

Review/Exercise 4

Sources

- HKN Spring 2013 MT1 Review Slides
- HKN Spring 2013 MT2 Review Slides
- CS 61A Spring 2013 TA MT1 Review Session Slides

Environment Diagrams

1. Rule One - Global Frame: The frame in which all (python) programs begin. Draw a box and label it "Global Frame."
2. Rule Two - Assignment / Bindings
 - Variable **names** are bound to their **values** in the **current frame**
 - **Evaluate** the **right side**
 - **Bind** the variable **name** on left side to whatever the right side **evaluated to**
 - def statements and import statements are also assignments!
 - lambdas are **expressions** and only show up when bound (as return values or to names)
 - Note that for functions, sometimes you need to denote the parent frame
3. Rule Three - Variable Lookup
 - When you **evaluate** an expression and look up the **value** of a variable, start in the **current frame** and **follow the parent frames**
4. Rule Four - Function Calls
 - For a **user-defined function call**, draw a **new frame**! Note: This is the **only situation** in which you draw a new frame.

Environment Diagrams

```
the = 4
def boom(goes):
    def dynamite():
        return boom(goes-1)
    if goes < the:
        return 9
    goes += 4
    return dynamite
the = boom(5)()
boom(10)
```

Recursion

A recursive function has two important components:

- A *base case*.
- A *recursive case*.

```
def factorial(n):  
    if n == 1 or n == 0:  
        return 1  
    return n * factorial(n - 1)
```

Recursion

Write a recursive function `eat_chocolate` that takes in a number of chocolate pieces and returns a string as follows:

```
>>> eat_chocolate(5)
"nom nom nom nom nom"
>>> eat_chocolate(2)
"nom nom"
>>> eat_chocolate(1)
"nom"
>>> eat_chocolate(0)
"No chocolate :("
```

```
def eat_chocolate(num_pieces):
    if num_pieces == 0:
        return "No chocolate :("
    elif num_pieces == 1:
        return "nom"
    return "nom " + \ eat_chocolate(num_pieces - 1)
```

Fibonacci

Write a function that prints out the first n fibonacci prime numbers (a number that is both a Fibonacci number and a prime number). Assume that we gave you a function `is_prime` that returns a boolean expressing whether or not a number is prime.

```
def nth_fib_prime(n):
```

Iterables

- Lists - Sequences that are **mutable**. We can add, remove, and change the items of a list.
- Tuples - Sequences that are **immutable**. We **cannot** change the items in a tuple, only create new ones.
- Dictionaries - Stores data by mapping keys to values. Remember that they are unordered and the keys are unique!
 - Remember that dictionaries have unique keys! (If I try to add a key that already exists, it overrides the previous value with the new one.)

Rlist Implementation

This is the data abstraction that we will be using for our immutable rlists:

```
empty_rlist = None
```

```
def rlist(first, rest):  
    """Construct a recursive list from its first element and the rest."""  
    return (first, rest)
```

```
def first(s):  
    """Return the first element of a recursive list s."""  
    return s[0]
```

```
def rest(s):  
    """Return the rest of the elements of a recursive list s."""  
    return s[1]
```



```
def less_rlist(n, r):
    """Construct an rlist containing only values from r less than
    n."""
    if r == empty_rlist:
        return r
    if first(r) < n:
        return rlist(first(r), less_rlist(n, rest(r)))
    return less_rlist(n, rest(r))
```

```
def greater_rlist(n, r):
    """Construct an rlist containing only values from r greater
    than or equal to n."""
    if r == empty_rlist:
        return r
    if first(r) >= n:
        return rlist(first(r), greater_rlist(n, rest(r)))
    return greater_rlist(n, rest(r))
```

What would Python print?

```
class Animal(object):
    def __init__(self, name):
        self.n = name
        self.hunger = 0
    def eat(self, food):
        self.hunger+=1
        if self.hunger >= 2:
            print('Dead')
            else: self.hunger = 0

        print('eaten')
    def name(self):
        if self.hunger >= 3:
            return 'Dead'
        else: return self.n
```

```
>>> c = Animal('cow')
```

```
>>> c.eat('grass')
```

```
eaten
```

```
>>> c.eat('grass')
```

```
Dead
```

General Tips

- If you don't get it, ask.
- Don't procrastinate on the projects!
- When preparing for the exams, do tons of practice problems, but make sure you understand them before moving on.

Final Words