CS61A Final Review Session Fall 2011 **Solutions updated 3:08PM 12/9/2011**

Here are some questions that the TAs have written to help you review for the final. This review sheet covers only some of the topics after the second midterm – be sure to review other concepts as well!

Exceptions
What would Python print?

```
def a():
   print("Steven says")
   int("what happens here")
   print("hello")

def b():
   try:
       print(1)
       a()
       print(2)
       return 3
   except ValueError:
       print(4)
       return 5

def c():
   b()
   a()
   return 6
```

```
>>> a()
Steven says
Traceback.... ValueError: invalid literal for int()...


>>> b()
1
Steven says
4
5


>>> c()
1
Steven says
4
Steven says
Traceback... ValueError: invalid literal for int()...
```

Dynamic Scope

```
x = 10
def car(x):
   return van()

def van():
   if x == 10:
       return "honk"
   return "tumble"
```

What would `car(11)` return in lexical scope?
"honk"
What would `car(11)` return in dynamic scope? Draw an environment diagram.
"tumble"

Concurrency

x = 10
Assume the following 2 lines are run in parallel.
>>> x = x + x
>>> x = x * x

Correct values of x:
200
400
Possible values of x when interleaving has occurred:
20
100
110
200 ← Note that you can get this both through correct execution and interleaved execution!

Parsing

Write the function `tokenize_html`. Given a string that includes HTML tags and text between the HTML tags, return a list which consists of HTML tags and the text between the HTML tags. See the doc-string for examples.

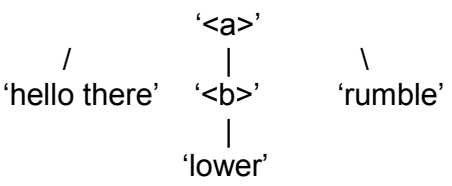
```
def tokenize_html(line):
    """Given a well-formed HTML string, return a list where each element is a token.

    HTML tags are considered elements, and text between tags are elements.

    An HTML tag starts with a < and ends with a >.  Any time a < appears, you
    can assume there is a corresponding >, and another < will not appear before the
    corresponding >.

    For example, you will NOT have to worry about a string like "<html <asdf>>".

    You may assume that the string starts and ends with an HTML tag.

    >>> tokenize_html("<html>hi</html>")
    ['<html>', 'hi', '</html>']
    >>> tokenize_html("<body>hello there    </body>")
    ['<body>', 'hello there    ', '</body>']
    """

    output = []
    current = ""
    for char in line:
        if char == "<":
            output.append(current)
            current = ""
        current += char
        if char == ">":
            output.append(current)
            current = ""
    return [x for x in output if x] #gets rid of empty strings
```

Interpreters

Given a list returned by a call to `tokenize_html`, turn that list into a Tree structure. For example,

```
['<a>', 'hello there', '<b>', 'lower', '</b>', 'rumble', '</a>']
```

should turn into the tree structure:



The tag <a> corresponds to the closing tag , so the elements between those two tags become children of the Tree whose datum is '<a>'. Relevant Tree code has been included below.

```
class Tree(object):
   def __init__(self, datum, children=[]):
       self.datum = datum
       self.children = children

def print_tree(t, prefix=""):
   print prefix+t.datum
   for child in t.children:
       new_prefix = "  |___";
       for _ in prefix:
           new_prefix = " " + new_prefix
       print_tree(child, new_prefix)

def is_tag(token):
   return token.startswith("<")

def is_end_tag_of(tag, token):
   return token == tag[0] + "/" + tag[1:]

#continued on next page
```

```
def list_to_tree(lst):
    def eval_one(lst):
        first = lst.pop(0)
        if not is_tag(first):
            return Tree(first,[]), lst
        contained = []
        nxt = lst.pop(0)
        while not is_end_tag_of(first, nxt):
            contained.append(nxt)
            nxt = lst.pop(0)
        children = []
        while contained:
            child, contained = eval_one(contained)
            children.append(child)
        return Tree(first, children), lst
    return eval_one(lst)[0]
```

Iterators

The basic idea behind the Sieve of Eratosthenes that you saw in class was that a number *n* is prime if it is not divisible by any primes less than *n*. Write an iterator that produces prime numbers in order forever.

```
class Primes(object):
    def __iter__(self):
        past_primes = []
        guess = 2
        while True:
            is_prime = True
            for p in past_primes:
                if guess % p == 0:
                    is_prime = False
                    break
            if is_prime:
                yield guess
                past_primes.append(guess)
            guess += 1
```

Streams

Write interleave, a function that takes two streams and returns a stream where the elements of each stream are interleaved.

```
def interleave(s1, s2):
    def compute_rest():
        return interleave(s2, s1.rest)
    return Stream(s1.first, compute_rest)
```

Now create a stream of all positive and negative integers. *Hint*: The first element in the stream should be 0.

```
def all_integers_stream():
    pos_stream = make_positive_stream() #positive stream includes 0
    neg_stream = make_negative_stream()
    return interleave(pos_stream, neg_stream)

def make_positive_stream(first = 0):
    def compute_rest():
        return make_positive_stream(first + 1)
    return Stream(first, compute_rest)

def make_negative_stream(first = -1):
    def compute_rest():
        return make_negative_stream(first - 1)
    return Stream(first, compute_rest)
```