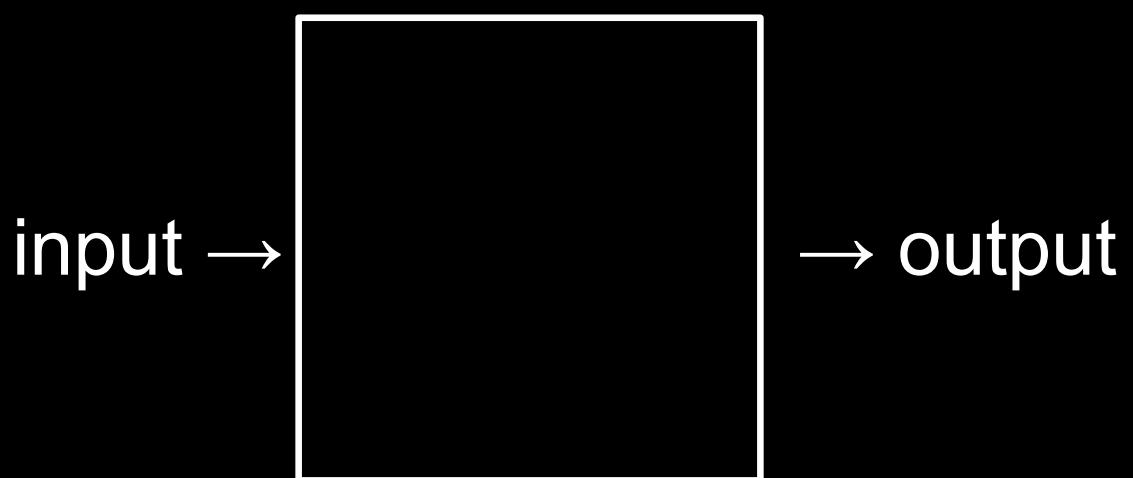


# This is CS50

# 2/3

of CS50 students have never taken CS before

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



representation



0 1 2 3 4 5 6 7 8 9

0 1

123

1

123

10 1

123

100 10 1

123

100 10 1

123

$100 \times 1$

100 10 1

123

$100 \times 1 +$

100    10    1

123

$100 \times 1 + 10 \times 2$

100    10    1

123

$100 \times 1 + 10 \times 2 +$

100    10    1

123

$100 \times 1 + 10 \times 2 + 1 \times 3$

100    10    1

123

100    +    20    +    3

123

100 10 1

000

100 10 1

001

100 10 1

002

100 10 1

003

100 10 1

004

100 10 1

005

100 10 1

006

100 10 1

007

100 10 1

008

100 10 1

009

100 10 1

010

100 10 1

000

$10^2$     $10^1$     $10^0$

000

$2^2$      $2^1$      $2^0$

000

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

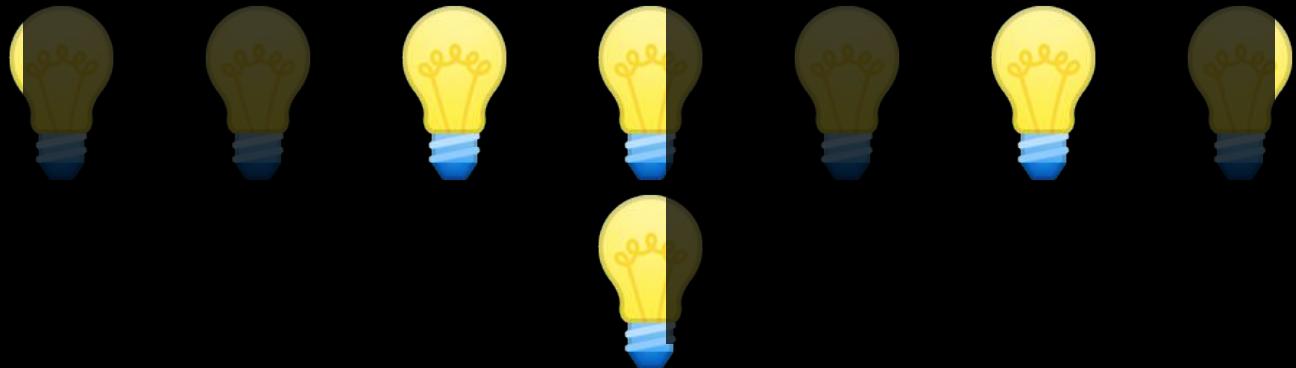
**bit**



bit bit bit bit bit bit bit bit



byte



A

65

01000001

65

# ASCII

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

72

73

33

H

72

I

73

33

H

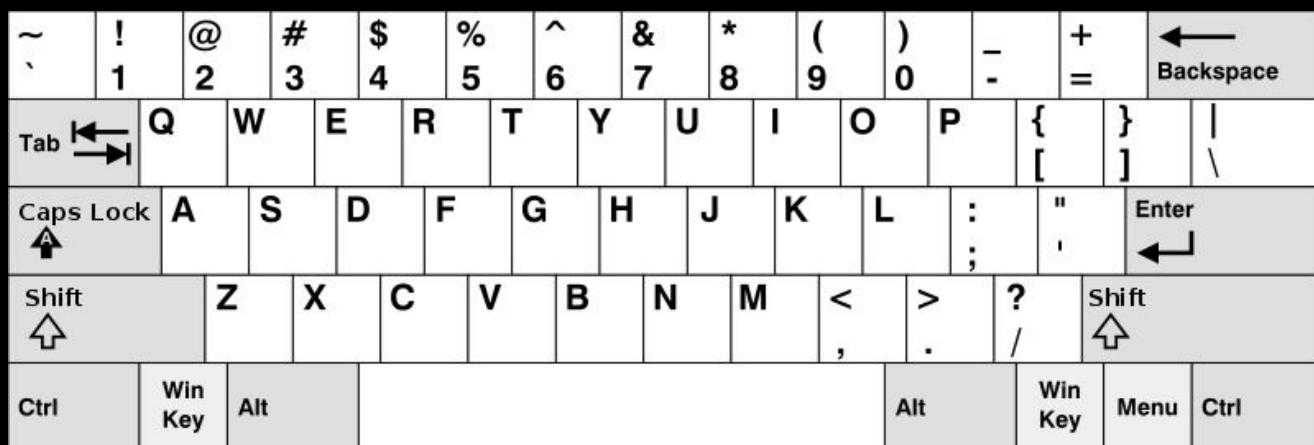
72

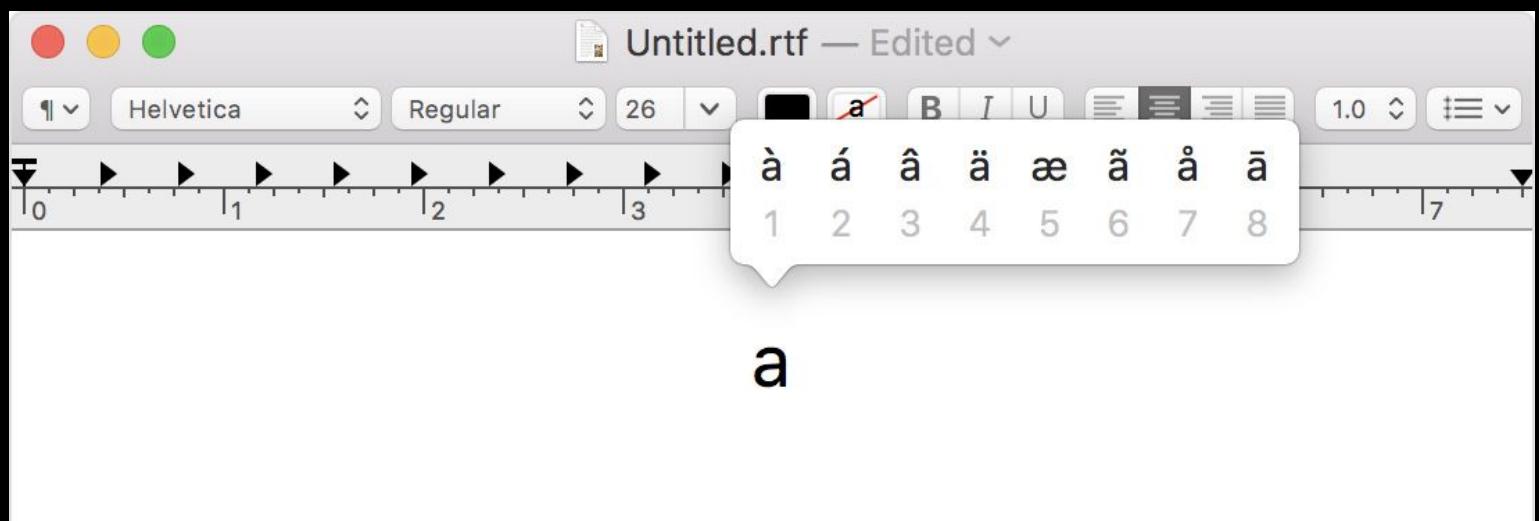
I

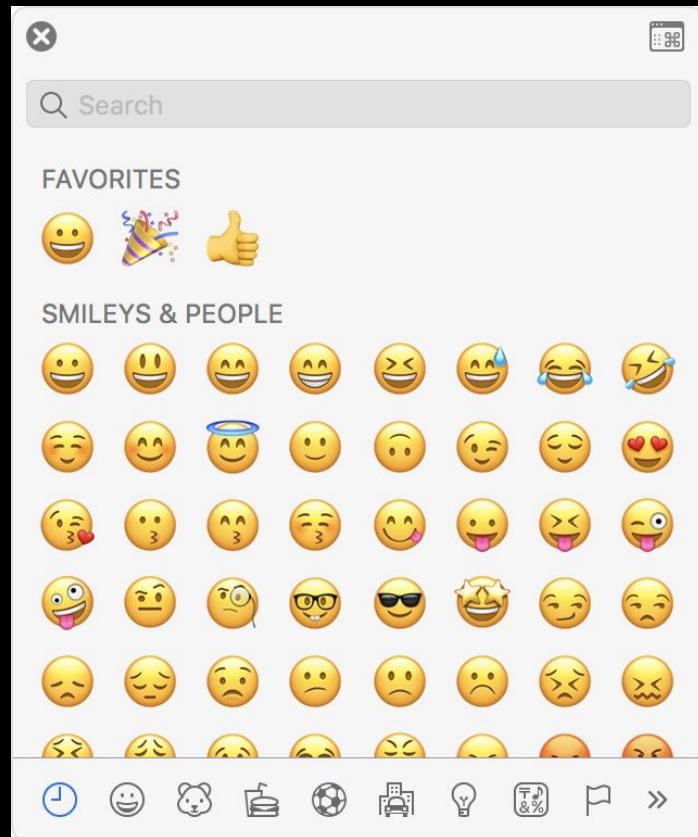
73

!

33







# Unicode

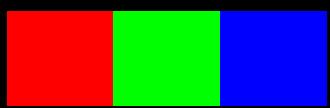


128514

111101100000010

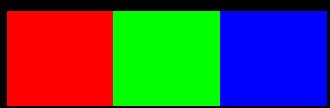


RGB

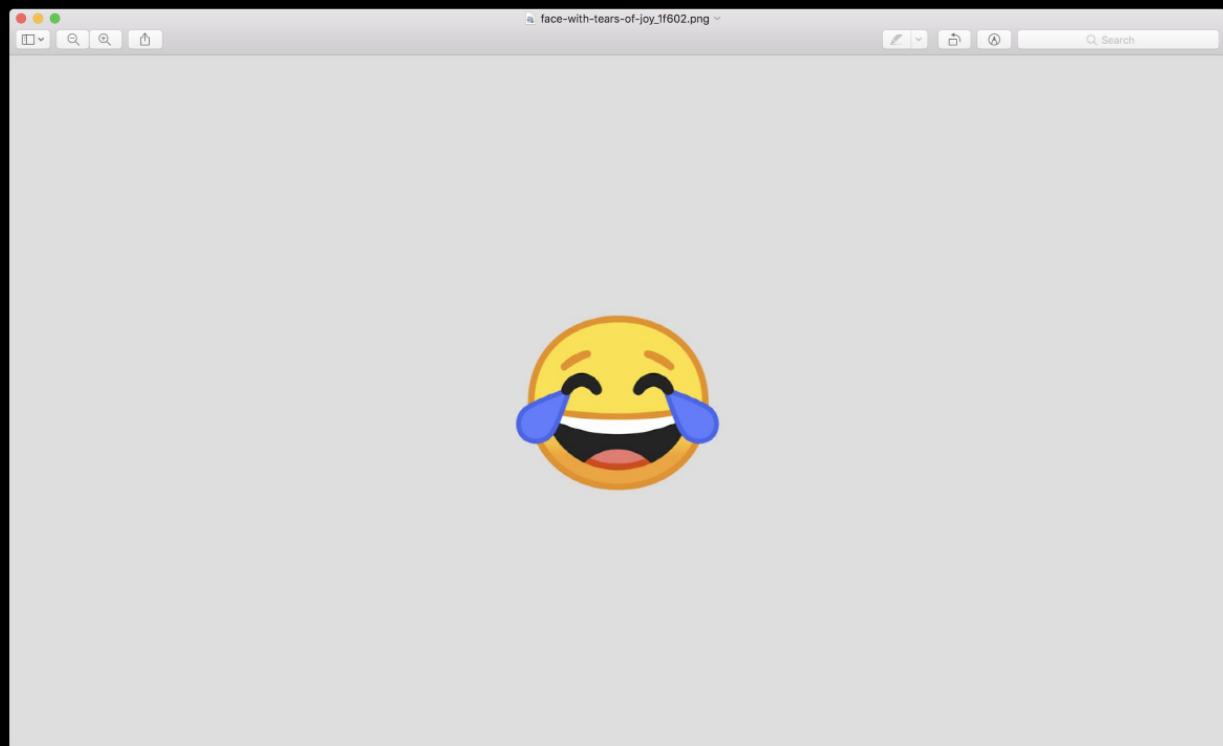


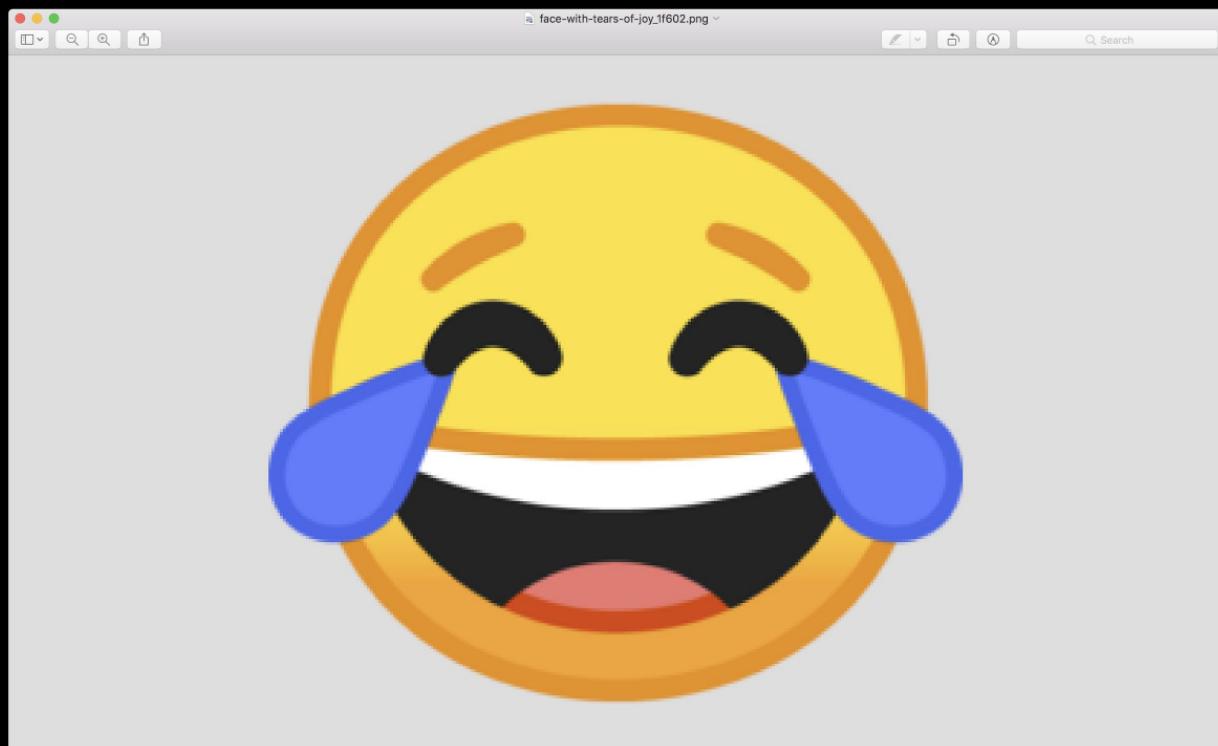
72 73 33

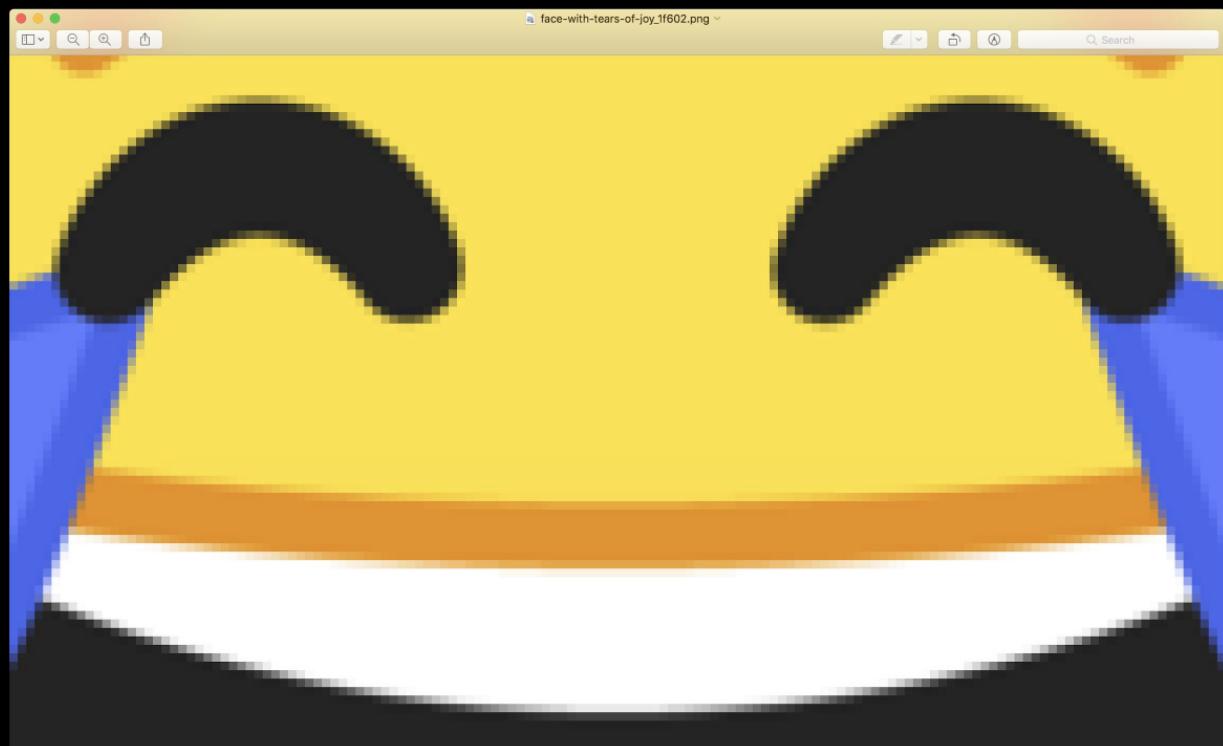
72 73 33

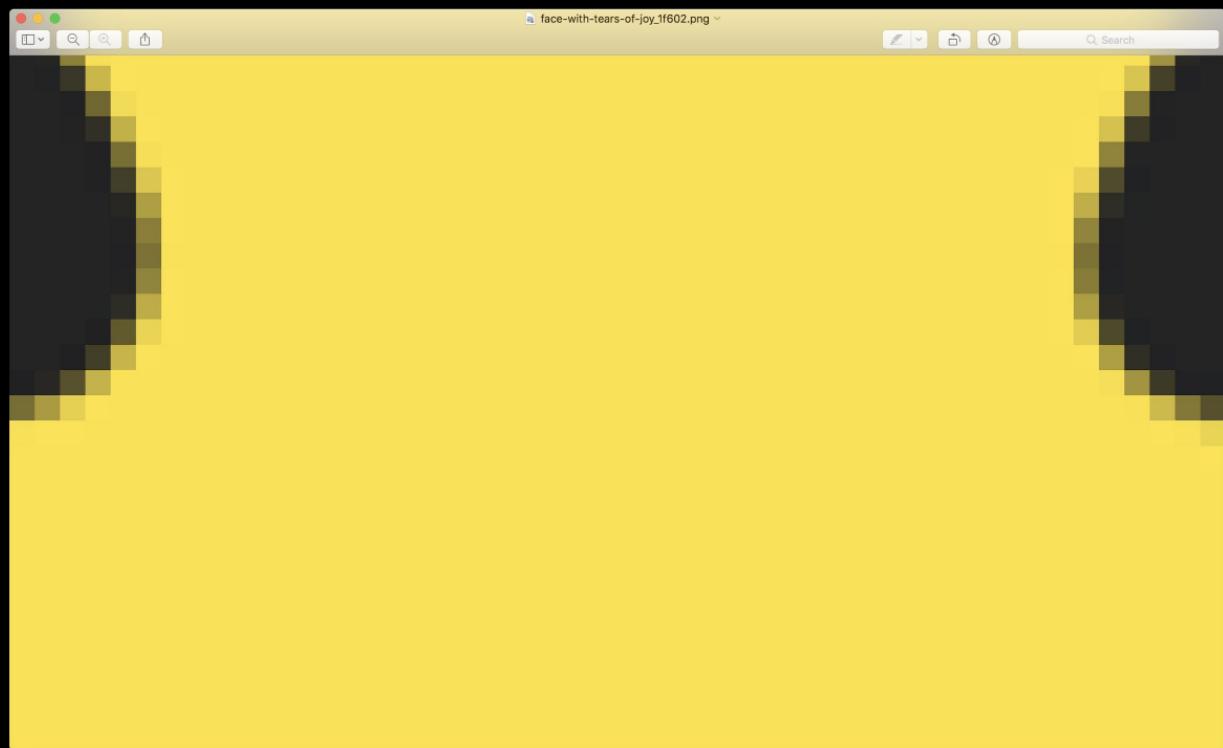




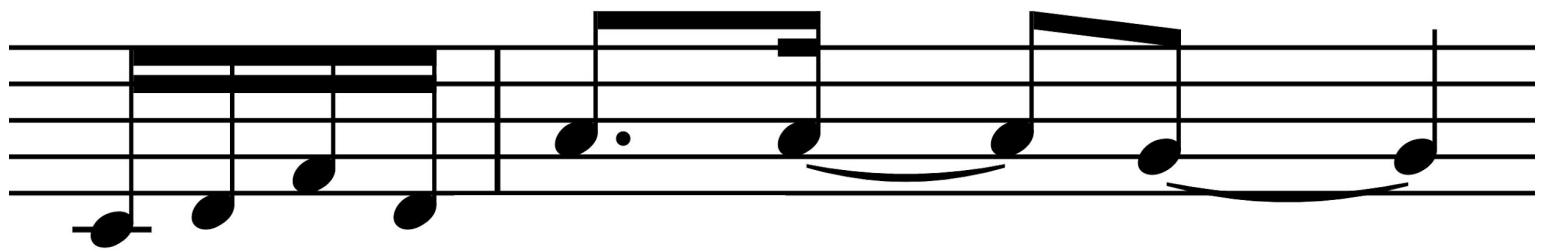


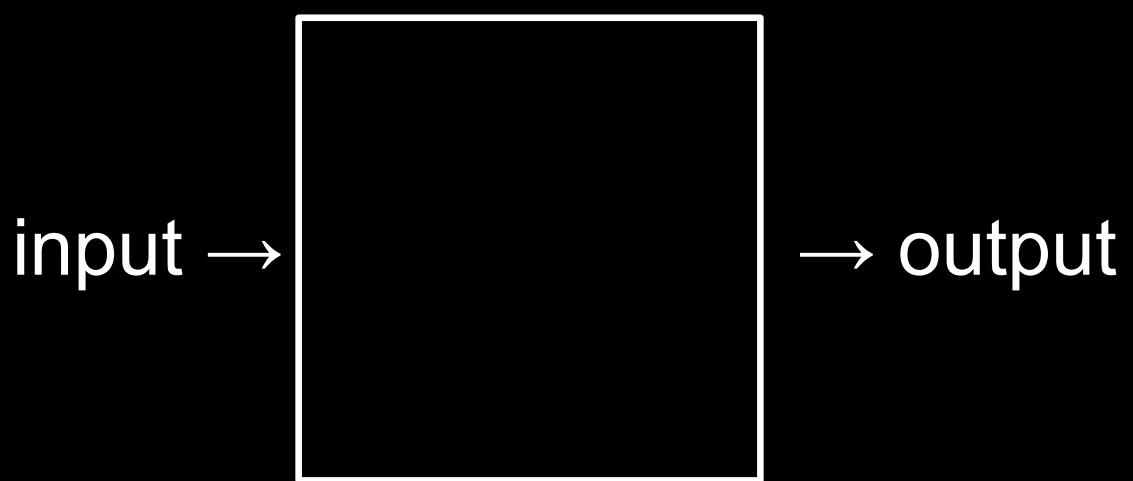










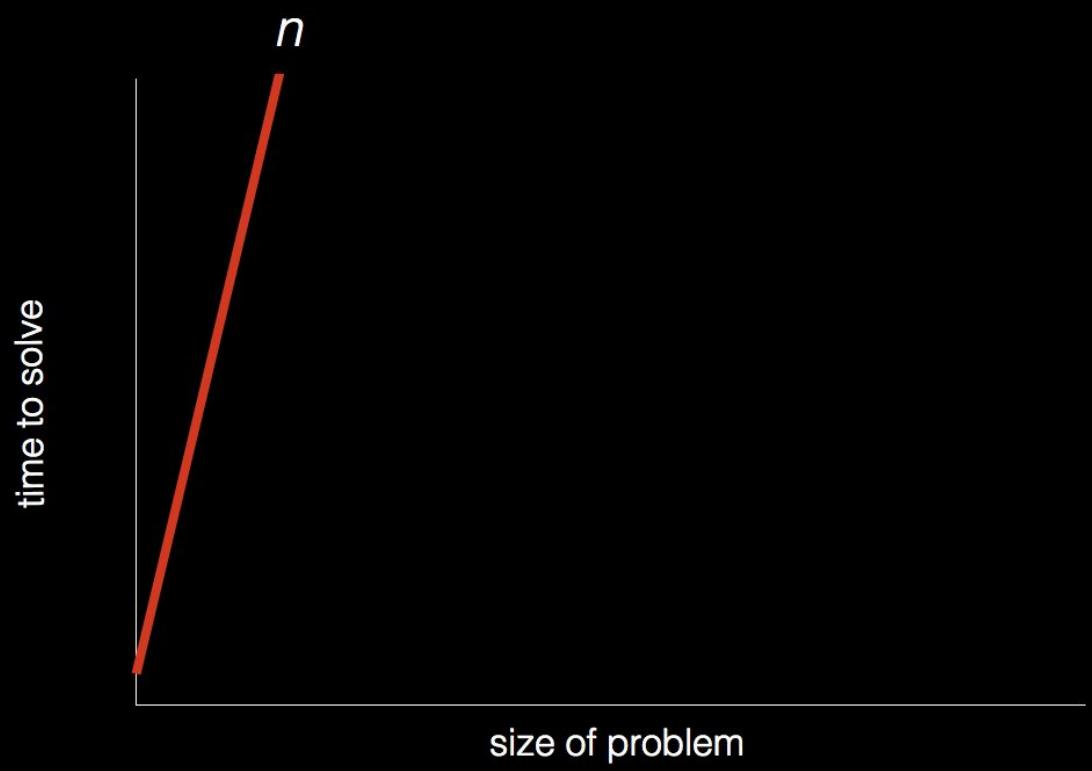


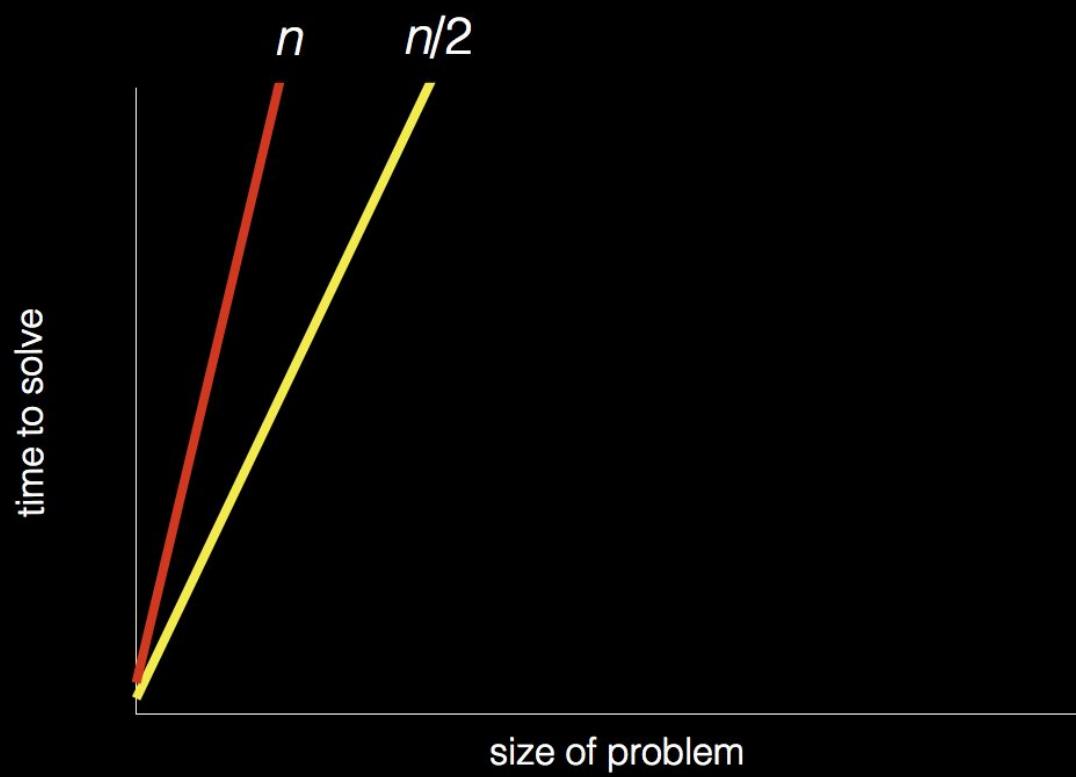
algorithms

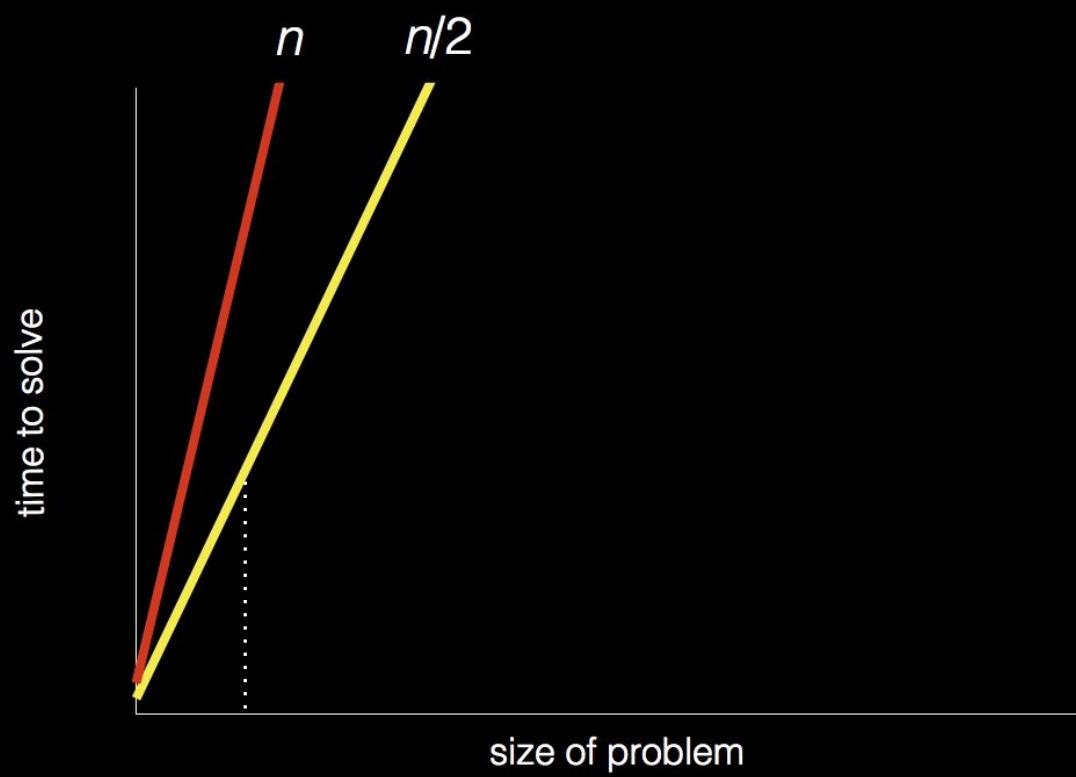
1024  
512  
256  
128  
64  
32  
16  
8  
4  
2  
1

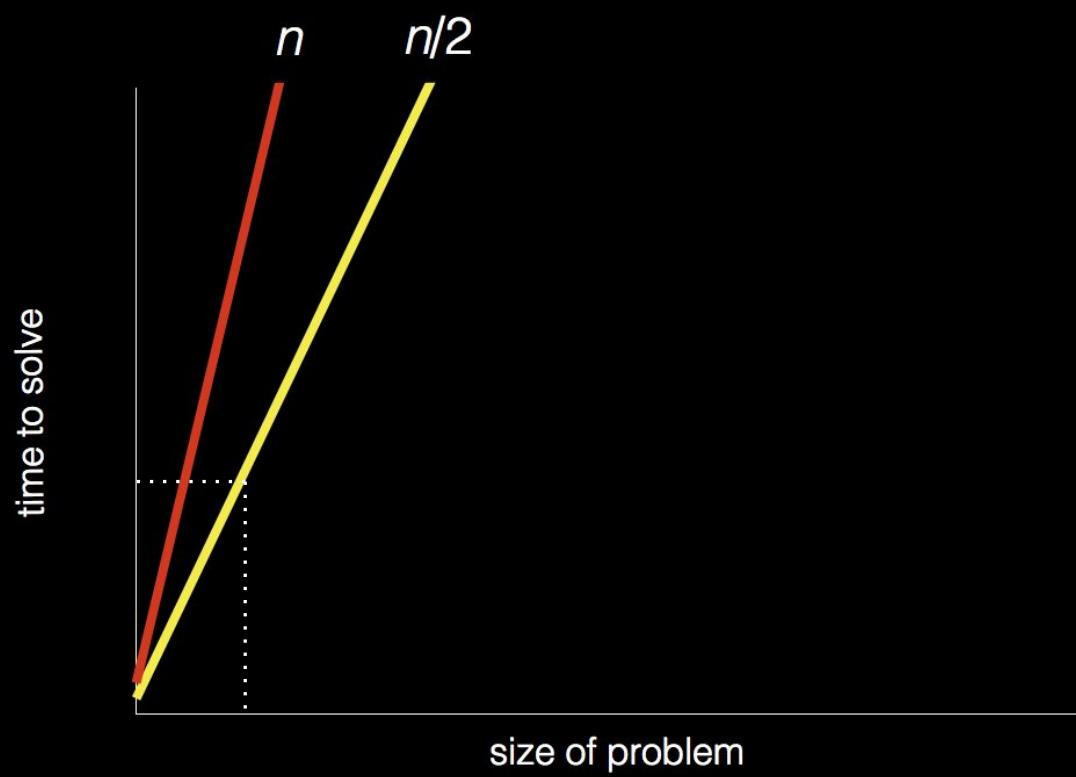
time to solve

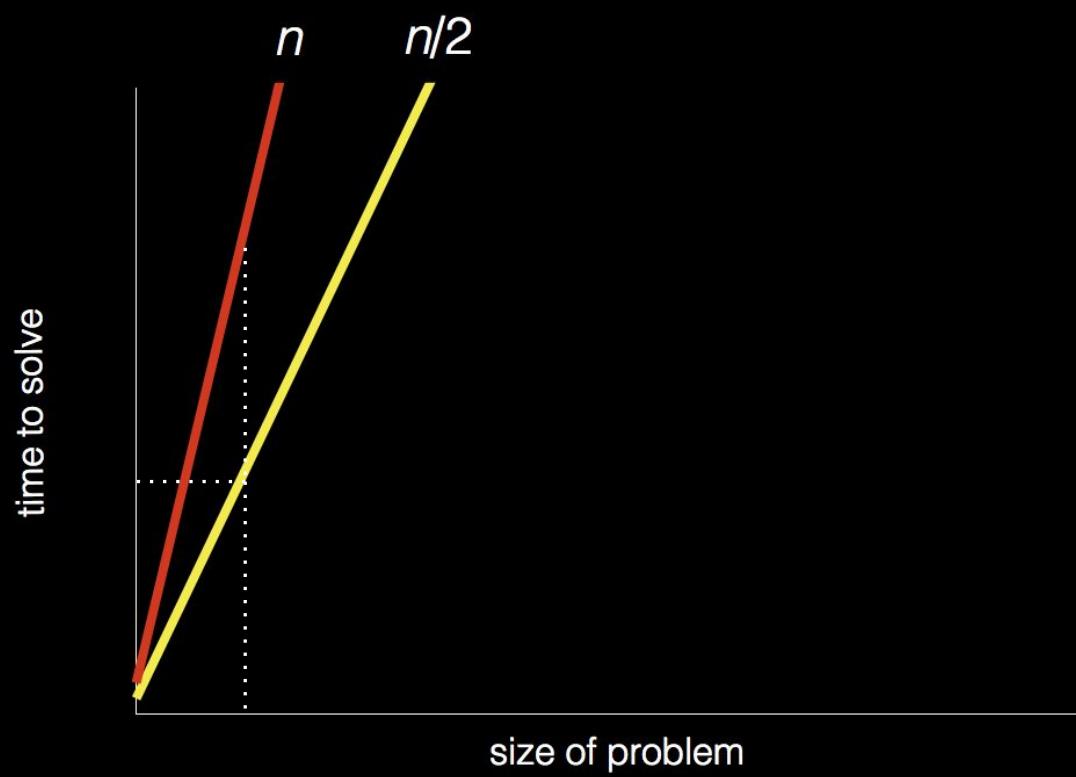
size of problem

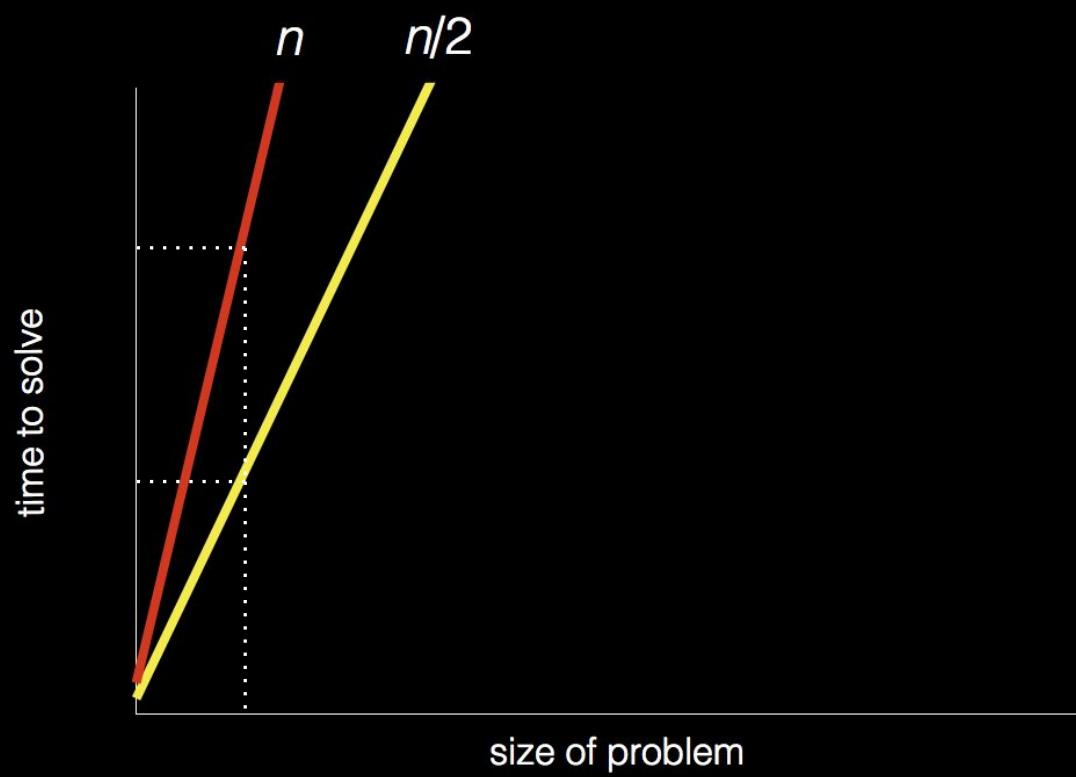


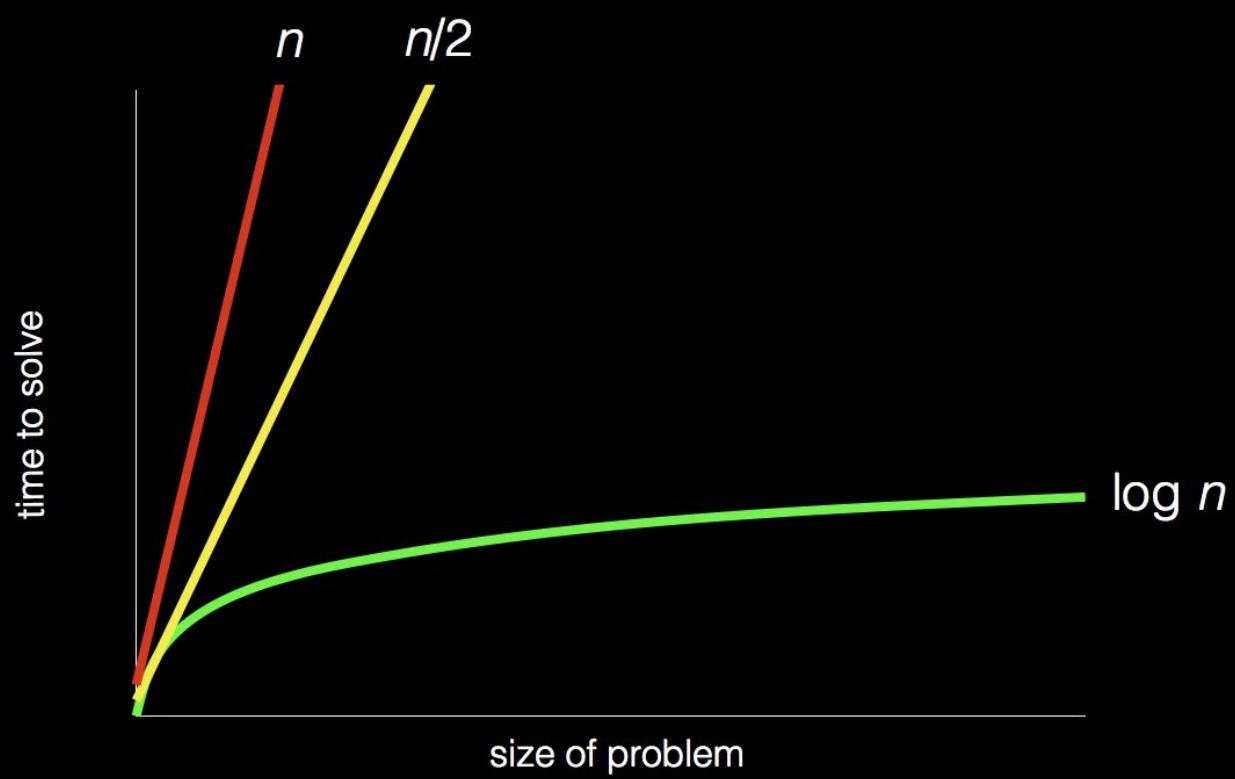












pseudocode

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

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13     Quit
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```
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9 Else if Smith is later in book
10 Open to middle of right half of book
11 Go back to line 3
12 Else
13 Quit
```

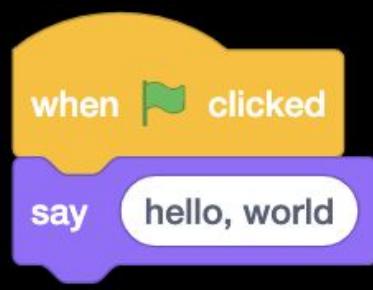
```
1 Pick up phone book
2 Open to middle of phone book
3 Look at page
4 If Smith is on page
    Call Mike
5 Else if Smith is earlier in book
    Open to middle of left half of book
8     Go back to line 3
9 Else if Smith is later in book
10    Open to middle of right half of book
11    Go back to line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

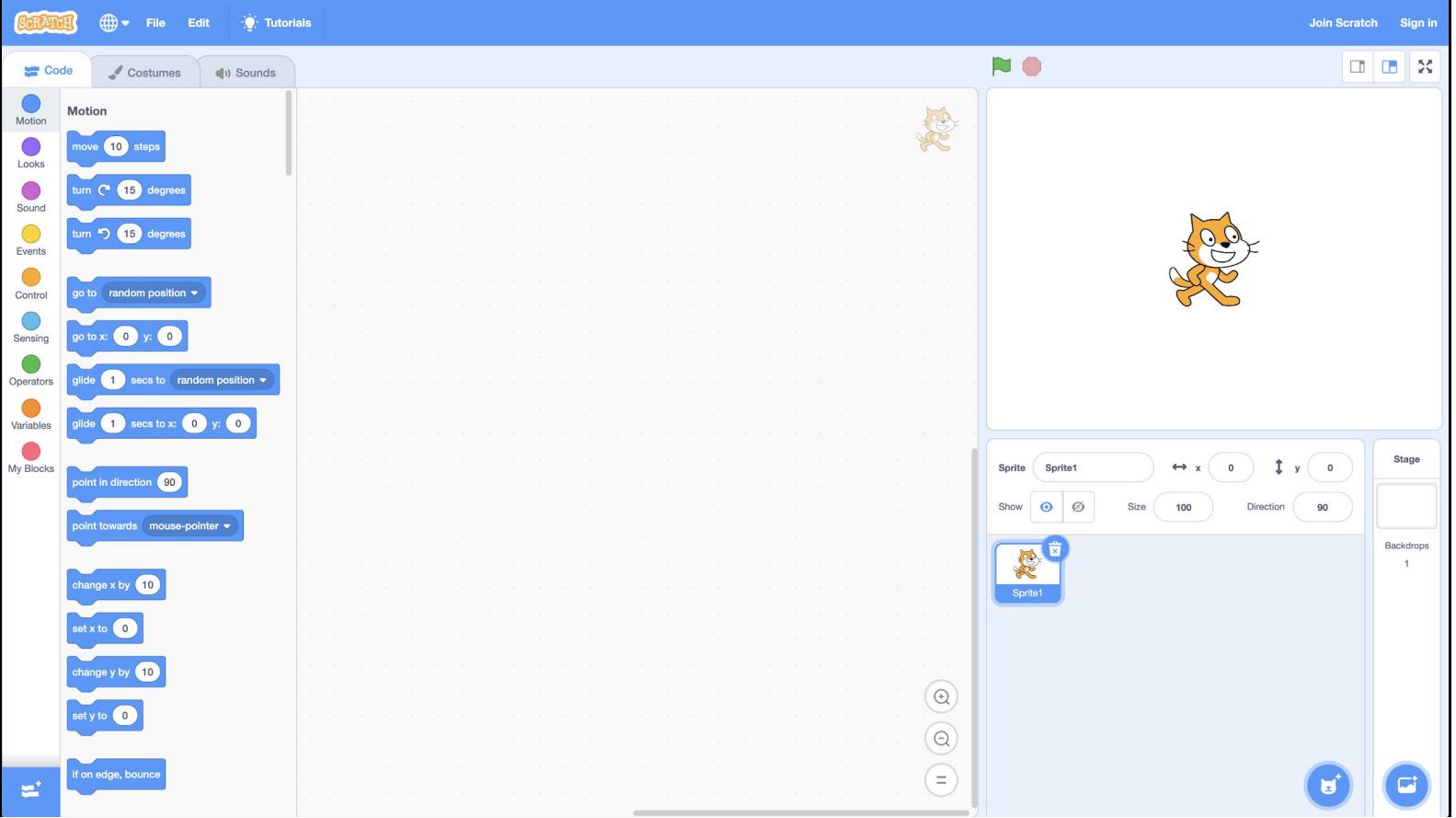
- functions
- conditions
- Boolean expressions
- loops

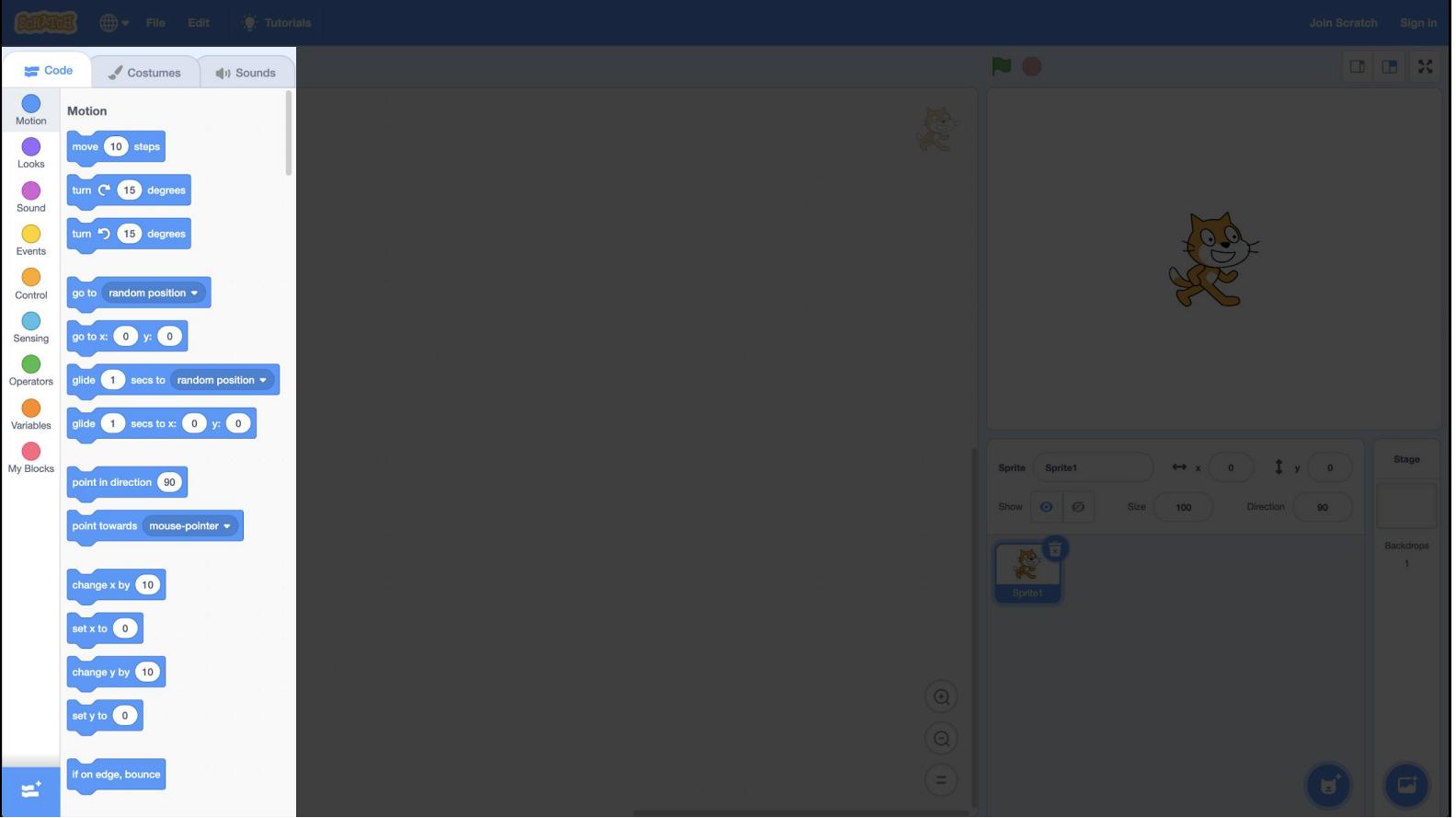
- functions
- conditions
- Boolean expressions
- loops
- variables
- threads
- events
- ...

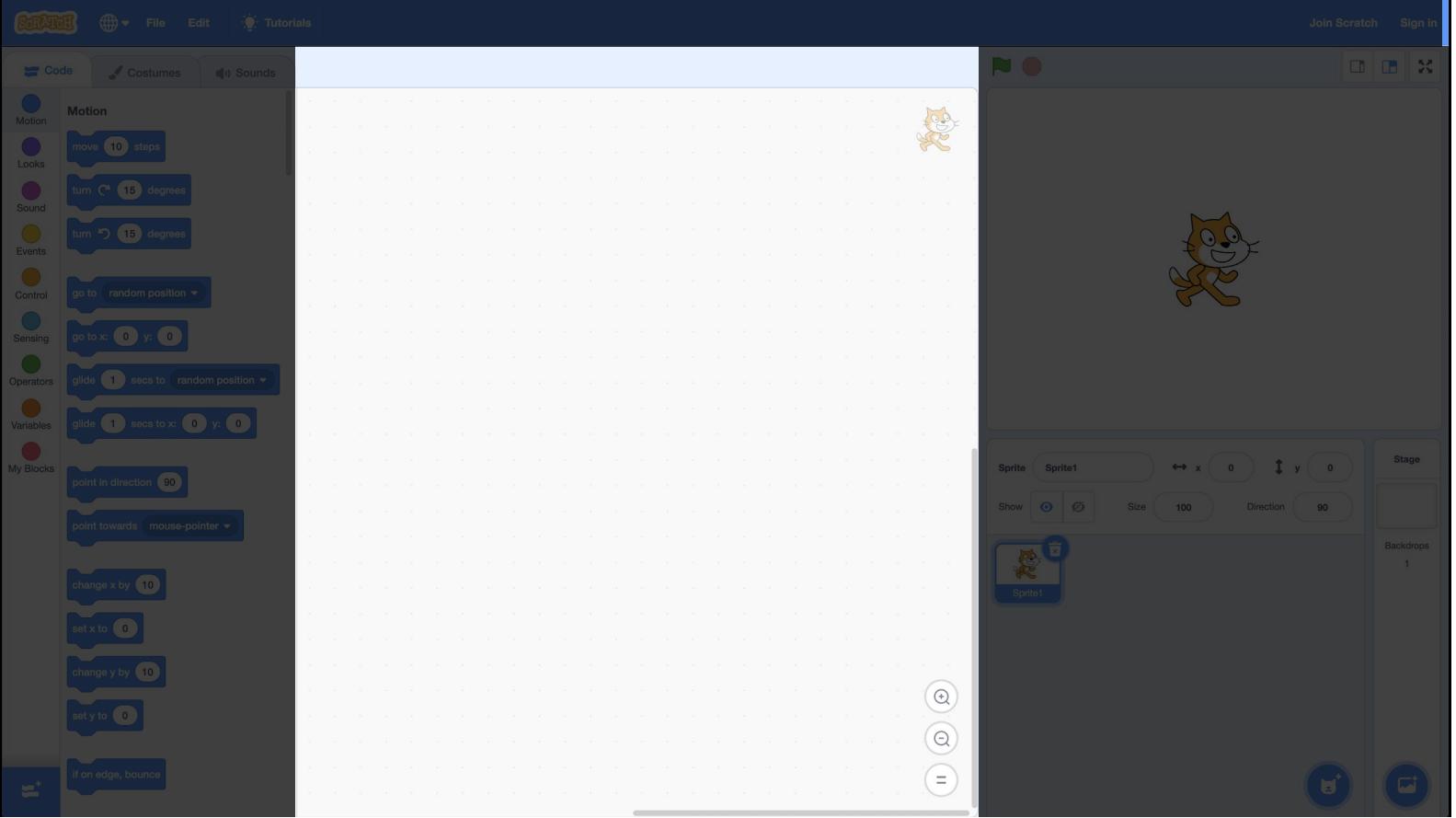
```
#include <stdio.h>

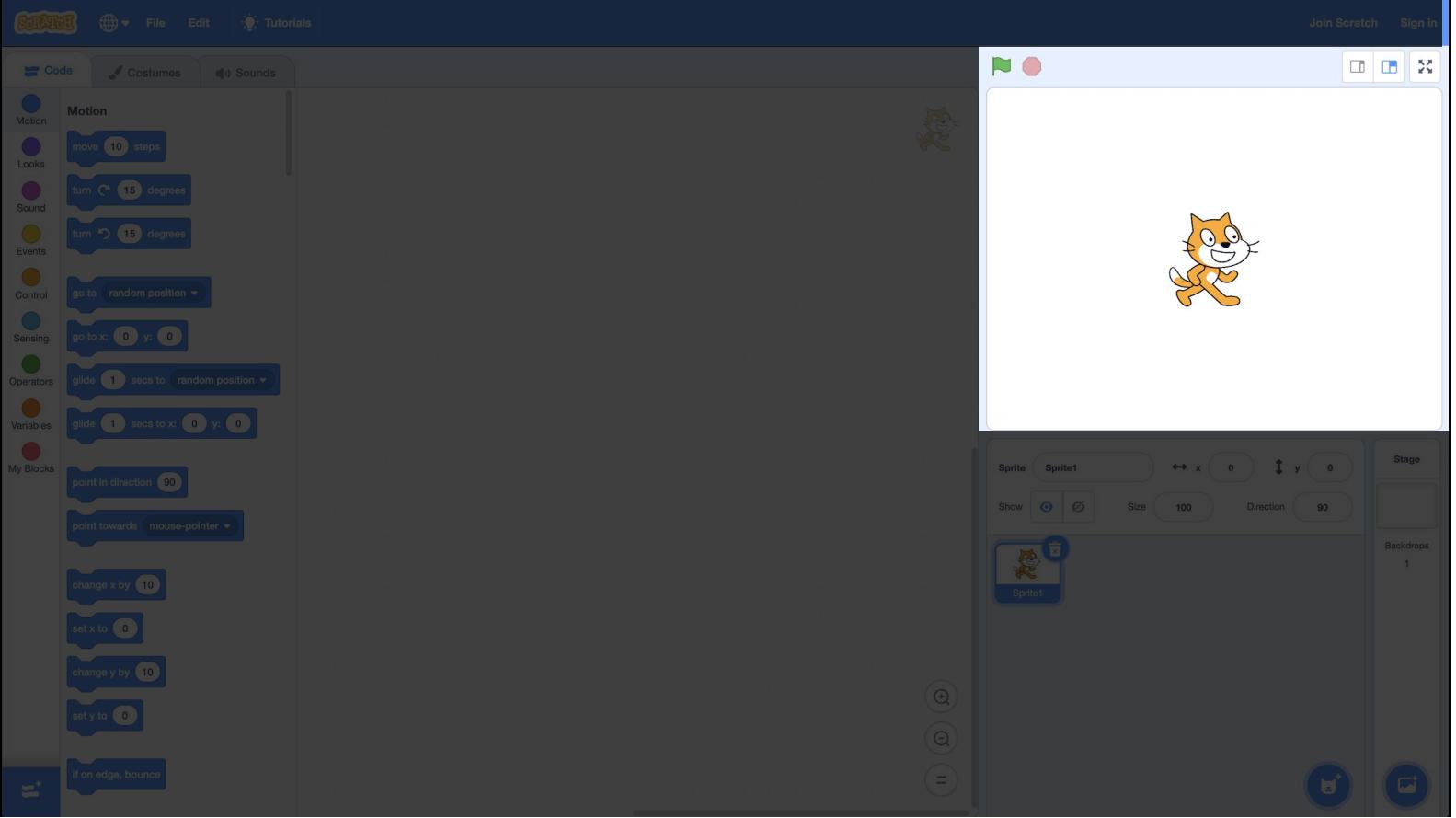
int main(void)
{
    printf("hello, world\n");
}
```

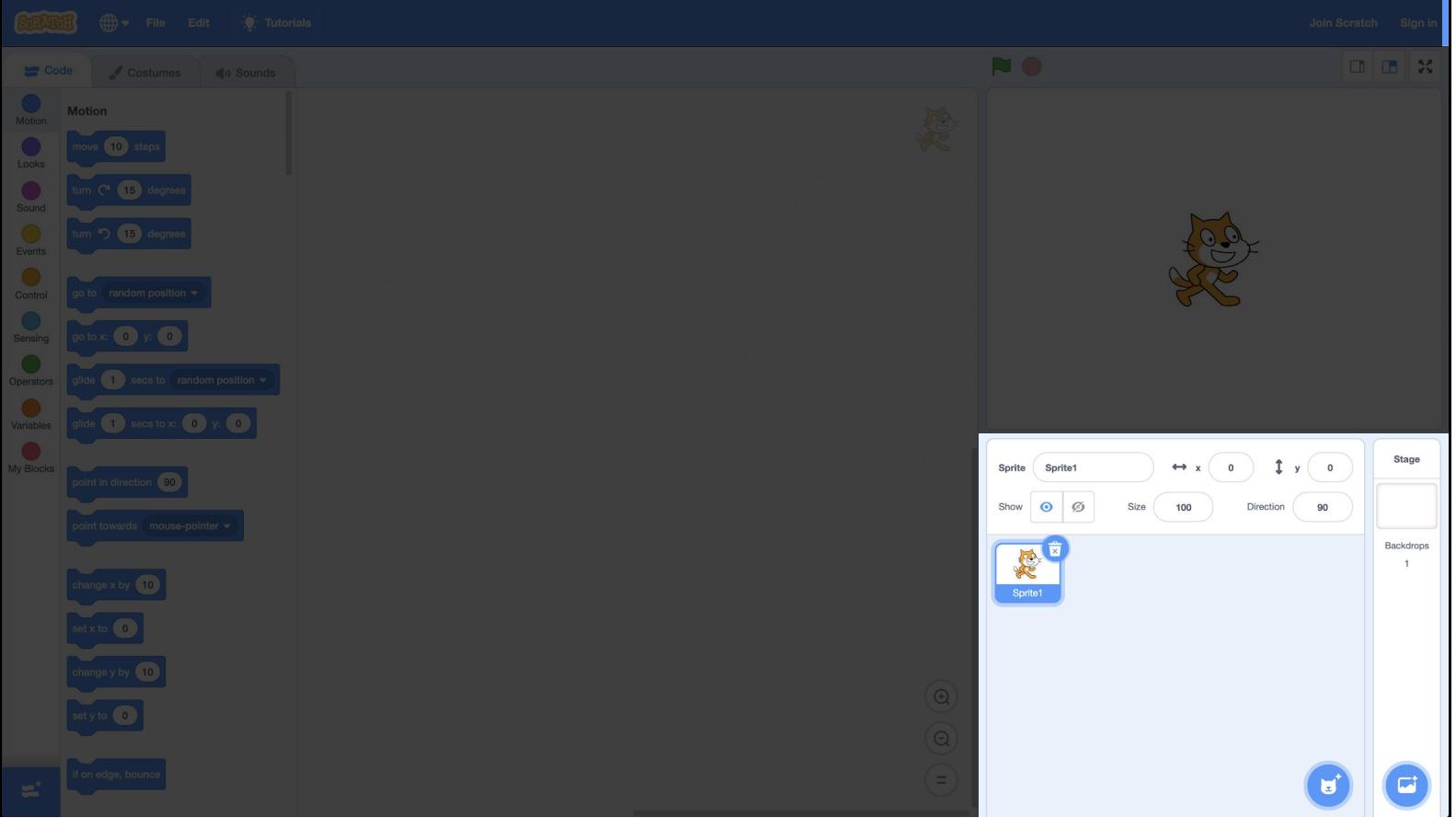






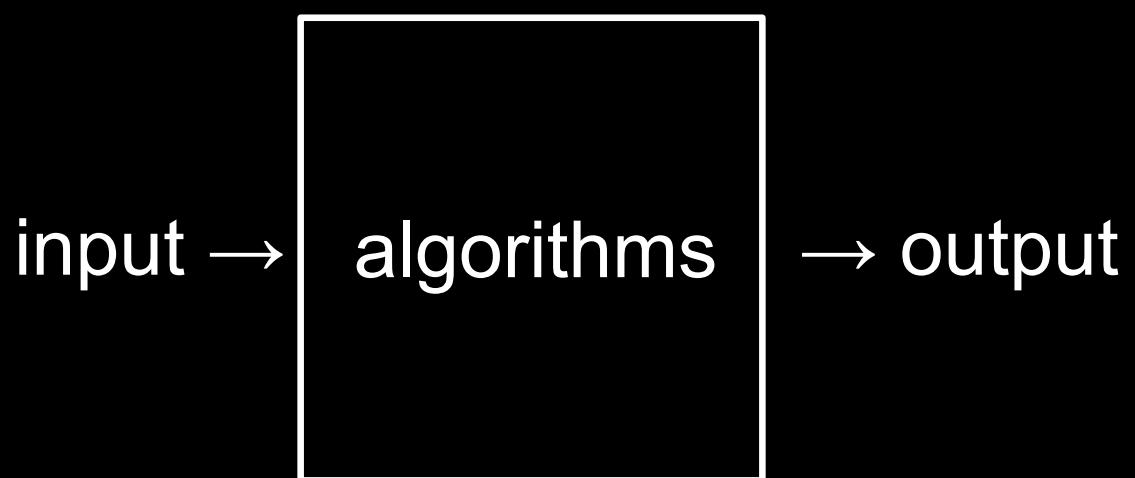






**say**

hello, world

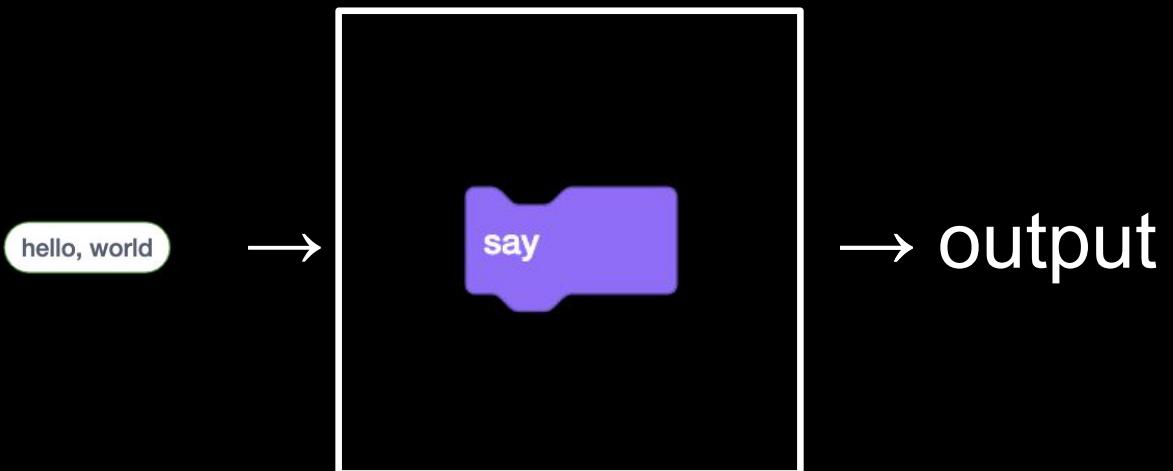


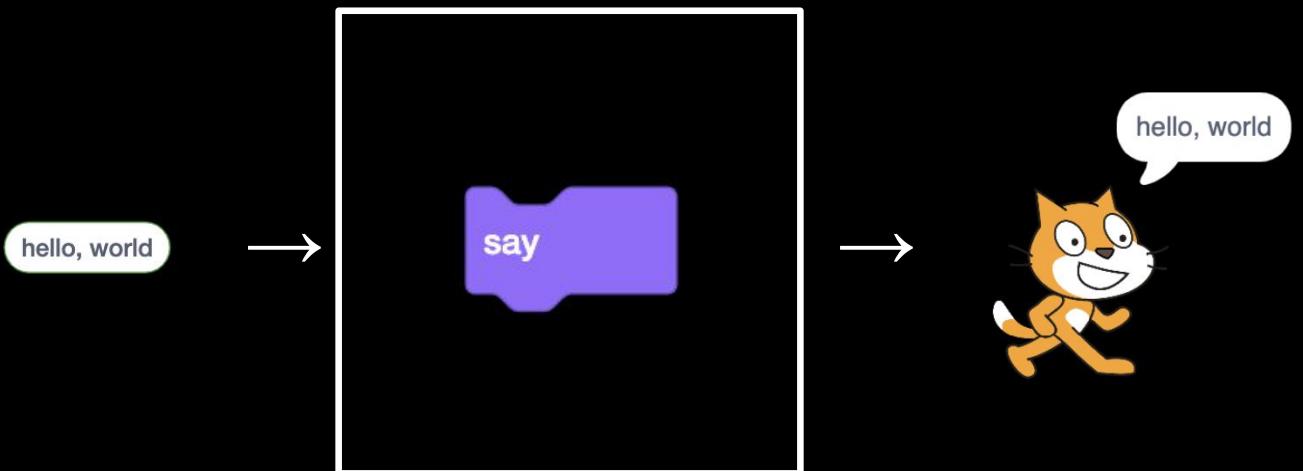
hello, world



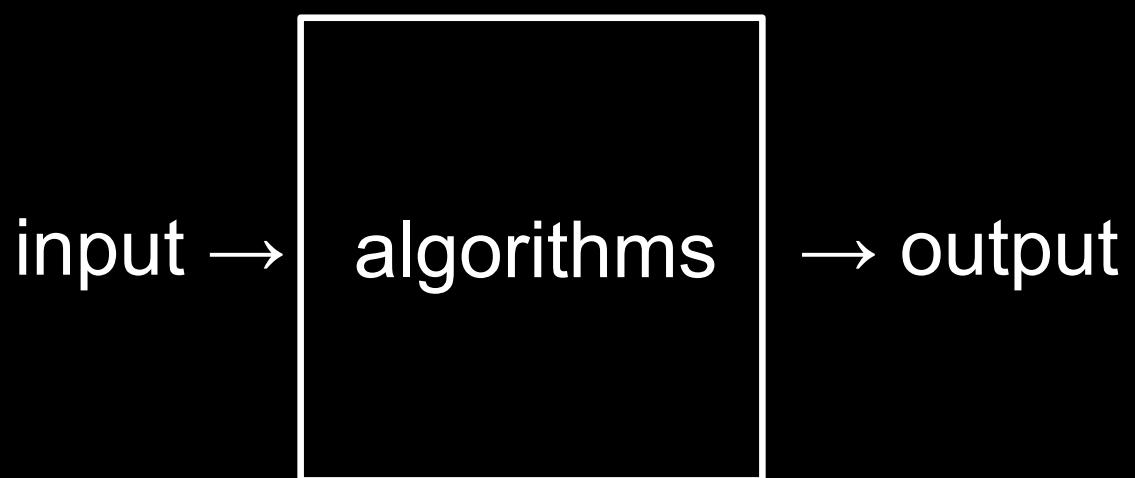
algorithms

→ output

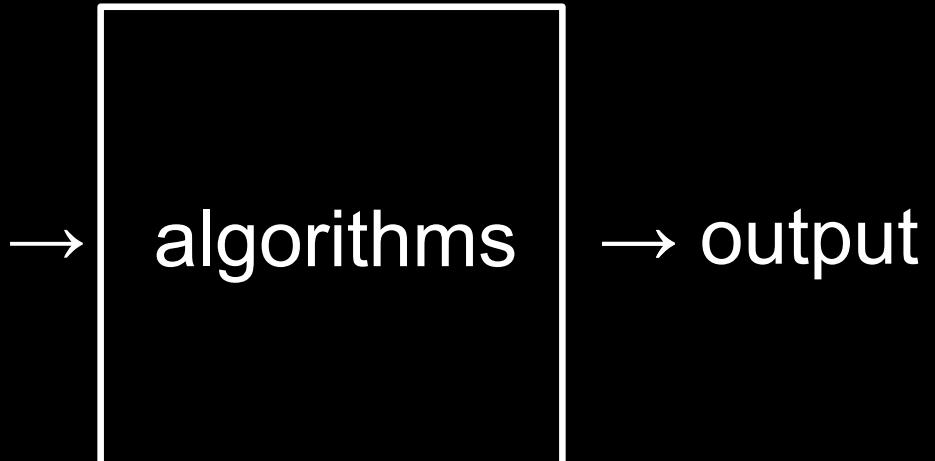




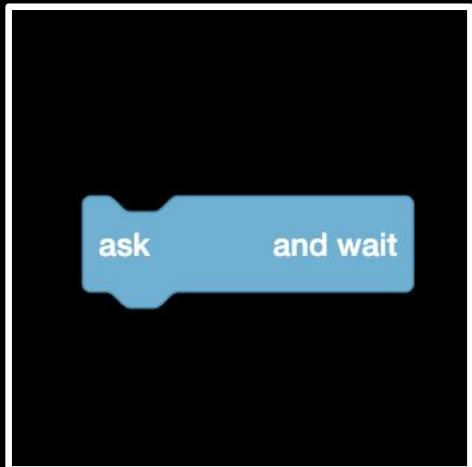
ask What's your name? and wait



What's your name?

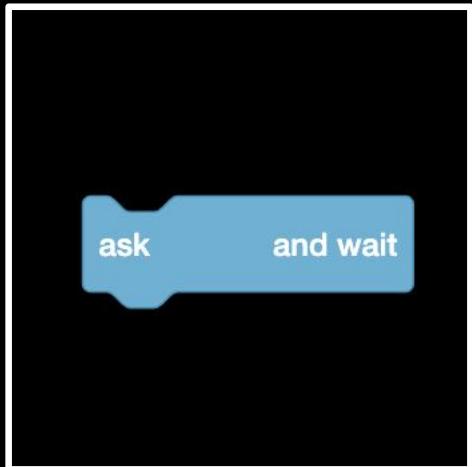


What's your name?



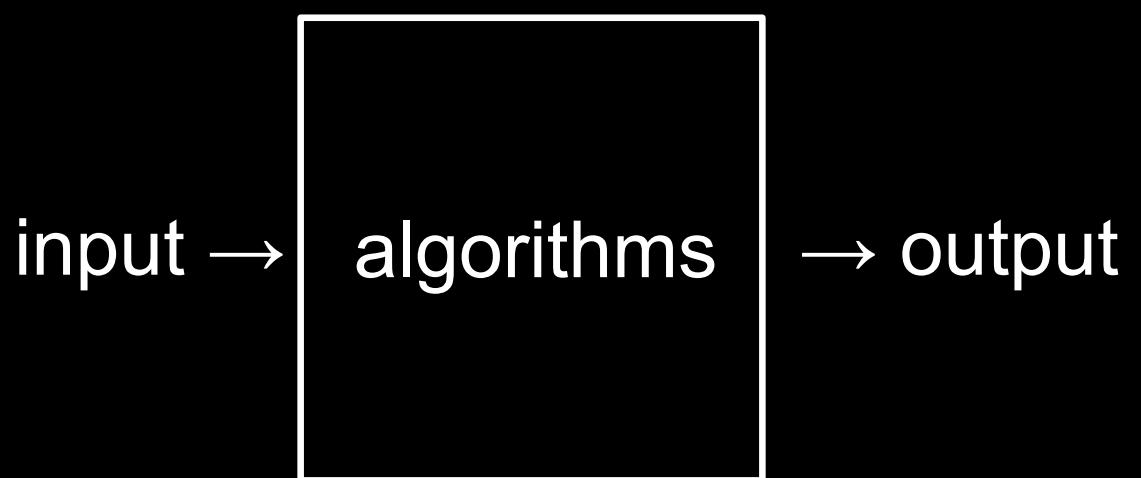
→ output

What's your name?



answer





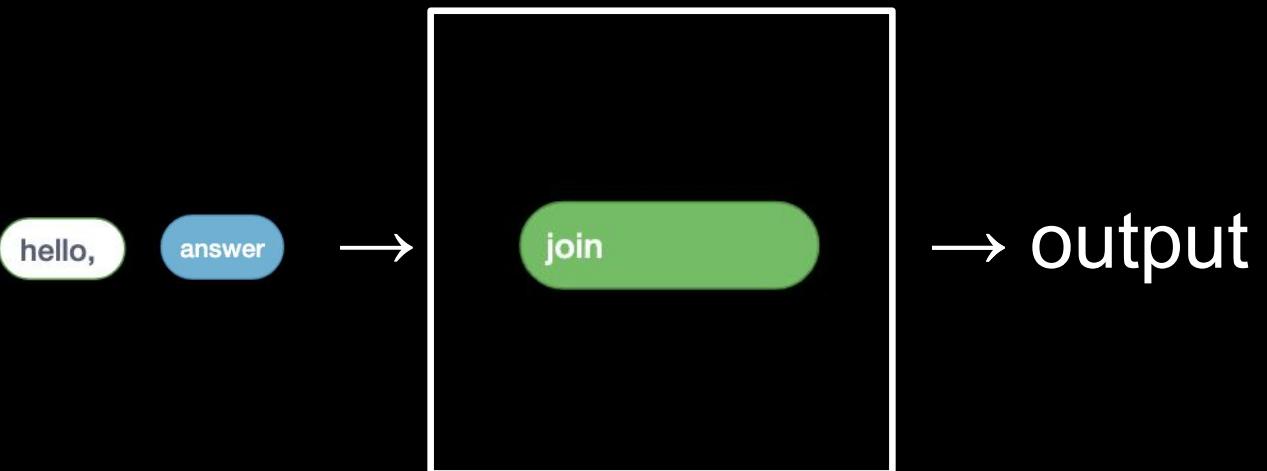
hello,

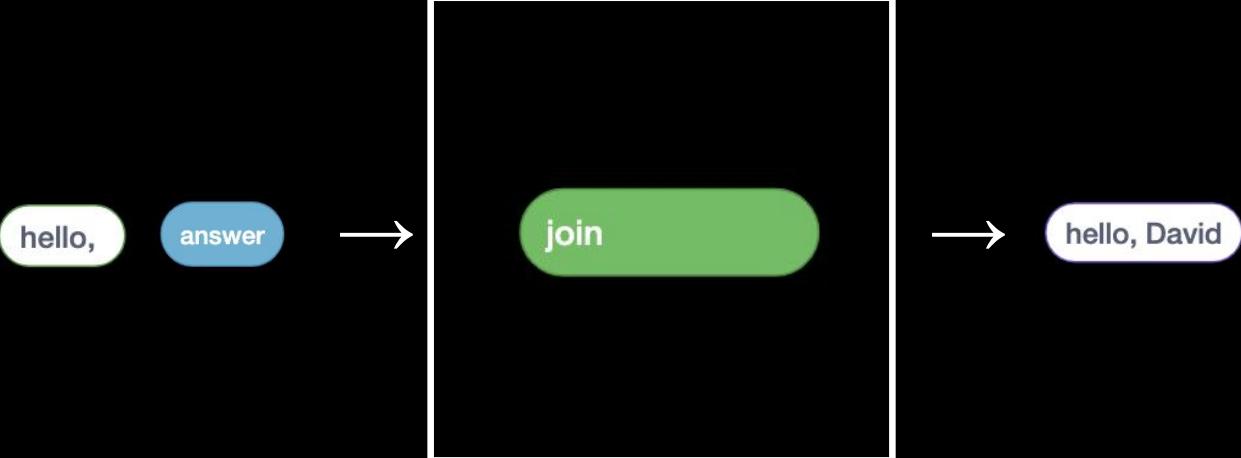
answer



algorithms

→ output







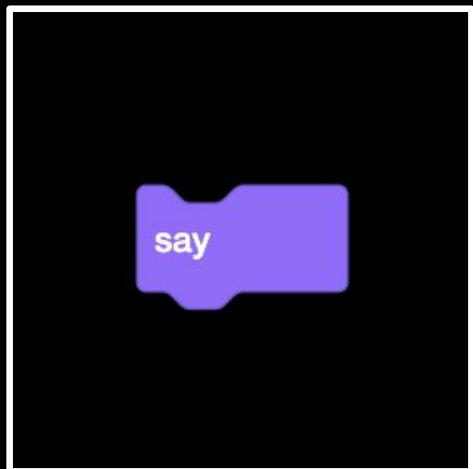
hello, David

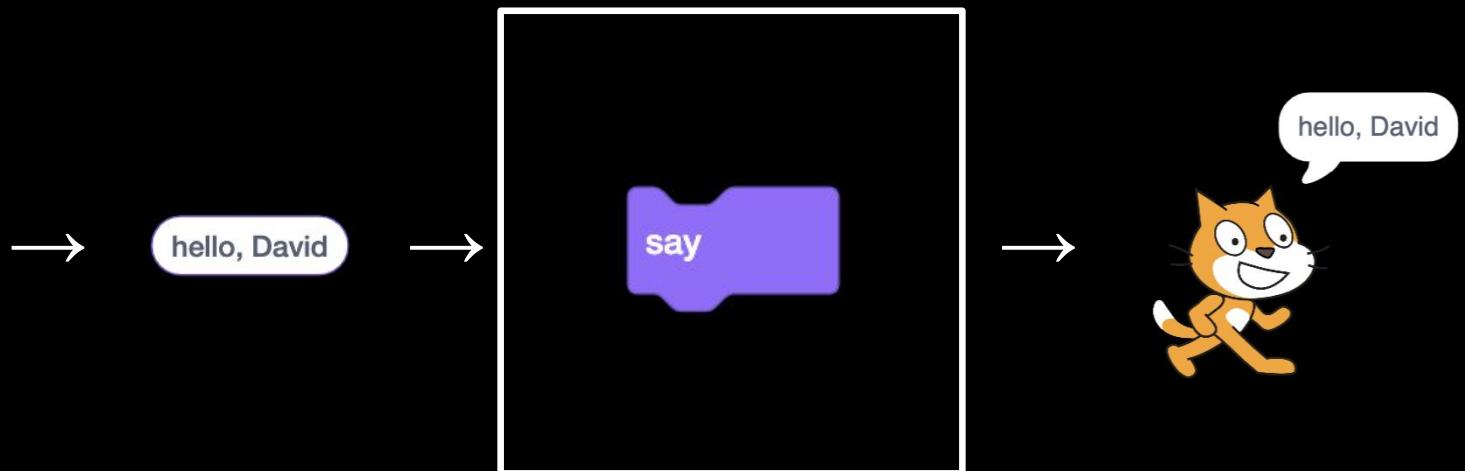


hello, David

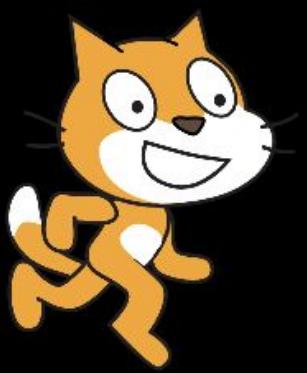


hello, David











# This is CS50