Control

(Enter quietly so we can hear John)

Announcements

Announcements

Office hours start this week! (Wednesday morning is hybrid)

Homework: suggested to finish by Friday (demo)

Print and None

Example: Printing and Returning

```
def f(x):
    return x + 1
```

How are the following functions different?

(A)

```
def h(x):
    f(x)
```

(B)

```
def h(x):
    print(f(x))
```

(C)

```
def h(x):
    return print(f(x))
```

(D)

```
def h(x):
    return f(x)
```

h(3)

	(A)	(B)	(C)	(D)
Prints	(nothing)	4	4	(nothing)
Returns	None	None	None	4

Default return value

Default return value

Return value of print(f(x))

Example: Print Then Return

Implement a function h(x) that first prints, then returns, the value of f(x).

```
def h(x):
    return print(f(x))
```

(A)

```
def h(x):
    print(f(x))
    return f(x)
```

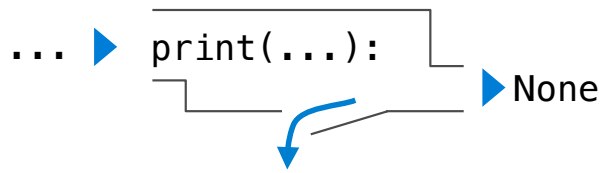
(B)

```
def h(x):
    y = f(x)
    print(y)
    return y
```

(C)

pollev.com/cs61a

What's a function f for which implementations (B) and (C) would have different behavior?



Non-pure function has side effects! Happen twice for (C)

```
>>> h(2)
...
```

```
>>> h(2)
...
```

(Demo: Code)

Control

Conditional Statements

Conditional statements (often called "If" Statements) contain statements that may or may not be evaluated.

		x=10	x=1	x=-1

`if x > 2:`
`  print('big')`
`if x > 0:`
`  print('positive')`
	Two separate (unrelated) conditional statements	big
		positive
			positive	

`if x > 2:`
`  print('big')`
`elif x > 0:`
`  print(‘less big’)`
	One statement with two clauses: if and elif
	Only one body can ever be executed
		big	less big	

`if x > 2:`
`  print('big')`
`elif x > 0:`
`  print(‘less big')`
`else:`
`  print(‘not pos')`
	One statement with three clauses: if, elif, else
	Only one body can ever be executed
		big	less big	not pos

Boolean Values and Expressions

False values: False, 0, None, ‘’

Values that evaluate to false in a boolean context

Comparison operators: >, <, >=, <=, ==, !=

Boolean operators: or, and, not

(Demo)

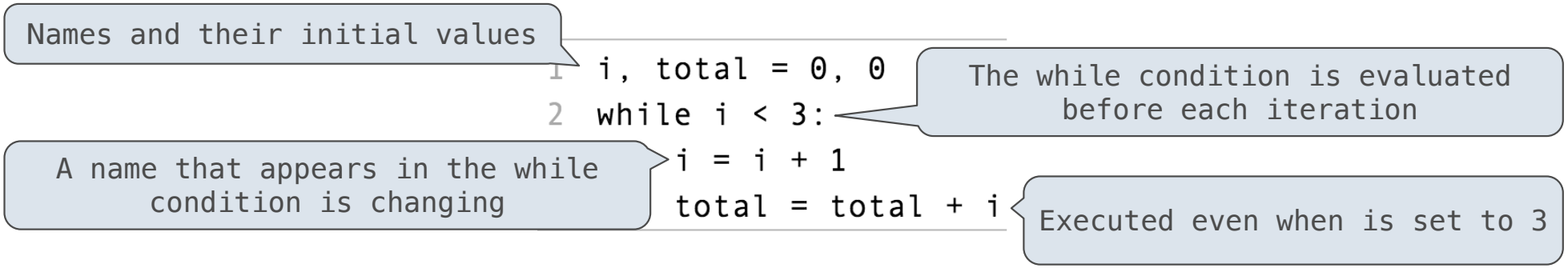
George Boole

While Statements

While statements contain statements that are repeated as long as some condition is true.

Important considerations:

- How many separate names are needed and what do they mean?
- The while condition **must eventually become a false value** for the statement to end (unless there is a return statement inside the while body).
- Once the while condition is evaluated, the entire body is executed.



Example: Prime Factorization

Prime Factorization

Each positive integer n has a set of prime factors: primes whose product is n

```
...
8  = 2 * 2 * 2
9  = 3 * 3
10 = 2 * 5
11 = 11
12 = 2 * 2 * 3
...
```

How can we determine whether a number is divisible by another?

One approach: Find the smallest prime factor of n, then divide by it

```
858  = 2 * 429  = 2 * 3 * 143  = 2 * 3 * 11 * 13
```

(Demo)