

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`

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
0
```

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  
    """  
    """ * * * 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):  
    """  
    >>> is_prime(10)  
    False  
    >>> is_prime(7)  
    True  
    >>> is_prime(1) # one is not a prime number!!  
    False  
    """  
    """ 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
 - `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 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!

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

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

Study Groups -> Will send out in email