Discussion 01

Variables and Functions, Control, Environment Diagrams

Aditya Balasubramanian aditbala [at] berkeley [dot] edu

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/

6/23

All Slides can be found on

teaching.aditbala.com

Contro



Booleans

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

Boolean Operators

- not <conditional expression>
 - o returns opposite of <conditional expression>
 - o not (1 == 2) -> True
- <conditional expression> or <conditional expression>
 - o returns the first **Truthy** value it finds, False if none
 - 0 or None or 1 -> 1
- <conditional expression> and <conditional expression>
 - o 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
 - o returns 435
- True and "Hello" and 0
 - o returns 0
- Short Circuiting
- 3 and 1/0 and False
 - o returns Error
- 3 and False and 1/0
 - o returns False

Questions or Comments?

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
```

Questions or Comments?

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

Question 1 (2 minutes)

```
def special_case():
    x = 10
    if x > 0:
        x += 2
    elif x < 13:
        x += 3
    elif x % 2 == 1:
        x += 4
    return x
special_case()
```

Question 1 (2 minutes)

```
def just_in_case():
    x = 10
    if x > 0:
        x += 2
    if x < 13:
        x += 3
    if x % 2 == 1:
        x += 4
    return x
just_in_case()
```

Question 1 (2 minutes)

```
def case_in_point():
    x = 10
    if x > 0:
        return x + 2
    if x < 13:
        return x + 3
    if x % 2 == 1:
        return x + 4
    return x
case_in_point()
```

Questions or Comments?

Question 2 (5 minutes)

```
def wears_jacket_with_if(temp, raining):
    >>> wears_jacket_with_if(90, False)
    False
    >>> wears_jacket_with_if(40, False)
    True
    >>> wears_jacket_with_if(100, True)
    True
    11 11 11
    "*** YOUR CODE HERE ***"
```

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

Questions or Comments?

Question 4: Is Prime? (10 min)

Hint: Use the % operator: x % y returns the remainder of x when divided by y

```
def is_prime(n):
    11 11 11
    >>> is_prime(10)
    False
    >>> is_prime(7)
    True
    >>> is_prime(1) # one is not a prime number!!
    False
    11 11 11
    "*** YOUR CODE HERE ***"
```

Question 5: Fizzbuzz (15 min)

Implement the fizzbuzz sequence, which prints out a single statement for each number from 1 to n. For a number i,

- If i is divisible by 3 only, then we print fizz.
- If i is divisible by 5 only, then we print buzz.
- If i is divisible by both 3 and 5, then we print fizzbuzz.
- Otherwise, we print the number i by itself.

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
 - 0 1 + 1 -> 2
- Statements
 - Bind names to values
 - Names
 - def statements, assignment statements, variable names
 - Values
 - numbers, strings, functions, or other objects
 - o x = 2
 - o 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

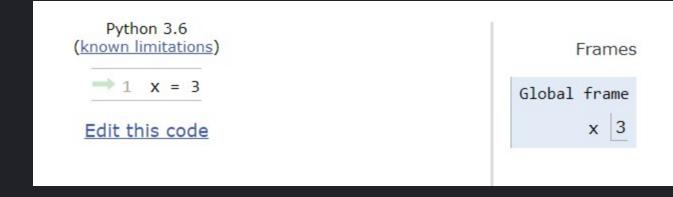
def square(x):
    return x ** 2

square(2)
```

- Let's create an 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



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
 - o foo() -> execute foo
- Binding name is function name
- Parent function is frame where function is defined
- Keep track of name, parameters, parent frame

```
Python 3.6
(known limitations)

1  x = 3

→ 2 def square(x):
3  return x ** 2

Edit this code

Frames Objects

Global frame
x 3
square

square

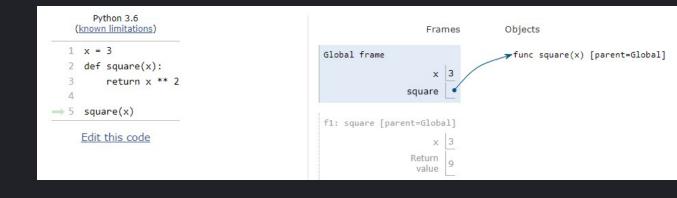
Frames Objects

Global frame
x 3
square
```

Call Expressions

- Syntax: function_name(arg1, arg2, ...)
- Create new frame for call expression
- Steps for evaluating:
 - 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!

Attendance Form -> https://tinyurl.com/aditdisc01

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

Study Groups -> Will send out in email