

CS50 for MBAs

Programming Languages

Slack

cs50.ly/hbs50

Office Hours

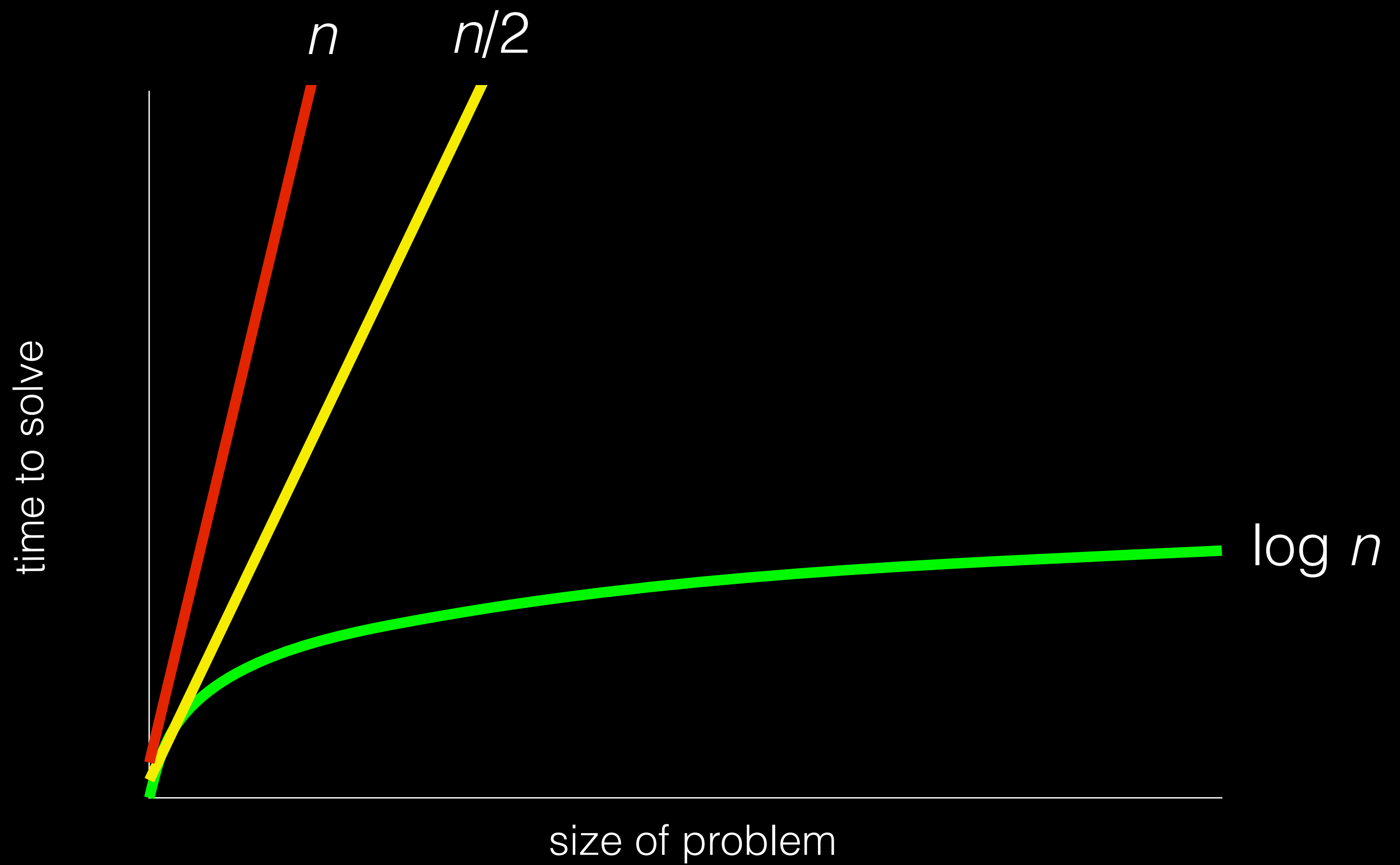
cs50.github.io/hbs/hours

Last Time

Computational Thinking

inputs → algorithms → outputs

```
graph LR; inputs --> algorithms; algorithms --> outputs; style algorithms fill:#fff,stroke:#fff,stroke-width:2px
```







B **Beats**

A **Buy**

4,000,000,000





$\frac{1}{3}$

.33333333333333333333

This Time

Programming Languages

pseudocode

```
0  pick up phone book
1  open to middle of phone book
2  look at names
3  if Smith is among names
4      call Mike
5  else if Smith is earlier in book
6      open to middle of left half of book
7      go back to step 2
8  else if Smith is later in book
9      open to middle of right half of book
10     go back to step 2
11 else
12     quit
```



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```

Scratch

when



clicked

say

hello, world

say

hello, world

forever

say

hello, world





set **i** to 0





if $x < y$ then

say x is less than y

else

if $x > y$ then

say x is greater than y

else

say x is equal to y

Python

say

hello, world



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


forever

say

hello, world





```
while True:  
    print("hello, world")
```





```
for i in range(50):  
    print("hello, world")
```

set **i** to 0



`i == 0`





$i < 50$





$x < y$

if $x < y$ then

say x is less than y

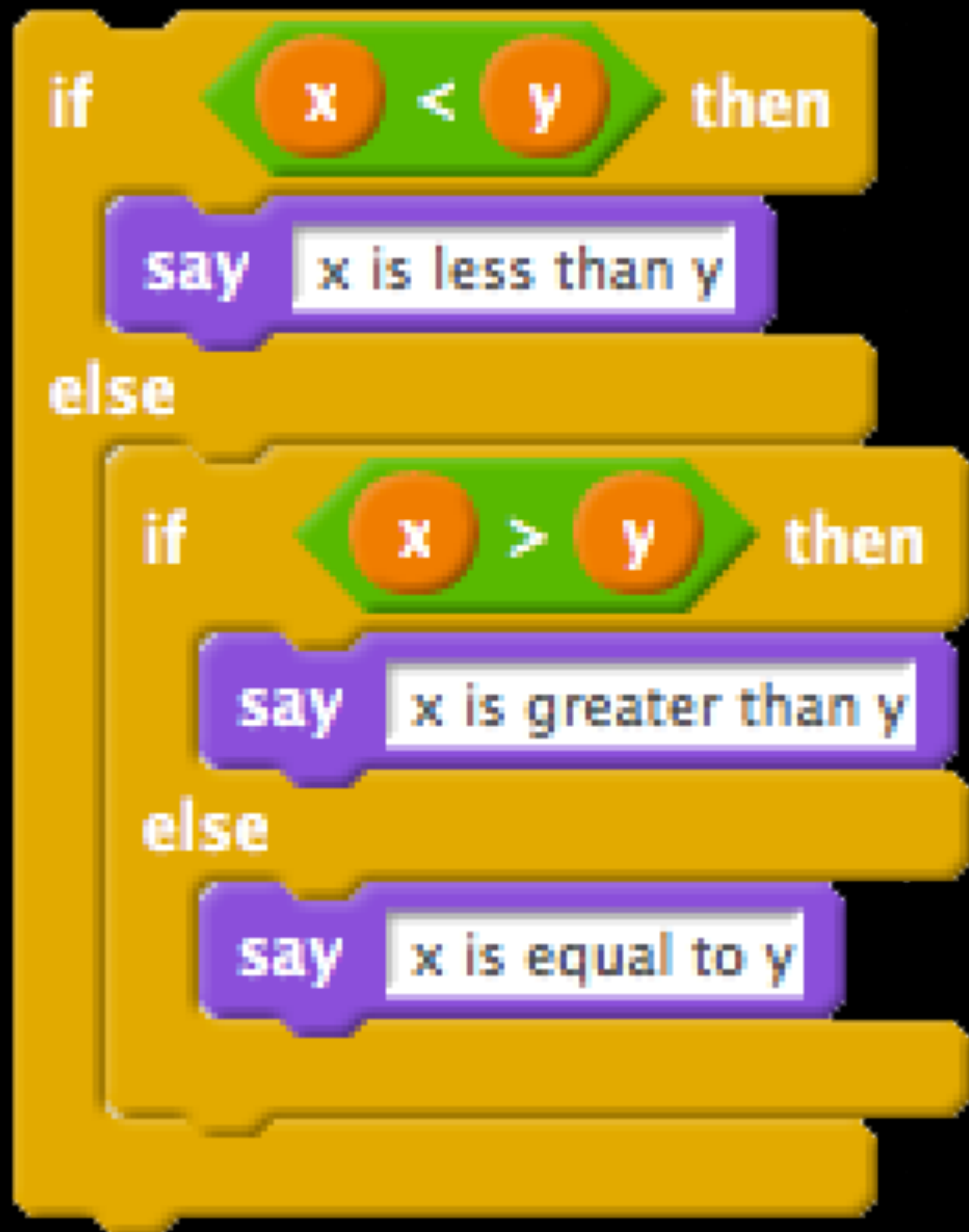
else

if $x > y$ then

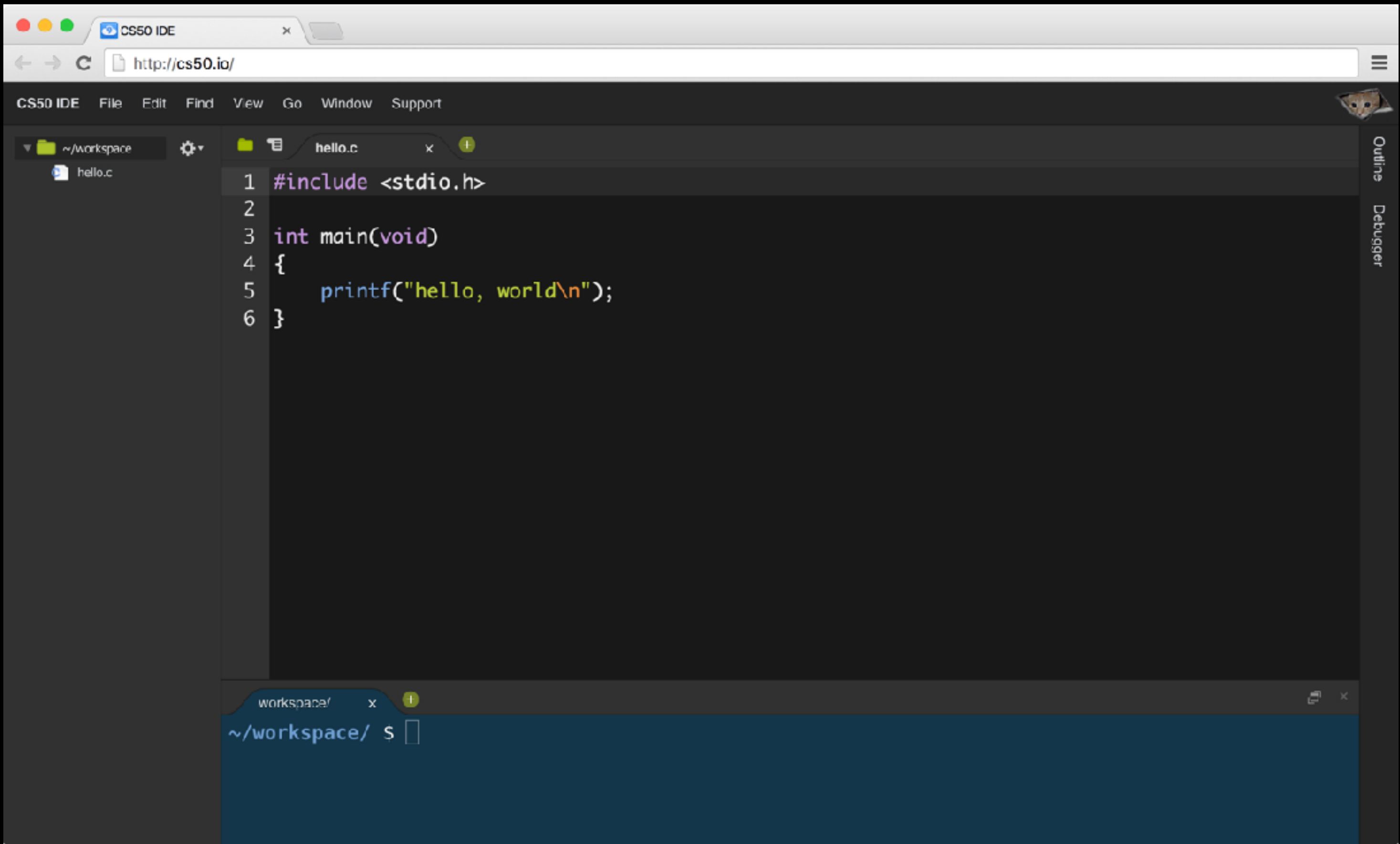
say x is greater than y

else

say x is equal to y



```
if x < y:  
    print("x is less than y")  
elif x > y:  
    print("x is greater than y")  
else:  
    print("x is equal to y")
```



source code

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

```
int main(void)
```

```
{
```

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

```
}
```

compiler

machine code

01111111	01000101	01001100	01000110	00000010	00000001	00000001	00000000
00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
00000010	00000000	00111110	00000000	00000001	00000000	00000000	00000000
10110000	00000101	01000000	00000000	00000000	00000000	00000000	00000000
01000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
11010000	00010011	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00000000	00000000	00000000	01000000	00000000	00111000	00000000
00001001	00000000	01000000	00000000	00100100	00000000	00100001	00000000
00000110	00000000	00000000	00000000	00000101	00000000	00000000	00000000
01000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
01000000	00000000	01000000	00000000	00000000	00000000	00000000	00000000
01000000	00000000	01000000	00000000	00000000	00000000	00000000	00000000
11111000	00000001	00000000	00000000	00000000	00000000	00000000	00000000
11111000	00000001	00000000	00000000	00000000	00000000	00000000	00000000
00001000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
00000011	00000000	00000000	00000000	00000100	00000000	00000000	00000000
00111000	00000010	00000000	00000000	00000000	00000000	00000000	00000000
00111000	00000010	01000000	00000000	00000000	00000000	00000000	00000000
00111000	00000010	01000000	00000000	00000000	00000000	00000000	00000000
00011100	00000000	00000000	00000000	00000000	00000000	00000000	00000000

. . .

```
clang hello.c
```

```
./a.out
```

source code

```
def main():  
    print("hello, world")
```

compiler

bytecode

2	0	LOAD_GLOBAL	0	(print)
	3	LOAD_CONST	1	('hello, world')
	6	CALL_FUNCTION	1	(1 positional, 0 keyword pair)
	9	POP_TOP		
	10	LOAD_CONST	0	(None)
	13	RETURN_VALUE		

interpreter

```
python hello.py
```

```
#include <iostream>
```

```
int main()
```

```
{
```

```
    std::cout << "hello, world" << std::endl;
```

```
}
```

```
class Hello
{
    public static void main(String [] args)
    {
        System.out.println("hello, world");
    }
}
```

```
put "hello, world"
```

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

```
console.log("hello, world")
```

<https://helloworldcollection.github.io/>

- Bash
- C
- C++
- C#
- Clojure
- Erlang
- F#
- Go
- Haskell
- Java
- JavaScript
- Objective-C

- OCaml
- PHP
- Python
- R
- Ruby
- Scala
- Scheme
- SQL
- Swift
- ...

wikipedia.org/wiki/List_of_programming_languages

Project 0

Next Time

Algorithms, Data Structures

CS50 for MBAs

Programming Languages