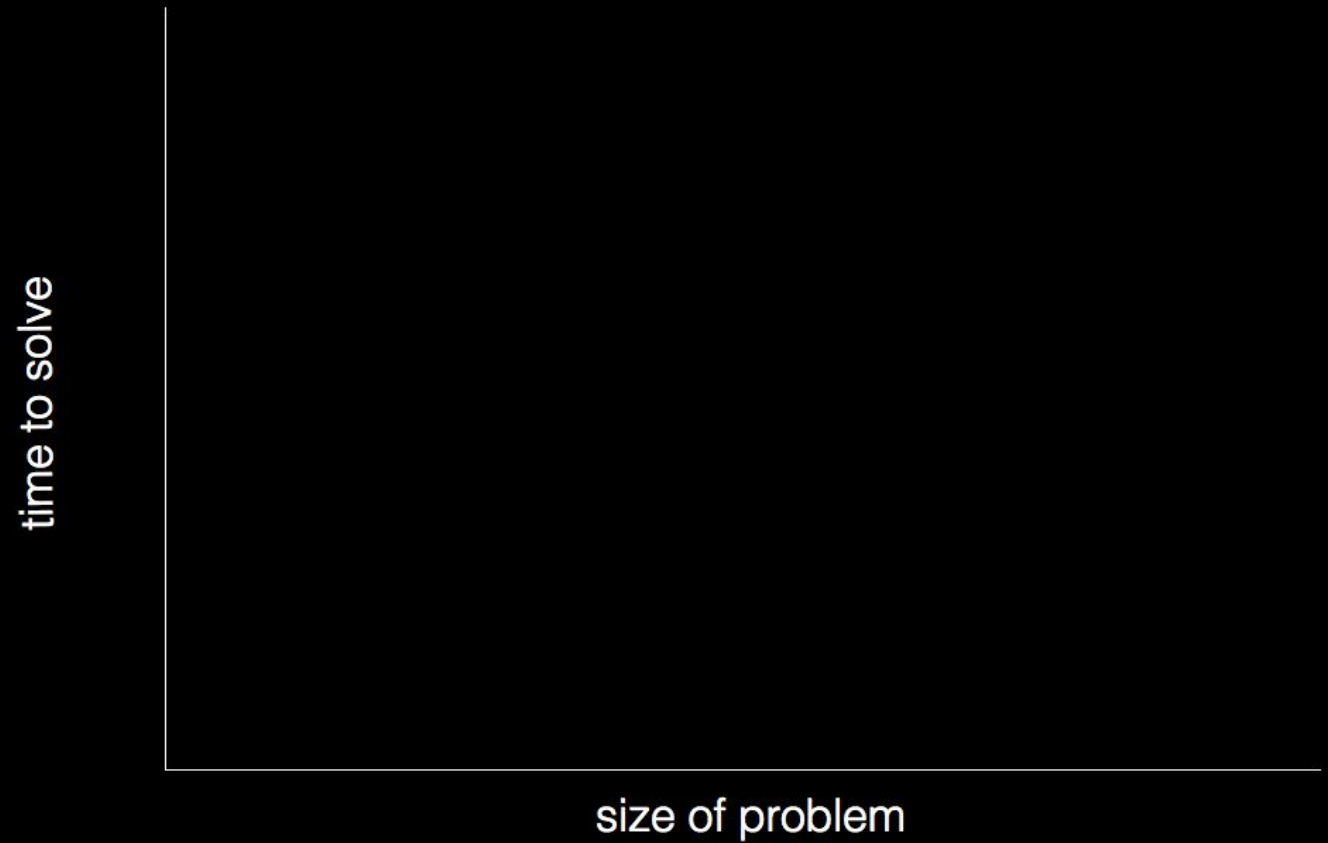
```
144 60 64
128 60 64
144 62 64
128 62 64
144 65 64
128 65 64
144 62 64
128 62 64
144 69 64
128 69 64
144 69 64
128 69 64
144 67 64
128 67 64
```

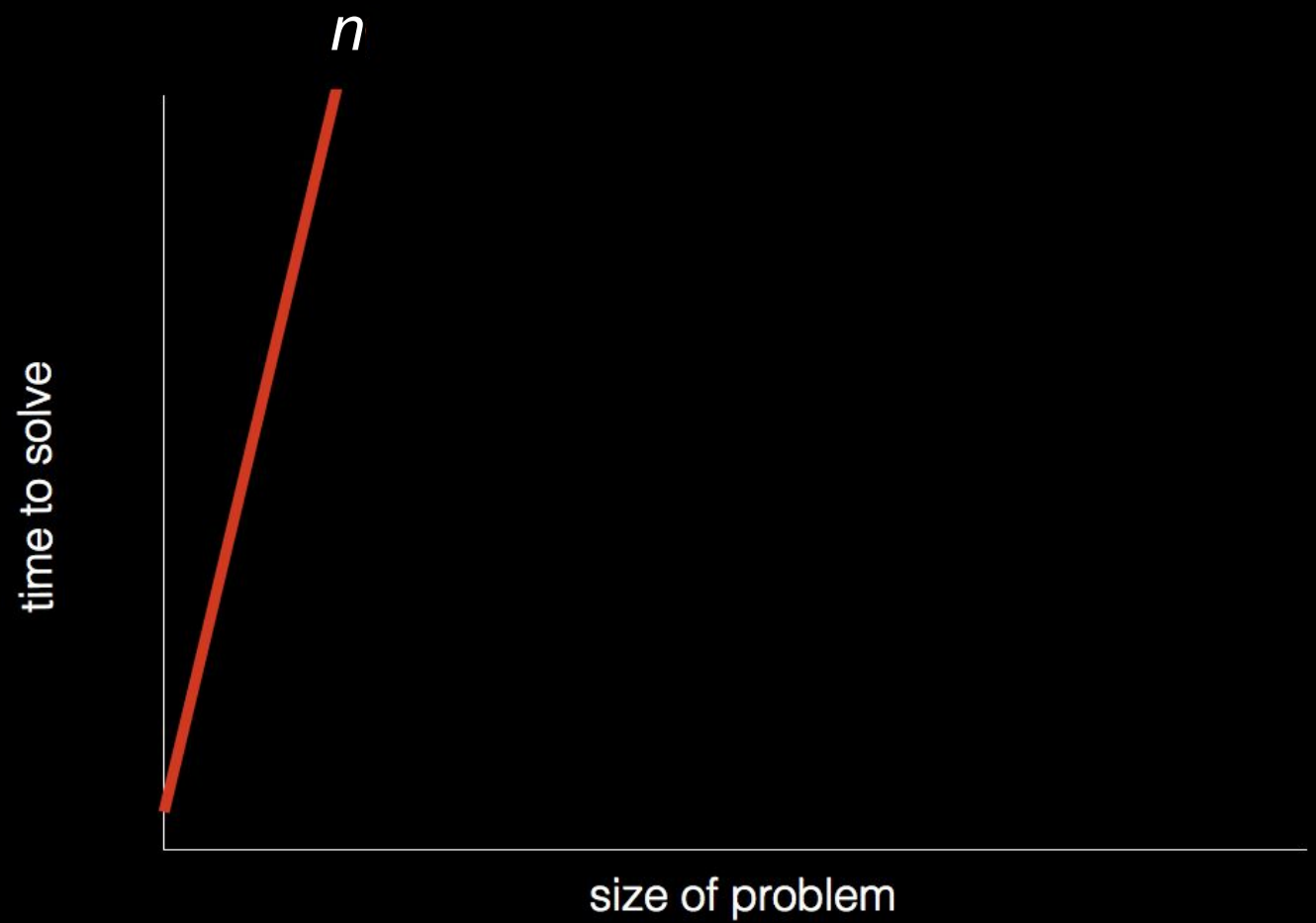

input →
→ output

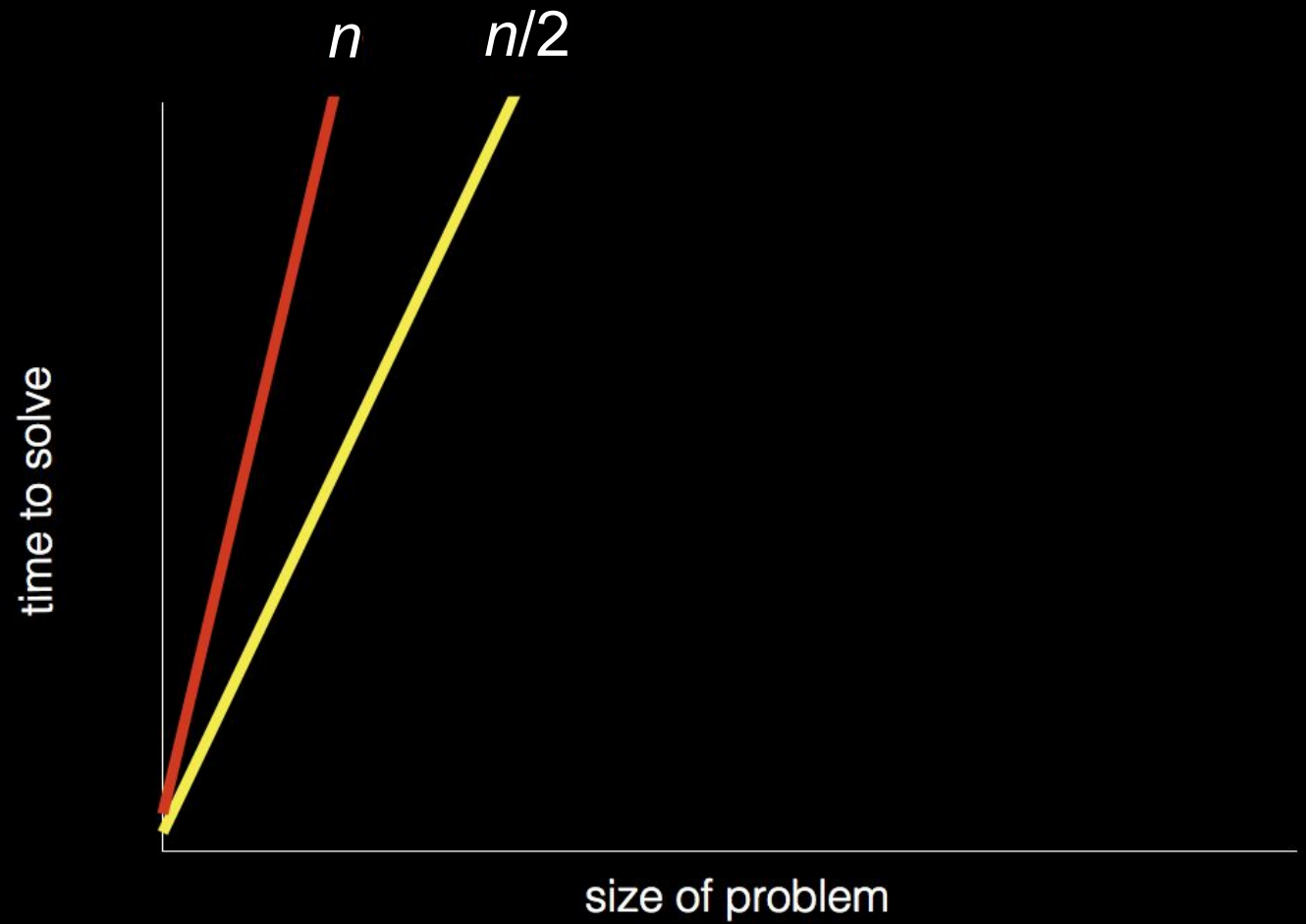

algorithm

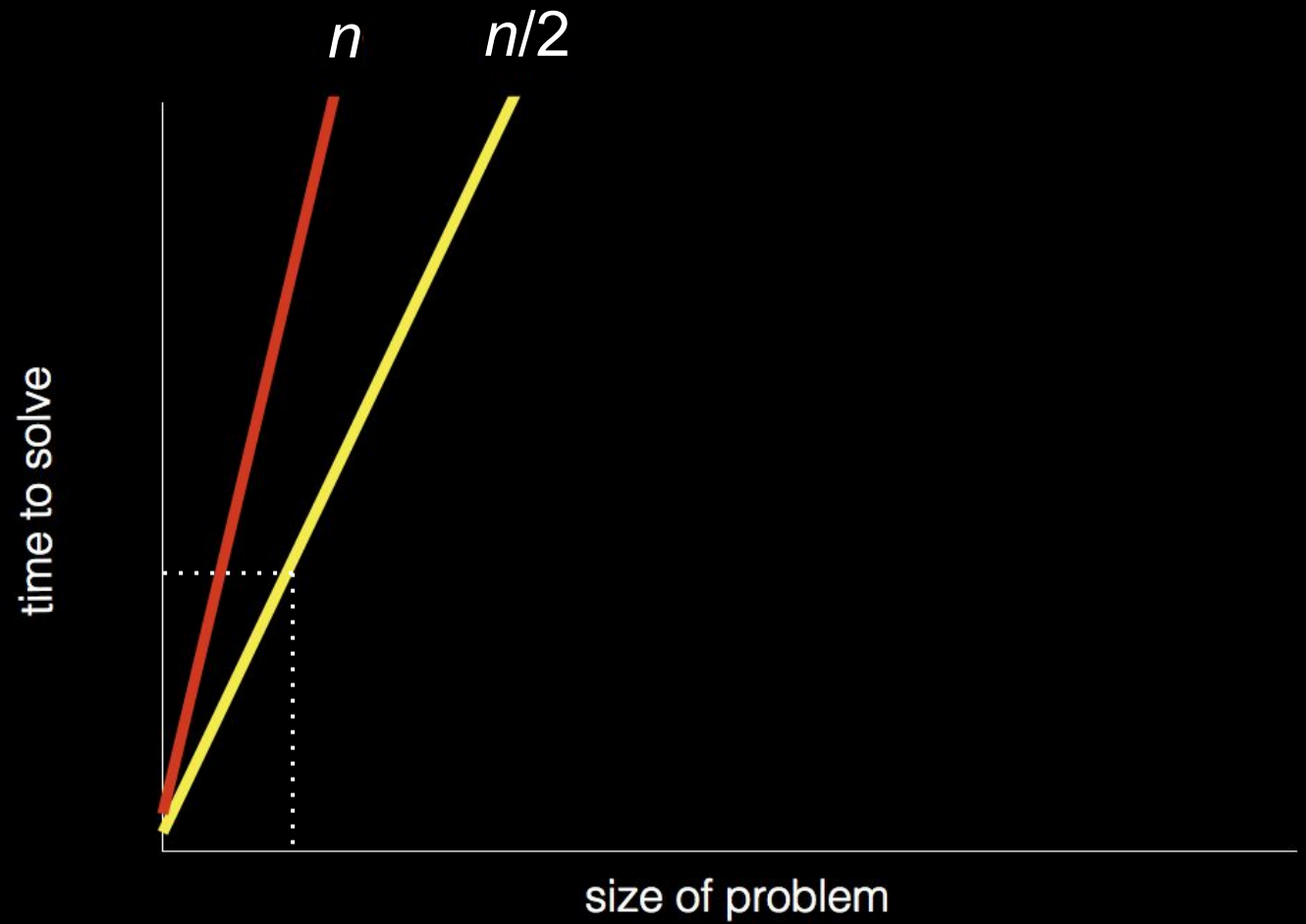

Groups
Contacts
Search
A
Albus
C
Cedric
D
Draco
F
Fred
G
George
Ginny
H
Hagrid
Harry
Hermione
J
James
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

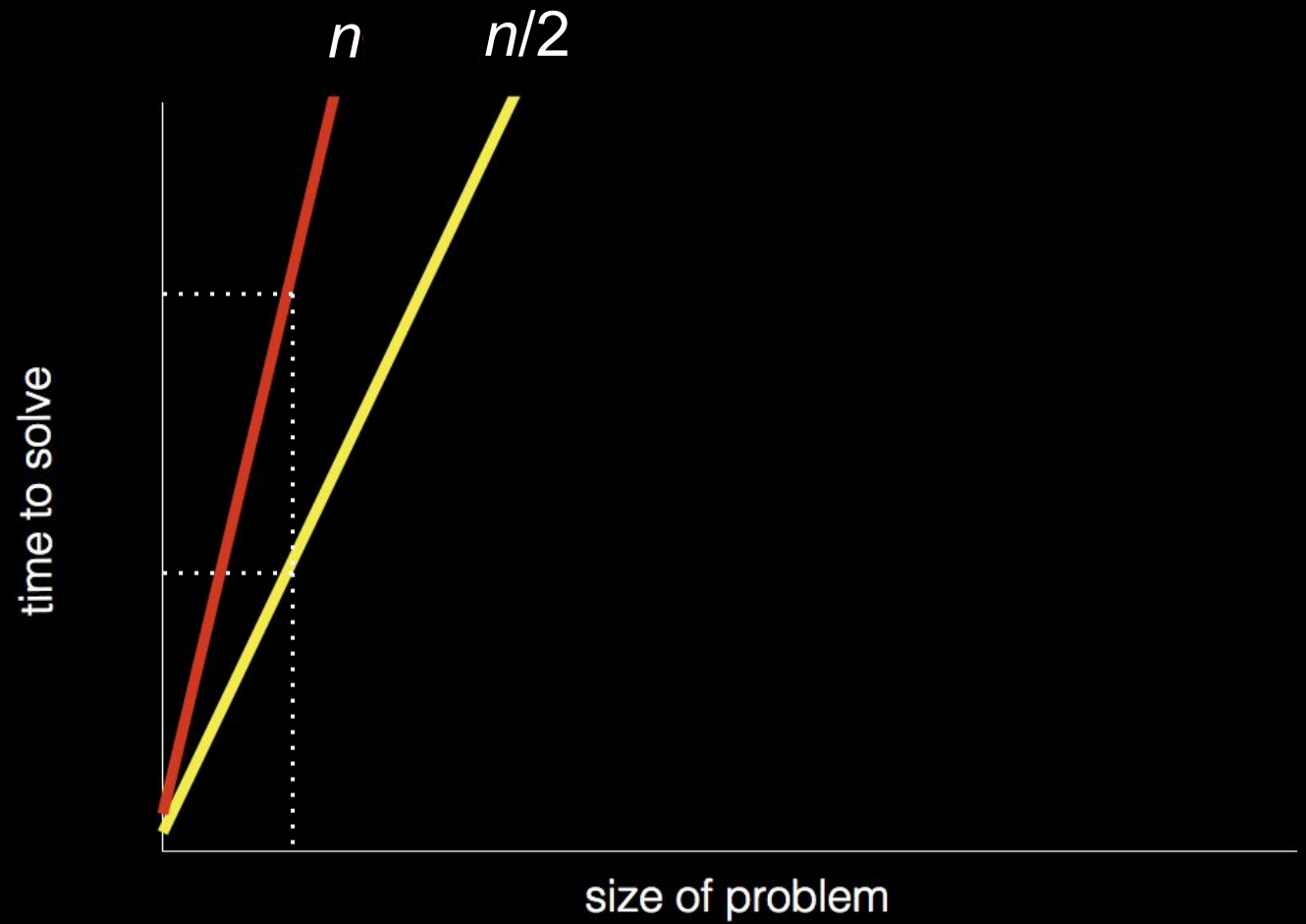

Contacts
Edit
JH
John Harvard
message
call
video
mail
pay
mobile
+1 (949) 468-2750

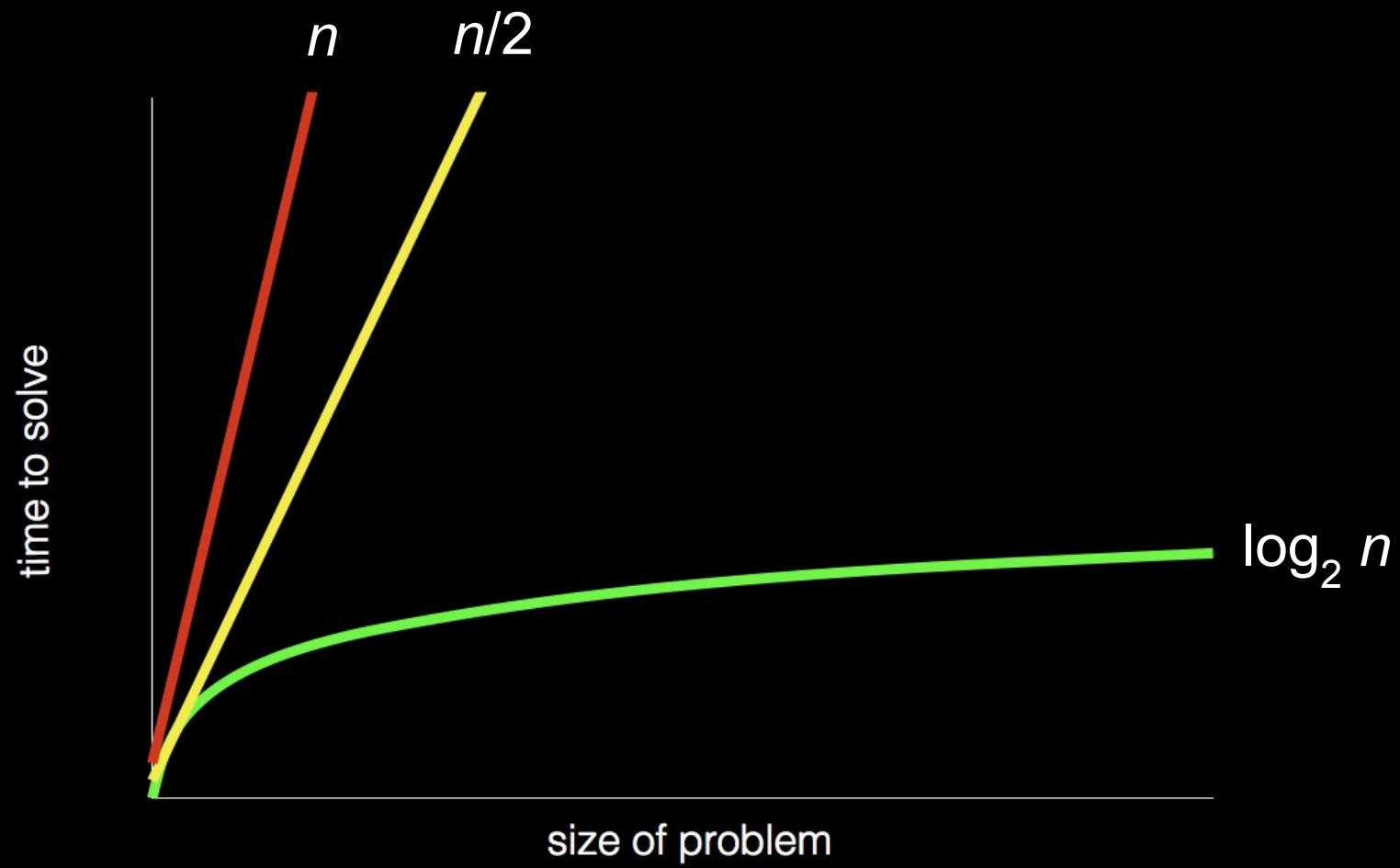

time to solve
size of problem


n
time to solve
size of problem


n
n/2
time to solve
size of problem


n
n/2
time to solve
size of problem


n
n/2
time to solve
size of problem


n
n/2
time to solve
log2 n
size of problem

# pseudocode

```
1   Pick up phone book
2   Open to middle of phone book
3   Look at page
4   If person is on page
5       Call person
6   Else if person is earlier in book
7       Open to middle of left half of book
8       Go back to line 3
9   Else if person is later in book
10      Open to middle of right half of book
11      Go back to line 3
12  Else
13      Quit
```

```
1   Pick up phone book
2   Open to middle of phone book
3   Look at page
4   If person is on page
5       Call person
6   Else if person is earlier in book
7       Open to middle of left half of book
8       Go back to line 3
9   Else if person is later in book
10      Open to middle of right half of book
11      Go back to line 3
12  Else
13      Quit
```

function

```
1   Pick up phone book
2   Open to middle of phone book
3   Look at page
4   If person is on page
5       Call person
6   Else if person is earlier in book
7       Open to middle of left half of book
8       Go back to line 3
9   Else if person is later in book
10      Open to middle of right half of book
11      Go back to line 3
12  Else
13      Quit
```

```
1   Pick up phone book
2   Open to middle of phone book
3   Look at page
4   If person is on page
5       Call person
6   Else if person is earlier in book
7       Open to middle of left half of book
8       Go back to line 3
9   Else if person is later in book
10      Open to middle of right half of book
11      Go back to line 3
12  Else
13      Quit
```

boolean

expression

```
1   Pick up phone book
2   Open to middle of phone book
3   Look at page
4   If person is on page
5       Call person
6   Else if person is earlier in book
7       Open to middle of left half of book
8       Go back to line 3
9   Else if person is later in book
10      Open to middle of right half of book
11      Go back to line 3
12  Else
13      Quit
```

loops

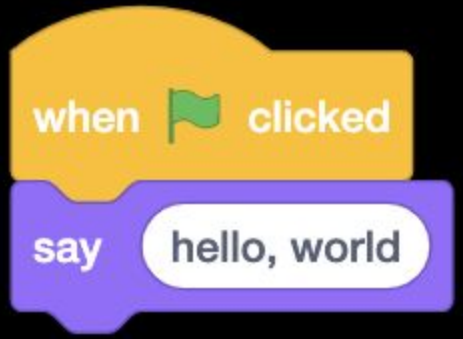
- functions
  - arguments, return values
- conditionals
- Boolean expressions
- loops
- variables
- ...

```c
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```

```
print("hello, world")
```

python

Scratch



Code Costumes Sounds

Motion
Looks
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

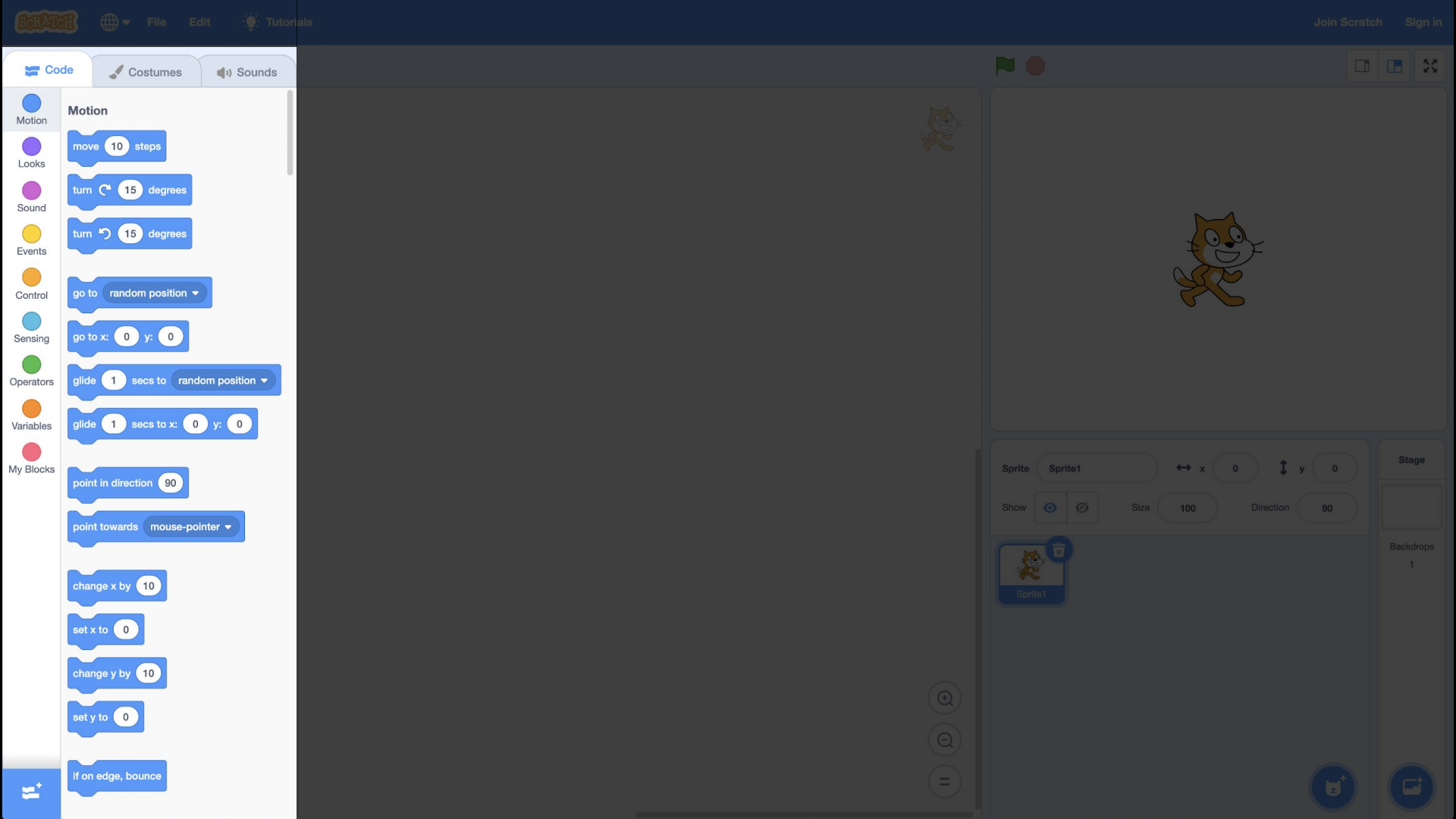
change x by 10
set x to 0
change y by 10
set y to 0

if on edge, bounce

Sprite Sprite1 x 0 y 0
Show Size 100 Direction 90


Sprite1

Stage
Backdrops 1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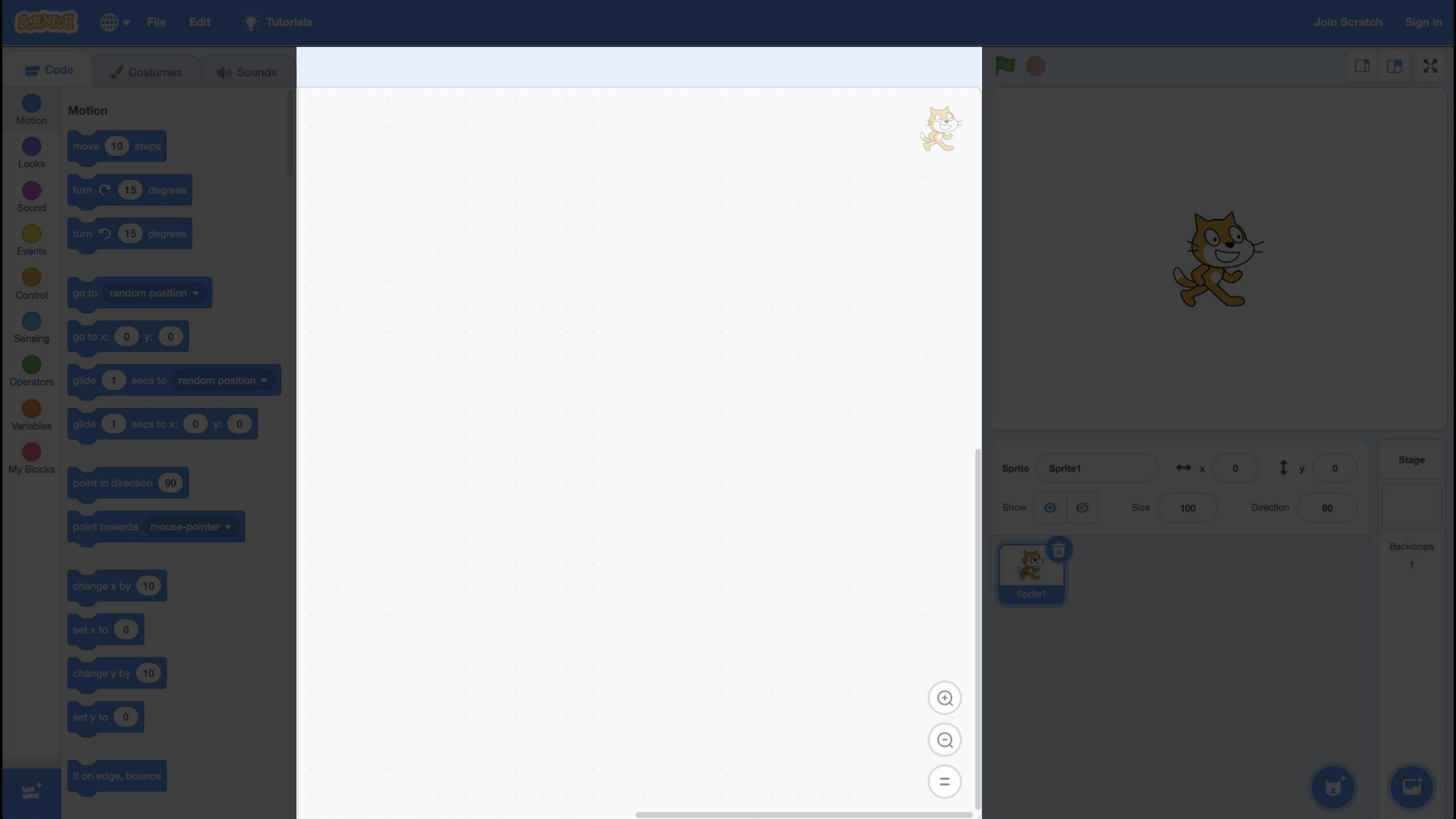
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
Motion
move 10 steps
turn 15 degrees
turn 15 degrees
go to random position
go to x: 0 y: 0
glide 1 secs to random position
glide 1 secs to x: 0 y: 0
point in direction 90
point towards mouse-pointer
change x by 10
set x to 0
change y by 10
set y to 0
if on edge, bounce
Sprite
Sprite1
x
0
y
0
Show
Size
100
Direction
90
Stage
Backdrops
1
Sprite1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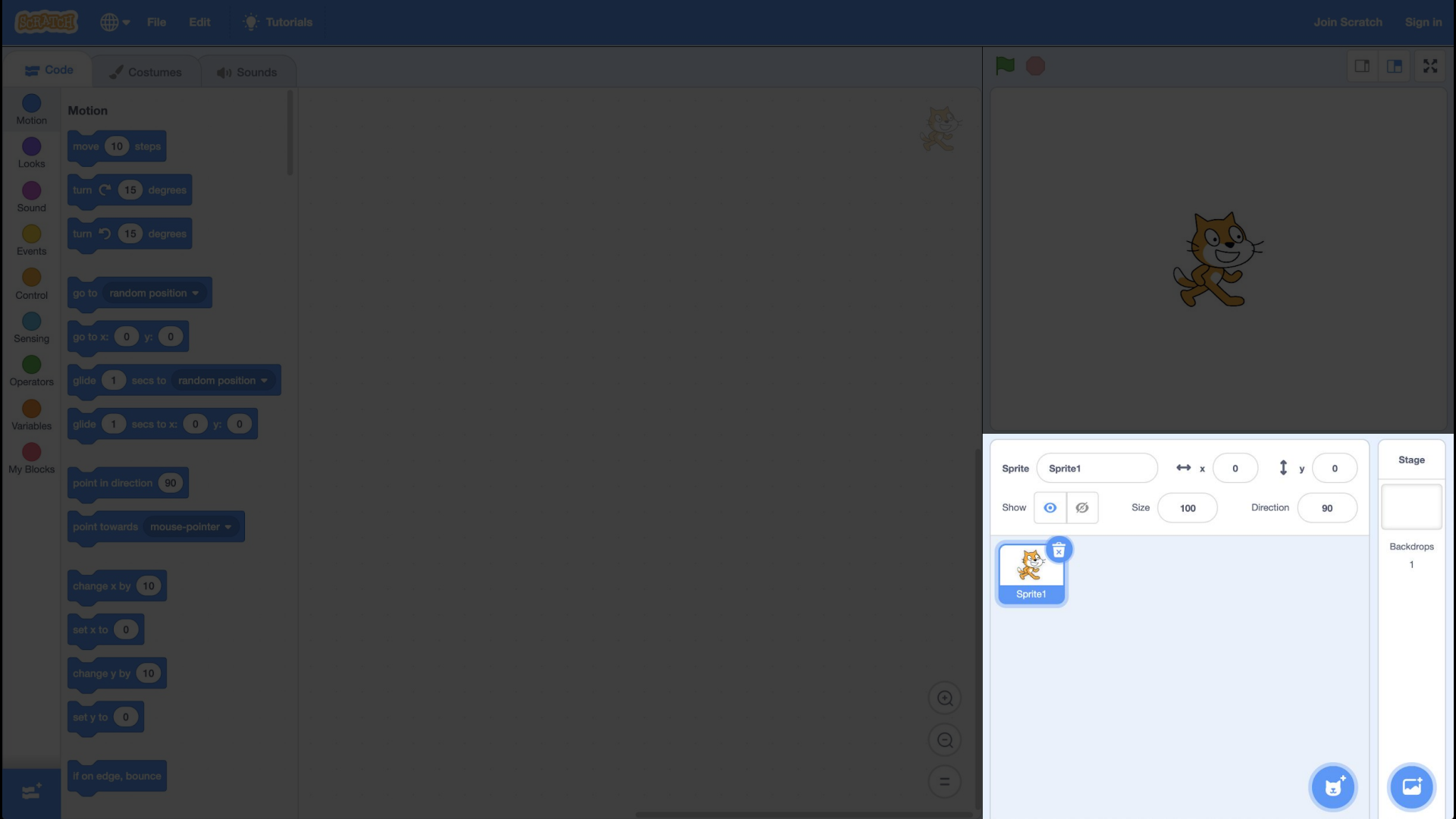
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
Motion
move 10 steps
turn 15 degrees
turn 15 degrees
go to random position
go to x: 0 y: 0
glide 1 secs to random position
glide 1 secs to x: 0 y: 0
point in direction 90
point towards mouse-pointer
change x by 10
set x to 0
change y by 10
set y to 0
if on edge, bounce
Sprite
Sprite1
x 0
y 0
Show
Size 100
Direction 90
Stage
Backdrops 1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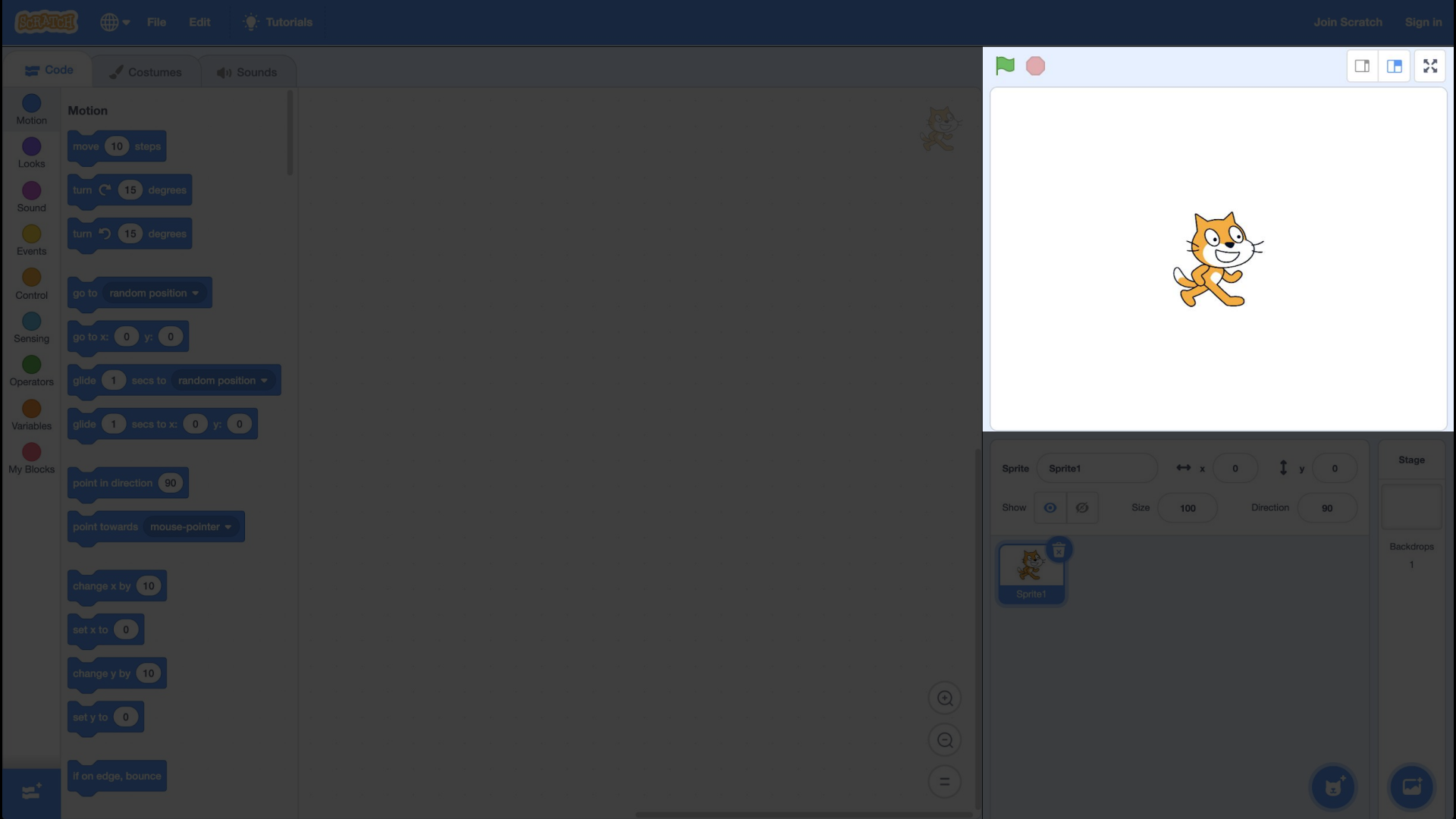
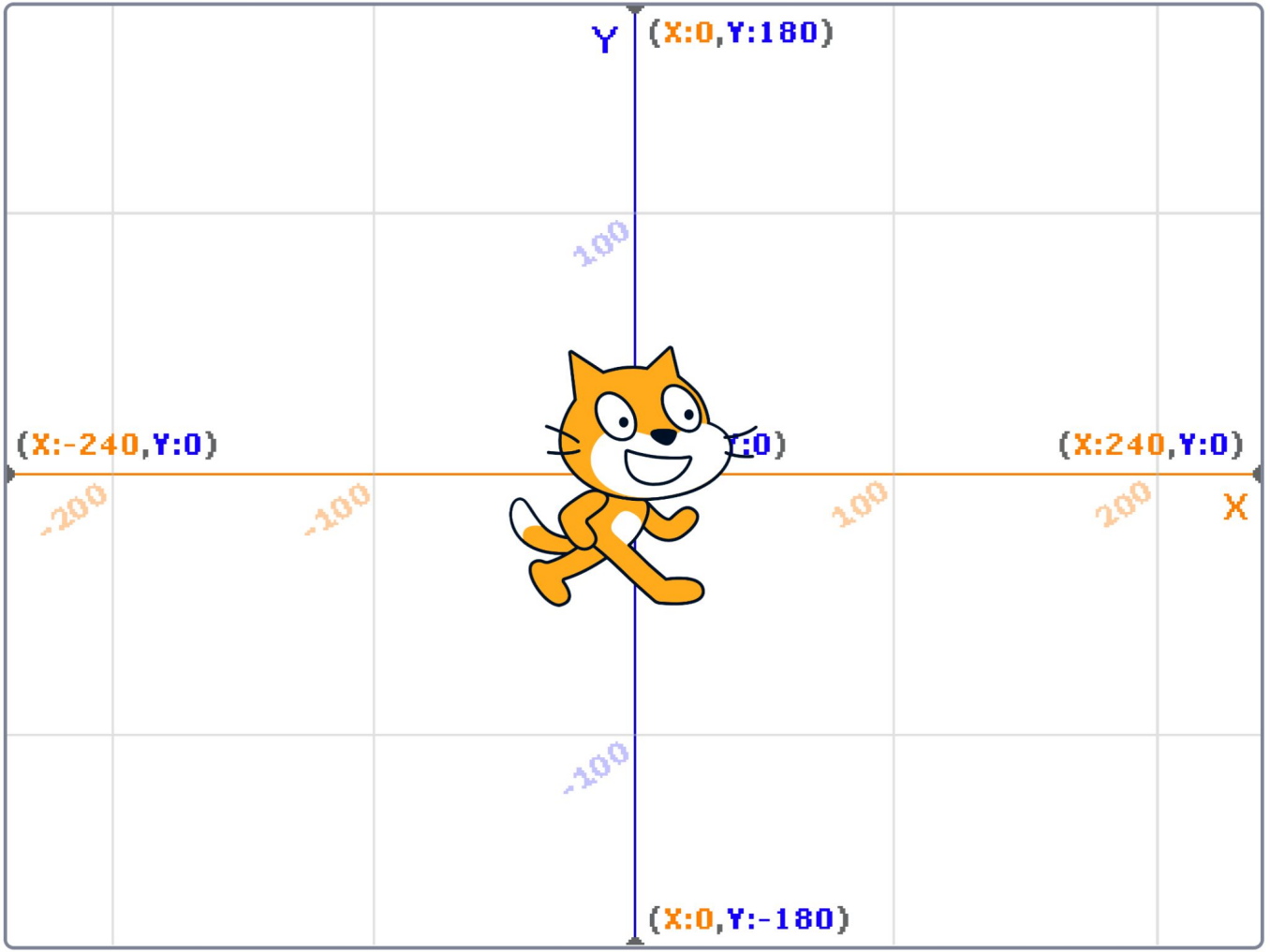
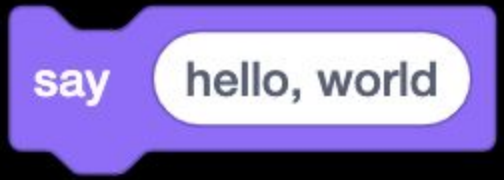
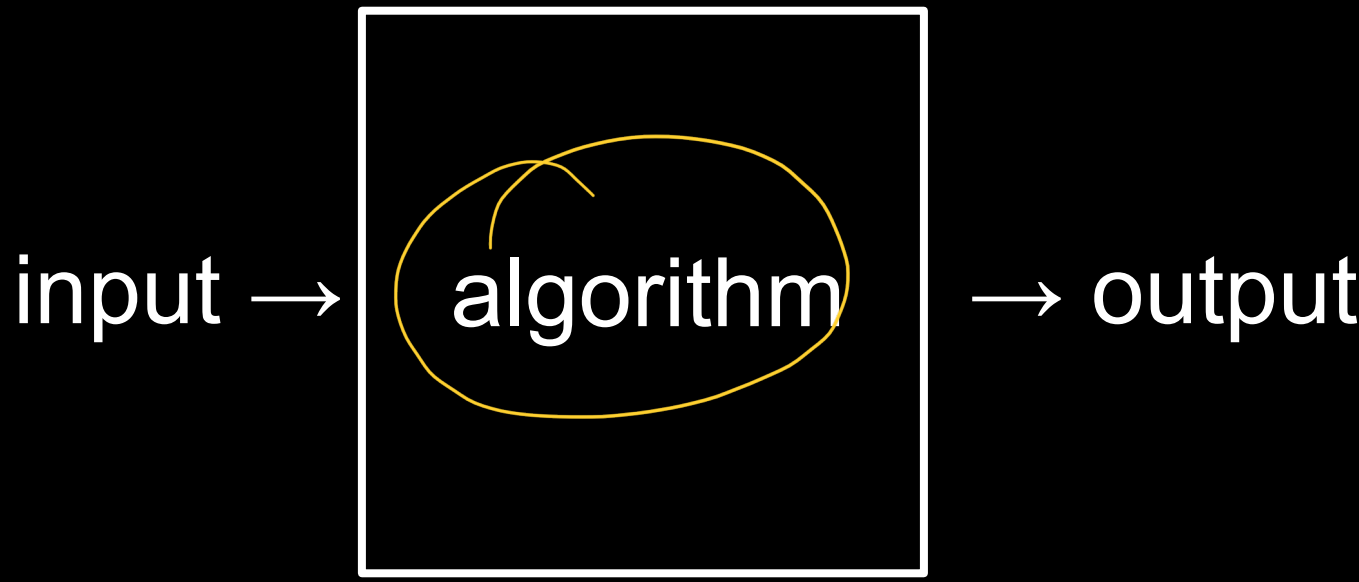
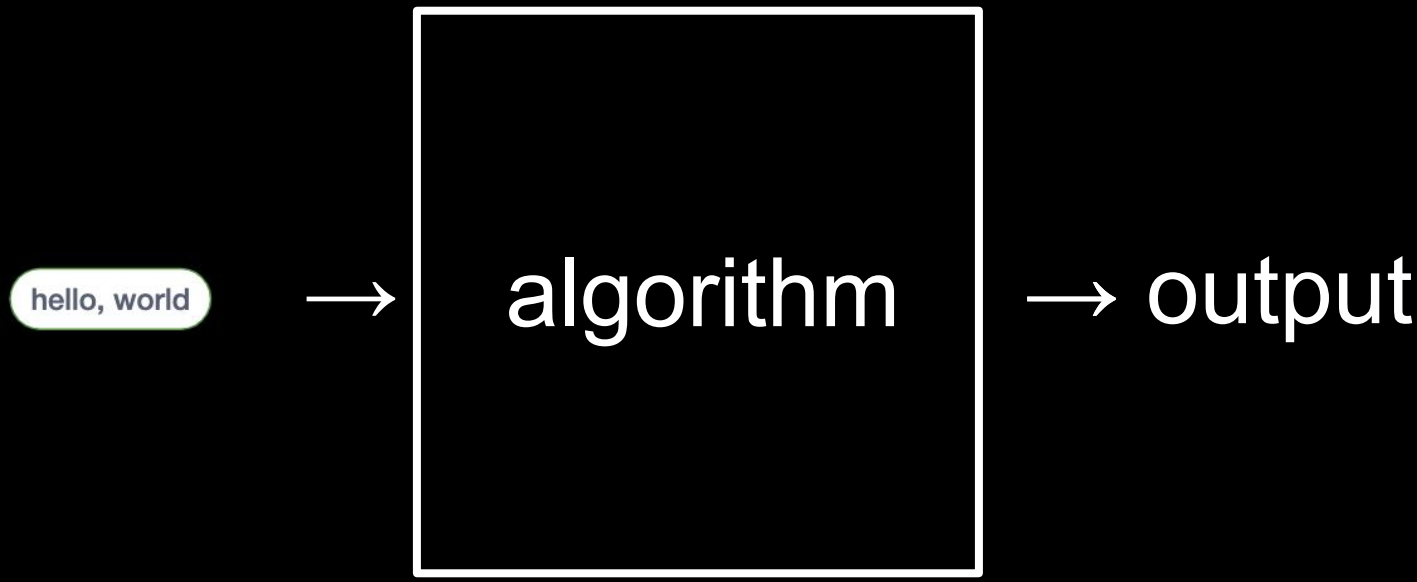
Code
Costumes
Sounds
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
Motion
move 10 steps
turn 15 degrees
turn 15 degrees
go to random position
go to x: 0 y: 0
glide 1 secs to random position
glide 1 secs to x: 0 y: 0
point in direction 90
point towards mouse-pointer
change x by 10
set x to 0
change y by 10
set y to 0
if on edge, bounce
Sprite
Sprite1
x
0
y
0
Show
Size
100
Direction
90
Sprite1
Stage
Backdrops
1

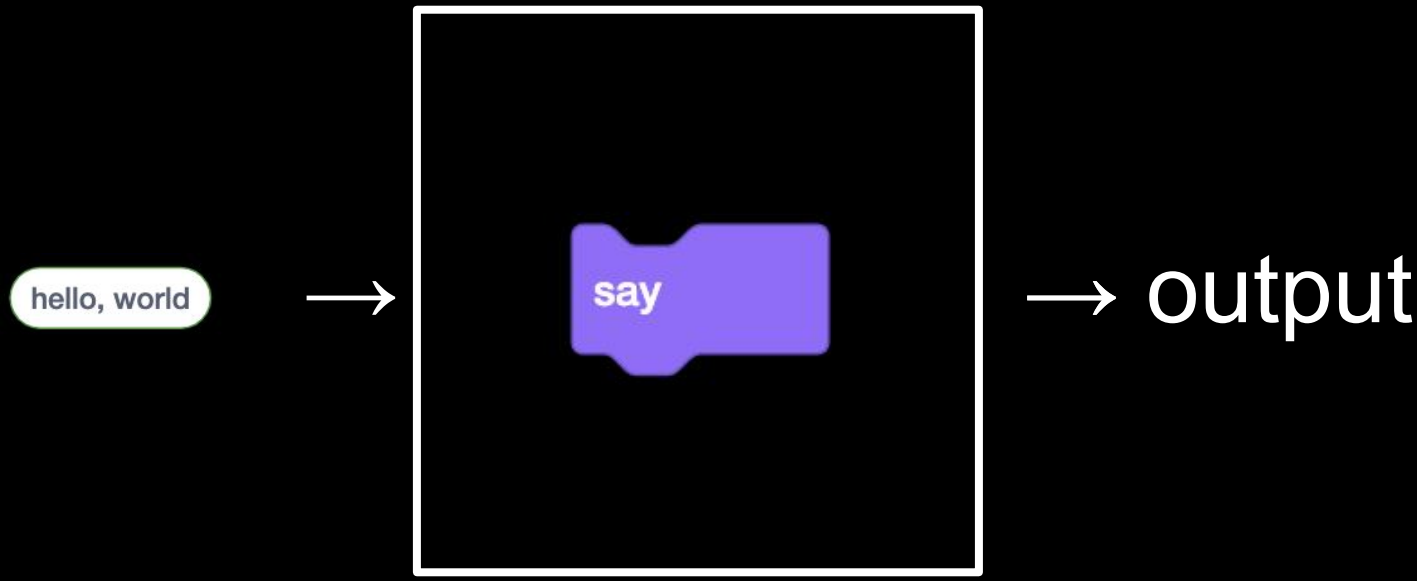

File
Edit
Tutorials
Join Scratch
Sign in
Code
Costumes
Sounds
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
Motion
move 10 steps
turn 15 degrees
turn 15 degrees
go to random position
go to x: 0 y: 0
glide 1 secs to random position
glide 1 secs to x: 0 y: 0
point in direction 90
point towards mouse-pointer
change x by 10
set x to 0
change y by 10
set y to 0
if on edge, bounce
Sprite
Sprite1
x
0
y
0
Show
Size
100
Direction
90
Stage
Backdrops
1

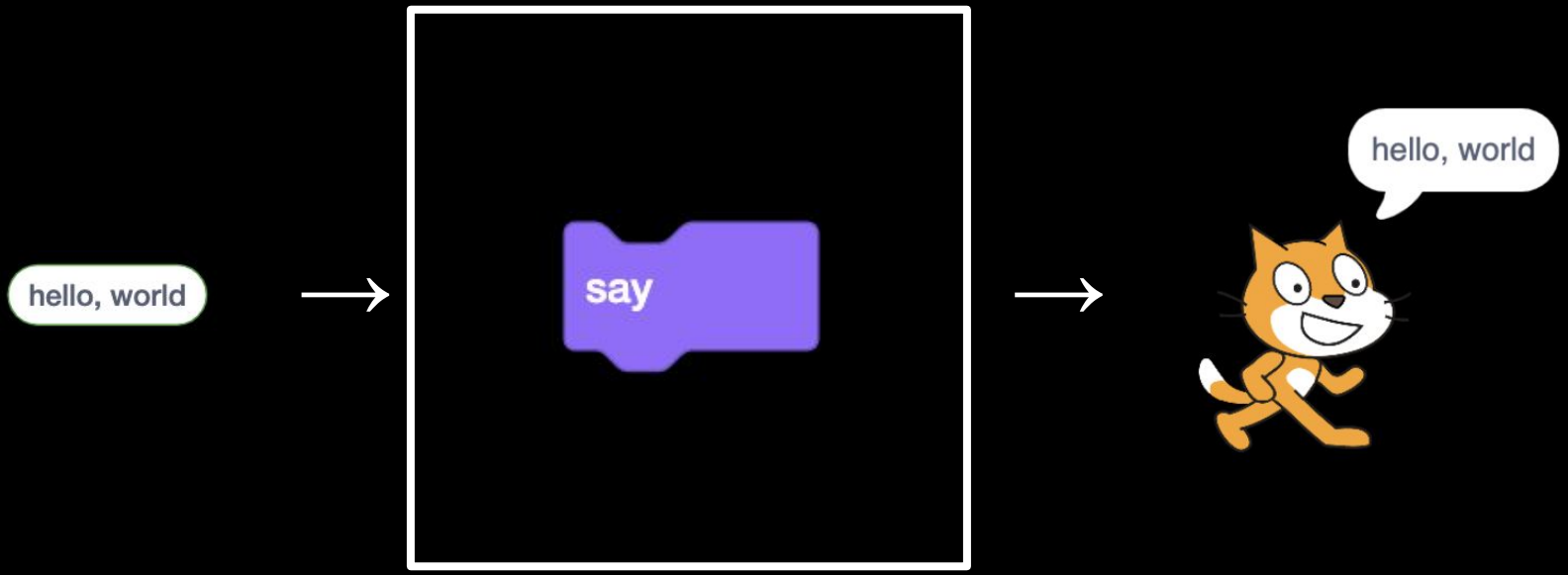

Y
(X:0,Y:180)
100
(X:-240,Y:0)
:0)
(X:240,Y:0)
-200
-100
100
200
X
-100
(X:0,Y:-180)

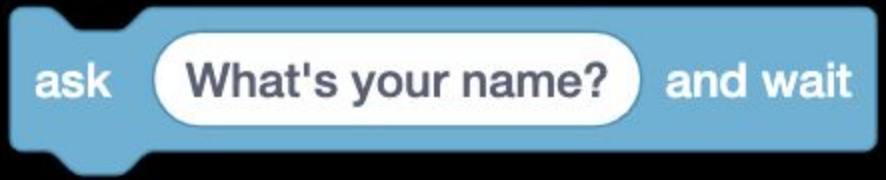

say
hello, world

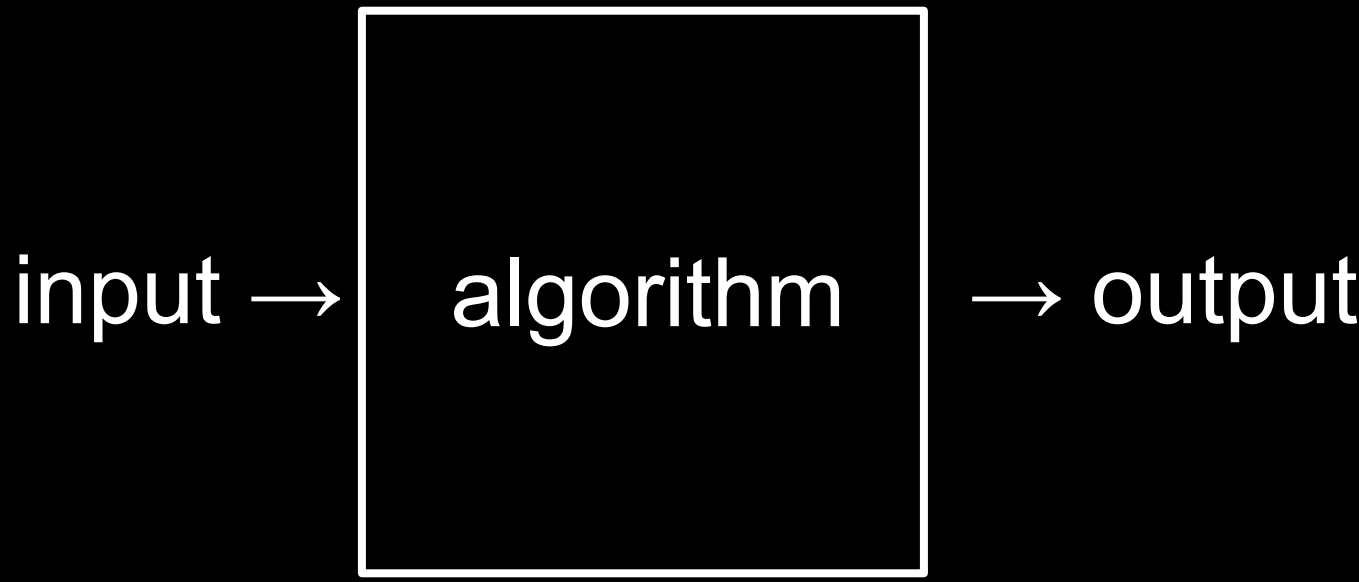

input →
algorithm
→ output

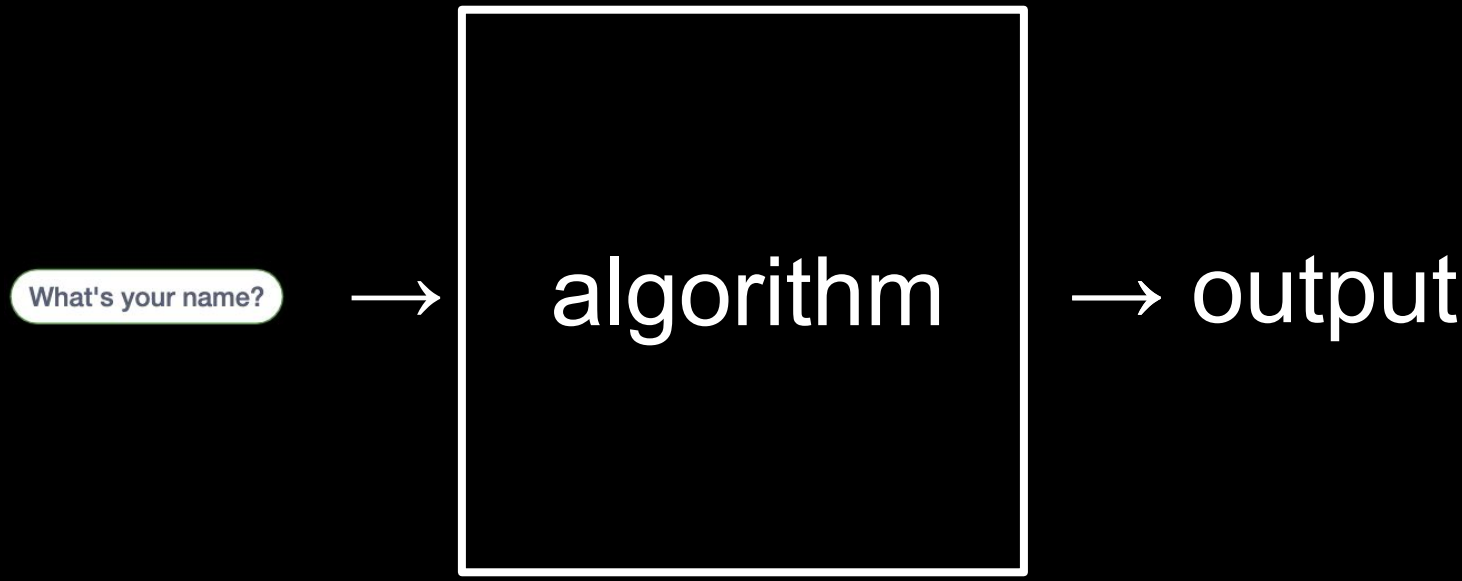

hello, world
algorithm
output

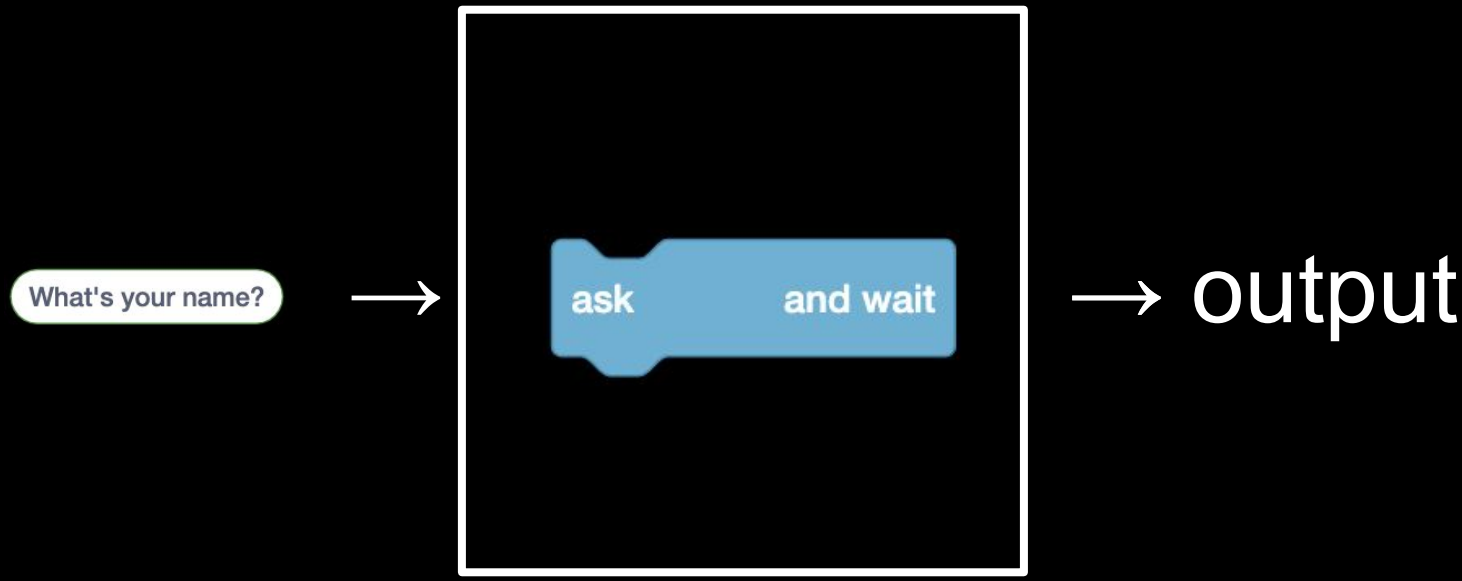

hello, world
say
output

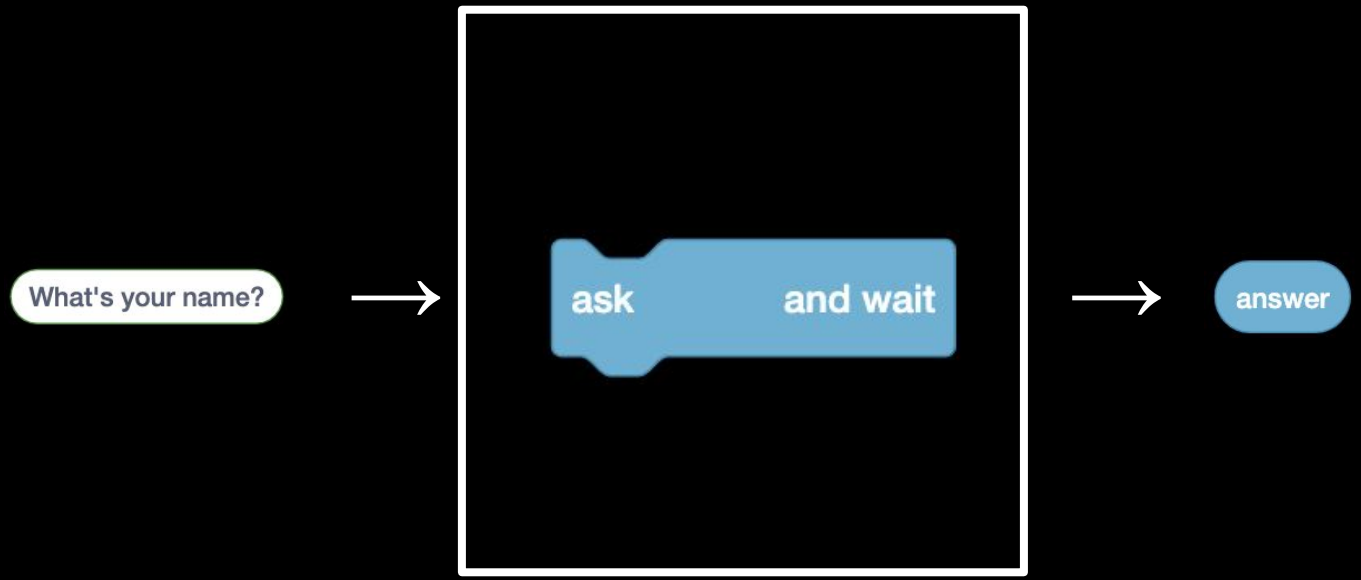

hello, world
say
hello, world

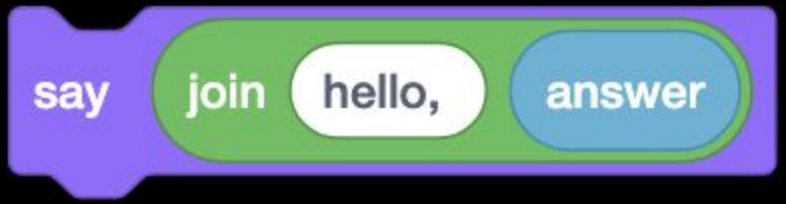

ask
What's your name?
and wait

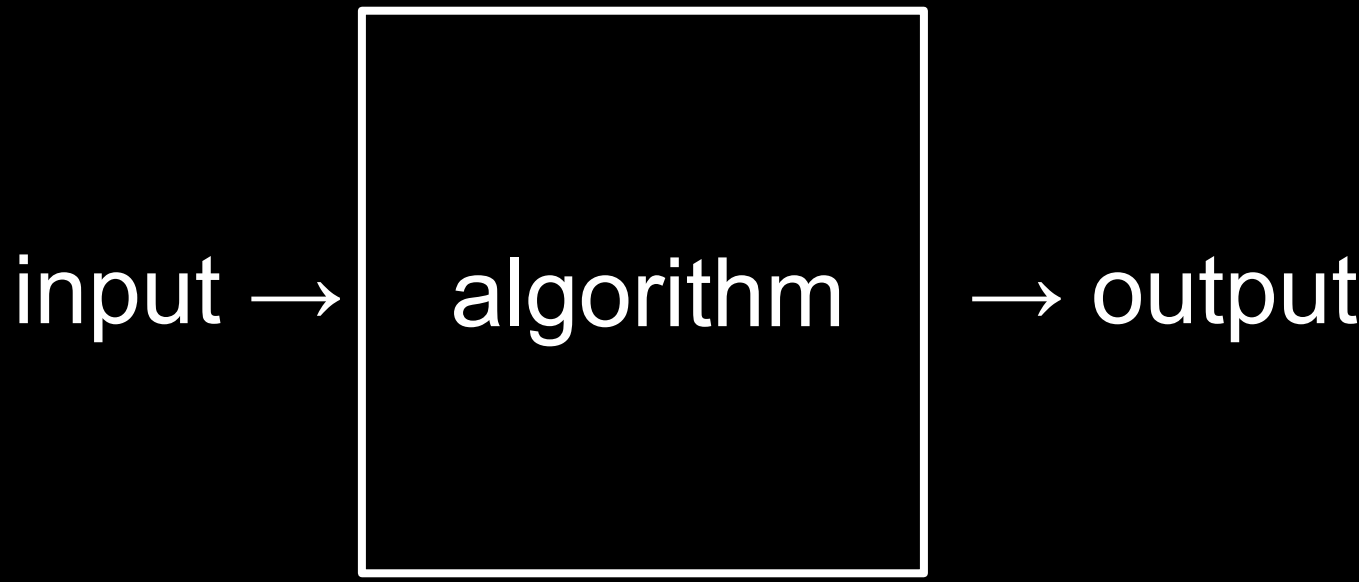

input →
algorithm
→ output

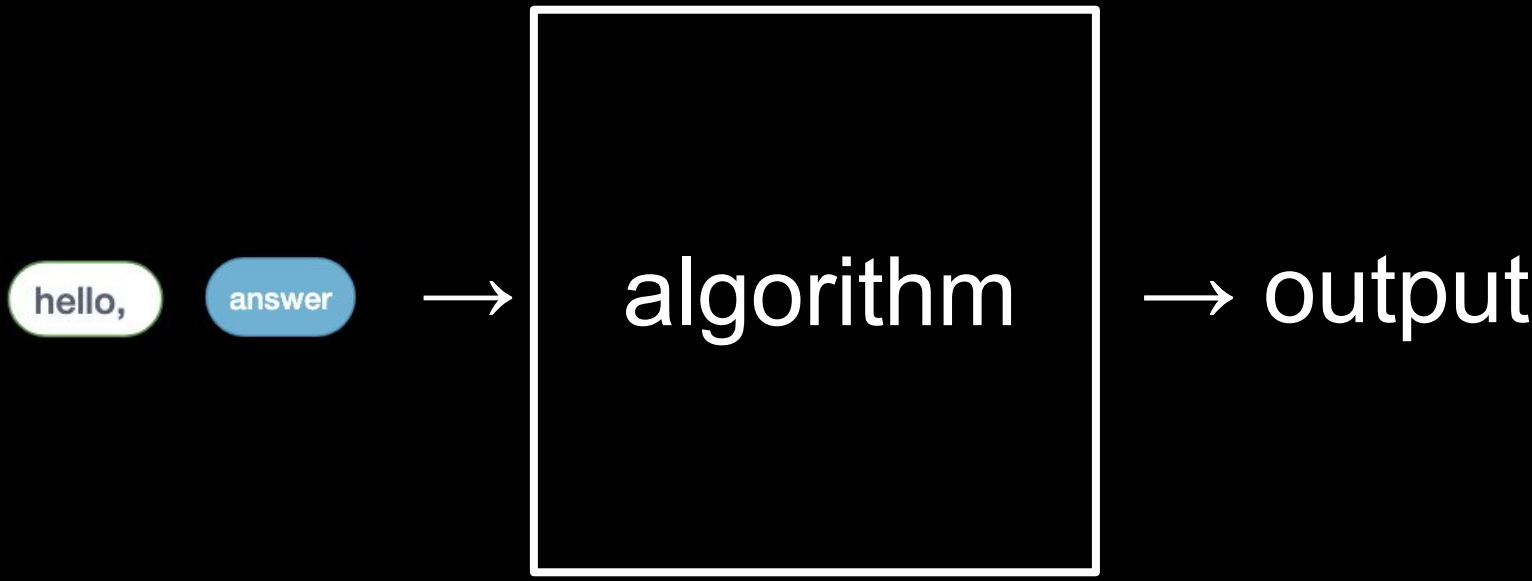

What's your name?
algorithm
output

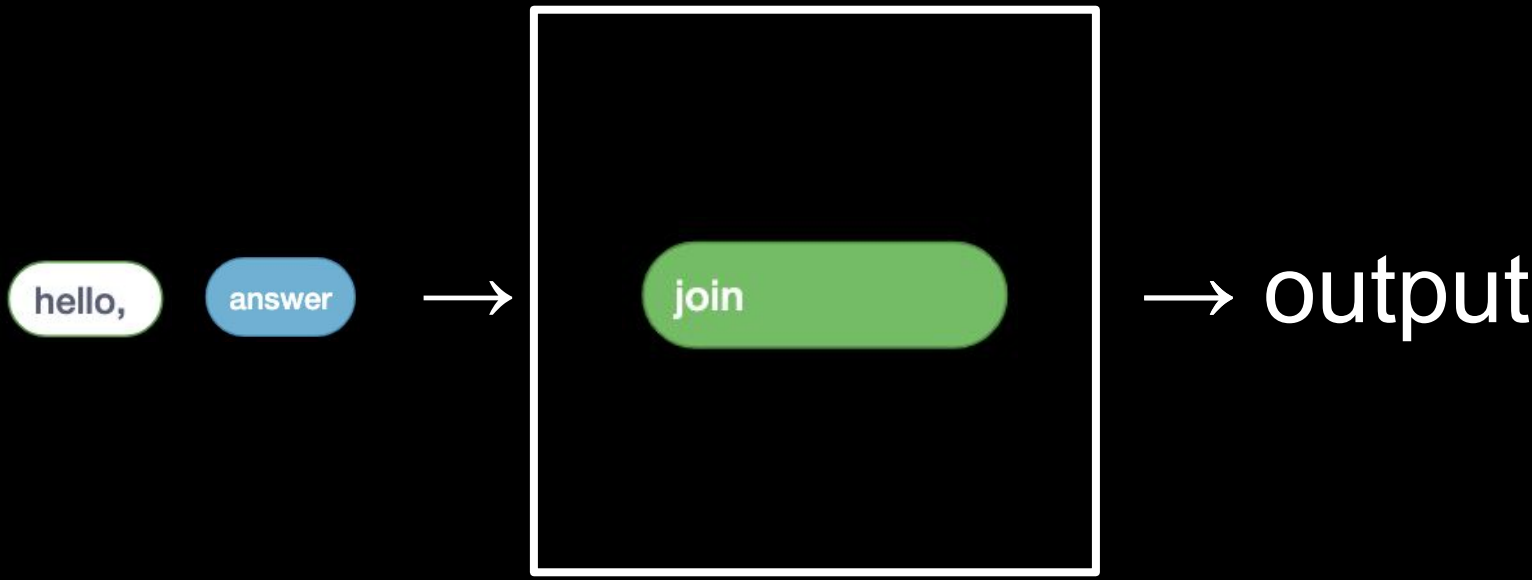

What's your name?
ask
and wait
output

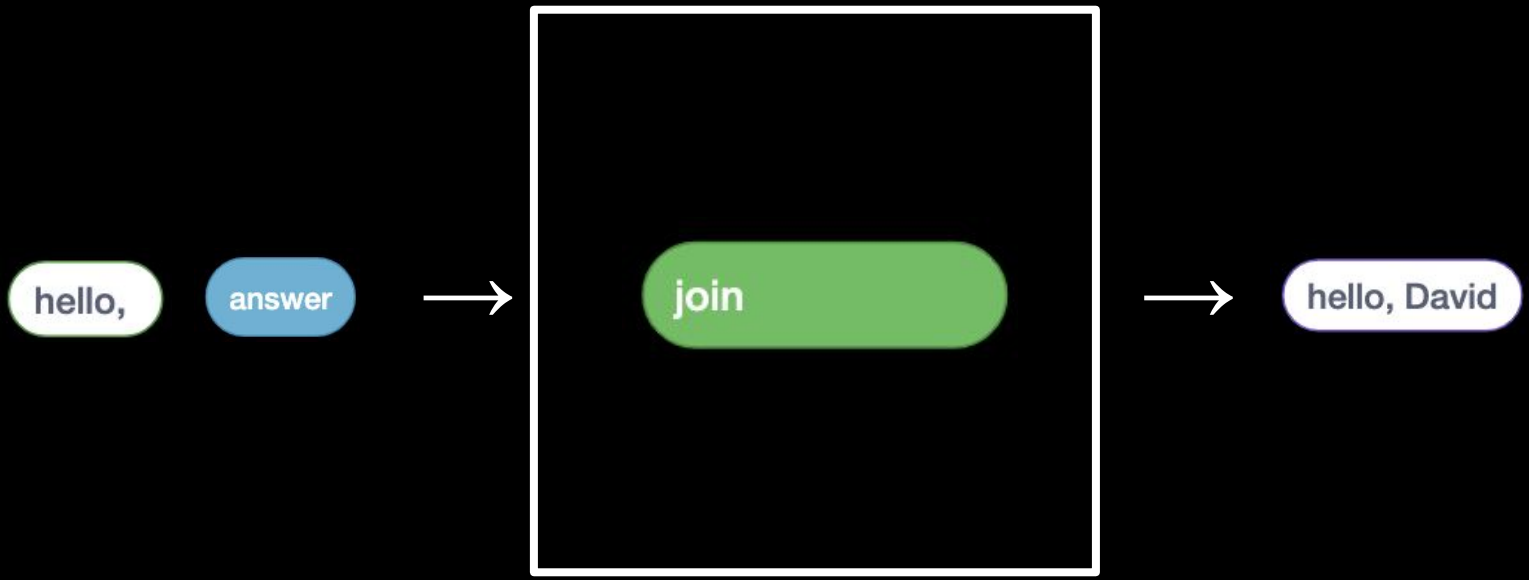

What's your name?
ask
and wait
answer


say
join
hello,
answer


input →
algorithm
→ output

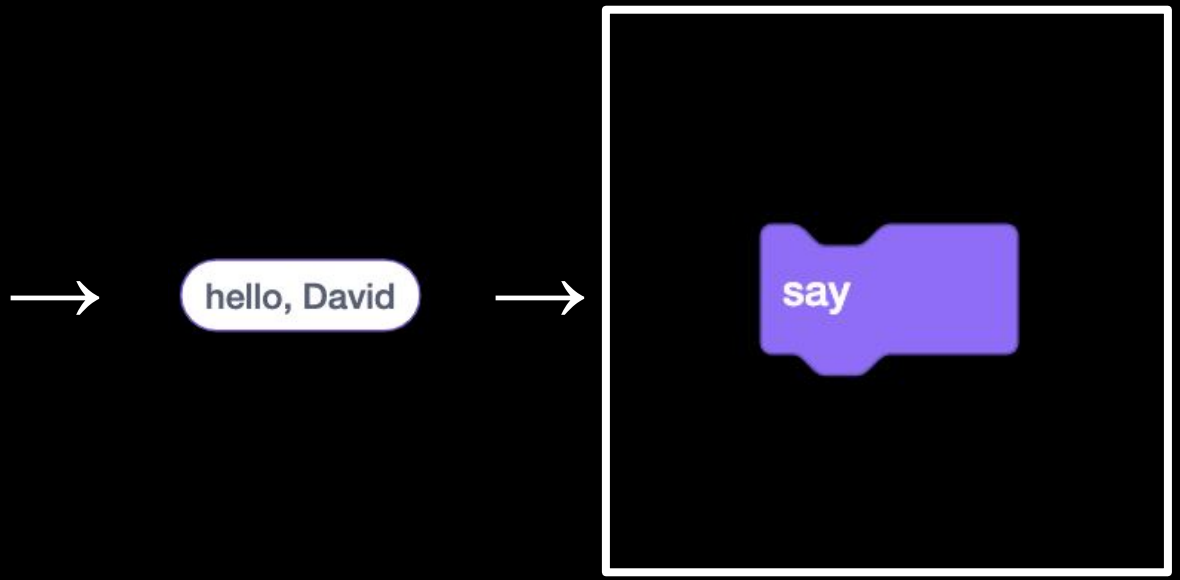

hello,
answer
algorithm
output


hello,
answer
join
output


hello,
answer
join
hello, David


hello, David


hello, David


hello, David
say


hello, David
say
hello, David

# This is CS50