



# CS50 for MBAs

[cs50.harvard.edu/hbs](https://cs50.harvard.edu/hbs)

# CS50 for MBAs

1. Welcome!
2. Put out name card if you have!
3. Submit [cs50.ly/welcome!](https://cs50.ly/welcome)

# CS50 for MBAs

-  Masks are required in Aldrich.
-  Food and drink are prohibited in Aldrich.

[cs50.ly/welcome](https://cs50.ly/welcome)

# CS50 for MBAs

[cs50.harvard.edu/hbs](https://cs50.harvard.edu/hbs)

# Lectures

- Computational Thinking
- Algorithms
- Python
- Data Structures
- Internet Technologies
- Web Development
- SQL
- Databases
- Cloud Computing
- Privacy, Security
- Artificial Intelligence
- Software Engineering
- Technology Stacks

# Labs

- Scratch
- **Python**
- **SQL**

# CS50 for MBAs

Computational Thinking



[cs50.ly/welcome](https://cs50.ly/welcome)



representation



decimal

base-10

0 1 2 3 4 5 6 7 8 9

0 1



base-2

binary

0 1

bits











1



























0 1

0 1 2 3 4 5 6 7 8 9

123



1

123

10 1

123

100 10 1

123

100 10 1

123

$100 \times 1$

100   10   1

123

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

100   10   1

123

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

100 10 1

123

100 + 20 + 3

123



100 10 1

**# # #**

$10^2$     $10^1$     $10^0$

**# # #**

$2^2$     $2^1$     $2^0$

**# # #**

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

This is CS50

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  
72

I  
73

33

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

H  
72

I  
73

!  
33

H

01001000

I

01001001

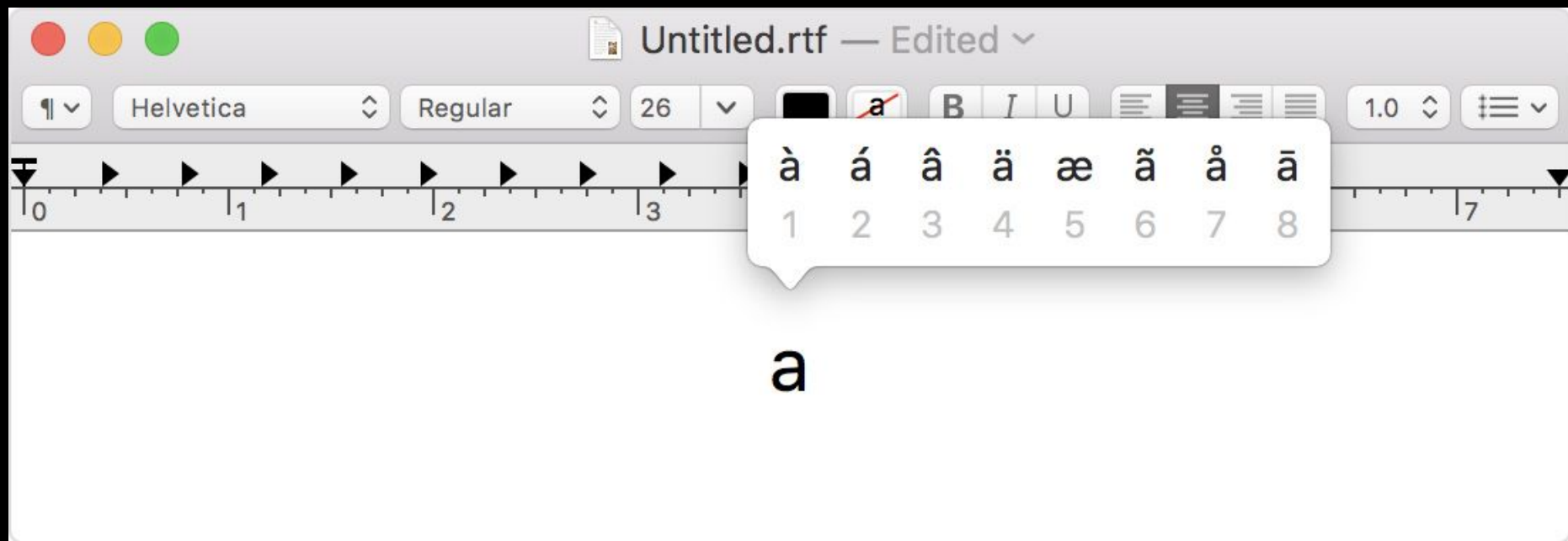
!

00100001

bytes



~ `	! 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





Search

## FAVORITES



## SMILEYS & PEOPLE



Unicode



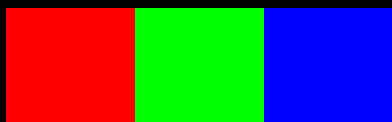
128514

000000111101100000010





RGB

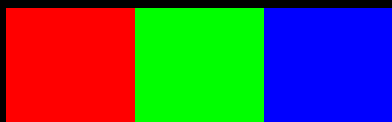


72 73 33

72

73

33

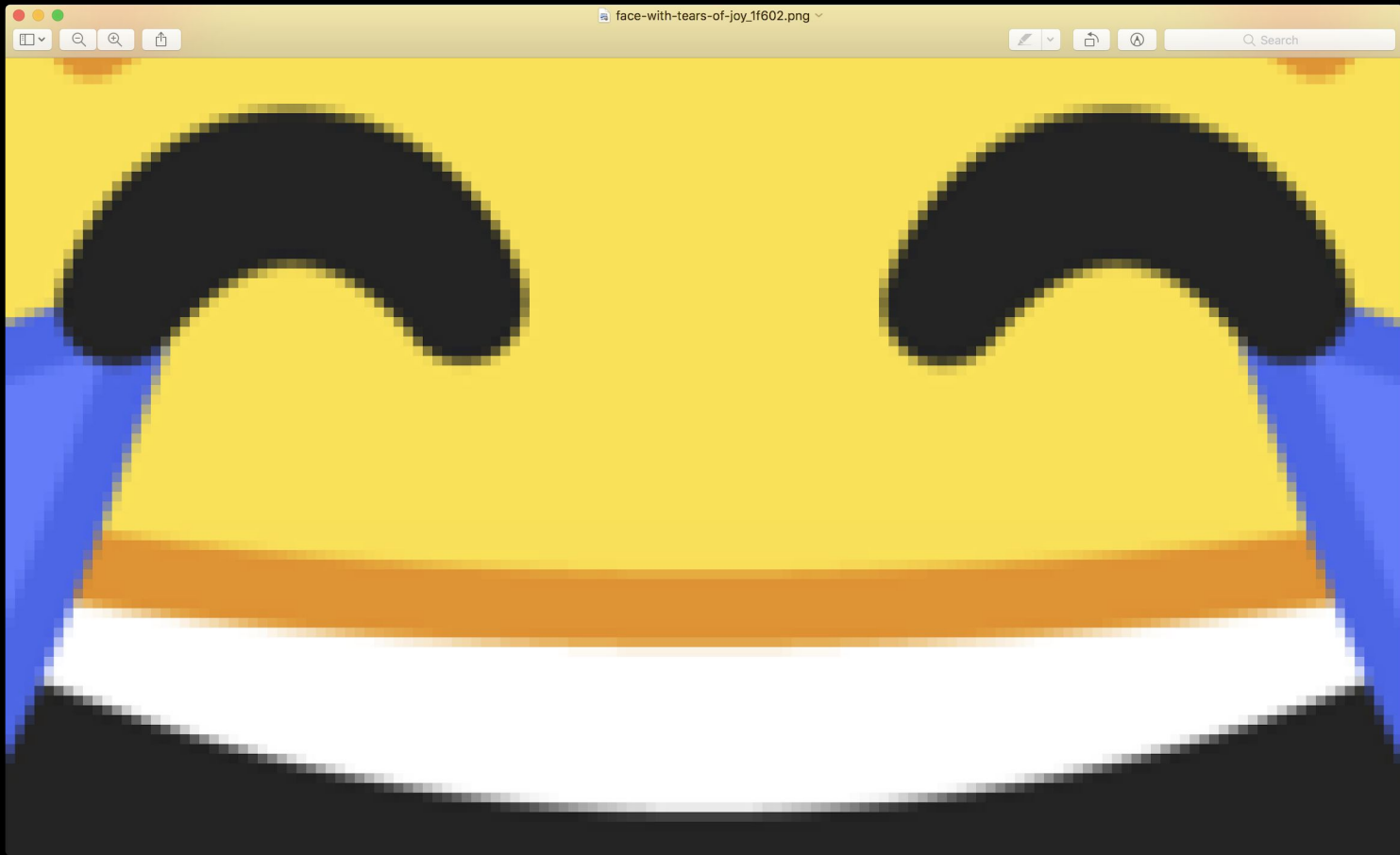


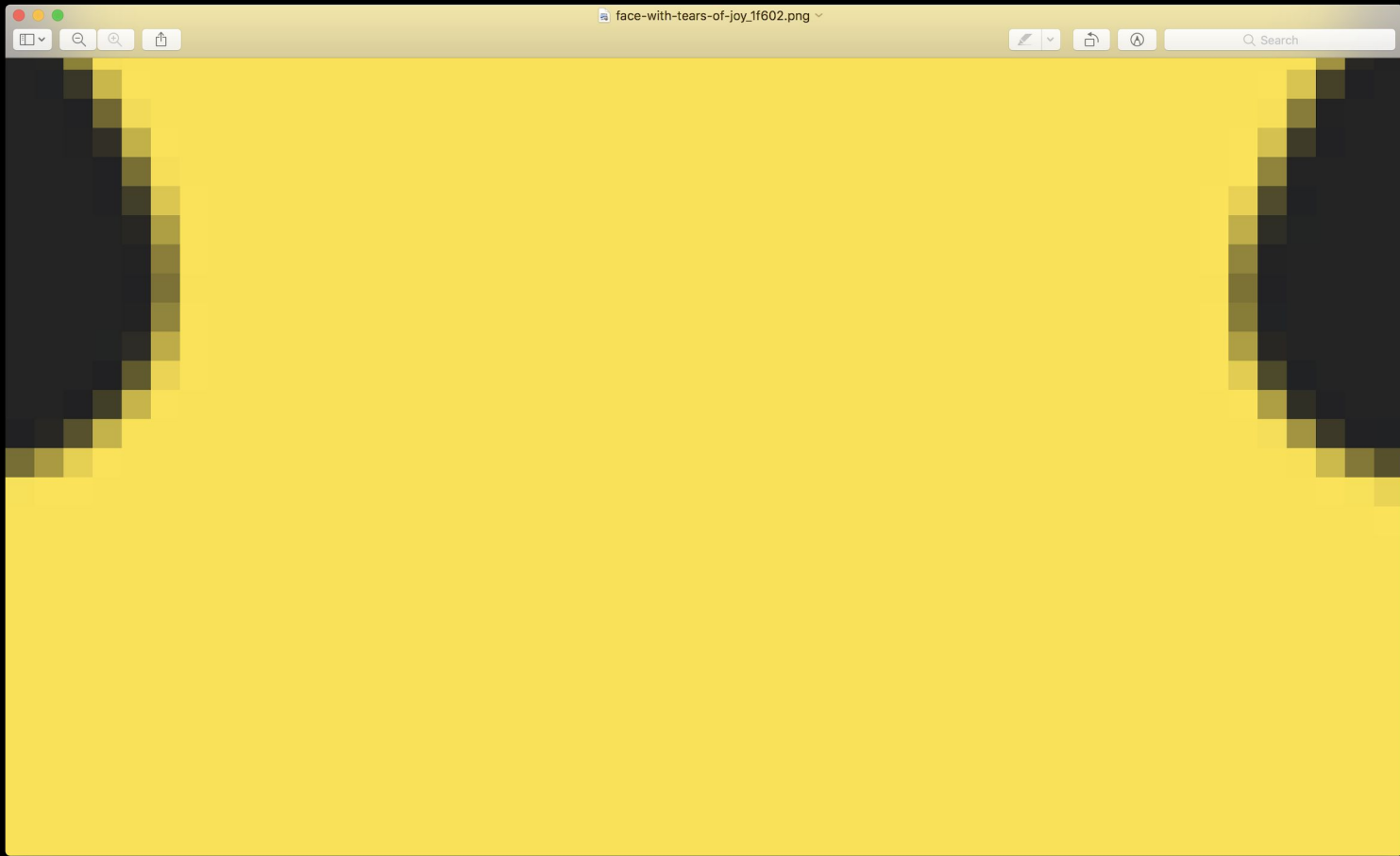




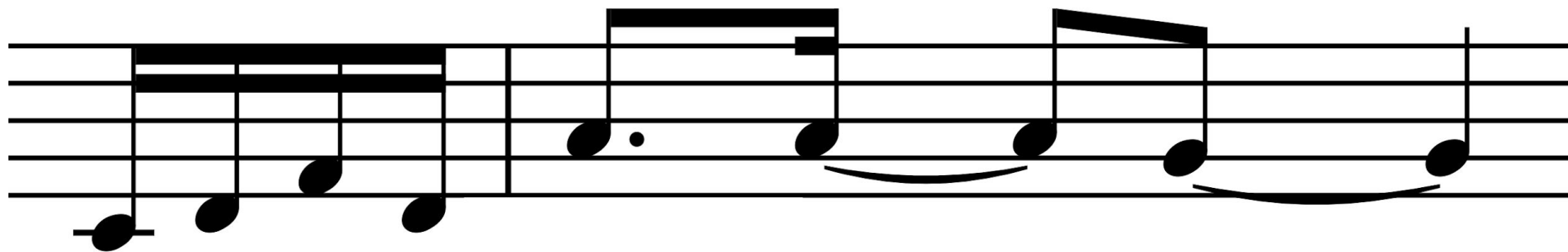
















algorithms



9:00



Groups



# Contacts

Search

A

Albus

C

Cedric

D

Draco

F

Fred

G

George

Ginny

H

Hagrid

Harry

Hermione

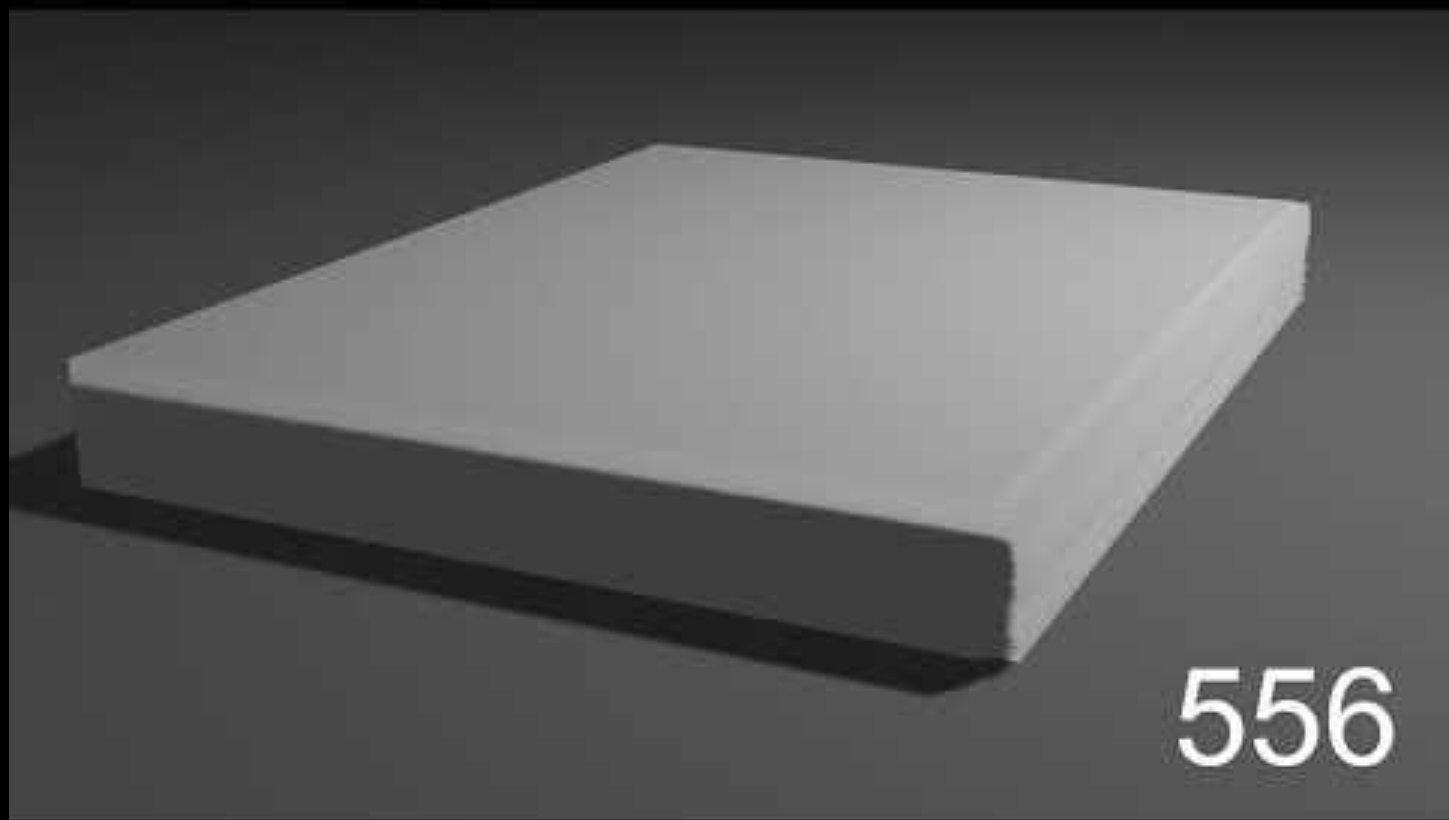
J

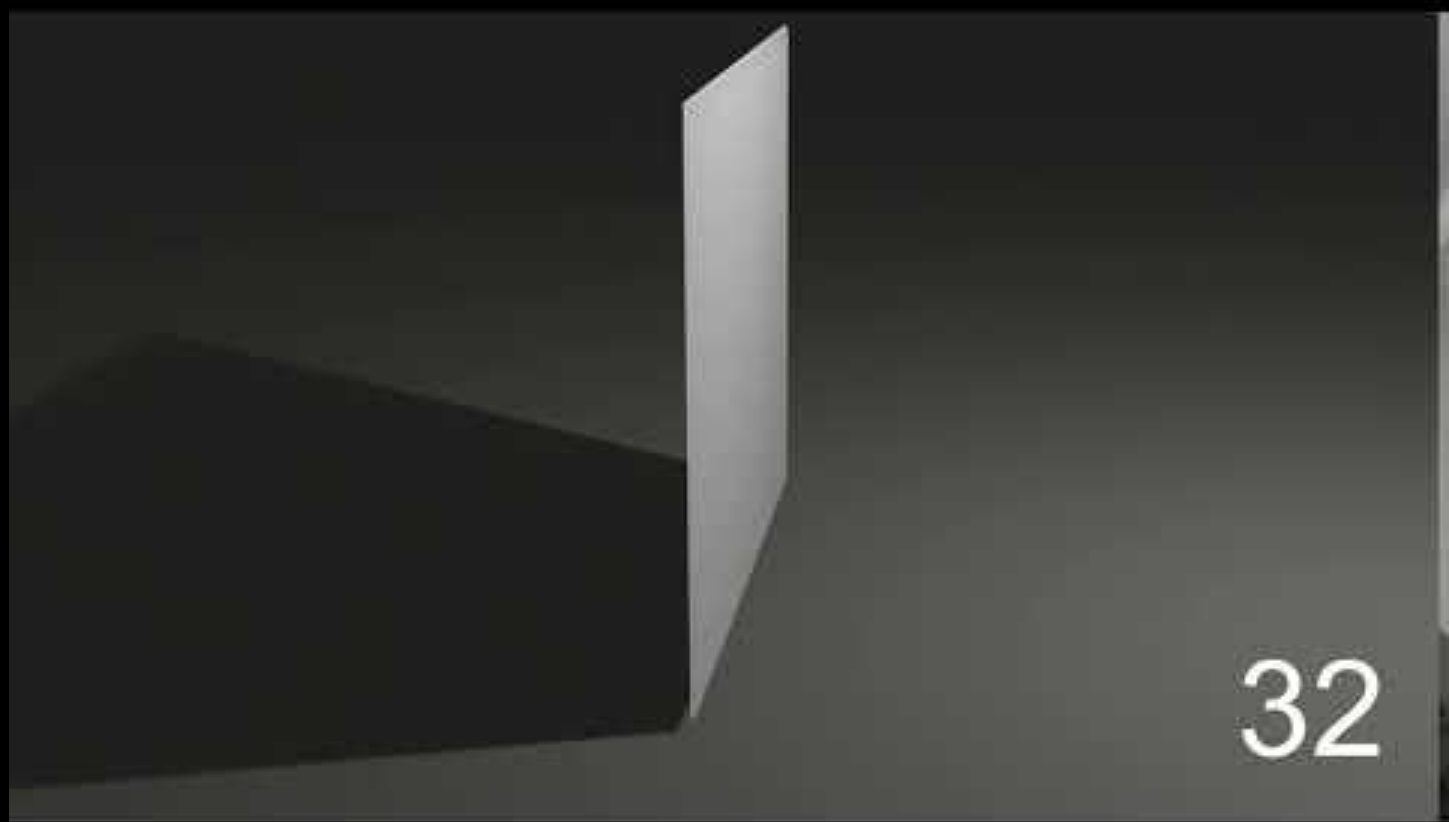
James

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  
#



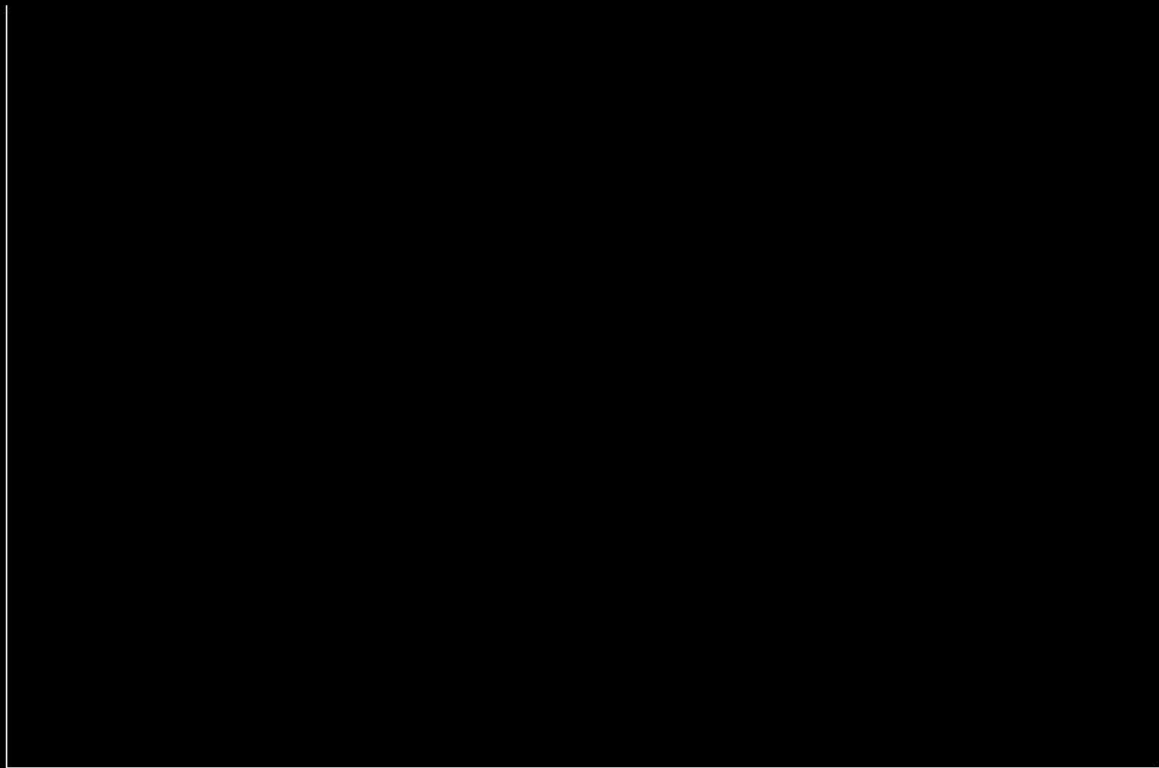
This is CS50

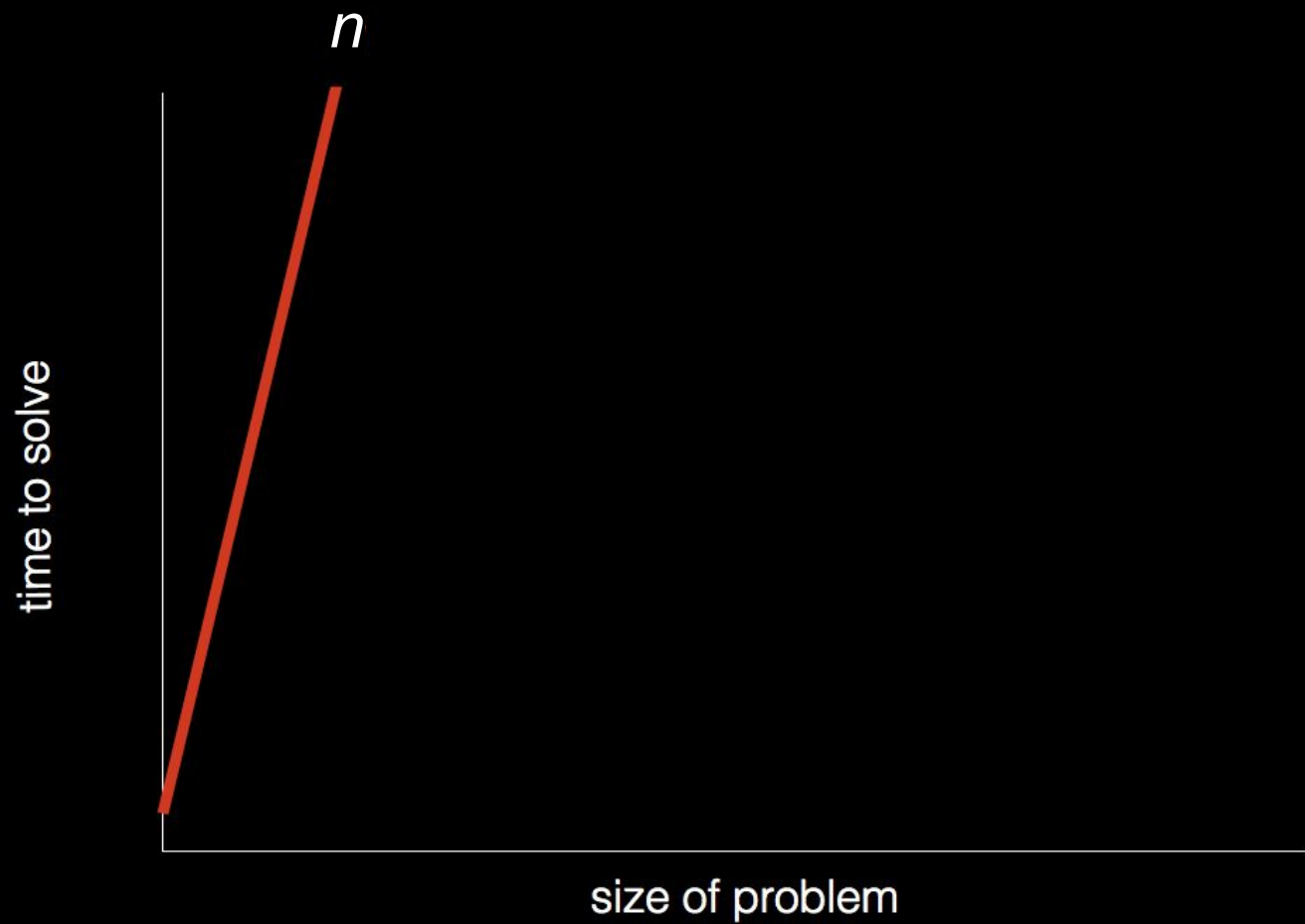


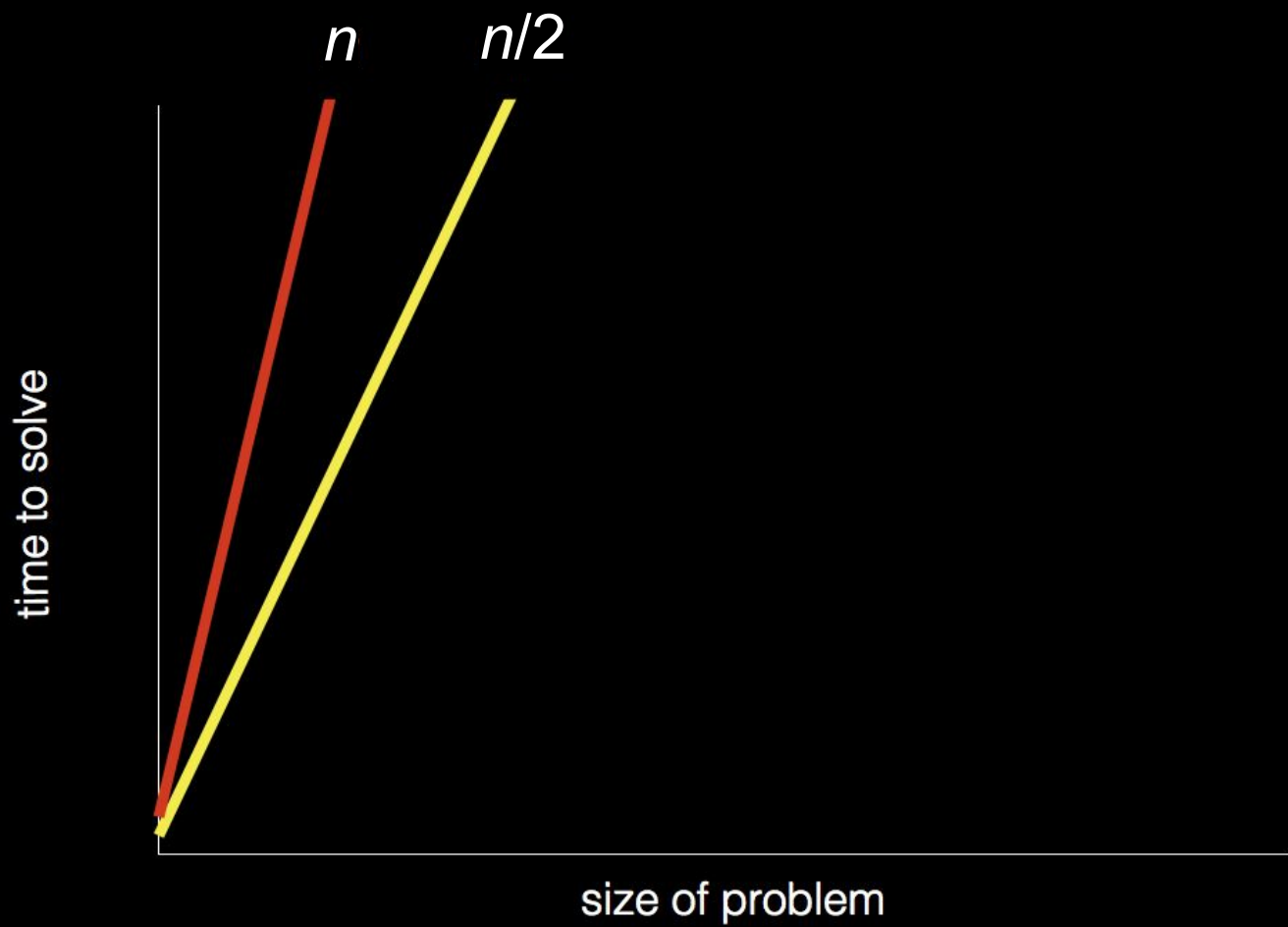


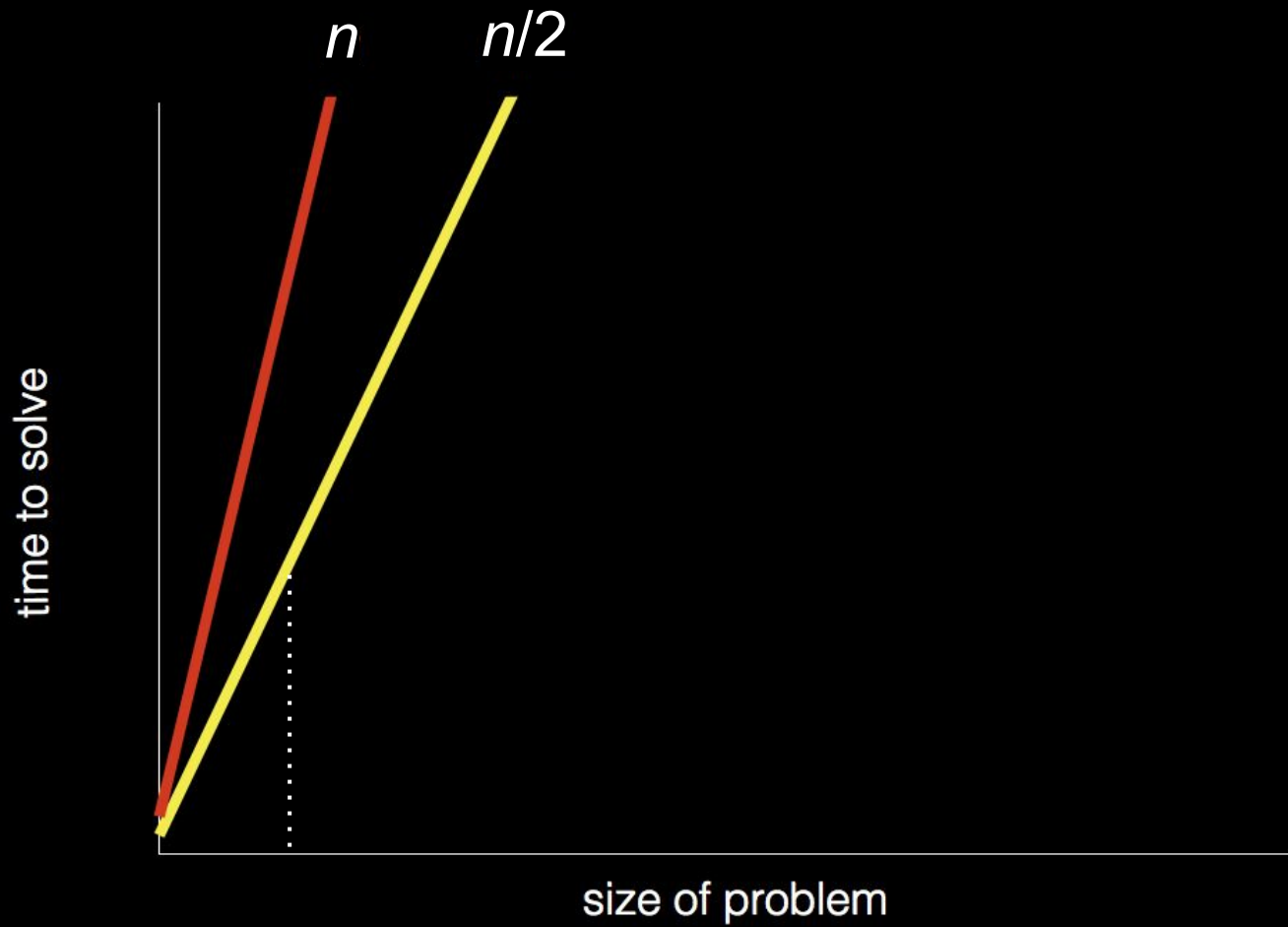
time to solve

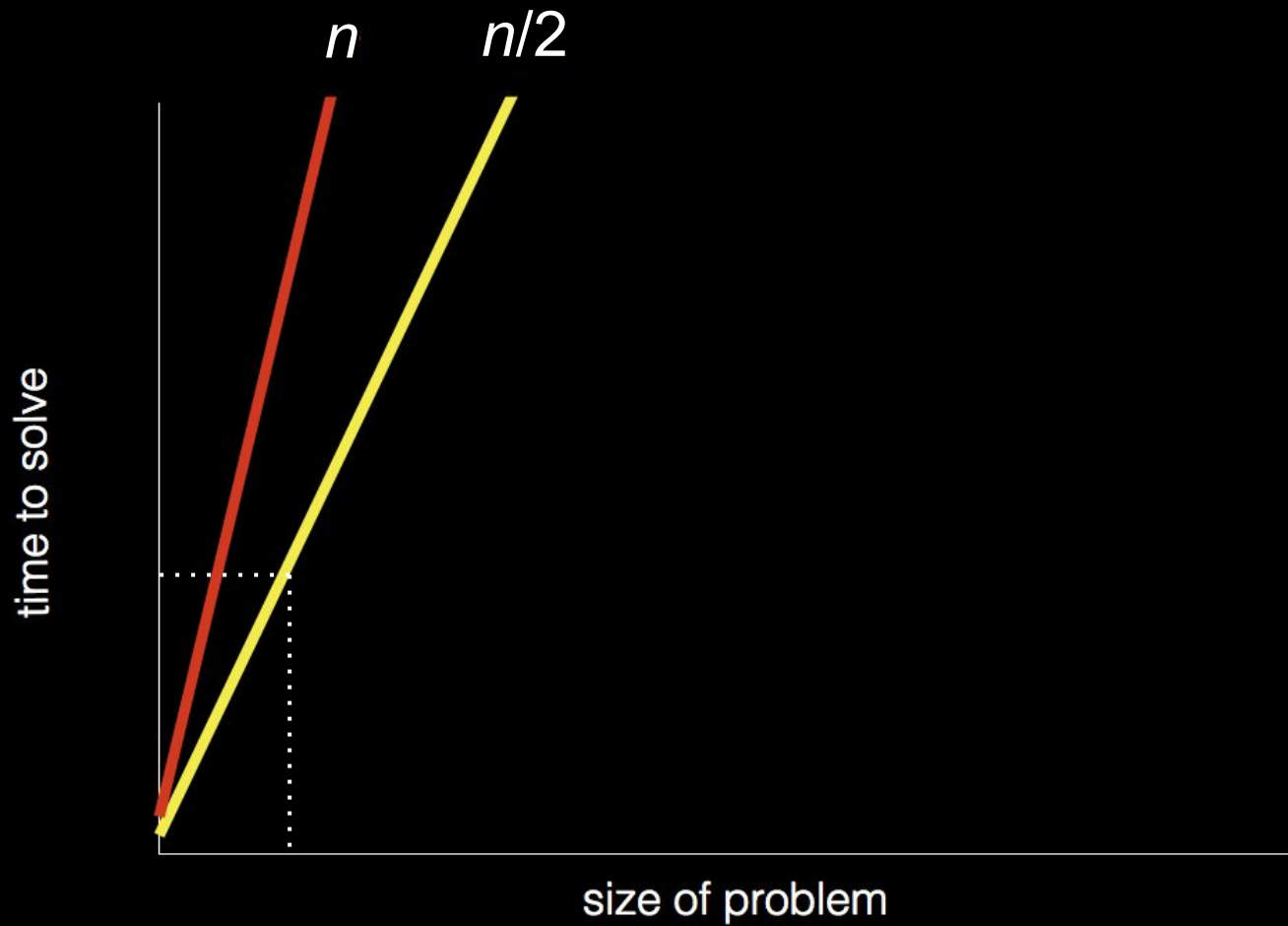
size of problem



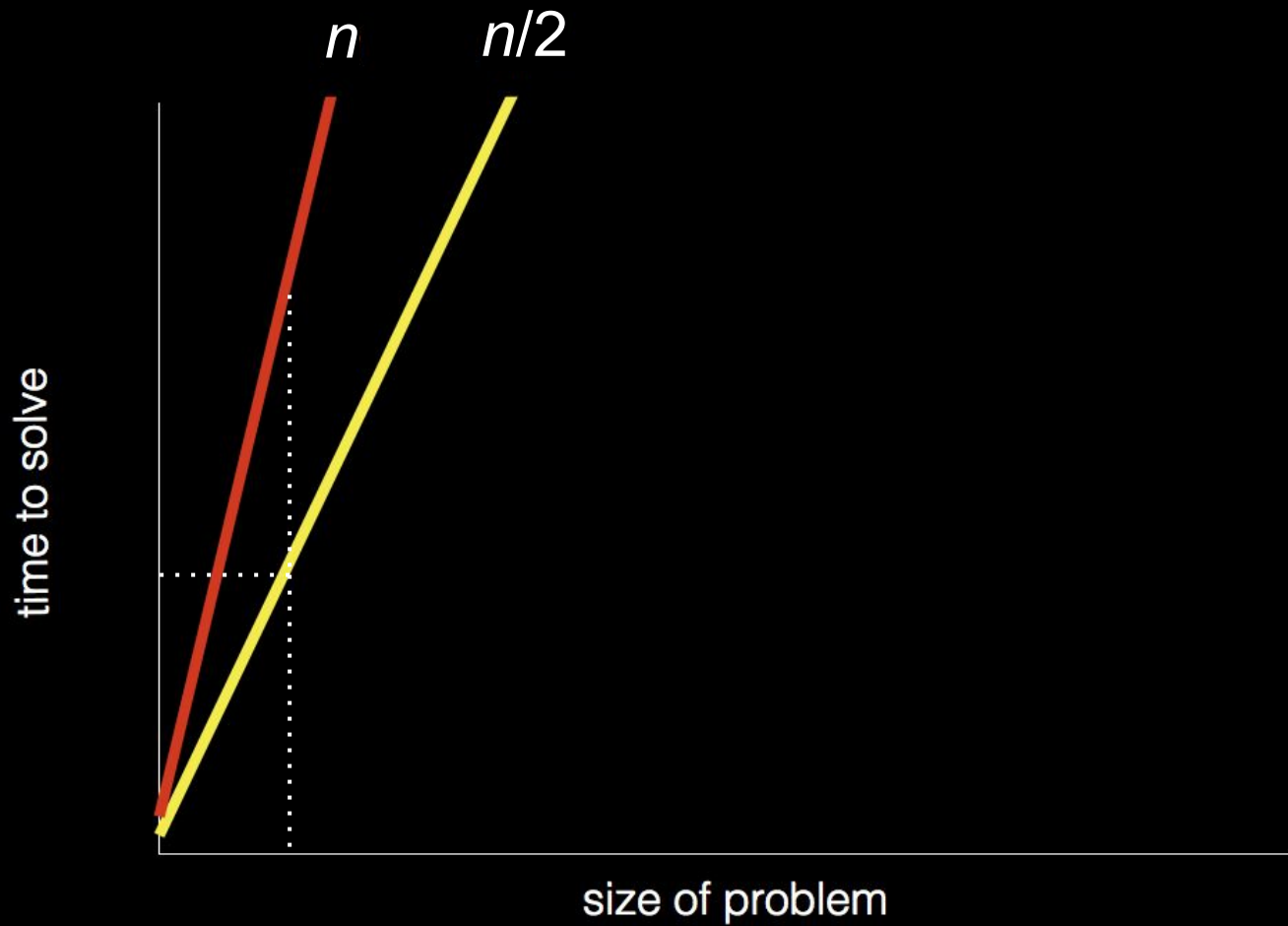


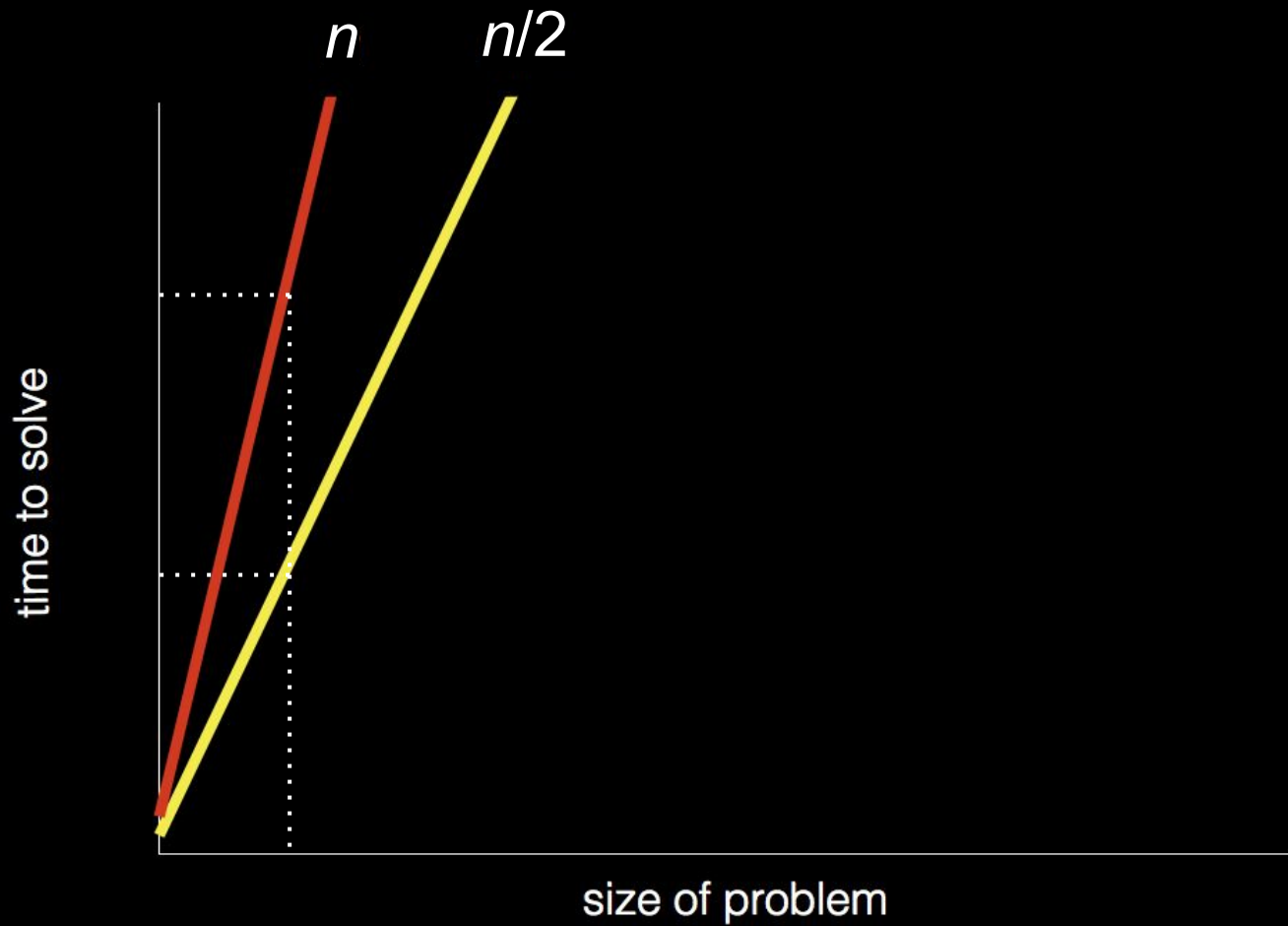


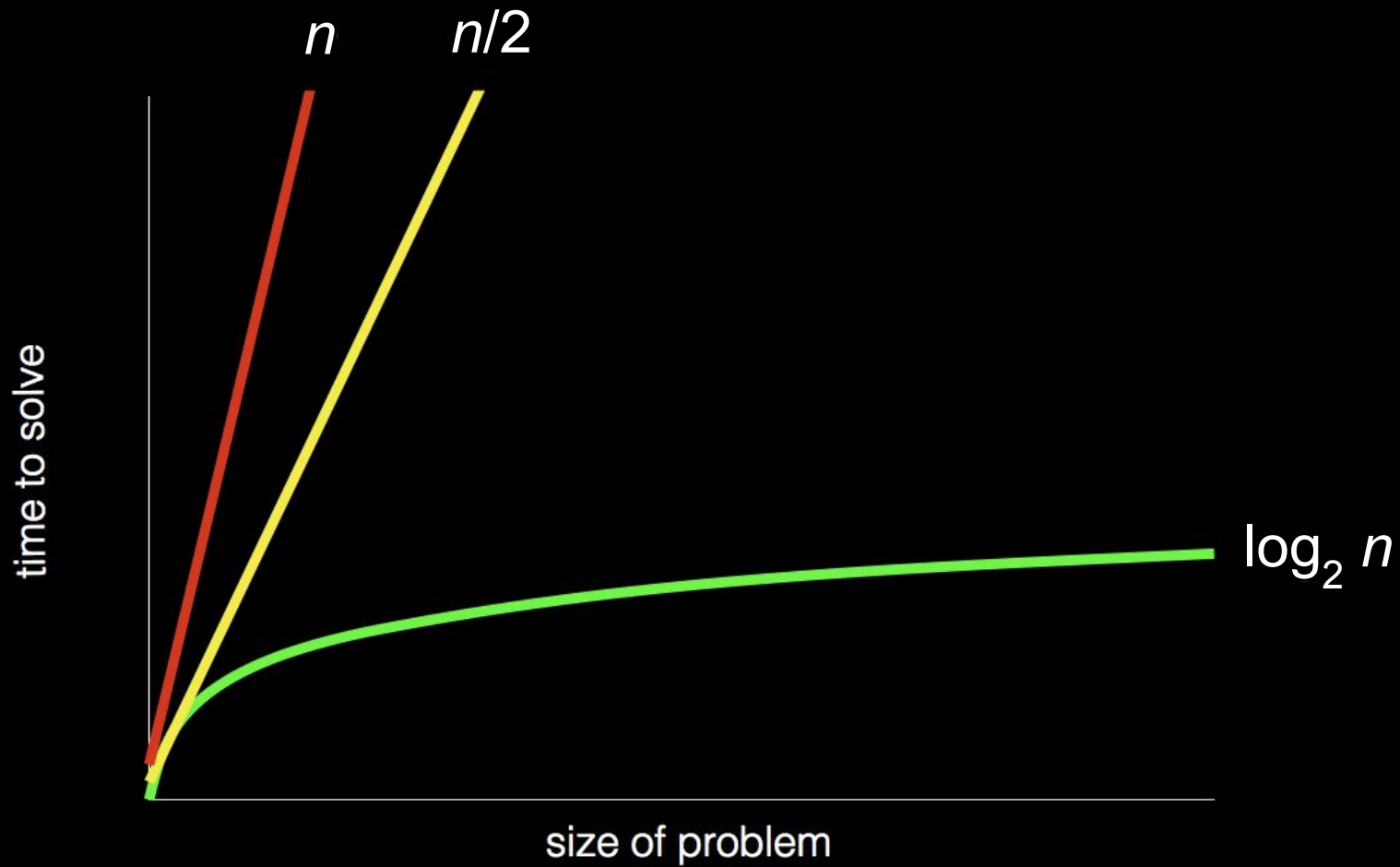












pseudocode

```
1  Pick up phone book
2  Open to middle of phone book
3  Look at page
4  If 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
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6  Else if person is earlier in book
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13     Quit
```

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```
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11     Go back to line 3
12 Else
13     Quit
```

- functions
- conditions
- Boolean expressions
- loops

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

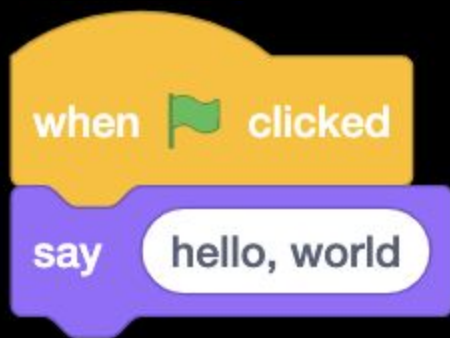
```
#include <stdio.h>
```

```
int main(void)
```

```
{
```

```
    printf("hello, world\n");
```

```
}
```



## 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



Code

Costumes

Sounds

Motion

Looks

Sound

Events

Control

Sensing

Operators

Variables

My Blocks

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

Scratch

Zoom In

Zoom Out

Reset Stage

Sprite1

x: 0 y: 0

Show

Size: 100

Direction: 90

Sprite1

Stage

Backdrops

1



Code

Costumes

Sounds



Motion

Looks

Sound

Events

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My Blocks

## Motion

move 10 steps

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set y to 0

if on edge, bounce



Sprite Sprite1

x 0

y 0

Show

Size 100

Direction 90



Sprite1

Stage

Backdrops

1



Code

Costumes

Sounds

Motion

Looks

Sound

Events

Control

Sensing

Operators

Variables

My Blocks

move 10 steps

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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

Scratch Cat

Sprite1

↔ x 0 ↑↓ y 0

Show

Size 100

Direction 90

Sprite1

Stage

Backdrops 1

Code

Costumes

Sounds

Motion

Looks

Sound

Events

Control

Sensing

Operators

Variables

My Blocks

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

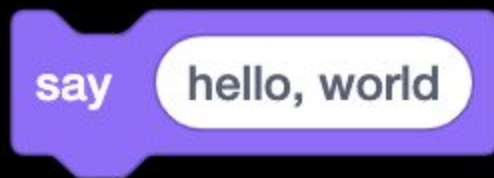
Scratch Cat

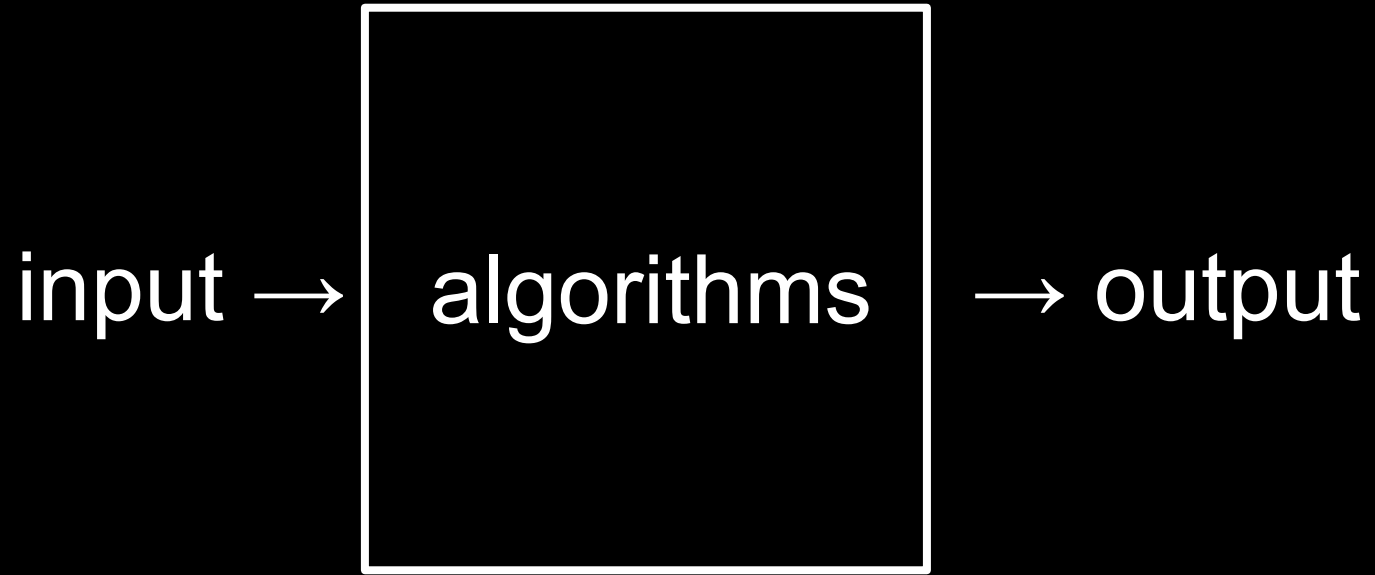
Stage

Sprite1

Sprite1

Backdrops 1





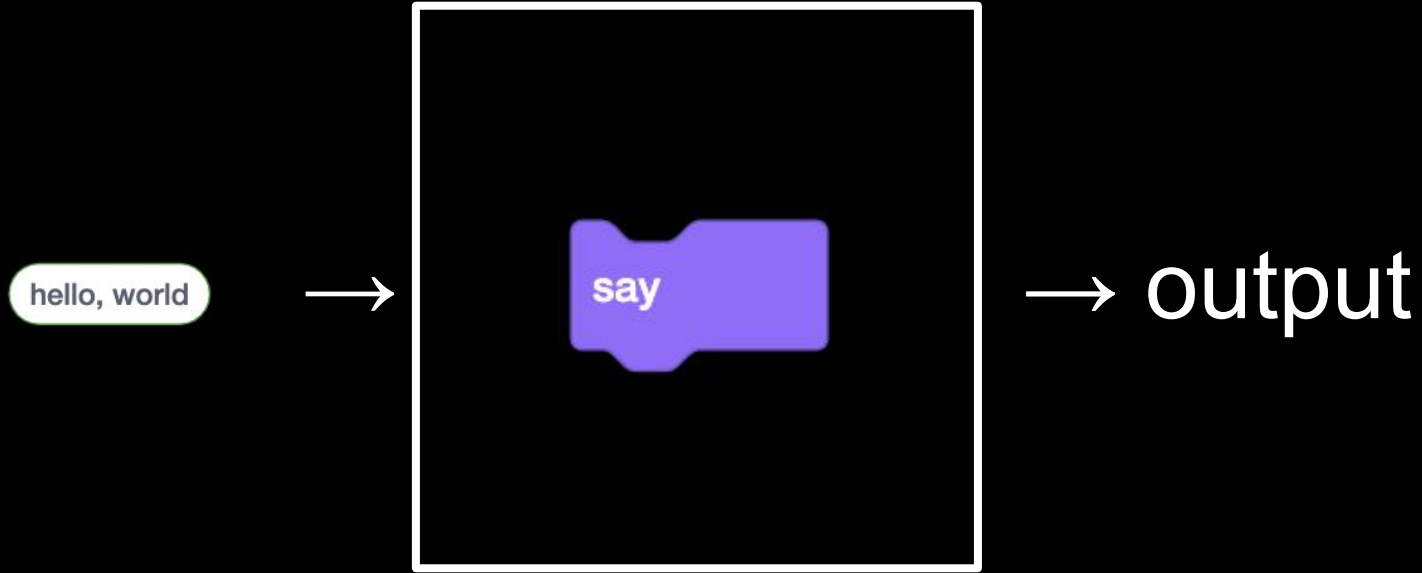
hello, world



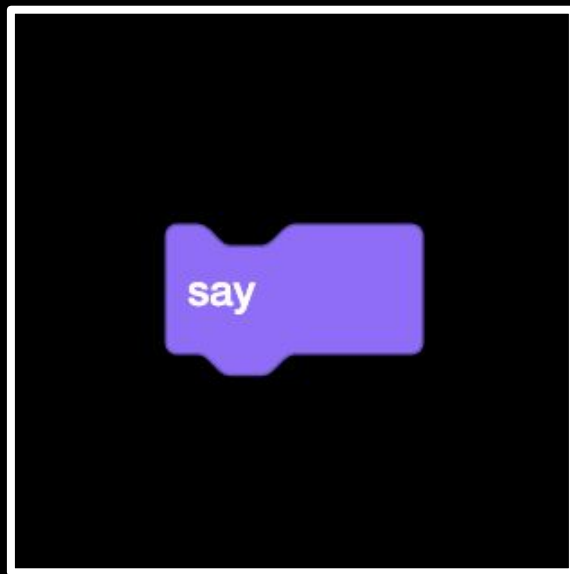
algorithms



output



hello, world



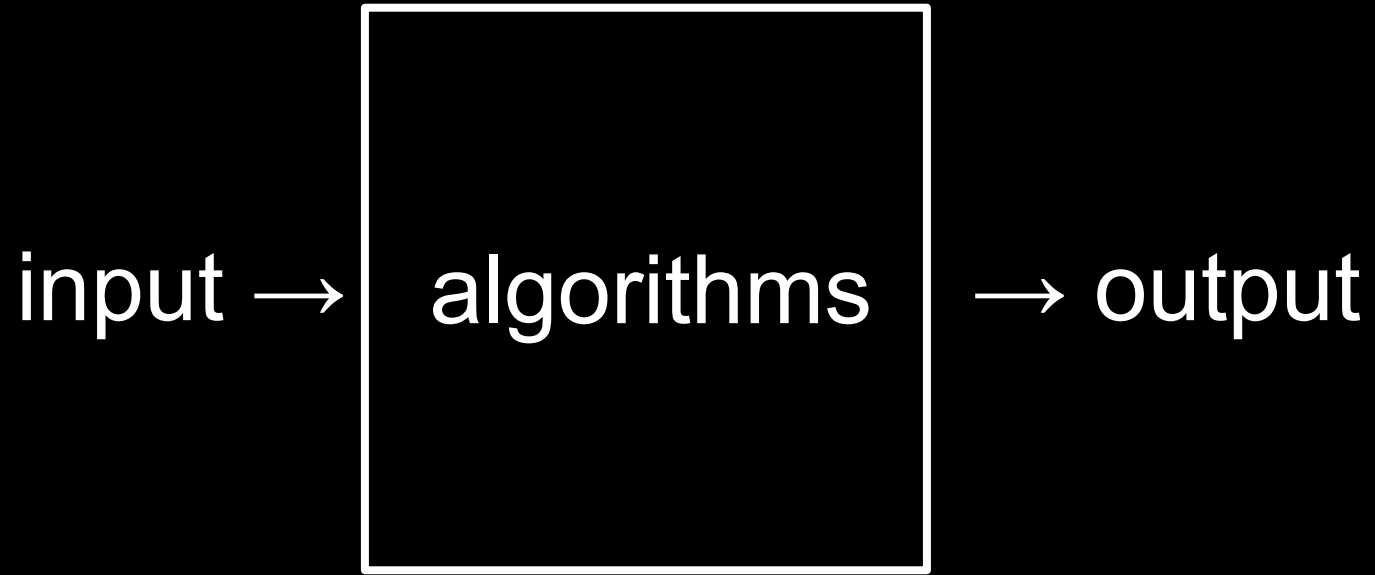
A blue Scratch 'ask and wait' block with a notch on the left side. It contains a white text input field with the text 'What's your name?' and the words 'ask' and 'and wait' in white text.

ask

What's your name?

and wait





What's your name?

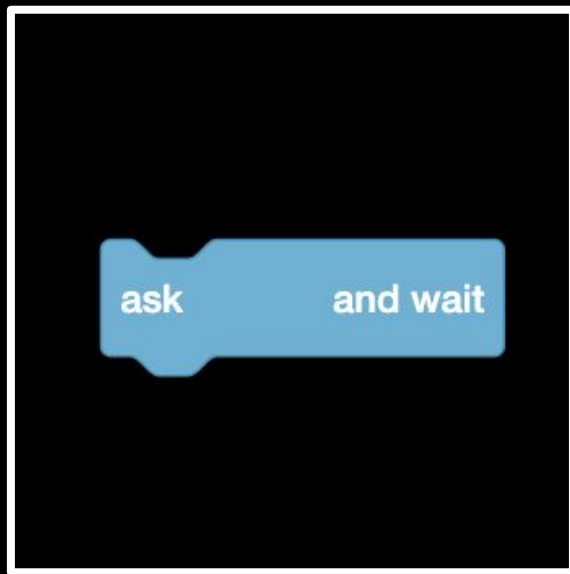


algorithms

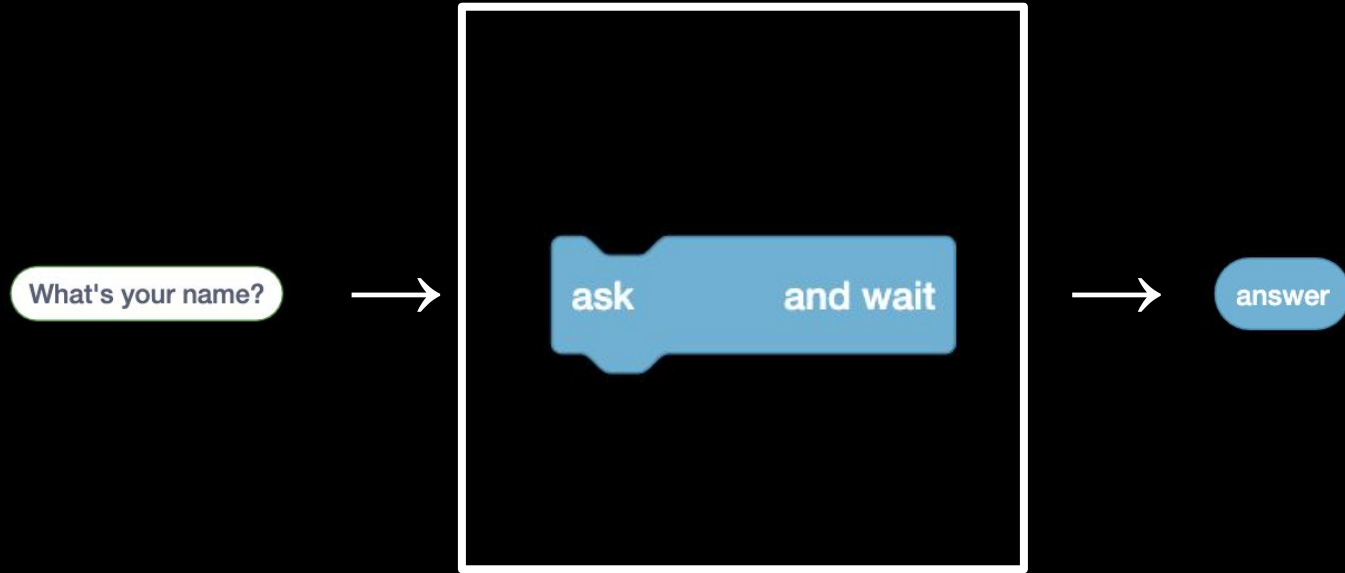


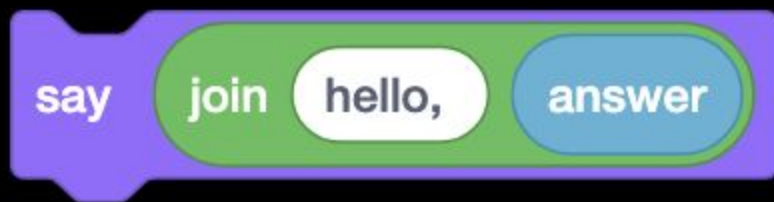
output

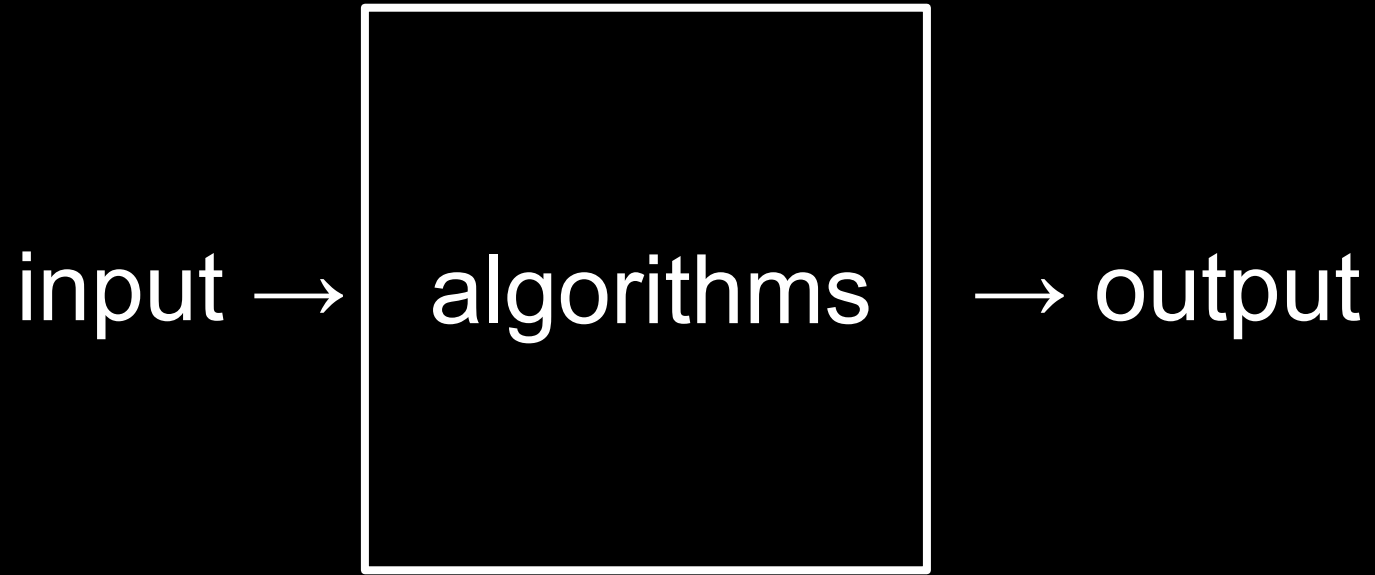
What's your name?



→ output

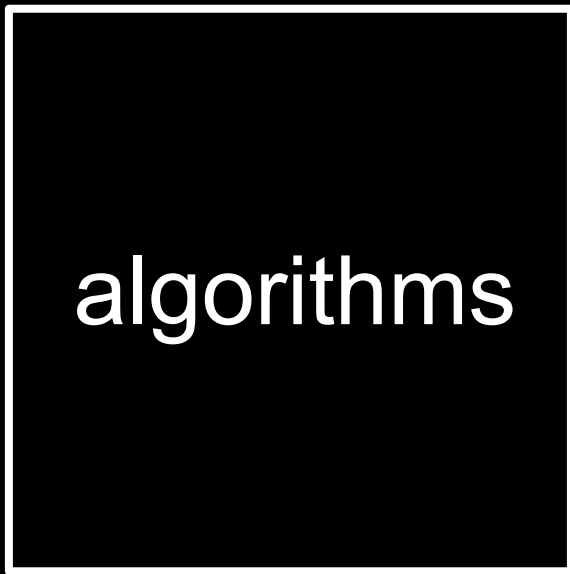




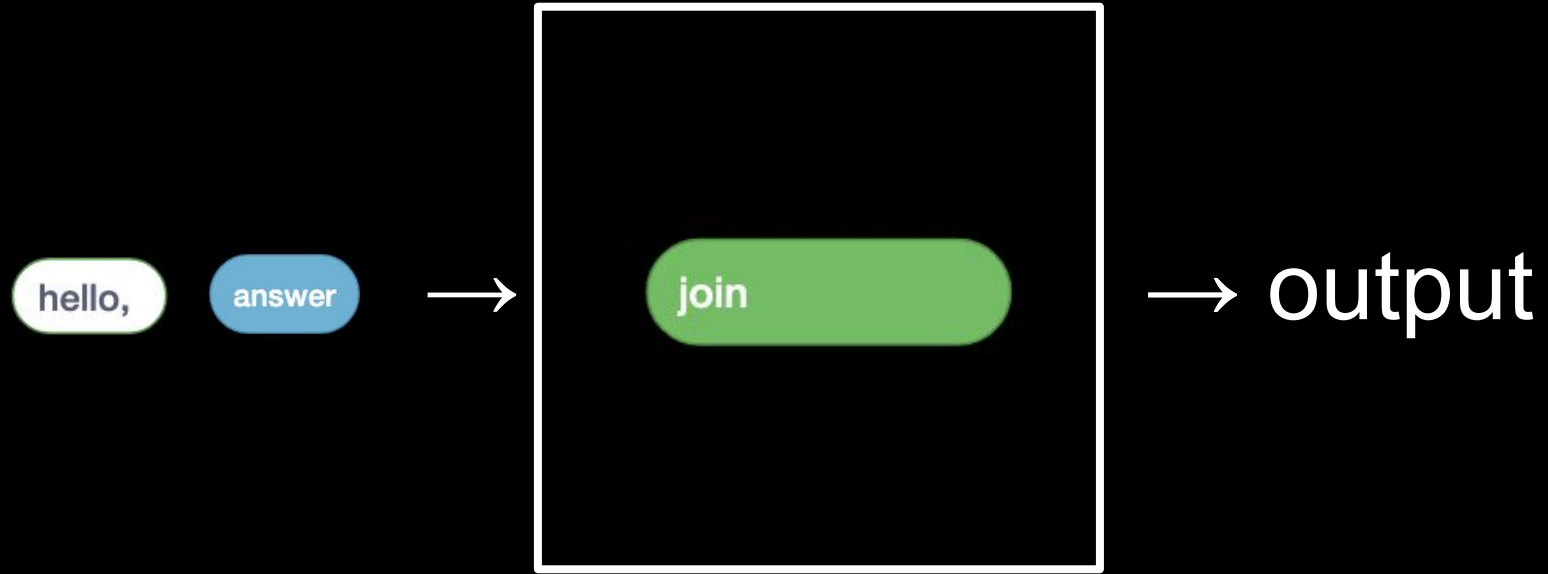


hello,

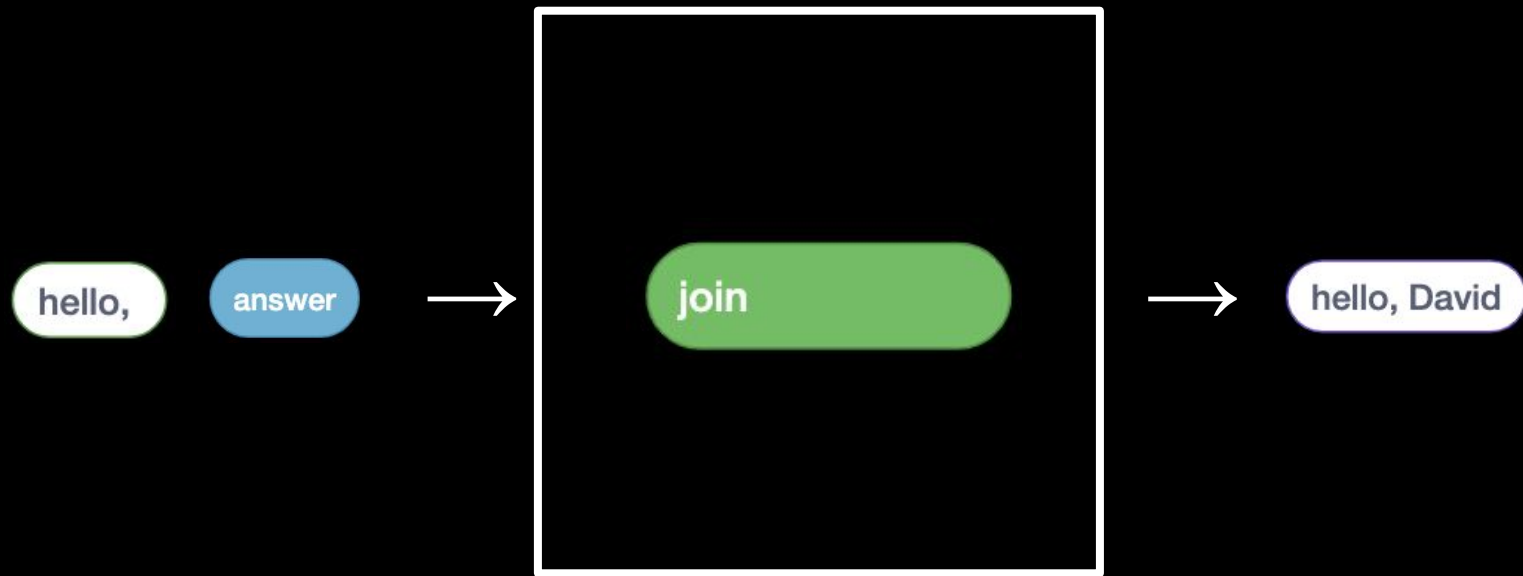
answer



output









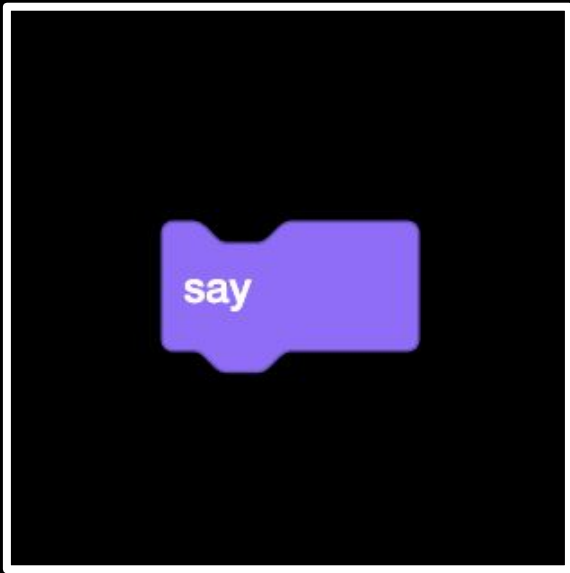
hello, David



hello, David



hello, David

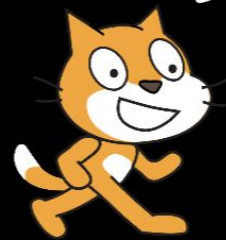




hello, David



say



hello, David





# Assignment 0



Office Hours

# CS50 for MBAs

Computational Thinking