# Introductory Computer Science

## Week 3 — Tracing

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Administrative Items

Review... from last lecture

Beginning Example

Mutability

Memory Model

Copying a list

Example

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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?

# 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?

# 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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# Beginning Example

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

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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?