CS 1110

Prelim 2 Review
Fall 2017
Exam Info

• Prelim 2: 7:30–9:00PM, Thursday, Nov. 9th
  ▪ Last name A – J in Uris G01
  ▪ Last name K – Z in Statler Auditorium
  ▪ SDS Students will get an e-mail

• To help you study:
  ▪ Study guides, review slides are online
  ▪ Review solution to prelim 1 (esp. call stack!)
  ▪ Review solution to Assignment 5 (posted soon)
What is on the Exam?

• Five questions from the following topics:
  § Recursion (Lab 8, A4)
  § Iteration and Lists (Lab 7, A4, A6)
  § Defining classes (Lab 9, Lab 10, A6)
  § Drawing folders (Lecture, A5)
  § Exceptions (Lectures 11 and 21)
  § Short Answer (Terminology, Potpourri)
• +2 points for name, netid AND SECTION
What is on the Exam?

- Recursion (Lab 8, A4)
  - Will be given a function specification
  - Implement it using recursion
  - May have an associated call stack question
- Iteration and Lists (Lab 7, A4, A6)
- Defining classes (Lab 9, Lab 10, A6)
- Drawing folders (Lecture, A5)
- Exceptions (Lectures 11 and 21)
- Short Answer (Terminology, Potpourri)
def histogram(s):
    """Return: a histogram (dictionary) of the # of letters in string s.

    The letters in s are keys, and the count of each letter is the value. If
    the letter is not in s, then there is NO KEY for it in the histogram.

    Example: histogram('') returns {},
    histogram('abracadabra') returns {'a':5,'b':2,'c':1,'d':1,'r':2}

    Precondition: s is a string (possibly empty) of just letters."""
def histogram(s):
    """Return: a histogram (dictionary) of the # of letters in string s.

    The letters in s are keys, and the count of each letter is the value. If
    the letter is not in s, then there is NO KEY for it in the histogram.

    Precondition: s is a string (possibly empty) of just letters."""

    Hint:
    
    • Use divide-and-conquer to break up the string
    • Get two dictionaries back when you do
    • Pick one and insert the results of the other
def skip(s):
    """Returns: copy of s
    Odd (from end) skipped"
    result = ''
    if (len(s) % 2 == 1):
        result = skip(s[1:])
    elif len(s) > 0:
        result = s[0] + skip(s[1:])
    return result

• **Call**: skip('abc')
• Recursive call results in four frames (why?)
  - Consider when 4th frame completes line 6
  - Draw the entire call stack at that time
• Do not draw more than four frames!
What is on the Exam?

- Recursion (Lab 8, A4)
- Iteration (Lab 7, A4, A6)
  - Again, given a function specification
  - Implement it using a for-loop
  - May involve 2-dimensional lists
- Defining classes (Lab 9, Lab 10, A6)
- Drawing folders (Lecture, A5)
- Exceptions (Lectures 11 and 21)
- Short Answer (Terminology, Potpourri)
def evaluate(p, x):
    """Returns: The evaluated polynomial p(x)
    We represent polynomials as a list of floats. In other words
    
    [1.5, -2.2, 3.1, 0, -1.0] is 1.5 - 2.2x + 3.1x**2 + 0x**3 - x**4
    
    We evaluate by substituting in for the value x. For example
    
    evaluate([1.5,-2.2,3.1,0,-1.0], 2) is 1.5-2.2(2)+3.1(4)-1(16) = -6.5
    evaluate([2], 4) is 2
    
    Precondition: p is a list (len > 0) of floats, x is a float"""
Example with 2D Lists (Like A6)

```python
def max_cols(table):
    """Returns: Row with max value of each column

    We assume that table is a 2D list of floats (so it is a list of rows and each row has the same number of columns. This function returns a new list that stores the maximum value of each column.

    Examples:
    max_cols([ [1,2,3], [2,0,4], [0,5,2] ]) is [2,5,4]
    max_cols([ [1,2,3] ]) is [1,2,3]

    Precondition: table is a NONEMPTY 2D list of floats"
```

11/5/17 Prelim 2 Review
What is on the Exam?

• Recursion (Lab 8, A4)
• Iteration (Lab 7, A4, A6)
• Defining Classes (Lab 9, Lab 10, A6)
  ▪ Given a specification for a class
  ▪ Also given a specification for a subclass
  ▪ Will “fill in blanks” for both
• Drawing folders (Lecture, A5)
• Exceptions (Lectures 11 and 21)
• Short Answer (Terminology, Potpourri)
class Customer(object):
    
    """Instance is a customer for our company
    
    Mutable attributes:
    _name: last name [string or None if unknown]
    _email: e-mail address [string or None if unknown]
    
    Immutable attributes:
    _born: birth year [int > 1900; -1 if unknown]"

    # DEFINE GETTERS/SETTERS HERE
    # Enforce all invariants and enforce immutable/mutable restrictions

    # DEFINE INITIALIZER HERE
    # Initializer: Make a Customer with last name n, birth year y, e-mail address e.
    # E-mail is None by default
    # Precondition: parameters n, b, e satisfy the appropriate invariants

    # OVERLOAD STR() OPERATOR HERE
    # Return: String representation of customer
    # If e-mail is a string, format is 'name (email)'
    # If e-mail is not a string, just returns name
class PrefCustomer(Customer):

    """An instance is a 'preferred' customer
    Mutable attributes (in addition to Customer):
        _level: level of preference [One of 'bronze', 'silver', 'gold'] """

    # DEFINE GETTERS/SETTERS HERE
    # Enforce all invariants and enforce immutable/mutable restrictions

    # DEFINE INITIALIZER HERE
    # Initializer: Make a new Customer with last name n, birth year y,
    # e-mail address e, and level l
    # E-mail is None by default
    # Level is 'bronze' by default
    # Precondition: parameters n, b, e, l satisfy the appropriate invariants

    # OVERLOAD STR() OPERATOR HERE
    # Return: String representation of customer
    # Format is customer string (from parent class) +', level'
    # Use __str__ from Customer in your definition
What is on the Exam?

- Recursion (Lab 7, A4)
- Iteration and Lists (Lab 6, A4, A5)
- Defining classes (Lab 8, Lab 9, A5)
- Drawing class folders (Lecture, A5)
  - Given a skeleton for a class
  - Also given several assignment statements
  - Draw all folders and variables created
- Exceptions (Lectures 11 and 21)
- Short Answer (Terminology, Potpourri)
Two Example Classes

class CongressMember(object):
    """Instance is legislator in congress
    Instance attributes:
        _name: Member's name [str]"
    ""
    def getName(self):
        return self._name

def setName(self, value):
    assert type(value) == str
    self._name = value

def __init__(self, n):
    selfsetName(n)  # Use the setter

    def __str__(self):
        return 'Honorable ' + self.name

class Senator(CongressMember):
    """Instance is legislator in congress
    Instance attributes (plus inherited):
        _state: Senator's state [str]"
    ""
    def getState(self):
        return self._state

def setName(self, value):
    assert type(value) == str
    self._name = 'Senator ' + value

def __init__(self, n, s):
    assert type(s) == str and len(s) == 2
    super().__init__(n)
    self._state = s

    def __str__(self):
        return (super().__str__() +
            ' of ' + self.state)
‘Execute’ the Following Code

```python
>>> b = CongressMember('Jack')
>>> c = Senator('John', 'NY')
>>> d = c
>>> d.setName('Clint')
```

• Draw two columns:
  - Global space
  - Heap space

• Draw both the
  - Variables created
  - Object folders created
  - Class folders created

• If an attribute changes
  - Mark out the old value
  - Write in the new value

Remember:
Commands outside of a function definition happen in global space
What is on the Exam?

- Recursion (Lab 8, A4)
- Iteration and Lists (Lab 7, A4, A6)
- Defining classes (Lab 9, Lab 10, A6)
- Drawing class folders (Lecture, A5)
- Exceptions (Lectures 11 and 21)
  - Try-except tracing (skipped on Prelim 1)
  - But now with dispatch on type
  - Will give you exception hierarchy
- Short Answer (Terminology, Potpourri)
What is the output of `first(-1)`?

**HINT:**
- StandardError
- AssertionError
- IOError
def first(x):
    print 'Starting first.'
    try:
        second(x)
    except IOError:
        print 'Caught at first'
    print 'Ending first'

def second(x):
    print 'Starting second.'
    try:
        third(x)
    except AssertionError:
        print 'Caught at second'
    print 'Ending second'

def third(x):
    print 'Starting third.'
    if x < 0:
        raise IOError()
    elif x > 0:
        raise AssertionError()
    print 'Ending third.'

What is the output of first(1)?
What is on the Exam?

• Recursion (Lab 7, A4)
• Iteration and Lists (Lab 6, A4, A5)
• Defining classes (Lab 8, Lab 9, A5)
• Drawing class folders (Lecture, Study Guide)
• Exceptions (Lectures 11 and 21)
• Short Answer (Terminology, Potpourri)
  ▪ See the study guide
  ▪ Look at the lecture slides
  ▪ Read relevant book chapters

In that order