

Discussion 01

Control, Environment Diagrams

Aditya Balasubramanian

`aditbala [at] berkeley [dot] edu`

Slides available at `teaching.aditbala.com`

Announcements

Control



Booleans

Falsey	Truthy
False	True
None	Everything else
0	
[], "", (), {}	

Some `<conditional expressions>` that will evaluate to either `False` / `True` most of the time, with a few exceptions later into the semester.

Boolean Operators

- `not <conditional expression>`
 - returns opposite of `<conditional expression>`
 - `not (1 == 2) -> True`
- `<conditional expression> or <conditional expression>`
 - returns the first **Truthy** value it finds, `False` if none
 - `0 or None or 1 -> 1`
- `<conditional expression> and <conditional expression>`
 - return first **Falsey** value, or last value if everything is true
 - `40 and 0 and True -> False`
 - `40 and 1 and True -> True`

Short Circuiting

- Sort of like making an assumption
 - If I'm broke, then I don't need to check the price of boba since I'll never be able to buy it lol 😬
- `and` will stop at the first **Falsey** value and return it
- `or` will stop at the first **Truthy** value and return it
- Why is this important?
 - May not need to evaluate all expressions. Even if there is an expression that errors, e.g. `1/0`, `and` / `or` expression might short circuit before it reaches error

Boolean Examples

- `0 or 435 or False`
 - returns `435`
- `True and "Hello" and 0`
 - returns `0`
- Short Circuiting
- `3 and 1/0 and False`
 - returns `Error`
- `3 and False and 1/0`
 - returns `False`

If Statements

- How to use `<conditional expressions>` to execute/skip lines of code?

```
if <conditional expression>:  
    <suite of statements>  
elif <conditional expression>:  
    <suite of statements>  
else:  
    <suite of statements>
```

- Colons after `if`, `elif`, `else` statements
- `else` doesn't need `<conditional expression>`

If Statements Example

```
wallet = 0

if wallet > 0:
    print('you are not broke')
else:
    print('you are broke')
if wallet == 0:
    print(0)
```

If Statements Example

```
wallet = 0

if wallet > 0:
    print('you are not broke')
else:
    print('you are broke')
if wallet == 0:
    print(0)
```

```
you are broke
0
```

[ADD EXAMPLES]

While Loops

- How to execute a statement multiple times in a program?

```
while <conditional clause>:  
    <statements body>
```

- program executes until `<conditional clause>` is false

[ADD EXAMPLES]

Enviroment Diagrams



Enviroment Diagrams

- What are they?
 - A way to model how our program runs line by line
 - Keep track of variables, function calls and what they return, etc.
- Why use them?
 - Can help us understand where there is a bug in program (debugging)
 - Useful for other questions (WWPD, coding)
 - Exam points!

Important Concepts

- Expressions
 - Evaluate to values
 - `1 + 1 -> 2`
- Statements
 - Bind **names** to **values**
 - **Names**
 - `def` statements, assignment statements, variable names
 - **Values**
 - numbers, strings, functions, or other objects
 - `x = 2`
 - doesn't return anything

Interactive Example

```
x = 3

def square(x):
    return x ** 2

square(2)
```

- Let's create an environment diagram for this program!
- Start from top, go to bottom

Frame

- Frames are objects that list bindings of **variables** and **values**
 - tell us how to look up bindings
- **Global Frame** exists by default
- Assignment statement (denoted by =) creates binding of **variable** `x` and **values** `3`

Python 3.6
([known limitations](#))

→ 1 x = 3

[Edit this code](#)

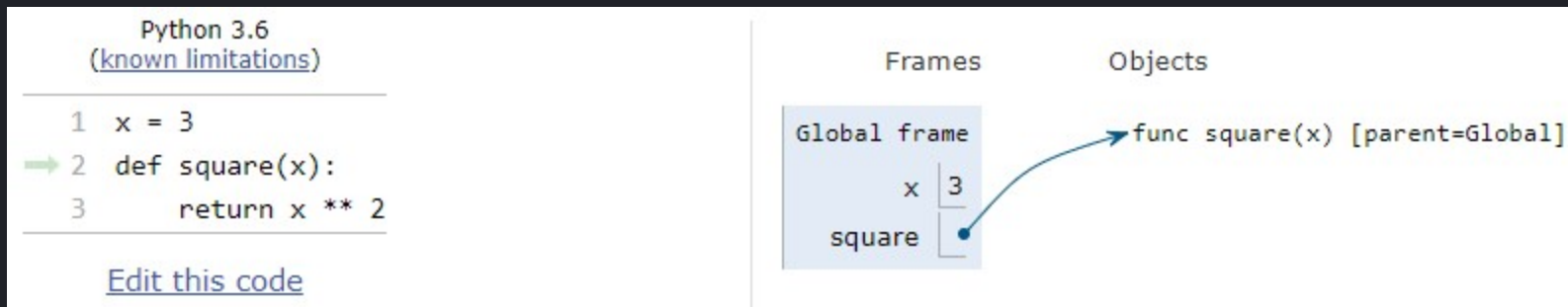
Frames

Global frame

x 3

def statements

- `def` statements are used to bind **function objects** to a **variable**
- Only bind, **NO** execution until function is called
 - `def foo():` -> define function called `foo` with no parameters
 - `foo()` -> execute `foo`
- Binding name is function name
- Parent function is frame where function is defined
- Keep track of *name, parameters, parent frame*



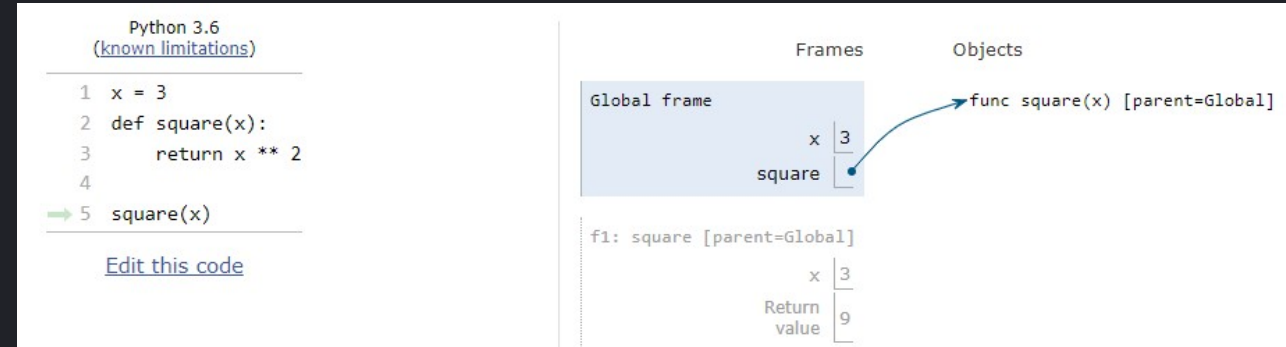
Call Expressions

- Syntax:

```
function_name(arg1, arg2,  
...)
```

- Create new frame for call expression
- Steps for evaluating:
 1. Evaluate operator (function)
 - See if it exists
 2. Evaluate operands (args)
 - simplify args
 3. Apply operator to the operands

Slides by Aditya Balasubramanian



Thank you!