

CSE 8A: Intro to Programming in Python

Fall 2021

Lecture 11 - Reference, Objects

UC San Diego

Announcement

- Lab this Thursday
- Q/A session: zoom on Monday night 7pm – 8pm
 - Zoom link: <https://ucsd.zoom.us/my/yic242>
- Midterm seating chart to be released

Topics for Today

- Reference and Objects
- Methods

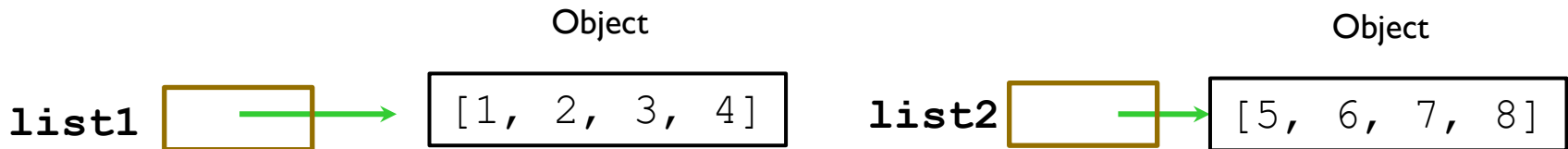
References and Objects

- Python is an object oriented programming language
 - What does it mean?
- References are variables that refer to big data objects.
- int, float, str can be considered “Non-objects”
 - details beyond this class
- lists are considered to be objects

CS Concepts: References

```
list1 = [1, 2, 3, 4]
```

```
list2 = [5, 6, 7, 8]
```

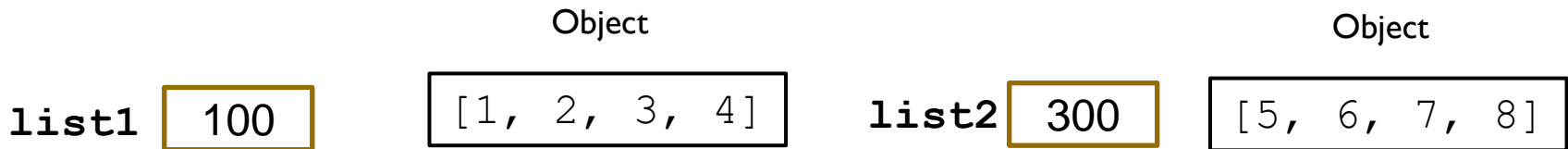


The arrows in `list1` and `list2`'s boxes are just graphical representation of the reference (i.e., location of) the object in memory.

CS Concepts: References

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list1 = [1, 2, 3, 4]
```

```
list2 = [5, 6, 7, 8]
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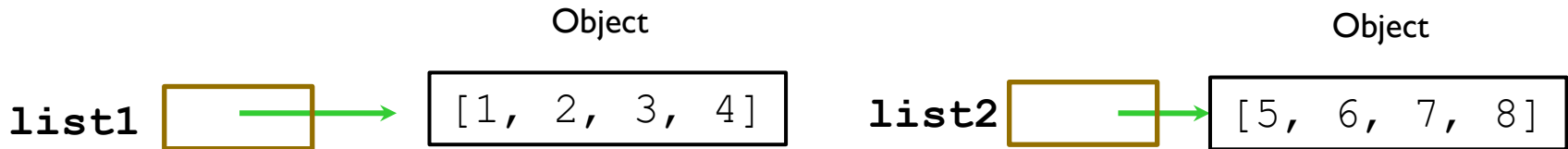


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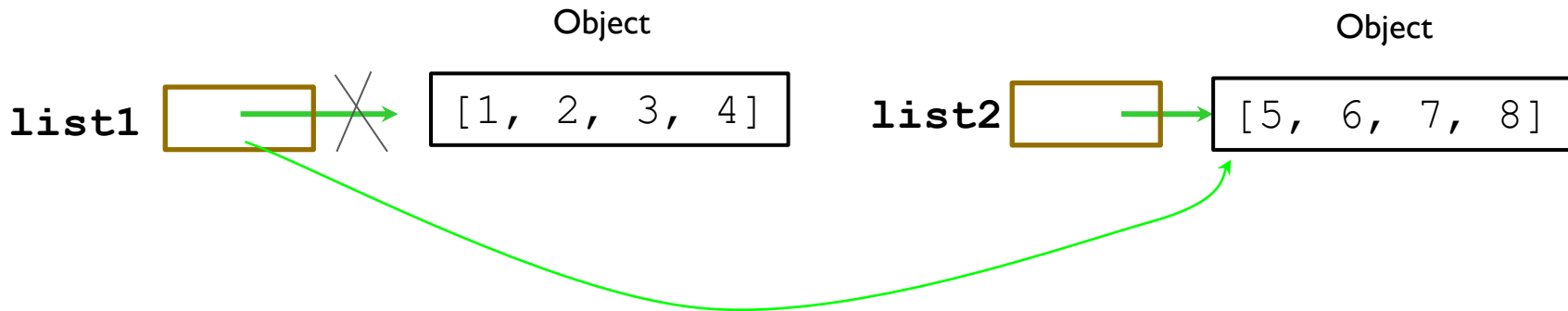
CS Concepts: References

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list1 = [1, 2, 3, 4]
```

```
list2 = [5, 6, 7, 8]
```



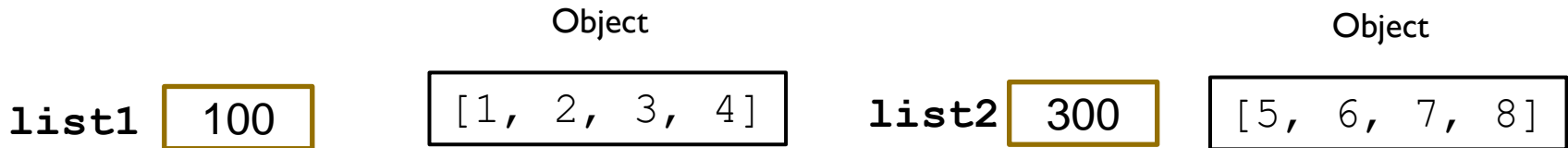
```
list1 = list2
```



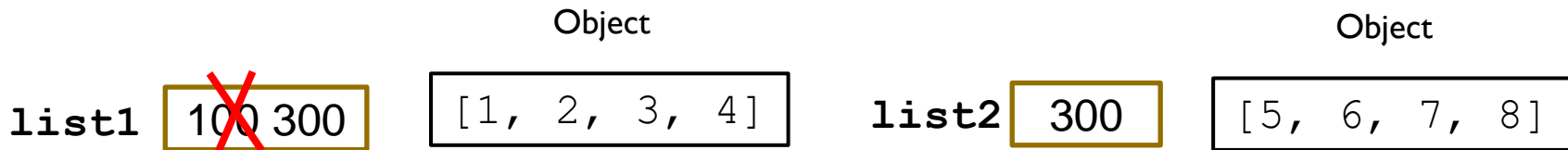
CS Concepts: References

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```
list1 = list2
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CS Concepts: References

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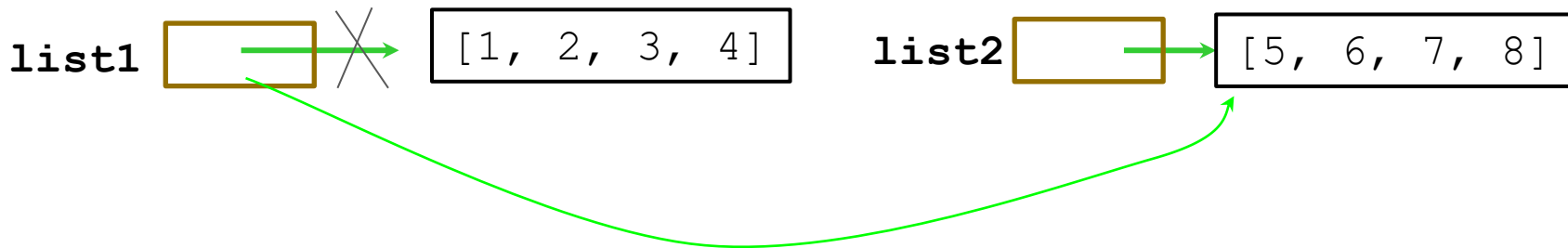
Object

Object

The arrows in list1 and list2's boxes are just graphical representation of the reference (i.e., location of) the object in memory.

This holds for all Object types (not for primitive types)

THIS IS THE HARDEST THING YOU WILL LEARN IN CSE8A. MASTER THIS IDEA AND YOU WILL ACE CSE8A (AND MUCH MORE)



Exercise: References and Objects

How many references and objects are there in the code below?

```
>>> list1 = [10, 20, 30]
>>> list2 = [40, 50, 60]
```

- A) 1 reference and 1 object
- B) 1 reference and 2 objects
- C) 2 references and 1 object
- D) 2 references and 2 objects

Exercise: References and Objects

How many references and objects are there in the code below?

```
>>> list1 = [10, 20, 30]
>>> list2 = list1
```

- A) 1 reference and 1 object
- B) 1 reference and 2 objects
- C) 2 references and 1 object
- D) 2 references and 2 objects

Exercise: References and Objects

What will be printed out by the following code

```
list1 = [1, 3, 5]
list2 = [2, 4, 6]
list1 = list2
list2 = list1
print(list1)
```

- A) [1,3, 5] B) [2, 4, 6] C) [1, 2, 3, 4, 5, 6] D) list1
E) None of the given choices

Exercise: Change an Object via Reference

What is the value of x and y after executing these lines of code?

```
>>> x = [10, 20, 30]
>>> y = [10, 20, 30]
>>> x[-2] = 40
```

A)

```
x = [40, 20, 30]
y = [10, 20, 30]
```

B)

```
x = [10, 40, 30]
y = [10, 20, 30]
```

C)

```
x = [10, 40, 30]
y = [10, 40, 30]
```

D)

```
x = [40, 20, 30]
y = [40, 20, 30]
```

E) Error: list index out of range

Exercise: Change an Object via Reference

What is the value of x and y after executing these lines of code?

```
>>> x = [10, 20, 30]
>>> y = x
>>> x[-2] = 40
```

A)

```
x = [40, 20, 30]
y = [10, 20, 30]
```

B)

```
x = [10, 40, 30]
y = [10, 20, 30]
```

C)

```
x = [10, 40, 30]
y = [10, 40, 30]
```

D)

```
x = [40, 20, 30]
y = [40, 20, 30]
```

E) Error: list index out of range

Exercise: Modifying a List within a Function

What will be printed?

```
def clear_list(lst):  
    for idx in range(len(lst)):  
        lst[idx - 1] = 0
```

```
nums = [11, 12, 13]  
clear_list(nums)  
print(nums)
```

A) [11, 12, 13]

B) [0, 0, 13]

C) [0, 0, 0]

D) [11, 0, 0]

E) Error: List index out of range

Memory Model

```
def clear_list(lst):  
    for idx in range(len(lst)):  
        lst[idx - 1] = 0
```

```
nums = [11, 12, 13]  
clear_list(nums)
```

[link here](#)

Methods

Objects in Python are packed with functionalities --> methods

Exercise: Modifying a String within a Function

What will happen when you run the program below?

```
def update_first_char(name):  
    name[0] = 'A'  
  
name = 'annie'  
update_first_char(name)  
print(name)
```

- A) The program will print 'Annie'
- B) The program will print 'annie'
- C) The program will print 'ANNIE'
- D) The program will throw an error

Exercise: Methods

What is the value of nums?

```
>>> nums = []  
>>> nums.append(2)  
>>> nums.append(2**2)  
>>> nums.append(8)  
>>> nums.append(2**4)  
>>> print(nums)
```

A) [2, 2**2, 8, 2**4]

B) [2, 4, 8, 16]

C) [16, 8, 4, 2]

D) [2**4, 8, 2**2, 2]

E) Error: Cannot append to an empty list!

Exercise: Methods

What will be printed?

```
>>> chars = "a;b;c;d;".split(";")  
>>> len(chars)
```

- A) 3 B) 4 C) 5 D) 8
- E) Error: Cannot split using a semicolon (;)

Exercise: Methods

What will be printed?

```
>>> words = "you:-are:-awesome".split(":-")  
>>> words
```

- A) ['you', 'are', 'awesome']
- B) ['you:', 'are:', 'awesome:']
- C) ['you-', 'are-', 'awesome-']
- D) ['you:-', 'are:-', 'awesome:-']
- E) Error: Cannot split using more than one character

Exercise: Methods

What will be printed?

```
>>> "+".join([1, 2, 3])
```

- A) '1+2+3'
- B) '123'
- C) 6
- D) '1+2+3+'
- E) Error: Cannot join a list of integers