CSC 111:
Intro to Computer Science through Programming

Spring 2017
Prof. Sara Mathieson

Admin

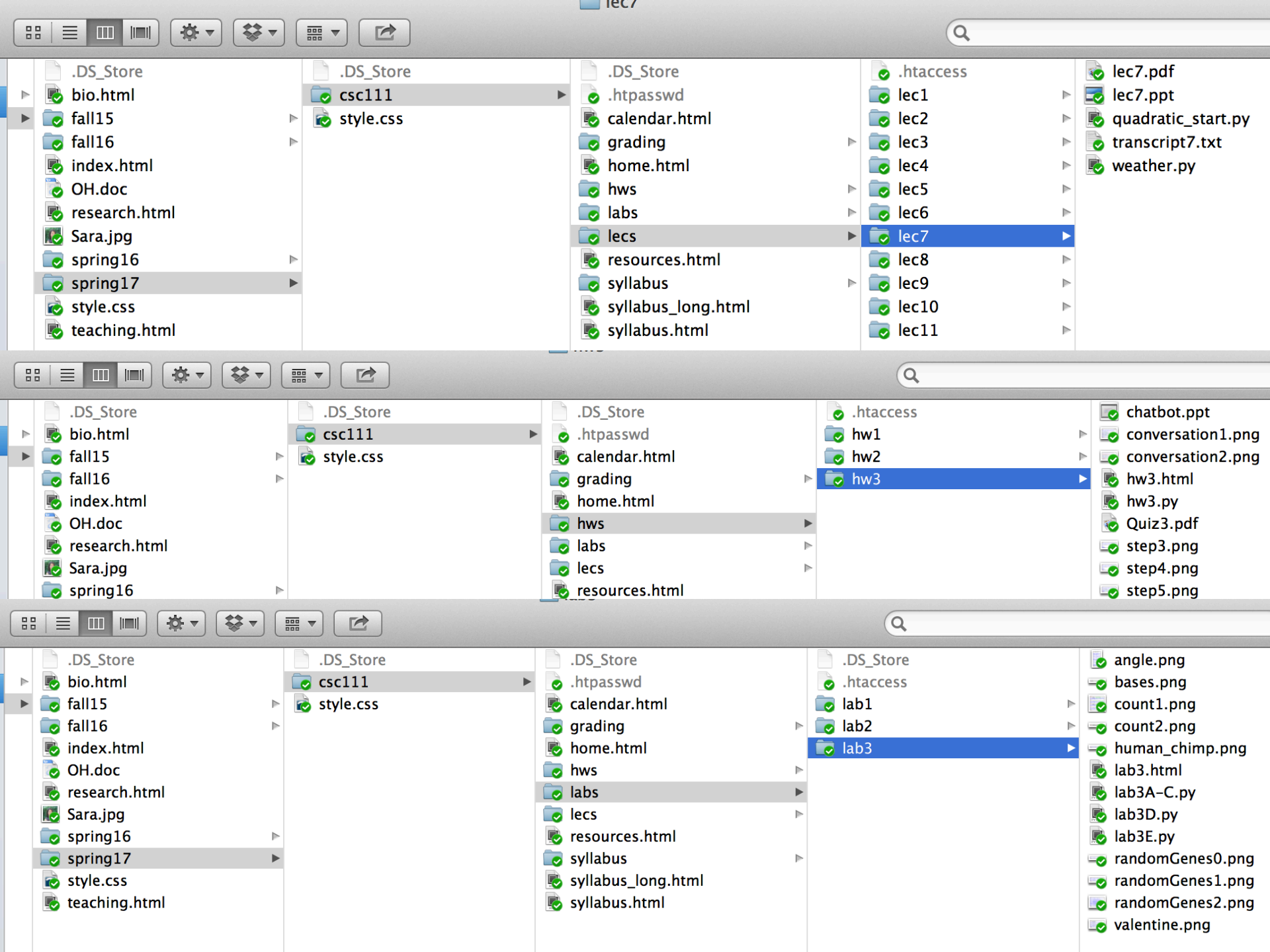
- No Lab 4 due to Rally Day (optional exercises online)
- Office hours tomorrow 11am-1pm (Ford 015)
- Notes about Chap 6 reading: skip graphics (Chap 4) examples
- Notes about homeworks and labs

Outline: 2/22

WEEK 4: all about FUNCTIONS

- Homework 1 examples
- Recap last time
- Return statements (vs. print statements)
- Modify parameters vs. return

Extra:
Directory structure suggestions


lec7
.DS_Store
bio.html
fall15
fall16
index.html
OH.doc
research.html
Sara.jpg
spring16
spring17
style.css
teaching.html
.DS_Store
csc111
style.css
.DS_Store
.htpasswd
calendar.html
grading
home.html
hws
labs
lecs
resources.html
syllabus
syllabus_long.html
syllabus.html
.htaccess
lec1
lec2
lec3
lec4
lec5
lec6
lec7
lec8
lec9
lec10
lec11
lec7.pdf
lec7.ppt
quadratic_start.py
transcript7.txt
weather.py
.DS_Store
bio.html
fall15
fall16
index.html
OH.doc
research.html
Sara.jpg
spring16
.DS_Store
csc111
style.css
.DS_Store
.htpasswd
calendar.html
grading
home.html
hws
labs
lecs
resources.html
.htaccess
hw1
hw2
hw3
chatbot.ppt
conversation1.png
conversation2.png
hw3.html
hw3.py
Quiz3.pdf
step3.png
step4.png
step5.png
.DS_Store
bio.html
fall15
fall16
index.html
OH.doc
research.html
Sara.jpg
spring16
spring17
style.css
teaching.html
.DS_Store
csc111
style.css
.DS_Store
.htpasswd
calendar.html
grading
home.html
hws
labs
lecs
resources.html
syllabus
syllabus_long.html
syllabus.html
.DS_Store
.htaccess
lab1
lab2
lab3
angle.png
bases.png
count1.png
count2.png
human_chimp.png
lab3.html
lab3A-C.py
lab3D.py
lab3E.py
randomGenes0.png
randomGenes1.png
randomGenes2.png
valentine.png

Homework 1 examples

Homework 1, Part A

```
# CSC 111, Homework 1
# PartA: Computing Taxes
# Julia Kim

def main():
    # Info Gathering from user
    print ("This program will compute your taxes for 2016.")
    first_name= (input("Enter your first name: "))
    last_name= (input ("Enter you last name: "))
    salary=eval (input ("Enter your salary for 2016: "))
    deductions= eval (input ("Enter your deductions: "))

    # Computing Tax values
    federal_Taxes=round((salary-deductions)*0.28)
    state_Taxes=round ((salary-deductions)*0.05)

    # Values to return to user
    # Blank print used below to provide a line gap between then entries given,
    # and the data returned
    print ("")
    print ("Dear "+first_name+last_name+":")
    print ("Your federal taxes for 2016 are $", federal_Taxes)
    print ("Your state taxes for 2016 are $", state_Taxes)
    print ("You will have to pay a total of $", (federal_Taxes+state_Taxes))

main()
```

Homework 1, Part A

```
# CSC 111, Homework 1, Part A
# Author: Susannah Davis


# Define function main
def main():
    print('This program will compute your taxes for 2016')
    first = input('Enter your first name: ')
    last = input('Enter your last name: ')
    salary = eval(input('Enter your salary for 2016: '))
    deductions = eval(input('Enter your deductions: '))

    # Compute taxes
    fedtax = round((salary - deductions) * 0.28)
    statetax = round((salary - deductions) * 0.05)



    # Experiment with displaying $ 0 when deductions are greater than salary
    if salary > deductions :            #this section runs like the code asked for

        # Display info for user
        print("")
        print("Dear" , first , last + ":")
        print("Your federal taxes for 2016 are $" , fedtax)
        print("Your state taxes for 2016 are $" , statetax)
        print("You will have to pay a total of $" , fedtax + statetax , "in taxes.")


    if salary == deductions :
        # Display info for user
        print("")
        print("Dear" , first , last + ":")
        print("Your federal taxes for 2016 are $" , fedtax)
        print("Your state taxes for 2016 are $" , statetax)
        print("You will have to pay a total of $" , fedtax + statetax , "in taxes.")

    if salary < deductions :
        # Display info for user
        print("")
        print("Dear" , first , last + ":")
        print("Your federal taxes for 2016 are $ 0")
        print("Your state taxes for 2016 are $ 0")
        print("You will have to pay a total of $ 0 in taxes.")


#Invoke Main
main()
```

Homework 1, Part B

```
# CSC 111 HW1 B
# Heloise Cheruvalath
# Program to find how many hours it would take to travel distances between 100 and 1000 kms
# (intervals of 50kms) based on input speed in miles/hr

def main():
    # Person inputs speed in miles/hr
    mph = eval(input("Enter your speed in miles/hour:"))

    # function to print out values
    for kms in range(100,1050,50):
        miles = round(kms * 0.62137119)
        hours = miles/mph
        print(kms,"kms is", miles,"miles.","At",mph,"miles/hr, this would take",hours,"hrs.")
main()
```

Homework 1, Part B

```
# CSC HW Part B: Distance Conversions
# Author: Danica Miguel
# This program will convert distance

def main():
    speed = eval(input("Enter your speed in miles/hr: "))
    for i in range(100, 1001, 50):

        # convert kms to miles (conversion factor is kms * 0.62)
        miles =round( i * 0.62)

        # formula for hours
        hours =(miles/speed)

        # give this information back to the user
        print(i, "kms is", miles, "miles.", "At", speed, "miles/hr,", "this would take", hours, "hrs.")


main()
```

Recap

Informal quiz (discuss with a partner)

1) Which are the "helper functions" in this code?

2) Which parameters are formal vs. actual?

3) How many time is the function **happy()** called?

4) True or false: **return** is kind of like **print**

```
# Happy Birthday
# Zelle, Section 6.2

def happy():
    print("Happy Birthday to you!")

def sing(person):
    happy()
    happy()
    print("Happy Birthday, dear",
          person + ".")
    happy()

def main():
    sing("Shaneil")
    print()
    sing("Yuhan")
    print()
    sing("Sarah")
    print()
    sing("Sophia")

main()
```

Informal quiz (discuss with a partner)

1) Which are the "helper functions" in this code?

   happy() and sing(person)

2) Which parameters are formal vs. actual?

3) How many time is the function **happy()** called?

4) True or false: **return** is kind of like **print**

```
# Happy Birthday
# Zelle, Section 6.2

def happy():
    print("Happy Birthday to you!")

def sing(person):
    happy()
    happy()
    print("Happy Birthday, dear",
          person + ".")
    happy()

def main():
    sing("Shaneil")
    print()
    sing("Yuhan")
    print()
    sing("Sarah")
    print()
    sing("Sophia")

main()
```

Informal quiz (discuss with a partner)

1) Which are the "helper functions" in this code?

   happy() and sing(person)

2) Which parameters are formal vs. actual?

formal: person

actual: "Shaneil","Yuhan","Sarah","Sophia"

3) How many time is the function **happy()** called?

4) True or false: **return** is kind of like **print**

```
# Happy Birthday
# Zelle, Section 6.2

def happy():
    print("Happy Birthday to you!")

def sing(person):
    happy()
    happy()
    print("Happy Birthday, dear",
          person + ".")
    happy()

def main():
    sing("Shaneil")
    print()
    sing("Yuhan")
    print()
    sing("Sarah")
    print()
    sing("Sophia")

main()
```

Informal quiz (discuss with a partner)

1) Which are the "helper functions" in this code?

   happy() and sing(person)

2) Which parameters are formal vs. actual?

formal: person

actual: "Shaneil","Yuhan","Sarah","Sophia"

3) How many time is the function **happy()** called?

   12 times

4) True or false: **return** is kind of like **print**

```
# Happy Birthday
# Zelle, Section 6.2

def happy():
    print("Happy Birthday to you!")

def sing(person):
    happy()
    happy()
    print("Happy Birthday, dear",
          person + ".")
    happy()

def main():
    sing("Shaneil")
    print()
    sing("Yuhan")
    print()
    sing("Sarah")
    print()
    sing("Sophia")

main()
```

Informal quiz (discuss with a partner)

1) Which are the "helper functions" in this code?

   happy() and sing(person)

2) Which parameters are formal vs. actual?

formal: person

actual: "Shaneil","Yuhan","Sarah","Sophia"

3) How many time is the function **happy()** called?

   12 times

4) True or false: **return** is kind of like **print**

   FALSE!

```
# Happy Birthday
# Zelle, Section 6.2

def happy():
    print("Happy Birthday to you!")

def sing(person):
    happy()
    happy()
    print("Happy Birthday, dear",
          person + ".")
    happy()

def main():
    sing("Shaneil")
    print()
    sing("Yuhan")
    print()
    sing("Sarah")
    print()
    sing("Sophia")

main()
```

Return statements

Return vs. print

- **Print** produces output on the screen (in the shell), it goes not actually give back anything.
- **Return** gives back the actual value of a variable, which can be used later on.
- **Print** is like **"showing"**, **return** is like **"giving"**.
- Functions should almost always either **return something** or **modify something**, although the birthday example only prints.

Back to Sea Level (HW 2)

Got to this point last time:

```
# CSC 111, Day 11
# Author: Sara Mathieson and CSC 111 class
# Sea-level (HW2) revisted using functions and return

# Compute the rate for a specific year
def compute_rate(orig_rate, accel, year):

    rate = orig_rate + accel*year
    return rate # return ("give back") rate


# Compute the sea level for a specific year
def compute_level(orig_rate, accel, year):

    # start off with a sea level of 0
    level = 0

    # loop over each year, adding on the current rate
    for i in range(year):

        # use our "helper function" to compute the rate
        curr_rate = compute_rate(orig_rate, accel, i)
        level = level + curr_rate

    # here we printed level, but if we wanted to use it
    # later on, we would need to return it
    print(level)
```

Get back to original output:

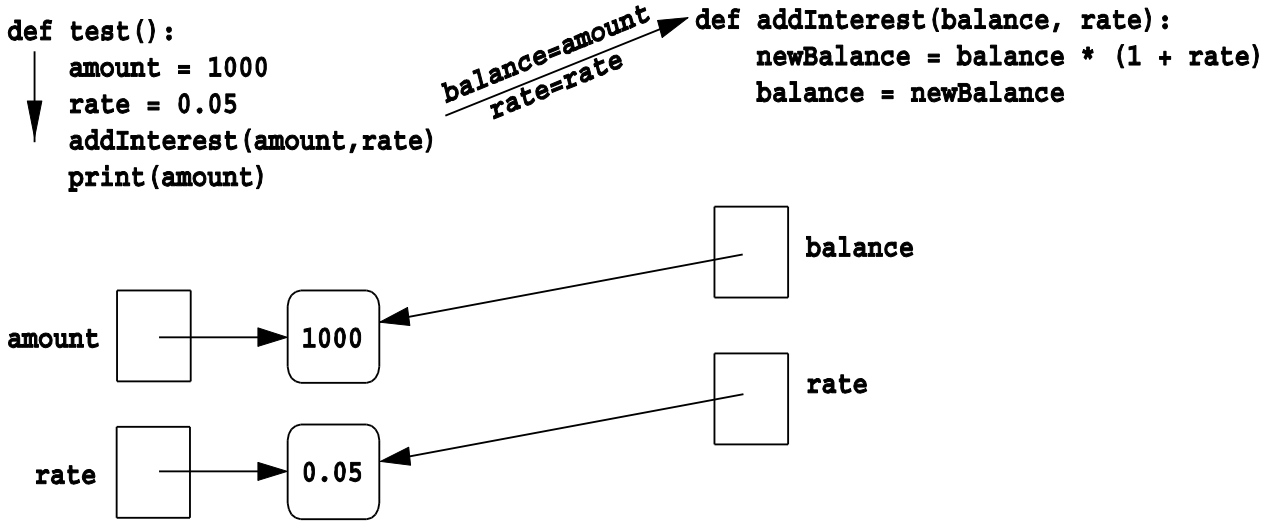
```
Enter rate (mm/yr) = 3
Enter acceleration (mm/yr^2) = 0.1
Enter # of years = 8

year=0 rate=3.0 level=0.0
year=1 rate=3.1 level=3.0
year=2 rate=3.2 level=6.1
year=3 rate=3.3 level=9.3
year=4 rate=3.4 level=12.6
year=5 rate=3.5 level=16.0
year=6 rate=3.6 level=19.5
year=7 rate=3.7 level=23.1
year=8 rate=3.8 level=26.8
```

Return vs. Modify

(live coding demo)

Functions that modify parameters

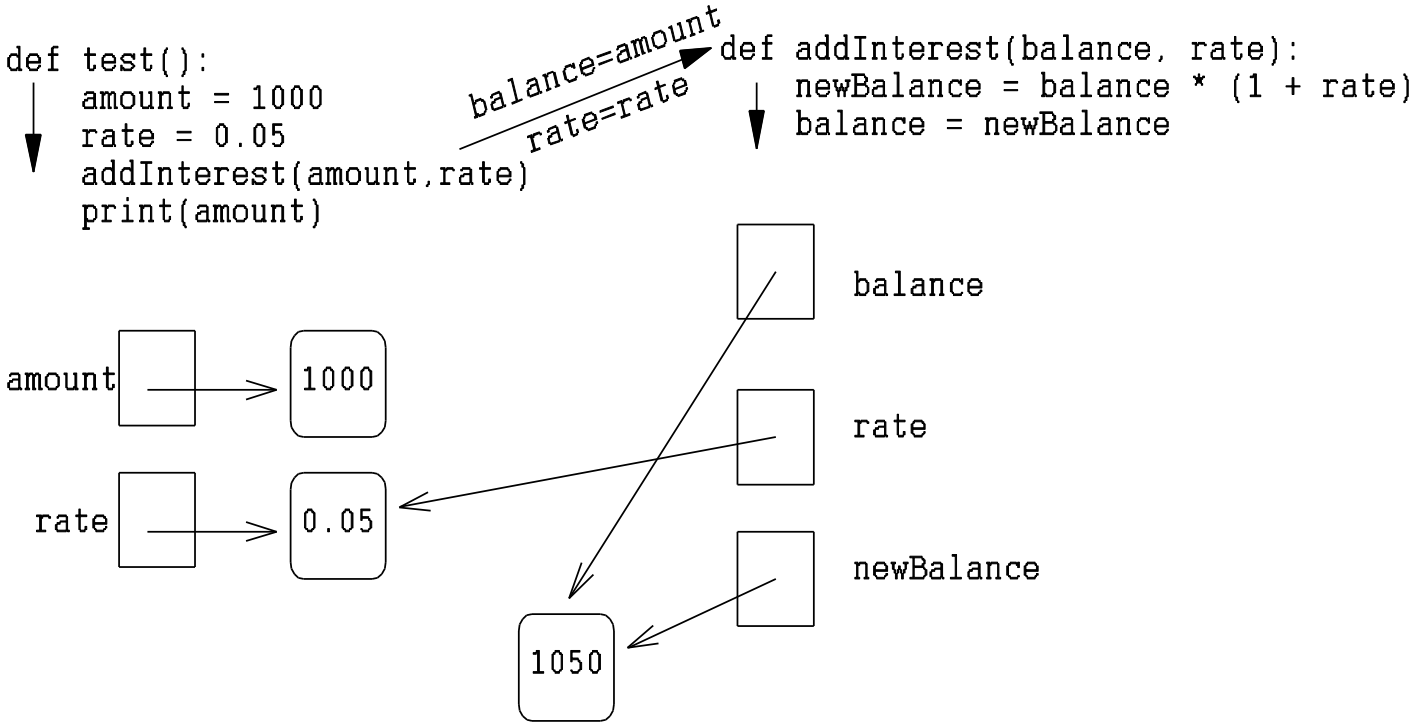
Right after **addInterest** is called, **balance** and **amount** both point to 1000



Zelle, Figure 6.6

Functions that modify parameters

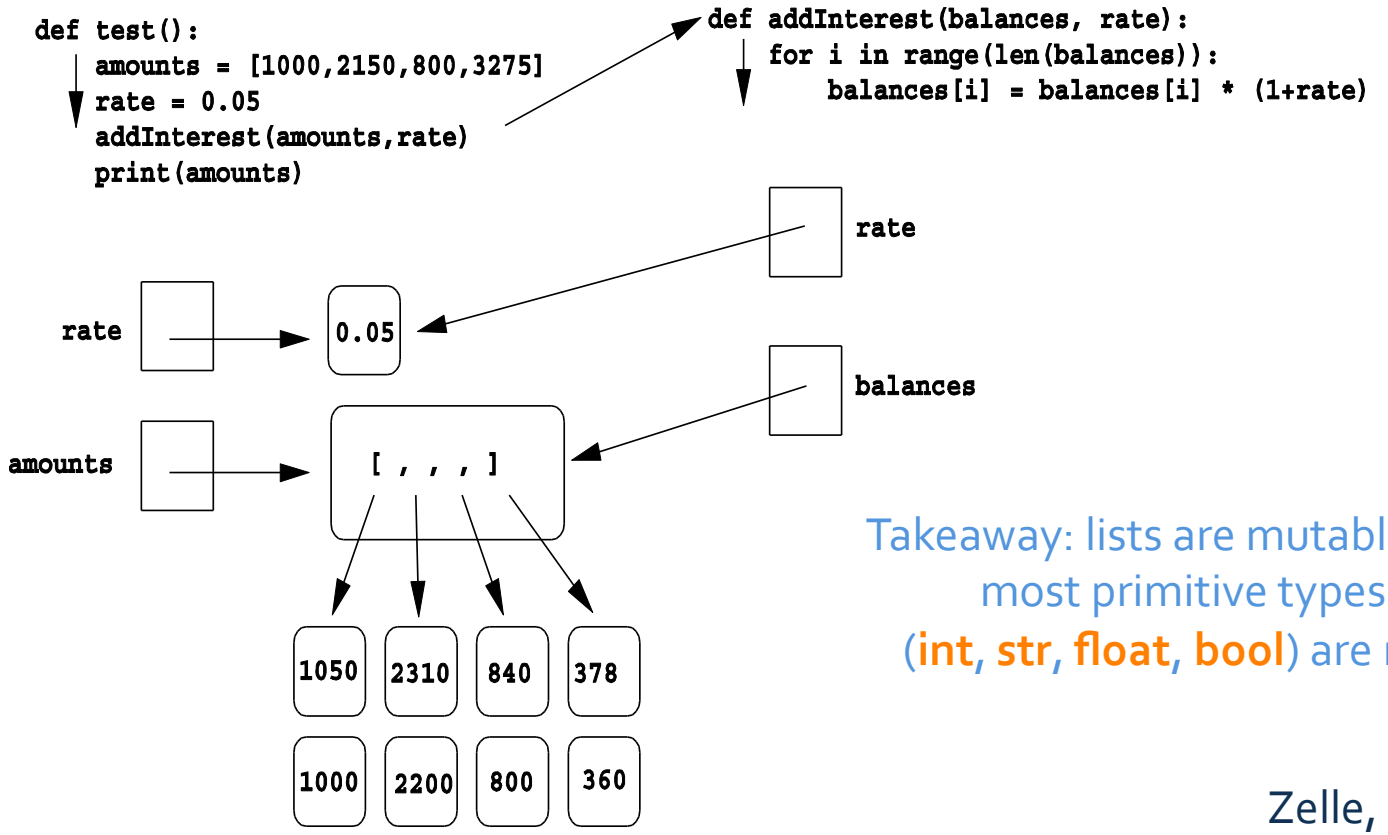
After **addInterest** is finished, **balance** is 1050, but **amount** has never been reassigned



Zelle, Figure 6.7

Functions that modify parameters

Balances and **amounts** still point to the same structure, but the elements have been changed.



Takeaway: lists are mutable, but most primitive types (**int**, **str**, **float**, **bool**) are not.

Zelle, Figure 6.9