CS 1110

Prelim 1 Review
Fall 2024

Exam Info

- **Prelim 1**: Thursday, October 17th at 7:30 pm
  - The exam is entirely online
  - A proctor should contact you with the link
  - Will connect to Zoom twice (computer, phone)
- **Mock exam** to test your devices on Oct. 16th
  - Your proctor will contact you with details
- Exceptions ONLY if you filed a conflict
- Grades promised Sunday, October 20th

Important Things for Online Exam

1. Computer with a webcam
2. Phone that can connect to Zoom
3. Pen/pencil and paper for the exam
4. Phone app to scan the exam

Studying for the Exam

- Read study guides, review slides online
  - Solution to review posted after review
- Review all labs and assignments
  - Solutions to Assignment 2 are in CMS
  - No solutions to code, but talk to TAs
- Look at exams from past years
  - Exams with solutions on course web page
  - Only look at the **fall exams**; spring is different

Grading

- We will announce *approximate* letter grades
  - 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 next week, October 21st
  - Will have open office hours on that day to meet
  - Will reach out to students of concern (C or lower)

What is on the Exam?

- **Five** Questions on the following topics:
  - String slicing functions (A1)
  - Call frames and the call stack (A2)
  - Functions on mutable objects (A3)
  - Testing and debugging (Labs 6 and 10)
  - Short Answer (Terminology)
- + 2 pts for writing your name and net-id

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  - String slicing functions (A1)
  - Call frames and t
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  - Testing debugging (Labs 6 and 10)
  - Short Answer (Terminology)
- + 2 pts for writing your name and net-id

What about lists?

What is on the Exam?

- **Five** Questions on the following topics:
  - String slicing functions
  - Call frames and the call stack
  - Functions on mutable objects
  - Testing and debugging
  - Short Answer

Lists may appear in any of these 5

- + 2 pts for writing your name and net-id

What is on the Exam?

- String slicing functions (A1)
  - Will be given a function specification
  - Implement it using string methods, slicing
- Call frames and the call stack (A2)
- Functions on mutable objects (A3)
- Testing and debugging (Labs 6 and 10)
- Short Answer (Terminology)

String Slicing

```
def make_netid(name,n):
    """Returns: a netid for name with suffix n

    Netid is either two letters and a number (if the student has no
    middle name) or three letters and a number (if the student has
    a middle name).  Letters in netid are lowercase.

    Example: make_netid('Walker McMillan White',2) is 'wmw2'
    Example: make_netid('Walker White',4) is 'ww4'

    Parameter name: the student name
    Precondition: name is a string either with format 'first last'
    or 'first middle last'

    Parameter n: the netid suffix
    Precondition: n > 0 is an int."""
```

Useful String Methods

Method	Result
s.find(s1)	Returns first position of s1 in s; -1 if not there.
s.rfind(s1)	Returns LAST position of s1 in s; -1 if not there.
s.lower()	Returns copy of s with all letters lower case
s.upper()	Returns copy of s with all letters upper case

- We will give you any methods you need
- But you must know how to slice strings!

String Slicing

```
def make_netid(name,n):
    """Returns: a netid for name with suffix n."""
    name = name.lower() # switch to lower case
    fpos = name.find(' ')   # find first space
    first = name[:fpos]
    last = name[fpos+1:]
    mpos = last.find(' ')    # see if there is another space
    if mpos == -1:
        return first[0]+last[0]+str(n)  # remember, n is not a string
    else:
        middle = last[:mpos]
        last = last[mpos+1:]
        return first[0]+middle[0]+last[0]+str(n)
```

What is on the Exam?

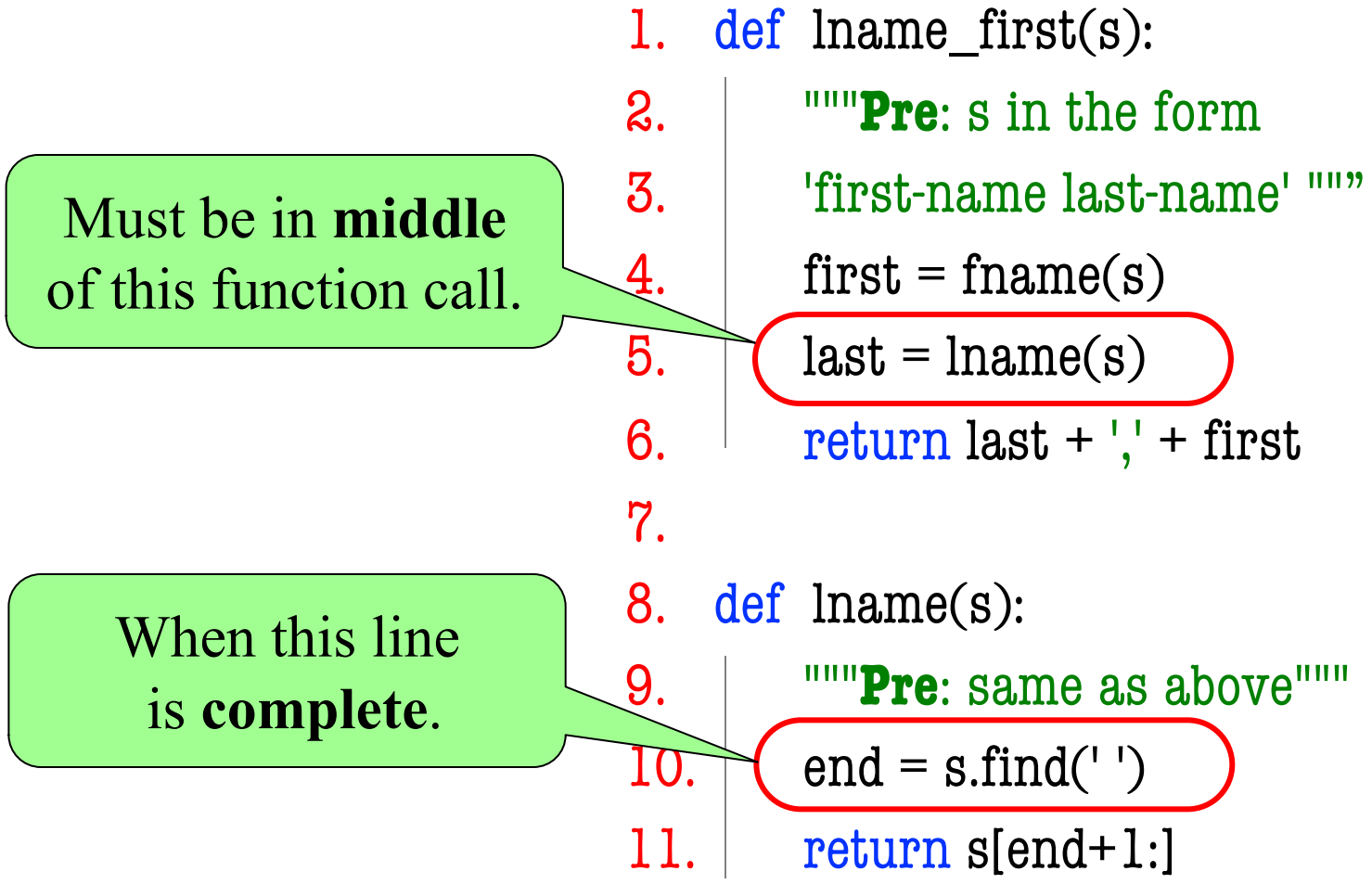
- String slicing functions (A1)
- Call frames and the call stack (A2)
  - **Very** similar to A2 (see solution in CMS)
  - May have to draw a full call stack
  - See lectures 4 and 10 (for call stack)
- Functions on mutable objects (A3)
- Testing and debugging (Labs 6 and 10)
- Short Answer (Terminology)

Call Stack Example

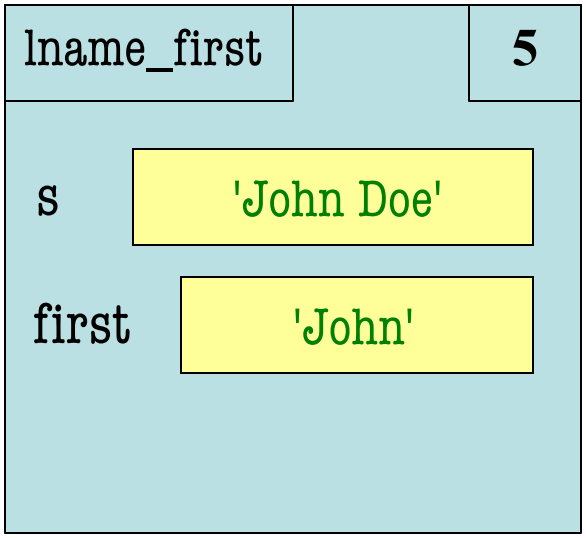
- Given functions to right
  - Function fname() is not important for problem
  - Use the numbers given
- Execute the call: lname_first('John Doe')
- Draw **entire** call stack when helper function lname completes line 10
  - Draw nothing else

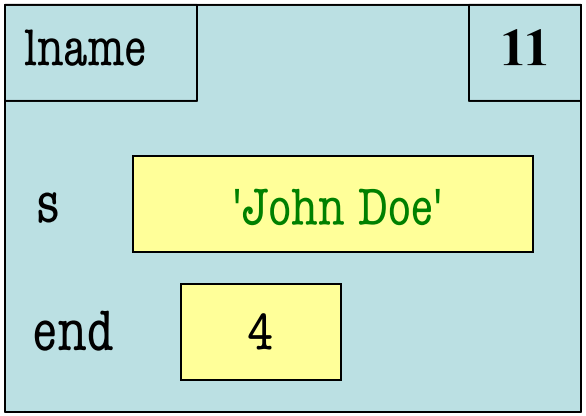
```
1.  def lname_first(s):
2.      """Pre: s in the form
3.      'first-name last-name' """
4.      first = fname(s)
5.      last = lname(s)
6.      return last + ',' + first
7.
8.  def lname(s):
9.      """Pre: same as above"""
10.     end = s.find(' ')
11.     return s[end+1:]
```

Call Stack Example: lname_first('John Doe')



Call Stack Example: lname_first('John Doe')



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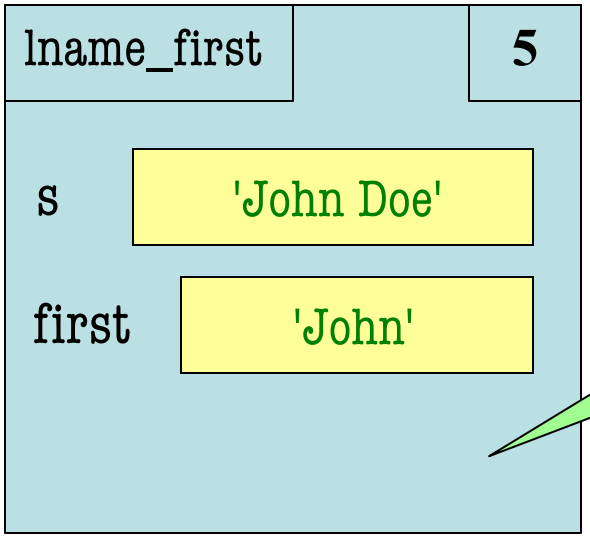
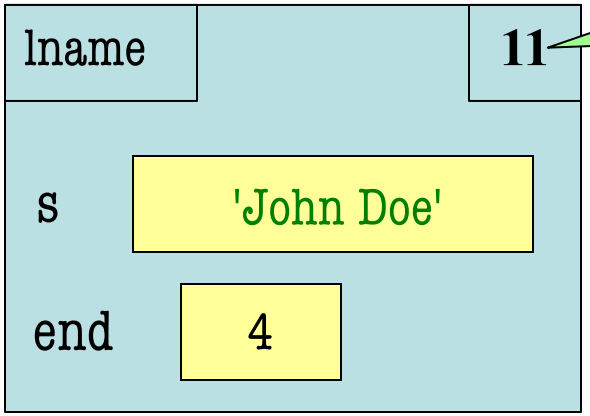
Call Stack Example: lname_first('John Doe')





No variable last.
Line 5 is not complete.

Line 10 is **complete**.
Counter is next line.

```
1.  def lname_first(s):
                                  the form
                                  last-name' """
                  first = lname(s)
5.                last = lname(s)
                                  ' + first
9.                """Pre: same as above"""
10.               end = s.find(' ')
11.               return s[end+1:]
```

Example with a Mutable Object

```
1. def cycle_left(p):
2.     """Cycle coords left
3.     Pre: p a point"""
4.     temp = p.x
5.     p.x = p.y
6.     p.y = p.z
7.     p.z = temp
```

- May get a function on a mutable object

  ```
  >>> p = Point3(1.0,2.0,3.0)
  >>> cycle_left(p)
  ```

- You are not expected to come up w/ the "folder"
  - Will provide it for you
  - You just track changes
- **Diagram all steps**

Example with a Mutable Object

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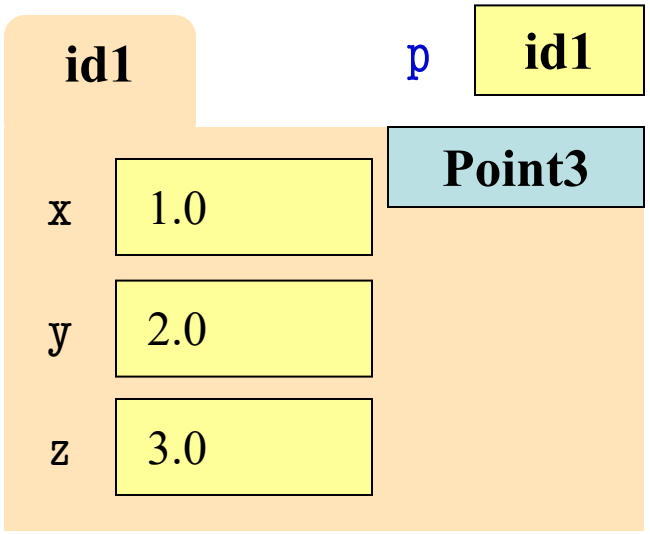
Function Call



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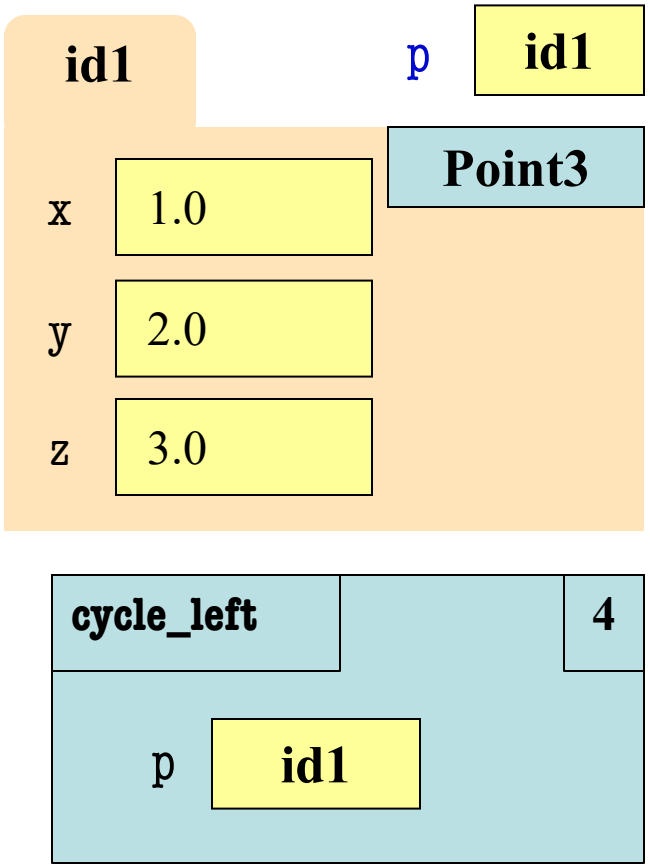

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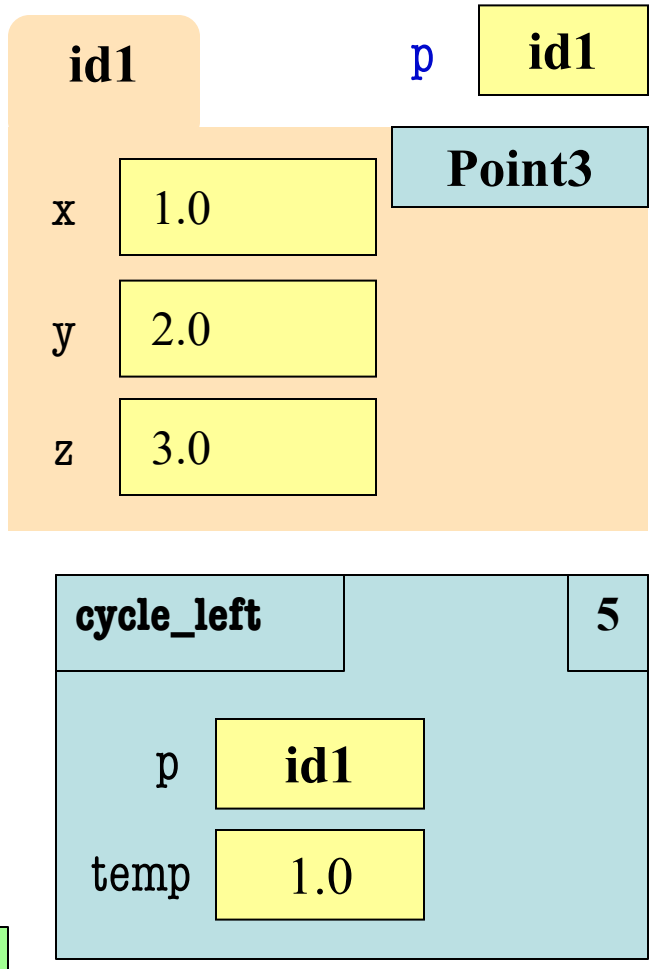

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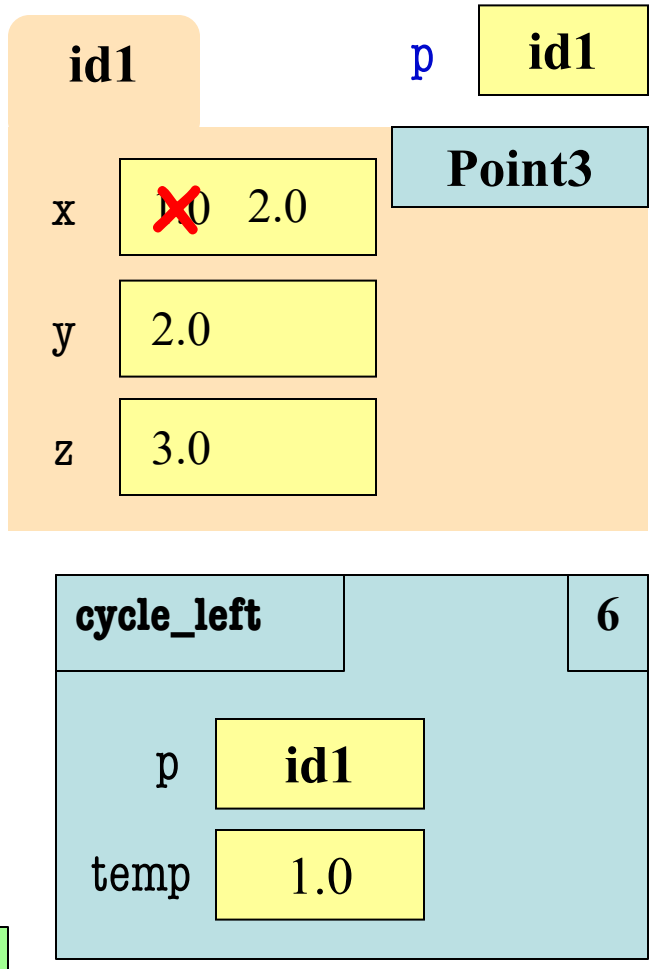

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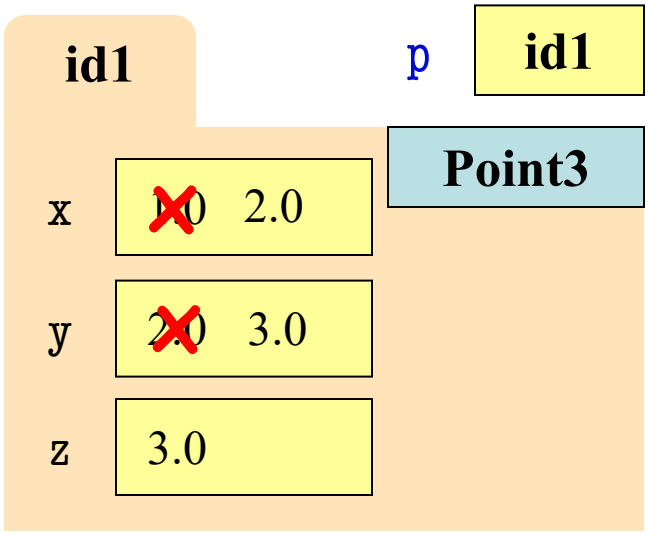
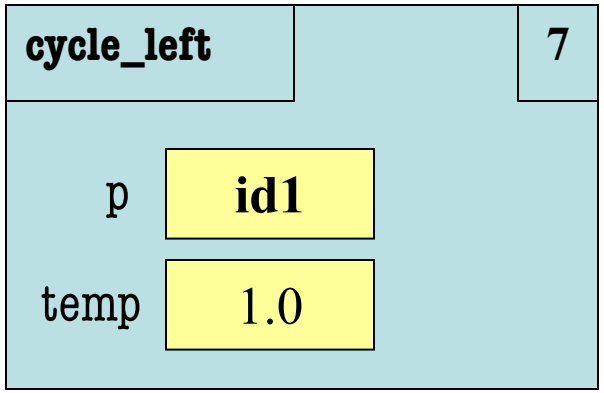
Function Call





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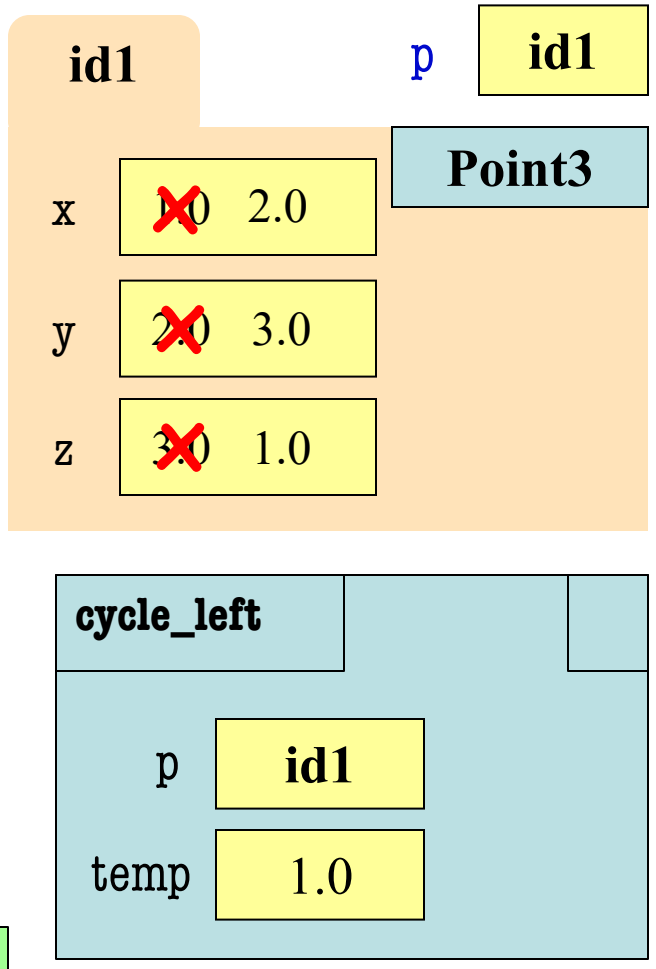

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```

Do not forget **cross out**

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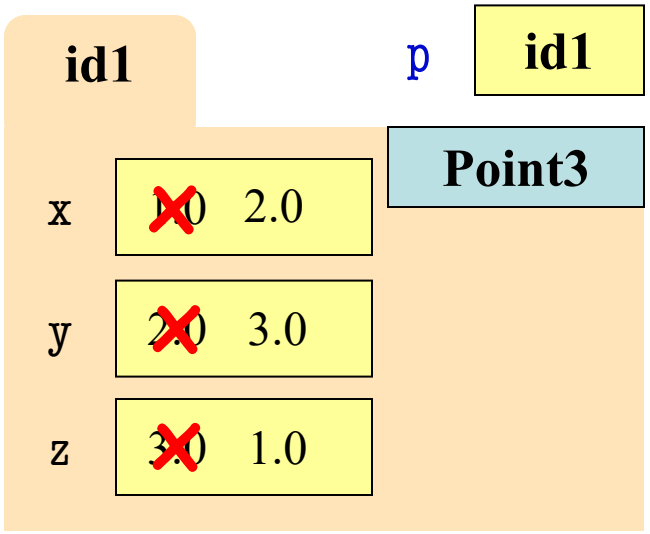
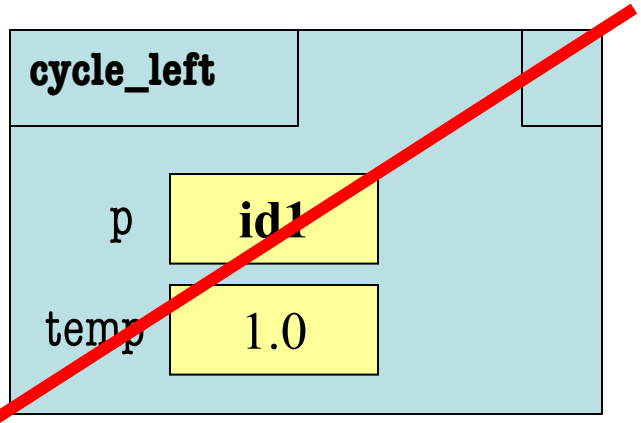
>>> cycle_left(p)
```

Function Call





What is on the Exam?

- String slicing functions (A1)
- Call frames and the call stack (A2)
- Functions on mutable objects (A3)
  - Given an object type (e.g. class)
  - Attributes will have invariants
  - Write a function respecting invariants
- Testing and debugging (Labs 6 and 10)
- Short Answer (Terminology)

Example from Assignment 3

- Class: RGB
  - Constructor function: RGB(r,g,b)
  - Remember constructor is just a function that gives us back a mutable object of that type
  - Attributes:

Attribute	Invariant
red	int, within range 0..255
green	int, within range 0..255
blue	int, within range 0..255

Function that Modifies Object

```
def lighten(rgb):
    """Lighten each attribute by 10%

    Attributes get lighter when they increase.

    Parameter rgb: the color to lighten
    Precondition: rgb an RGB object"""

    pass # implement me
```

Function that Modifies Object

Procedure:
no return

```
def lighten(rgb):
    """Lighten each attribute by 10%"""
    red = rgb.red  # puts red attribute in local var
    red = 1.1*red # increase by 10%
    red = int(round(red,0))  # convert to closest int
    rgb.red = min(255,red)  # cannot go over 255
    # Do the others in one line
    rgb.green = min(255,int(round(1.1*rgb.green,0)))
    rgb.blue = min(255,int(round(1.1*rgb.blue,0)))
```

Another Example

- Class: Length
  - Constructor function: Length(ft,in)
  - Remember constructor is just a function that gives us back a mutable object of that type
  - Attributes:

Attribute	Invariant
feet	int, non-negative, = 12 in
inches	int, within range 0..11

Function that Does Not Modify Object

```
def difference(len1,len2):
    """Returns: Difference between len1 and len2

    Result is returned in inches

    Parameter len1: the first length
    Precondition: len1 is a length object longer than len2

    Parameter len2: the second length
    Precondition: len2 is a length object shorter than len1"""

    pass # implement me
```

Function that Does Not Modify Object

```
def difference(len1,len2):
    """Returns: Difference between len1 and len2
    Result is returned in inches
    Parameter len1: the first length
    Parameter len2: the second length
    Precondition: len2 is a length object shorter than len1"""
    feetdif = (len1.feet-len2.feet)*12
    inchdif = len1.inches-len2.inches # may be negative
    return feetdif+inchdif
```

What is on the Exam?

- String slicing functions (A1)
- Call frames and the call stack (A2)
- Functions on mutable objects (A3)
- Testing and debugging (Lab 6 and 10)
  - Coming up with test cases
  - Tracing program flow
  - Understanding assert statements
- Short Answer (Terminology)

Picking Test Cases

```
def pigify(w):
    """Returns: copy of w converted to Pig Latin
    'y' is a vowel if it is not the first letter
    If word begins with a vowel, append 'hay'
    If word starts with 'q', assume followed by 'u';
    move 'qu' to the end, and append 'ay'
    If word begins with a consonant, move all
    consonants up to first vowel to end and add 'ay'
    Parameter w: the word to translate
    Precondition: w contains only (lowercase) letters"""
```

Picking Test Cases

```
def pigify(w):
    """Returns: copy of w converted to Pig Latin"""
    ...
```

- Test Cases (Determined by the rules):
  - **In:** 'are', **Out:** 'arehay' (Starts with vowel)
  - **In:** 'quiet', **Out:** 'ietquay' (Starts with qu)
  - **In:** 'ship', **Out:** 'ipshay' (Starts with consonant(s))
  - **In:** 'bzzz', **Out:** 'bzzzay' (All consonants)
  - **In:** 'yield', **Out:** 'ieldyay' (y as consonant)
  - **In:** 'byline', **Out:** 'ylinebay' (y as vowel)

Picking Test Cases

```
def pigify(w):
    """Returns: copy of                    g Latin"""
    ...
```

Do not forget the quotes!

- Test Cases (Determi ed by the rules):
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  - **In:** 'bzzz', **Out:** 'bzzzay' (All consonants)
  - **In:** 'yield', **Out:** 'ieldyay' (y as consonant)
  - **In:** 'byline', **Out:** 'ylinebay' (y as vowel)

Debugging Example

```
def replace_first(word,a,b):
    """Returns: a copy with FIRST instance of a replaced by b

    Example: replace_first('crane','a','o') returns 'crone'
    Example: replace_first('poll','l','o') returns 'pool'

    Parameter word: The string to copy and replace
    Precondition: word is a string

    Parameter a: The substring to find in word
    Precondition: a is a valid substring of word

    Parameter b: The substring to use in place of a
    Precondition: b is a string"""
```

Debugging Example

```
def replace_first(word,a,b):
    """Returns: a copy with
    FIRST a replaced by b"""

    pos = word.rfind(a)
    print(pos)
    before = word[:pos]
    print(before)
    after  = word[pos+1:]
    print(after)
    result = before+b+after
    print(result)
    return result
```

```
>>> replace_first('poll', 'l', 'o')
3
pol

polo
'polo'
>>> replace_first('askew', 'sk', 'ch')
1
a
kew
achkew
'achkew'
```

Identify the bug(s) in this function.

Debugging Example

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    """Returns: a copy with
    FIRST a replaced by b"""
    pos = word.rfind(a)
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    before = word[:pos]
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```

Unexpected!

Debugging Example

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    before = word[:pos]
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    print(after)
    result = before+b+after
    print(result)
    return result
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kew     Unexpected!
achkew
'achkew'
```

Debugging Example

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def replace_first(word,a,b):
    """Returns: a copy with
    FIRST a replaced by b"""

    pos = word.find(a)
    print(pos)
    before = word[:pos]
    print(before)
    after  = word[pos+len(a):]
    print(after)
    result = before+b+after
    print(result)
    return result
```

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>>> replace_first('poll', 'l', 'o')
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'polo'
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- String slicing functions (A1)
- Call frames and the call stack (A2)
- Functions on mutable objects (A3)
- Testing and debugging (Labs 6 and 10)
- Short Answer (Terminology)
  - See the study guide
  - Look at the lecture slides
  - Read relevant book chapters

In that order

Open to Questions

Good Luck!