CS 1110

Prelim 1 Review
Spring 2019

Exam Info

- Prelim 1: Tuesday, March 12th
  - **BKL 219 – Last names A-B**
  - **BKL 200 – Last names H-K(Balcony) L-S(Main)**
  - **GSH G76 – Last names C-G**
  - **GSH 132 - Last names T-Z**
- Exceptions ONLY if you filed a conflict
  - We expect you at time and room assigned
  - We will not have pen, pencil, erasers for you – you should be responsible to be prepared for the exam

Studying for the Exam

- Read study guides, review slides online
  - Review slides will be posted after review
- Review all labs and assignments
  - Solutions to A2 are at top of A2 description
  - No solutions to code, but talk to TAs
- Look at exams from past years
  - Exams with solutions on Canvas
  - Spring exams and Fall exam are different

Grading

- We will announce grades through Gradescope
  - We adjust letter grades based on all exams
  - But no hard guidelines (e.g. mean = grade X)
  - May adjust borderline grades again at final grades
- Use this to determine whether you want to drop
  - **Drop deadline** is March 19th
  - **Goal**: Have everyone graded by end of Thursday

What is on the Exam?

- Questions on the following topics:
  - String slicing functions
  - Call frames and the call stack
  - Functions on mutable objects
  - Testing and debugging
  - Possible short/multiple choice questions

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What about lists?

What is on the Exam?

- Questions on the following topics:
  - String slicing functions
  - Call frames and the call stack
  - Functions on mutable objects
  - Testing and debugging
  - Possible short/multiple choice

Lists may appear in any of these 5

What is on the Exam?

- Questions on the following topics:
  - String slicing functions
    - Do not use magic numbers for index calculations
    - String slicing <*string*>[*start*:*end*]
  - Call frames and the call stack
  - Functions on mutable objects
  - Testing and debugging
  - Possible short/multiple choice questions

3. [18 points] **String Slicing.**

For this question, you may find the following functions and methods may be useful:

Function or Method	Description
len(s)	**Returns**: number of characters in `s`; it can be 0.
s.find(s1)	**Returns**: index of the first character of the FIRST occurrence of `s1` in `s` (-1 if `s1` does not occur in s).
s.rfind(s1)	**Returns**: index of the first character of the LAST occurrence of `s1` in `s` (-1 if `s1` does not occur in s).
s.isalpha()	**Returns**: True if s is *not empty* and its elements are all letters; it returns False otherwise.
s.isdigit()	**Returns**: True if s is *not empty* and its elements are all numbers; it returns False otherwise.
s.islower()	**Returns**: True if s is *not empty* and its elements are all lowercase letters; it returns False otherwise.
s.isupper()	**Returns**: True if s is *not empty* and its elements are all uppercase letters; it returns False otherwise.

Recall that a Cornell netid is a string with either 2 or 3 letters (case does not matter), followed by a number. Use this to implement the function below.

```
def isnetid(s):
    """Return: True if s is a valid netid; False otherwise
    A valid netid is 2 or 3 letters followed by a number.
    Examples: 'wmw2' is a valid netid, but 'wmw2a' and 'w2' are not.
    Precondition: s is string.
```

Approach

```
def isnetid(s):
    if len(s) < 3:
        return False
    if s[2].isdigit():
        pos = 2
    else:
        pos = 3
    prefix = s[:pos].isalpha()
    suffix = s[pos:].isdigit()
    return prefix and suffix
```

Purpose:

1) Rule out strings that are shorter than 3 characters (because the shortest netid will have two letters and a single digit)
2) Find the position of the where the numbers "should" start (will be either the second or third position)

Why? Because a valid netid is two or three letters followed by numbers!

Approach

```
def isnetid(s):
    if len(s) < 3:
        return False
    if s[2].isdigit():
        pos = 2
    else:
        pos = 3
    prefix = s[:pos].isalpha()
    suffix = s[pos:].isdigit()
    return prefix and suffix
```

Purpose:

1) Check that the substring s[:pos] are all letters
2) Check that the substring s[pos:] are all numbers

This is why we made the variable pos - to check the prefix/suffix through substrings

What is on the Exam?

- Questions on the following topics:
  - String slicing functions
  - Call frames and the call stack
    - Do NOT follow the Fall semester style
    - Refer to A2 solutions
  - Functions on mutable objects
  - Testing and debugging
  - Possible short/multiple choice questions

```
 1   def h(y):
 2       y = x[1] - y
 3       return y
 4
 5   def g(z, x):
 6       x[0] = x[0] - z
 7       return x
 8
 9   def f(x, y, z):
10       x = g(y, z)
11       return h(x[0])
12
13   x = [2,3]
14   y = [4,5]
15   x[1] = f(x, 3, y)
```

Let's try to see what the global space, heap space, and call stack would look like!

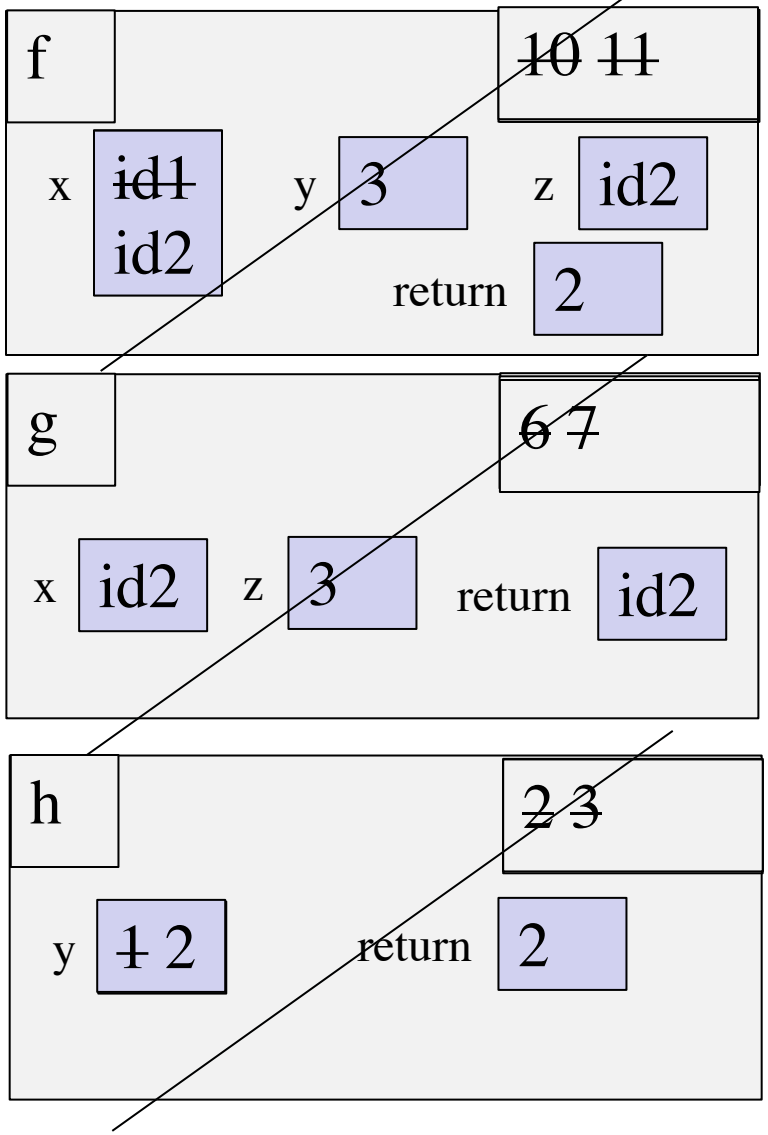
```
1   def h(y):
2       y = x[1] - y
3       return y
4
5   def g(z, x):
6       x[0] = x[0] - z
7       return x
8
9   def f(x, y, z):
10      x = g(y, z)
11      return h(x[0])
12
13  x = [2,3]
14  y = [4,5]
15  x[1] = f(x, 3, y)
```

Global Space

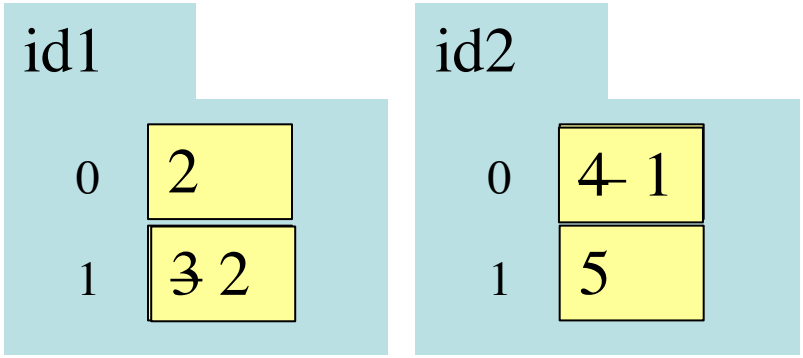
x id1

y id2

Call Stack



Heap Space

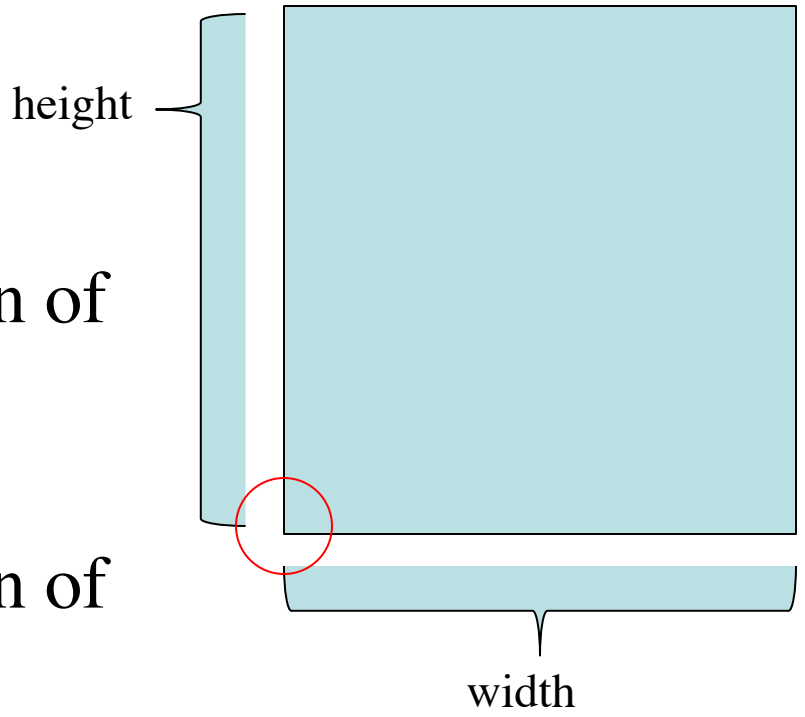


What is on the Exam?

- Questions on the following topics:
  - String slicing functions
  - Call frames and the call stack
  - Functions on mutable objects
    - Given an object type (e.g. class)
    - Attributes will have invariants
    - Write a function respecting invariants
  - Testing and debugging
  - Possible short/multiple choice questions

Class Square

- Square has a few attributes:
  - width
  - height
  - x – represents the position of the left bottom end of the square
  - y – represents the position of the left bottom end of the square



move(square1, new_x, new_y)

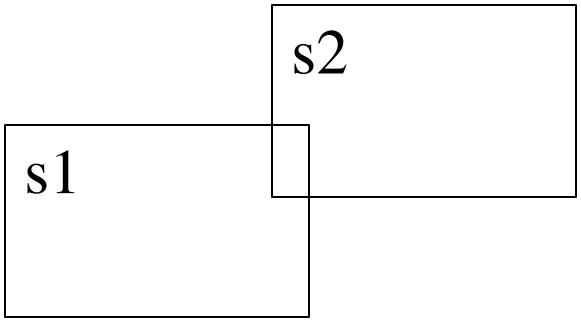
- Implement a function that will, when given a Square object, will set the x and y attributes of the object to the new values given
- Straigh
all you
the x and y attributes; you will assign new_x to square1.x and new_y to square1.y.

```
def move(square1, new_x, new_y):
    square1.x = new_x
    square1.y = new_y
```

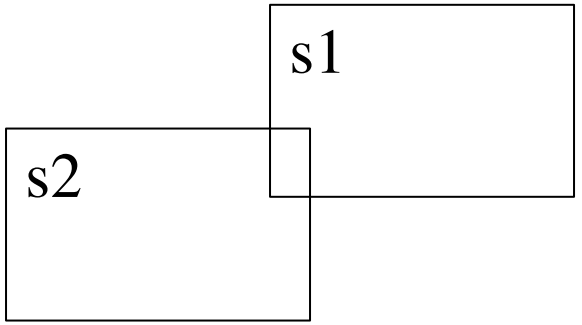
has_collided(s1, s2)

- Implement a function that will check if square1 and square2 “collided”; if the two squares have an overlapping region and returns a bool
- Before heading straight into coding, think about the scenarios where the two square objects will have overlapping regions
- What do we know about each square object?
  - The position of the square’s bottom left corner
  - The width and height of the square

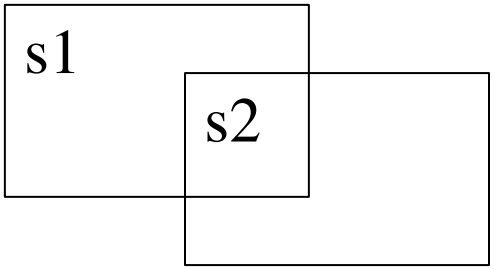
Possible scenarios



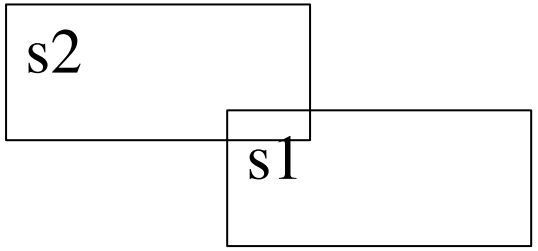
s1.x < s2.x and s1.y < s2.y
s2.x < s1.x+s1.width
s2.y < s1.y+s1.height



s2.x < s1.x and s2.y < s1.y
s1.x < s2.x+s2.width
s1.y < s2.y+s2.height



s1.x < s2.x and s2.y < s1.y
s2.x < s1.x+s1.width
s2.y+s2.height < s1.y+s1.height



s2.x < s1.x and s1.y < s2.y
s1.x < s2.x+s2.width
s1.y+s1.height < s2.y+s2.height

has_collided(s1, s2)

```
def has_collided(s1, s2):
    first_scenario = (s1.x < s2.x) and (s1.y < s2.y) and (s2.x <
s1.x+s1.width) and
(s2.y < s1.y+s1.height)
    second_scenario = (s2.x < s1.x) and (s2.y < s1.y) and (s1.x <
s2.x+s2.width) and (s1.y < s2.y+s2.height)
    third_scenario = (s1.x < s2.x) and (s2.y < s1.y) and (s2.x <
s1.x+s1.width) and (s2.y+s2.height < s1.y+s1.height)
    fourth_scenario = (s2.x < s1.x) and (s1.y < s2.y) and (s1.x <
s2.x+s2.width) and (s1.y+s1.height < s2.y+s2.height)
    return first_scenario or second_scenario or third_scenario or
fourth_scenario
```

What is on the Exam?

- Questions on the following topics:
  - String slicing functions
  - Call frames and the call stack
  - Functions on mutable objects
  - Testing and debugging
    - Constructing test cases
    - Figuring out where the code went wrong
    - Understand assert statements
  - Possible short/multiple choice questions

Recall the function before_space

- The function before_space returned the string before the first space character in a given string s
- Precondition of s was that it contained at least one space character
- How can we come up with distinct test cases?

Coming up with test cases

- Let's first think about the precondition to see what we know about the string s
  - It has at least one space character – this means it can have more than one (adjacent? non-adjacent?)
  - Doesn't have any conditions on where the space character is within s – the space character can be anywhere in the string (start? middle? end?)
- With this, we can construct distinct test cases with rationales for each one

Constructing the test cases

- ‘ abc’ – single space character at the start
- ’abc ‘ – single space character at the end
- ‘a bc’ – single space character in the mid
- ‘ abc’ – many adj. space characters at the start
- ‘abc ‘ – many adj. space characters at the end
- ‘a bc’ – many adj. space characters in mid
- ‘a b c’ – many non-adj. space characters

```
1  def happy_holiday(holiday):
2      print("Happy "+holiday)
3
4  def dear():
5      print("Dear "+name)
6
7  def to_you():
8      print("to "+"you")
9
10 def line_with_name(name):
11     happy_birthday(name)
12     dear(name)
13
14 def basic_line(holiday):
15     happy_holiday(holiday)
16     to_you()
17
18 def song():
19    basic_line("Birthday")
20    basic_line("Birthday")
21    line_with_name("Teo")
22    basic_line(200)
23
24 song()
```

If we follow through the execution, where would the code go wrong?

There is no function named happy_birthday! So, in the middle of executing line_with_name("Teo") in song(), the code will crash!

```
Traceback (most recent call last):
  File "happy_error.py", line 24, in <module>
    song()
  File "happy_error.py", line 21, in song
    line_with_name("Teo")
  File "happy_error.py", line 11, in line_with_name
    happy_birthday(name)
NameError: name 'happy_birthday' is not defined
```

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- Questions on the following topics:
  - String slicing functions
  - Call frames and the call stack
  - Functions on mutable objects
  - Testing and debugging
  - Possible short/multiple choice questions
    - See the study guide
    - Look at the lecture slides
    - Read relevant book chapters

Any More Questions?

Good Luck!