CSC148 - Python recap: What’s going on in memory?

Note: we’ve deliberately given you LOTS of space for drawing! Don’t just write down what the program outputs; the point of these exercises is to make sure you understand what’s going on “beneath the hood” in the computer’s memory when these code snippets are run.

1. Consider this code:

```python
me = "happy"
you = me
# What could go here?
print(me, you)
```

Below are several possible statements to put on the third line. Which of them would run without error and result in two different words being printed?

(a) me = "silly"
(b) you = "goofy"
(c) me.append("!")
(d) you.replace("p", "P")

2. For each code snippet, draw the memory model diagram for the end of the code, and write the program’s output.

```
# Part (a)
lst = [3, 2, 7, 8]
lst2 = lst
lst.append(99)
print(lst, lst2)

# Part (b)
x = [1, 2, 3]
y = x
y[1] = 100
print(x, y)

# Part (c)
n = 14
n2 = n
n = 15
print(n, n2)
```
3. For each code snippet, draw the memory model diagram for the end of the code, and write the program's output.

# Part (d)
```
s = "hello"
s2 = s
s = s[2:]
print(s, s2)
```

# Part (e)
```
one = [0,1,2,3,4,5,6,7]
two = one
one = one[1:5]
print(one, two)
```

# Part (f)
```
a = [1, 2, 3, 4, 2, 9, 6]
b = [1, 2, 3, 4, 2, 9, 6]
a.remove(2)
print(a, b)
```

4. For each code snippet, draw the memory model diagram for the end of the code, and write the program’s output.

# Part (a)
```
temp = 18
L = [9, temp, 27]
temp = 99
print(L)
```

# Part (b)
```
temp = [5, 10, 15]
other = 75
L = [temp, [3, 6], other]
temp[1] = 99
other = 0
print(L)
```

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```python
# Part (d)
s = "hello"
s2 = s
s = s[2:]
print(s, s2)
```

```python
# Part (e)
one = [0,1,2,3,4,5,6,7]
two = one
one = one[1:5]
print(one, two)
```

```python
# Part (f)
a = [1, 2, 3, 4, 2, 9, 6]
b = [1, 2, 3, 4, 2, 9, 6]
a.remove(2)
print(a, b)
```

```python
# Part (a)
temp = 18
L = [9, temp, 27]
temp = 99
print(L)
```

```python
# Part (b)
temp = [5, 10, 15]
other = 75
L = [temp, [3, 6], other]
temp[1] = 99
other = 0
print(L)
```
5. For each code snippet below, write down what the program outputs. Also, draw the memory model diagrams for the program’s state immediately before and after the first loop iteration. Make sure to show what the loop variable refers to.

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### Part (a)

```python
# Part (a)
L = [6, 2, 0, 44, -5, 8]
for item in L:
    item = item + 1
print(L)
```

### Part (b)

```python
# Part (b)
L = [[1], [2], [3]]
for element in L:
    element.append(8)
print(L)
```