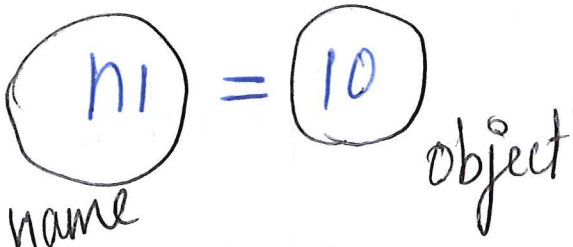
CS 301 - Lecture 15

Topics

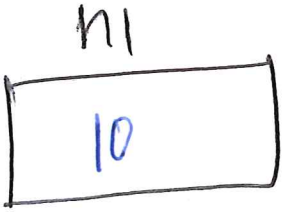
1. Objects
2. References
3. Copying

Real world:

	Things	Names
Programming:	Objects	Names



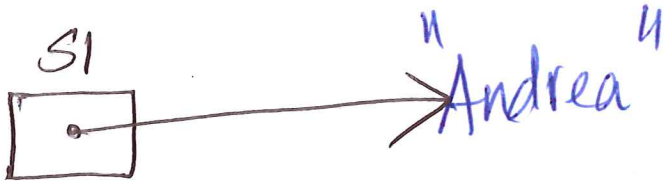
Mental model (V1)



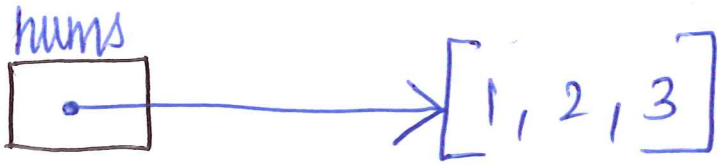
(V2)

(reference)

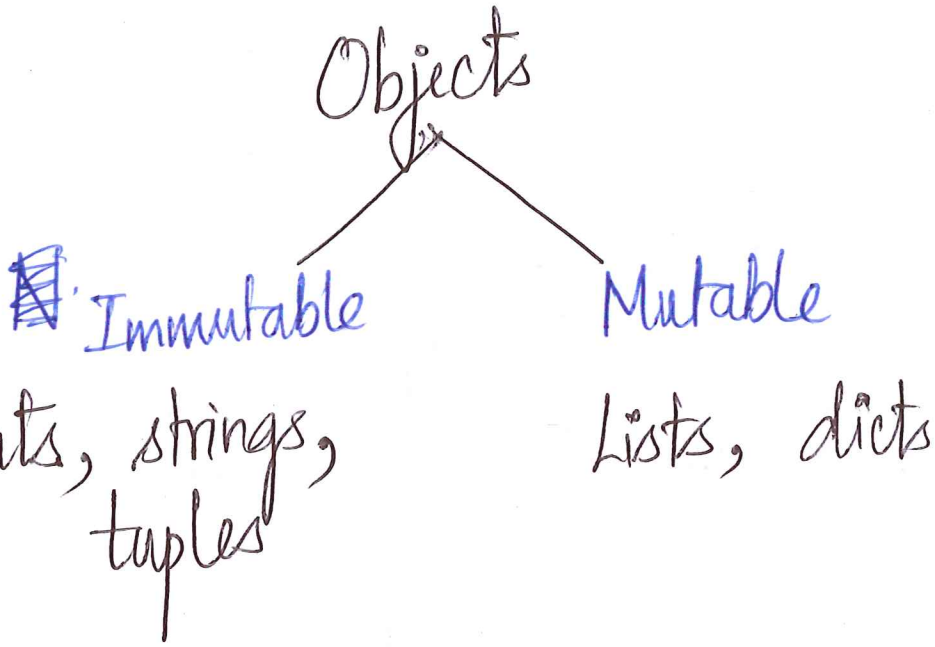
s1 = "Andrea"



nums = [1, 2, 3]



name/reference object

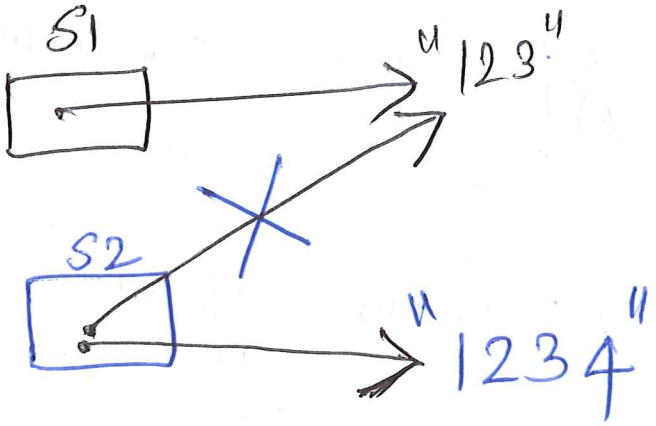


Immutable objects.

Code

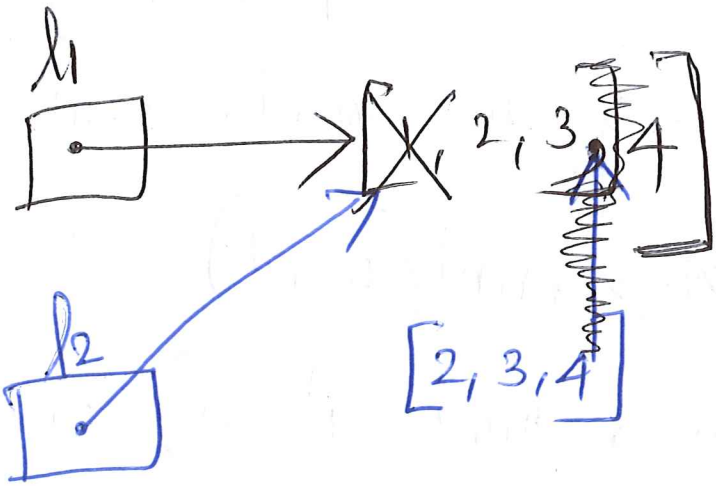
```
s1 = "123"

s2 = s1

s2 = s2 + "4"
```

State



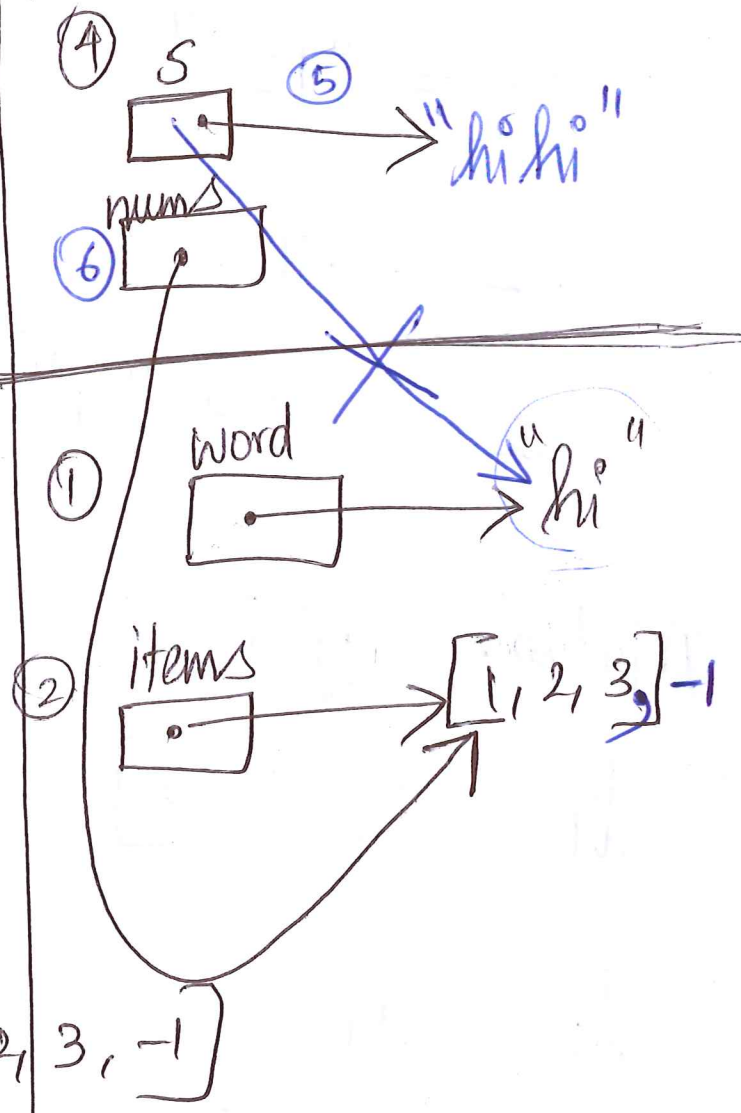
Mutable objects

```
l1 = [1, 2, 3]

l2 = l1

l2.append(4)

l1.pop(0)

print(l1) ⟹ [2,3,4]

print(l2) ⟹ [2,3,4]
```



Passing objects to functions

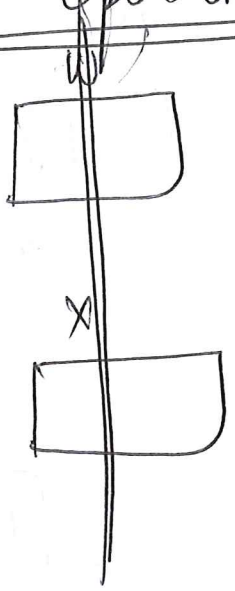
```
def func(s, nums):
    s = s * 2
    nums.append(-1)

word = "hi"
items = [1, 2, 3]
func(word, items)
print(word)
print(items)
```



7 → print(word) ⟹ "hi"

8 → print(items) ⟹ [1, 2, 3, -1]

is operator

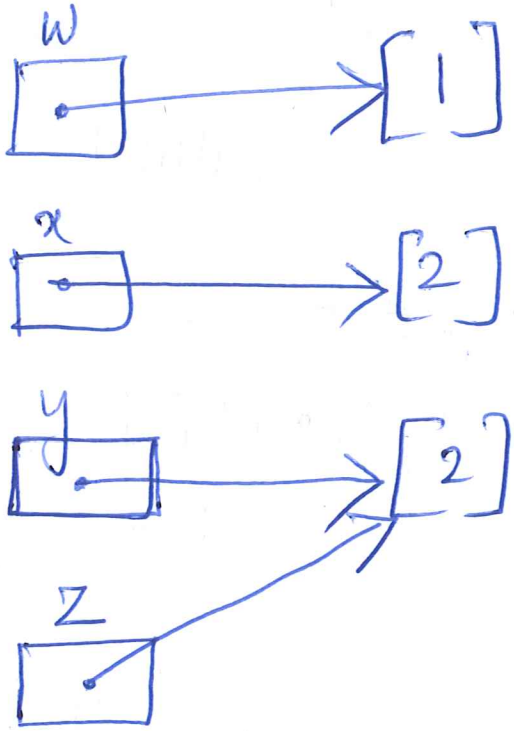


$w = [1]$

$x = [2]$

$y = [2]$

$z = y$



$w == x$	False
$y == z$	True
$x == y$	True

x is y	False
y is z	True

Copying

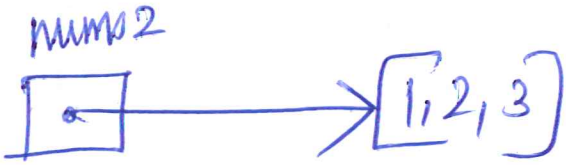
import copy

nums1 = [1, 2, 3]

1. Reference copy
2. shallow copy
3. deep copy

~~nums2 =~~

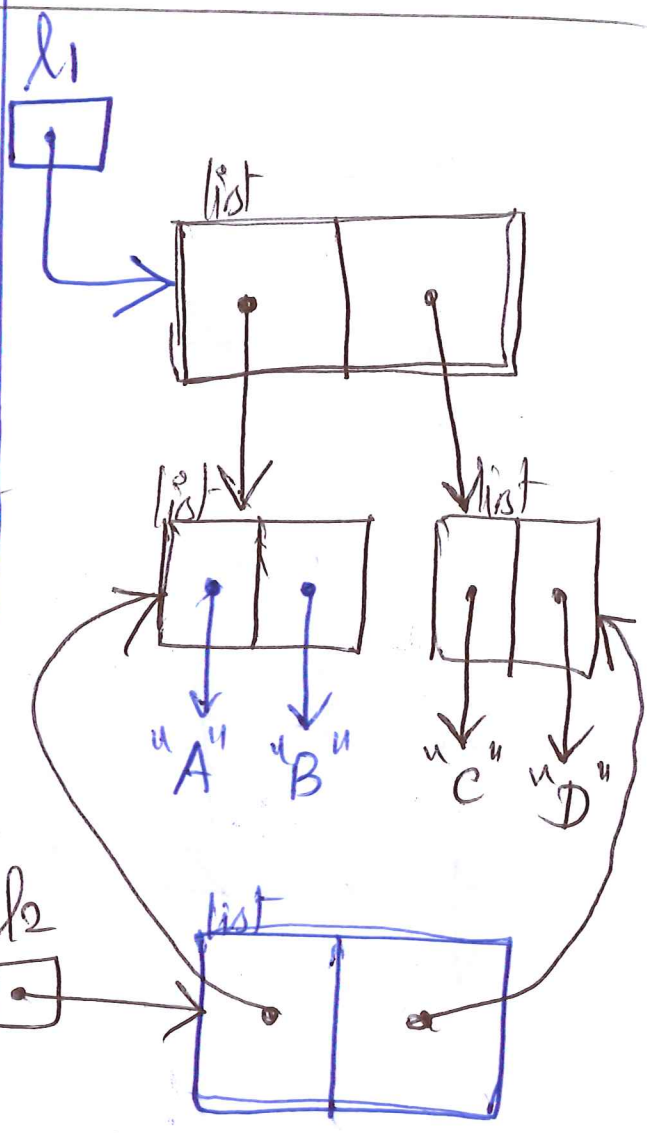
nums2 = copy.copy(nums1)



l1 = [["A", "B"], ["C", "D"]]

shallow copy

l2 = copy.copy(l1)



deep copy

l3 = copy.deepcopy(l1)