One-on-One Sessions

- Still ongoing: 1/2-hour one-on-one sessions
  - To help prepare you for the assignment
  - **Primarily for students with little experience**
- There are still some spots available
  - Sign up for a slot in CMS
- Will keep running after **September 17**
  - Will open additional slots after the due date
  - Will help students revise Assignment 1

A Motivating Example

Function Definition

```
def foo(a,b):
    """Do something
       Param a: number
       Param b: number"""
    x = a
    y = b
    return x*y+y
```

Function Call

```
>>> x = 2
>>> foo(3,4)
```

x ?

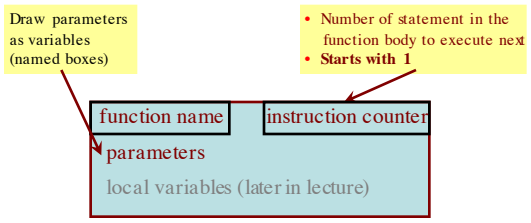
What is in the box?

A: 2
B: 3
C: 16
D: Nothing!
E: I do not know

How Do Functions Work?

Draw template on a piece of paper

- **Function Frame**: Representation of function call
- A **conceptual model** of Python

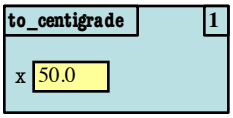


Text (Section 3.10) vs. Class

Textbook

to_centigrade → x -> 50.0

This Class



Definition:

```
def to_centigrade(x):
    return 5*(x-32)/9.0
```

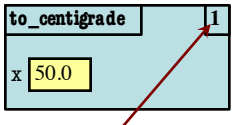
Call: to_centigrade(50.0)

Example: to_centigrade(50.0)

1. Draw a frame for the call
2. Assign the argument value to the parameter (in frame)
3. Execute the function body
   - Look for variables in the frame
   - If not there, look for global variables with that name
4. Erase the frame for the call

```
1  def to_centigrade(x):
       return 5*(x-32)/9.0
```

Initial call frame (before exec body)



next line to execute

Example: to_centigrade(50.0)

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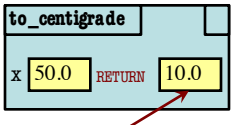
```
1  def to_centigrade(x):
       return 5*(x-32)/9.0
```

Executing the return statement



Return statement creates a special variable for result

Example: to_centigrade(50.0)

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```
1 def to_centigrade(x):
      return 5*(x-32)/9.0
```

ERASE WHOLE FRAME

But don't actually erase on an exam

Call Frames vs. Global Variables

The specification is a **lie**:

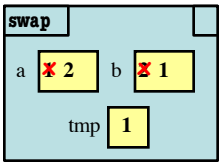
```
def swap(a,b):
    """Swap global a & b"""
1   tmp = a
2   a = b
3   b = tmp
```

```
>>> a = 1
>>> b = 2
>>> swap(a,b)
```

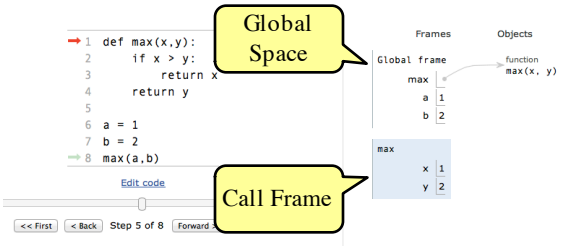
Global Variables

a 1 b 2

Call Frame

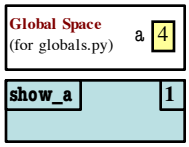


Visualizing Frames: The Python Tutor



Function Access to Global Space

- All function definitions are in some module
- Call can access global space for **that module**
  - math.cos: global for math
  - temperature.to_centigrade uses global for temperature
- But **cannot** change values
  - Assignment to a global makes a new local variable!
  - Why we limit to constants




```
# globals.py
"""Show how globals work"""
a = 4 # global space

def show_a():
    print a # shows global
```

Function Access to Global Space

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- But **cannot** change values
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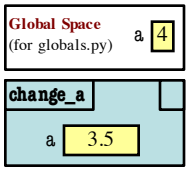


```
# globals.py
"""Show how globals work"""
a = 4 # global space

def change_a():
    a = 3.5 # local variable
```

Exercise Time

Function Definition

```
def foo(a,b):
    """Do something
       Param x: a number
       Param y: a number"""
1   x = a
2   y = b
3   return x*y+y
```

Function Call

```
>>> x = foo(3,4)
```

What does the frame look like at the **start**?