61A Lecture 3

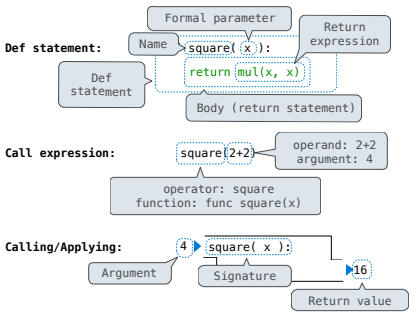
Friday, September 5

Announcements

- There's plenty of room in live lecture if you want to come (but videos are still better)
- ***Please*** don't make noise outside of the previous lecture!
- Homework 1 is due next Wednesday 9/10 at 2pm (***Changed from original time!***)
  - Homework is graded on effort, but the bar is high – you must make substantial progress
  - Monday homework parties 3pm–4pm in Wozniak Lounge and 6pm–8pm in 2050 VLSB
- Take-home quiz released next Wednesday 9/10 at 3pm, due Thursday 9/12 at 11:59pm
  - 3 points, similar in format to homework, but graded for correctness
  - If you score 0/3, you will need to talk to the course staff or be dropped
  - Open-computer: You can use the Python interpreter, watch course videos, etc.
  - Closed-help: Please don't **talk to your classmates**, search for answers, etc.
- Project 1 due Wednesday 9/17 at 11:59pm.

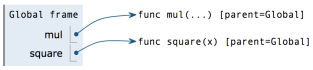
Multiple Environments

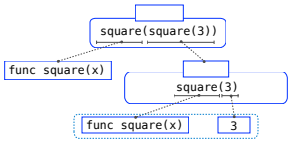
Life Cycle of a User-Defined Function



Multiple Environments in One Diagram!

```
1 from operator import mul
2 def square(x):
3     return mul(x, x)
4 square(square(3))
```





Interactive Diagram

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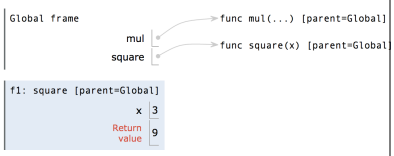

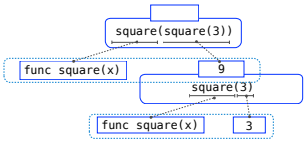

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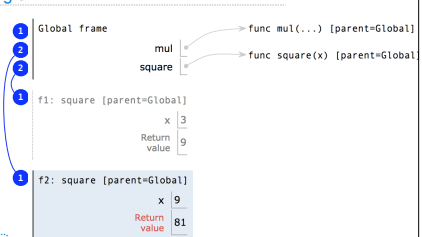

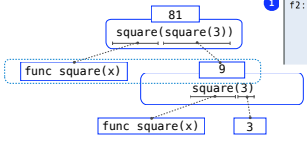

An environment is a sequence of frames.

- The global frame alone
- A local, then the global frame

Interactive Diagram

Names Have No Meaning Without Environments

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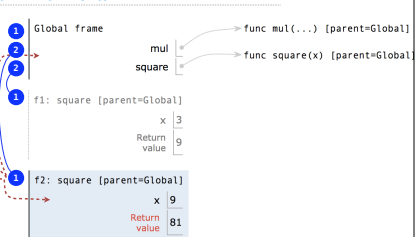
1 from operator import mul
2 def square(x):
3     return mul(x, x)
4 square(square(3))
```



Every expression is evaluated in the context of an environment.

A name evaluates to the value bound to that name in the earliest frame of the current environment in which that name is found.

An environment is a sequence of frames.

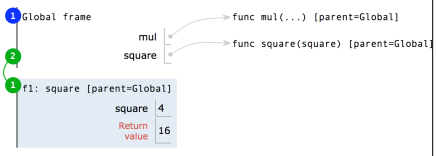
- The global frame alone
- A local, then the global frame

Interactive Diagram

Names Have Different Meanings in Different Environments

A call expression and the body of the function being called are evaluated in different environments

```
1 from operator import mul
2 def square(square):
3     return mul(square, square)
4 square(4)
```



Every expression is evaluated in the context of an environment.

A name evaluates to the value bound to that name in the earliest frame of the current environment in which that name is found.

Interactive Diagram

Miscellaneous Python Features

Operators
Multiple Return Values
Docstrings
Doctests
Default Arguments

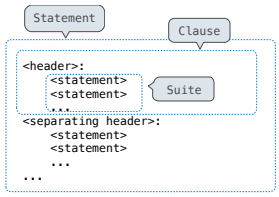
(Demo)

Conditional Statements

Statements

A ***statement*** is executed by the interpreter to perform an action

Compound statements:



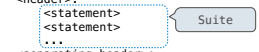
The first header determines a statement's type

The header of a clause "controls" the suite that follows

def statements are compound statements

Compound Statements

Compound statements:




```
<header>:
    <statement>
    <statement>
    ...
<separating header>:
    <statement>
    <statement>
    ...
...
```

A suite is a sequence of statements

To "execute" a suite means to execute its sequence of statements, in order

Execution Rule for a sequence of statements:

- Execute the first statement
- Unless directed otherwise, execute the rest

Conditional Statements

(Demo)


```
def absolute_value(x):
    """Return the absolute value of x."""
    if x < 0:
        return -x
    elif x == 0:
        return 0
    else:
        return x
```

Execution Rule for Conditional Statements:

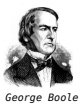
Each clause is considered in order.

1. Evaluate the header's expression.
2. If it is a true value, execute the suite & skip the remaining clauses.

Syntax Tips:

1. Always starts with "if" clause.
2. Zero or more "elif" clauses.
3. Zero or one "else" clause, always at the end.

Boolean Contexts



George Boole

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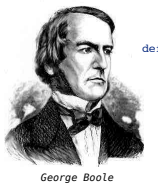
Boolean Contexts



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```

Two boolean contexts

False values in Python: False, 0, '', None *(more to come)*

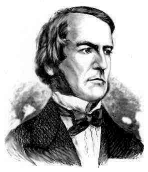
True values in Python: Anything else (True)

Read Section 1.5.4!

Reading: http://composingprograms.com/pages/15-control.html#conditional-statements

Iteration

While Statements



George Boole

(Demo)

```
1  i, total = 0, 0
2  while i < 3:
3      i = i + 1
4      total = total + i
```

Global frame

i	0 1 2 3
total	0 1 3 6

Execution Rule for While Statements:

1. Evaluate the header's expression.
2. If it is a true value, execute the (whole) suite, then return to step 1.