

Introductory Computer Science

Week 3 — Tracing

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Beginning Example

Mutability

Memory Model

Copying a list

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Administrative items

- ▶ Lifestyle changes, my apologies
- ▶ Itinerary is cut shorter
- ▶ Lectures is “lighter”, but is reflective in a University standpoint
- ▶ Exercise material is up
- ▶ Reminder: Assignment

Itinerary

1. ~~Introduction and Git~~
2. ~~Programming with Python*~~
3. Memory Model and Debugging*
4. Object Oriented Programming
5. Object Oriented Programming
6. Test day
7. Linked Lists

* = What will be tested

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What's going on here?

```
>>> a = [1, 2, 3, 4]
>>> b = a
>>> b[0] = 98
>>> a[0]
?
```

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Why is this the case?

- ▶ This is because lists, sets, and dictionaries are **mutable**
- ▶ Mutability: A class that can change states after it is created
- ▶ To illustrate: the memory model!

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>>> a = [1, 2, 3, 4]
>>> b = a
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So how do you “copy” a list in Python?

```
>>> a = [1, 2, 3, 4]
>>> b = a[:]
>>> b[0] = 98
>>> a[0]
```

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A harder example

```
def f1(L):          | def f2(L):
    print(L[0])     |     L.insert(0, L[0] + L[1])
    return L[-1]    |     L[1] = 2 * f1(L)
                    |     print(L.pop())
                    |     return L[-1] + L[-2]
```

```
>>> my_list = [2, 5]
>>> print(f2(my_list))
?
>>> print(my_list)
?
```

What is printed?