Discussion 01

Variables and Functions, Control, Environment Diagrams

Aditya Balasubramanian
aditbala [at] berkeley [dot] edu

Slides available at `teaching.aditbala.com`

Announcements 📣

- Technial OH 1-4pm in Cory 521 on Thursday (6/23) and 1-3pm in Cory 521 on Friday (6/24)
- Some appointment based OH on Thursday and Friday and signups for those will occur at midnight the night before at `oh.cs61a.org` . The schedule for OH can also be found at `https://cs61a.org/office-hours/`

All Slides can be found on

`teaching.aditbala.com`

Control

Booleans

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

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` -> 0
  - `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
```

General Tips for Approaching Problems

- Do not immediately start coding
  - Ensure you understand the problem
  - Have an idea of what you want to code
- Groupwork
  - Bounce ideas off of each other!
  - Share any ideas, questions, or misconceptions
- Reading the problem
  - Please read the entire problem
  - Hints are very useful
  - Doctests are SUPER useful

Worksheet (walkthrough + practice)

While Loops

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

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

- program executes until `<conditional clause>` is false
- In other words, only run when `<conditional clause>` evaluates to `true`

While Loop Examples

```
x = 3
while x > 0:
    print(x)
    x -= 1
```

While Loop Example

```
x = 3
while x > 0:
    print(x)
    x -= 1
    # x = x - 1
```

```
3
2
1
```

While Loop Example

- What is wrong with this while loop

```
x = 3
while x > 0:
    print(x)
```

- This will result in an infinite loop
- Make sure you are modifying the condition in the while loop

Enviroment Diagrams 

[SIMPLIFY THIS NO PARENTS NO RETURING FUNCTIONS]

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

Frames

- `Global Frame` always exists
- Frames list the bindings of variables and their corresponding value
- Used to look up the value of a variable

Question 7: Assignment Diagram

```
x = 11 % 4
y = x
x **= 2
```

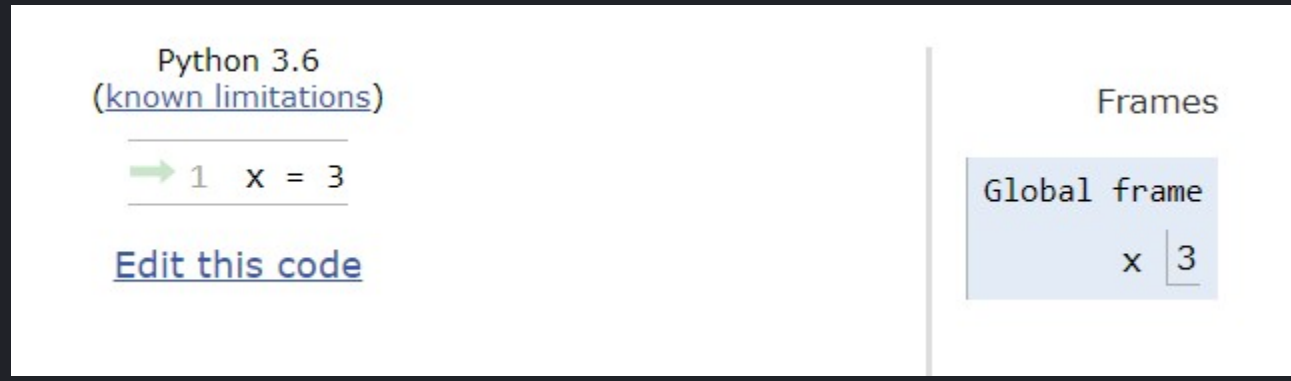
Interactive Example

```
x = 3

def square(x):
    return x ** 2

square(2)
```

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

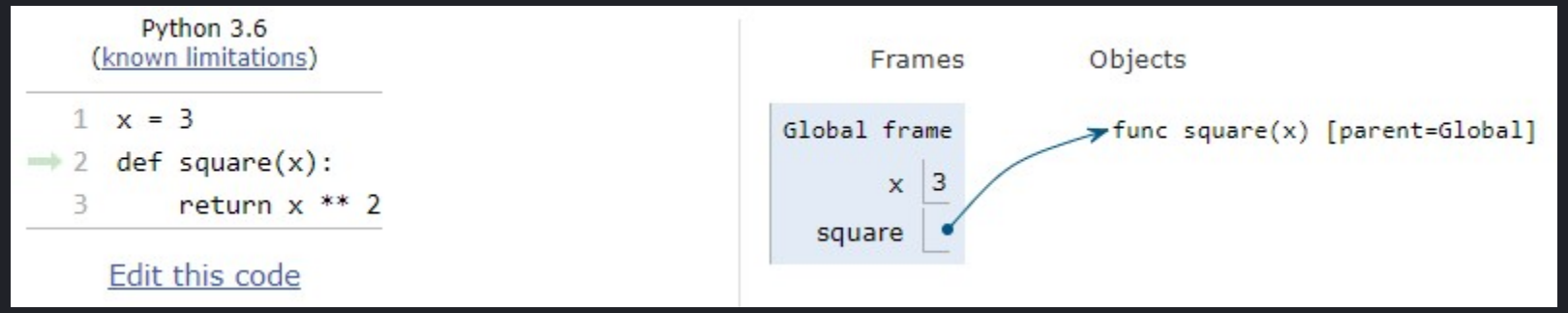
Frame

- 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`



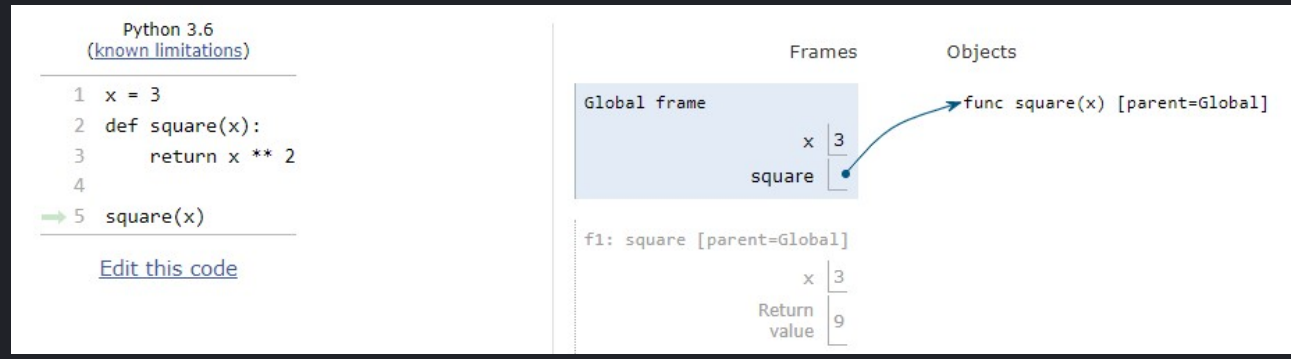
`def` statements

- `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



Thank you!

Attendance Form -> `https://tinyurl.com/adit-disc01`

Anon Feedback -> `https://tinyurl.com/adit-anon`

Study Groups -> Will send out in email