

CS 1110

**Prelim 1 Review**  
**Fall 2019**

# Exam Info

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- **Prelim 1:** Thursday, October 12th at 7:30 pm
  - Last name **A – F** in Uris G01
  - Last name **G – H** in Malott 228
  - Last name **I – L** in Ives 305
  - Last name **M – Z** in Statler Auditorium
  - SDS Students will get an e-mail
- Exceptions **ONLY** if you filed a conflict
  - We expect you at time and room assigned

# Studying for the Exam

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- 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

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- 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 24<sup>th</sup>
  - **Goal:** Have everyone graded by end of Saturday
  - Will definitely notify you if you made less than C+

# 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 3, 4, and 6)
  - Short Answer (Terminology)
- + 2 pts for writing your name and net-id

# What is on the Exam?

---

- **Five** Questions on the following topics:
  - String slicing functions (A1)
  - Call frames and ...
  - Function ...
  - Testing and debugging (Labs 3, 4, and 6)
  - 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 3, 4, and 6)
- 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
<code>s.find(s1)</code>	Returns first position of <code>s1</code> in <code>s</code> ; -1 if not there.
<code>s.rfind(s1)</code>	Returns LAST position of <code>s1</code> in <code>s</code> ; -1 if not there.
<code>s.lower()</code>	Returns copy of <code>s</code> with all letters lower case
<code>s.upper()</code>	Returns copy of <code>s</code> 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 3, 4, and 6)
- 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:]
```

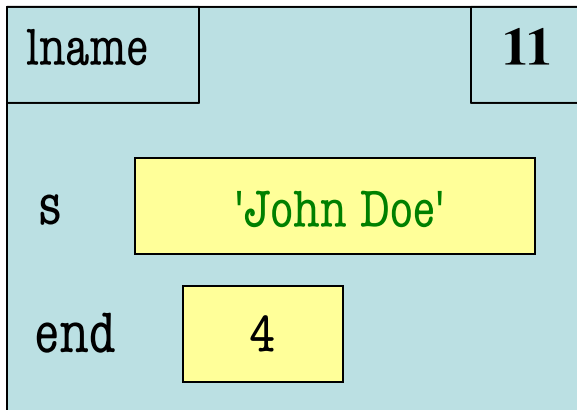
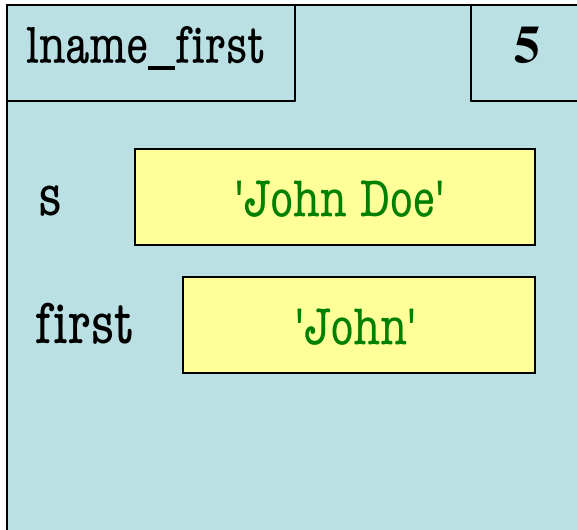
# Call Stack Example: lname\_first('John Doe')

Must be in **middle**  
of this function call.

```
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:]
```

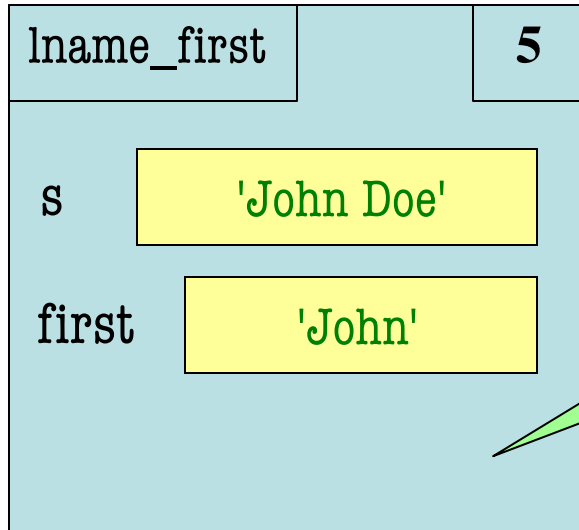
When this line  
is **complete**.

# Call Stack Example: lname\_first('John Doe')



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')



No variable last.  
Line 5 is not complete.

the form  
last-name' """

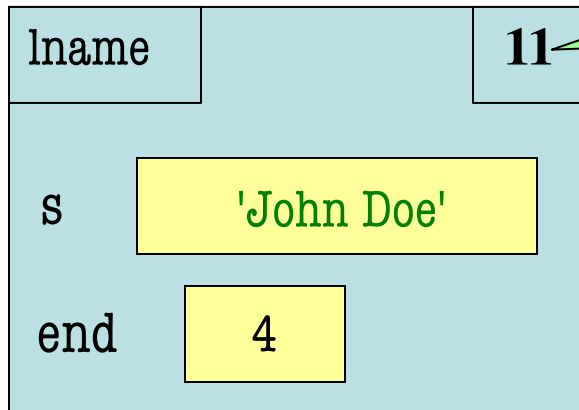
```
1. def lname_first(s):
```

```
5.
```

```
last = lname(s)
```

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

' + first



```
8. def lname(s):
```

```
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

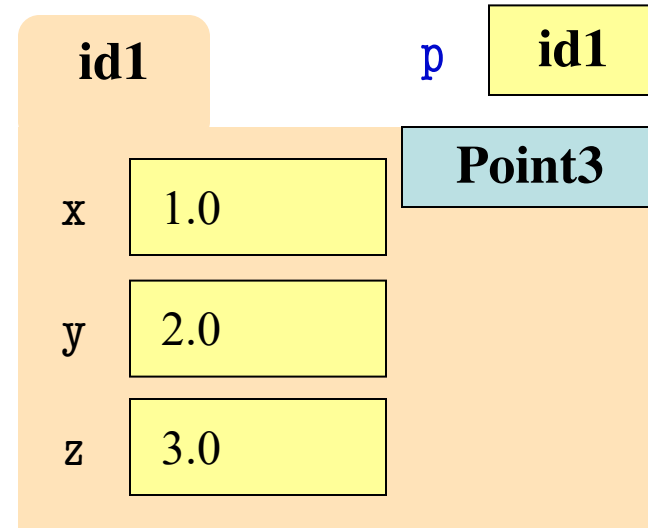
```
>>> p = Point3(1.0,2.0,3.0)
>>> cycle_left(p)
```
- You are not expected to come up w/ the “folder”
  - Will provide it for you
  - You just track changes
- **Diagram all steps**

# Example with a Mutable Object

```
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
```

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

```
>>> cycle_left(p)
```

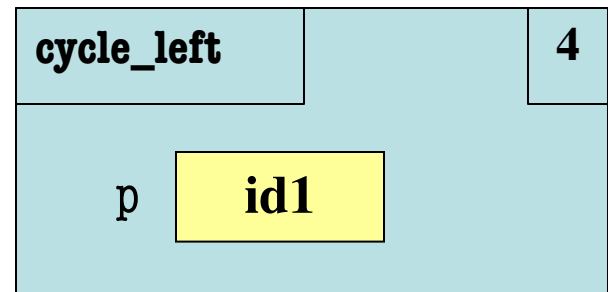
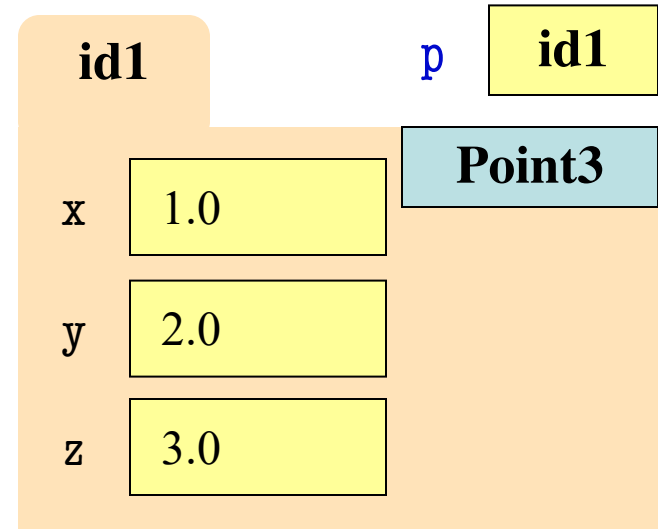


# Example with a Mutable Object

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

```
>>> cycle_left(p)
```

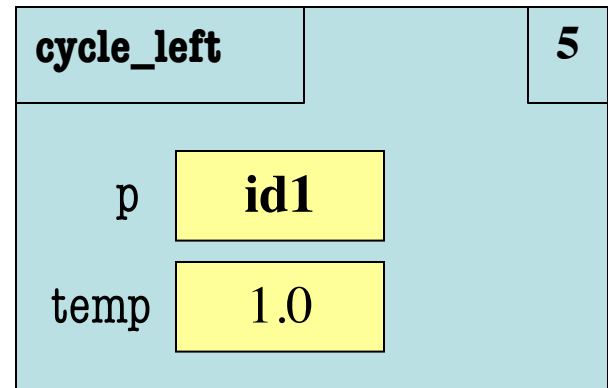
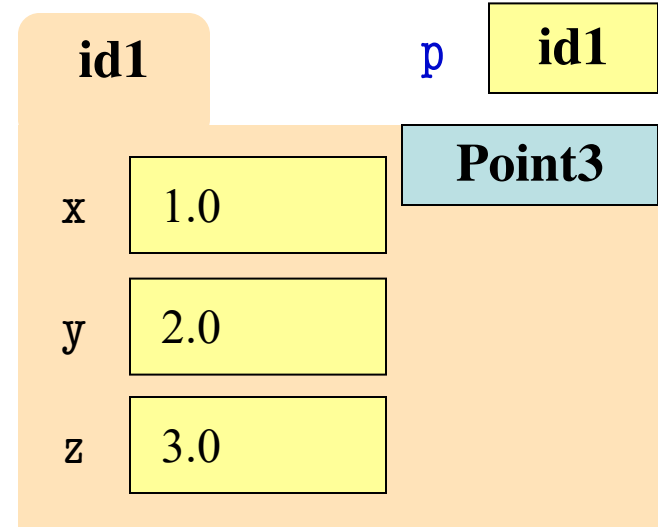
Function Call



# Example with a Mutable Object

```
1. def cycle_left(p):
2.     """Cycle coords left
3.     Pre: p a point"""
4.     temp = p.x
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6.     p.y = p.z
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>>> p = Point3(1.0,2.0,3.0)
>>> cycle_left(p)
```

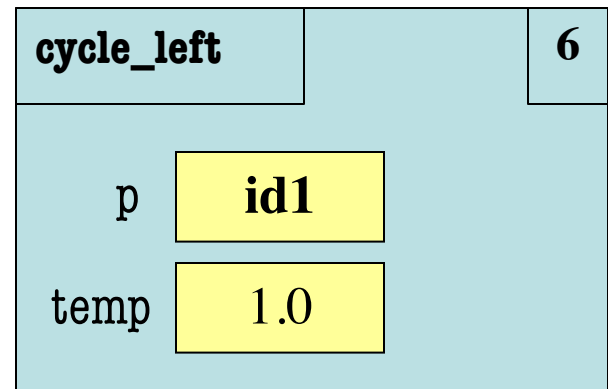
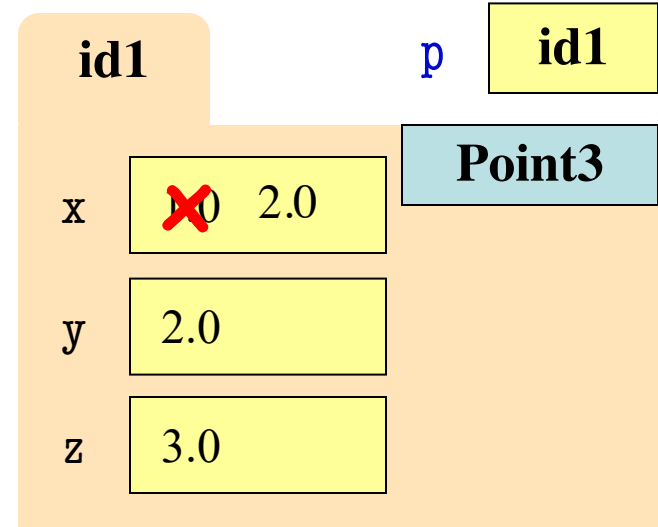


Function Call

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

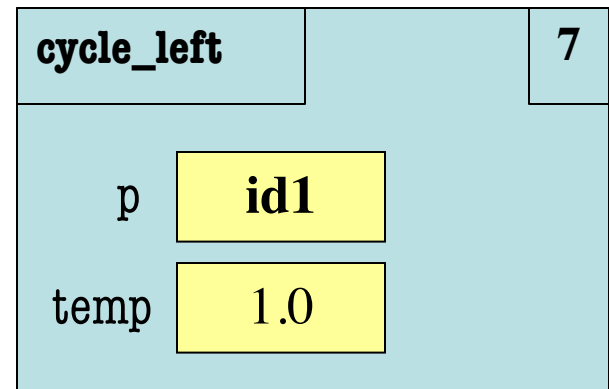
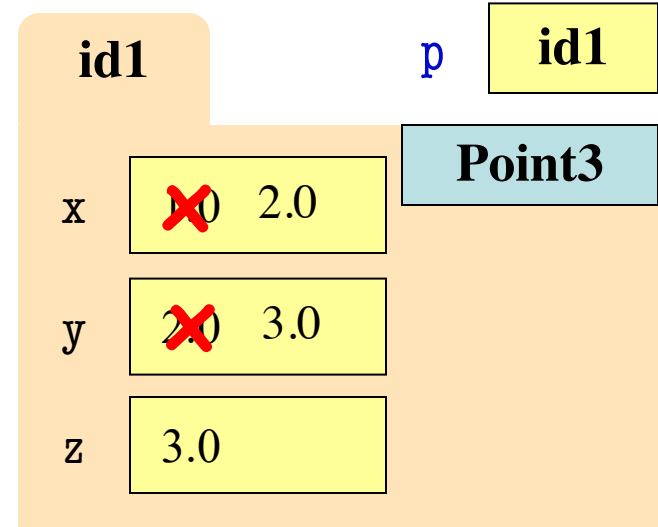


Function Call

# 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

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

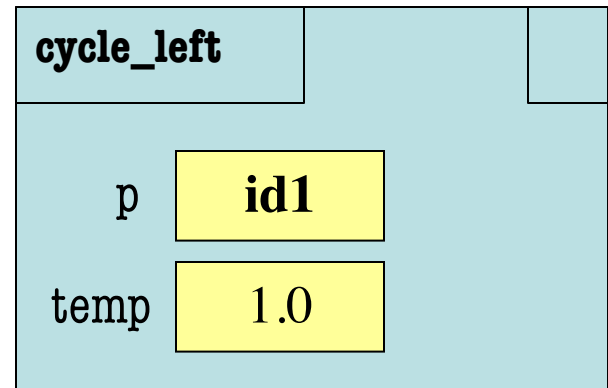
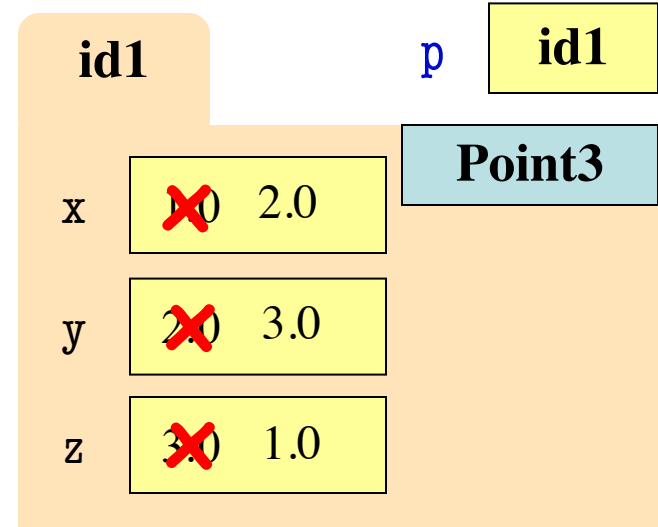


Function Call

# 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

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



Function Call

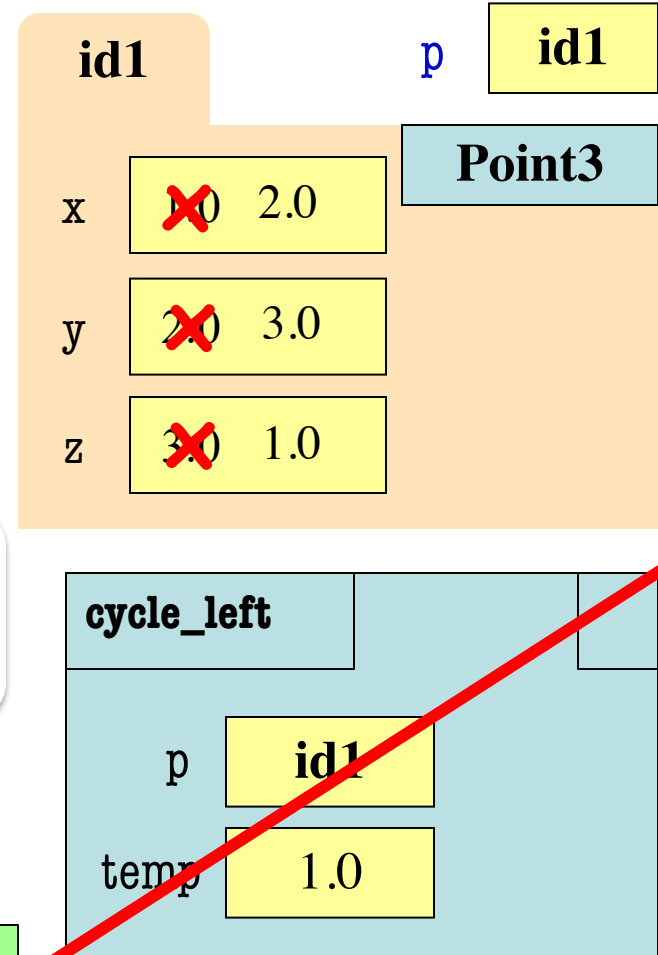
# Example with a Mutable Object

```
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
```

**Do not forget  
cross out**

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

```
>>> cycle_left(p)
```





# 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 3, 4, and 6)
- 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

```
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)))
```

Procedure:  
**no return**

# 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 3, 4, and 6)
  - 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 w with vowels shifted one place to the right, and a 'y' added at the end. If w is empty, return an empty string. If w is not a string, return w.  
    ...  
    """
```

Do not forget  
the quotes!

- 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)

# 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

```
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 Unexpected!
```

```
pol
```

```
polo
```

```
'polo'
```

```
>>> replace_first('askew', 'sk', 'ch')
```

```
1
```

```
a
```

```
kew
```

```
achkew
```

```
'achkew'
```

# Debugging Example

---

```
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+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'
```

# Debugging Example

```
def replace_first(word,a,b):  
    """Returns: a copy with  
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    pos = word.find(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 Unexpected!  
achkew  
'achkew'
```



# Debugging Example

---

```
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
```

```
>>> replace_first('poll', 'l', 'o')  
3  
pol  
  
polo  
'polo'  
  
>>> replace_first('askew', 'sk', 'ch')  
1  
a  
kew  
achkew  
'achkew'
```

# What is on the Exam?

---

- String slicing functions (A1)
  - Call frames and the call stack (A2)
  - Functions on mutable objects (A3)
  - Testing and debugging (Labs 3, 4, and 6)
  - Short Answer (Terminology)
    - See the study guide
    - Look at the lecture slides
    - Read relevant book chapters
- In that order

# Open to Questions

---



