CS101: Intro to Computing
Fall 2015

Lecture 10

Administrivia

- Homework 8 is due ***tonight***
- Homework 9 assigned (due on Mon)
- No homework assigned on Wednesday
- Midterm 1 is October 5th (1 week!)
  - Practice exam coming Wednesday

REVIEW

```
t=""
for c in s:
    if c not in "aeiou":
        t+=c
```

What is this program doing to string s?

a) Counting the vowels in s
b) Removing the vowels from s
c) Counting the consonants in s
d) Removing the consonants from s

```
x=0
for i in range(0,100):
   x=i
```

What is the final value of x?

a) 0

b) 99

c) 100

d) 4950

LISTS

Lists

- Represents an ordered collection of *items* or *elements.*
  - It's iterable.
- A ***container*** type
  - Contains other values of ***any type***
  - **NOTE*:*** elements don't have to be the same type

Lists

- We create an ***list*** by typing:

1. an open square bracket [
2. items of the list, separated by commas
3. a closing squre bracket]

Similarity to Strings

```
x=[10,3.14,”Ride”]
print x[1]
print x[1:3]
print len(x)
for i in x:
  print i
```

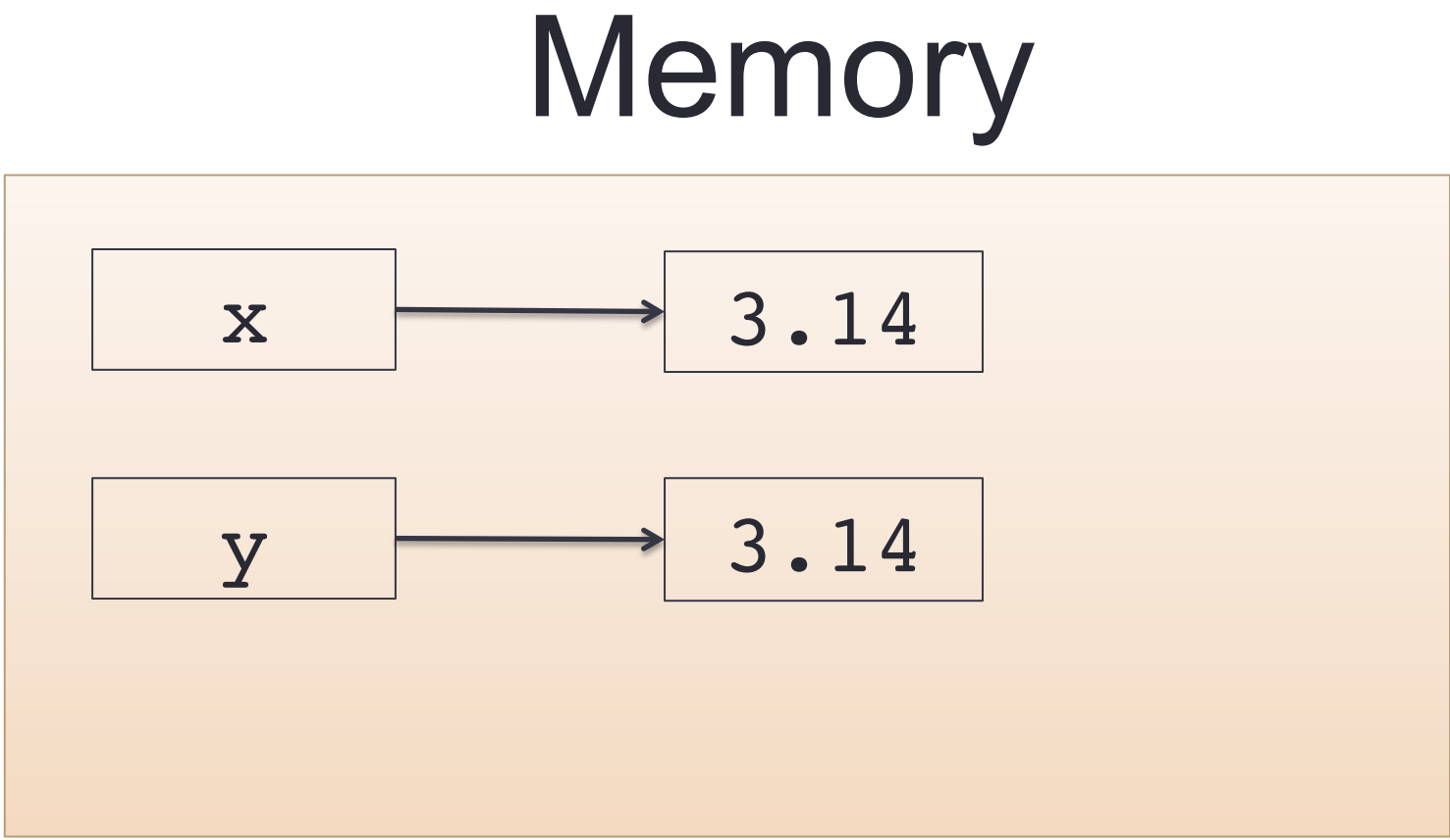
Dissimilarity to Strings

- Strings are ***immutable*** (we can't change the *contents* without ***creating a new string***)

```
s="Puraty Ring"
s[3]="i" ← NOT ALLOWED
s=s[:3]+"i"+s[4:]
```

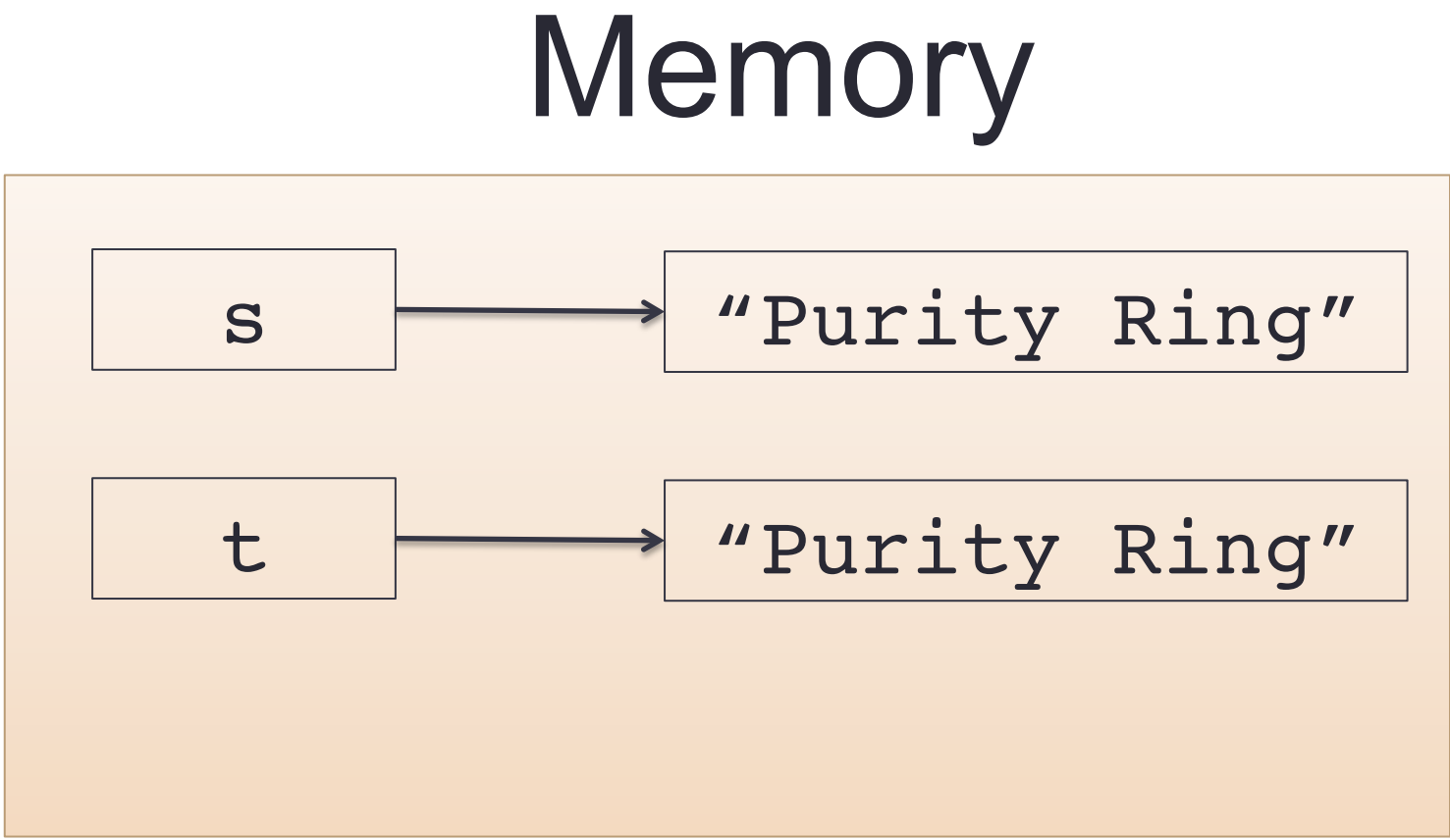
Immutable Assignment

```
x=3.14
y=x
```



Immutable Assignment

```
s="Purity Ring"
t=s
```



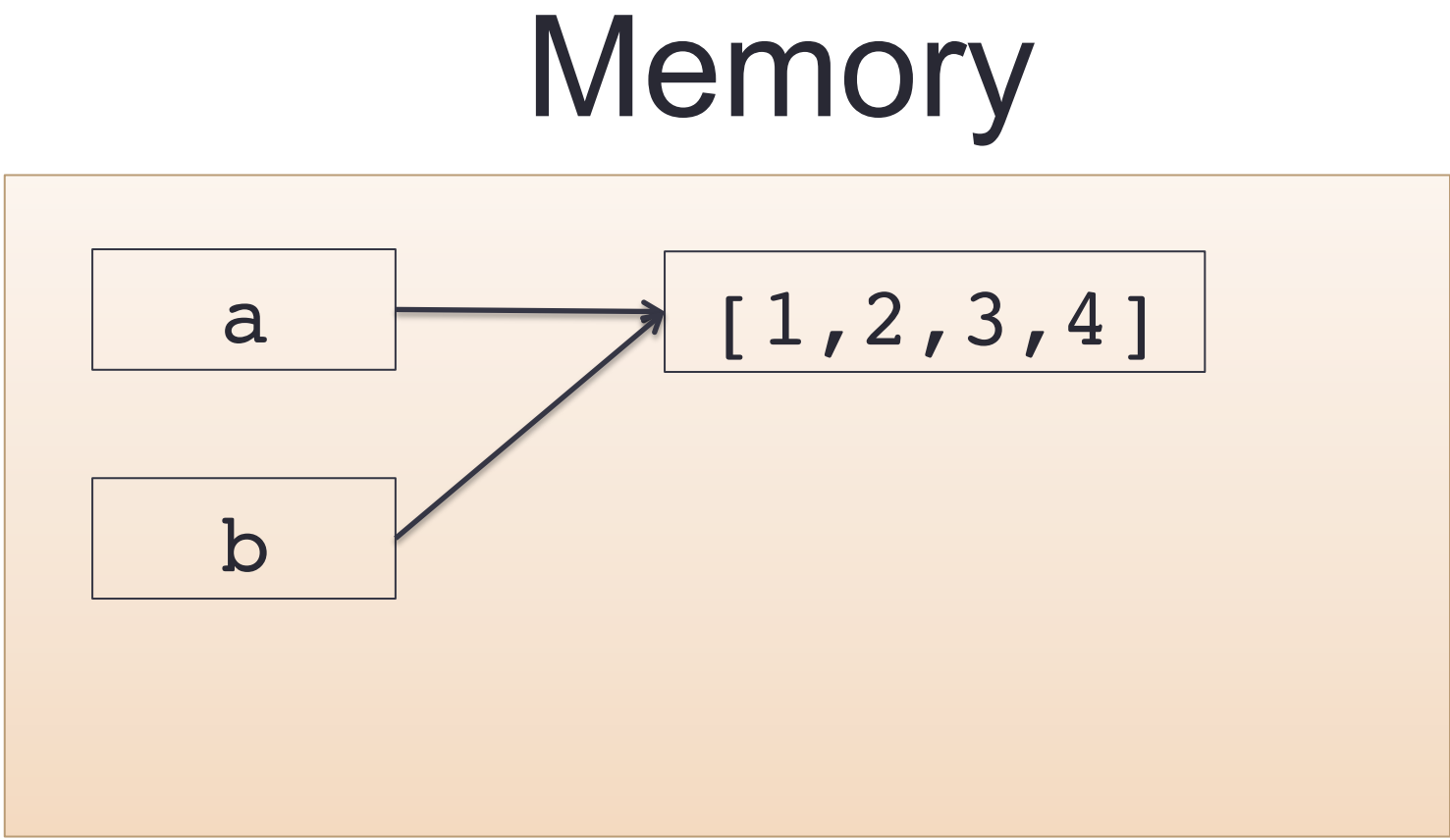
Dissimilarity to Strings

- Lists are ***mutable*** (we ***can*** change the contents of a list)

```
x=[4,1,2,3]
x[3]=-2 ← item assignment
x.append(5)
del x[1]
x.sort()
```

Mutable Assignment

```
a=[1,2,3,4]
b=a
```

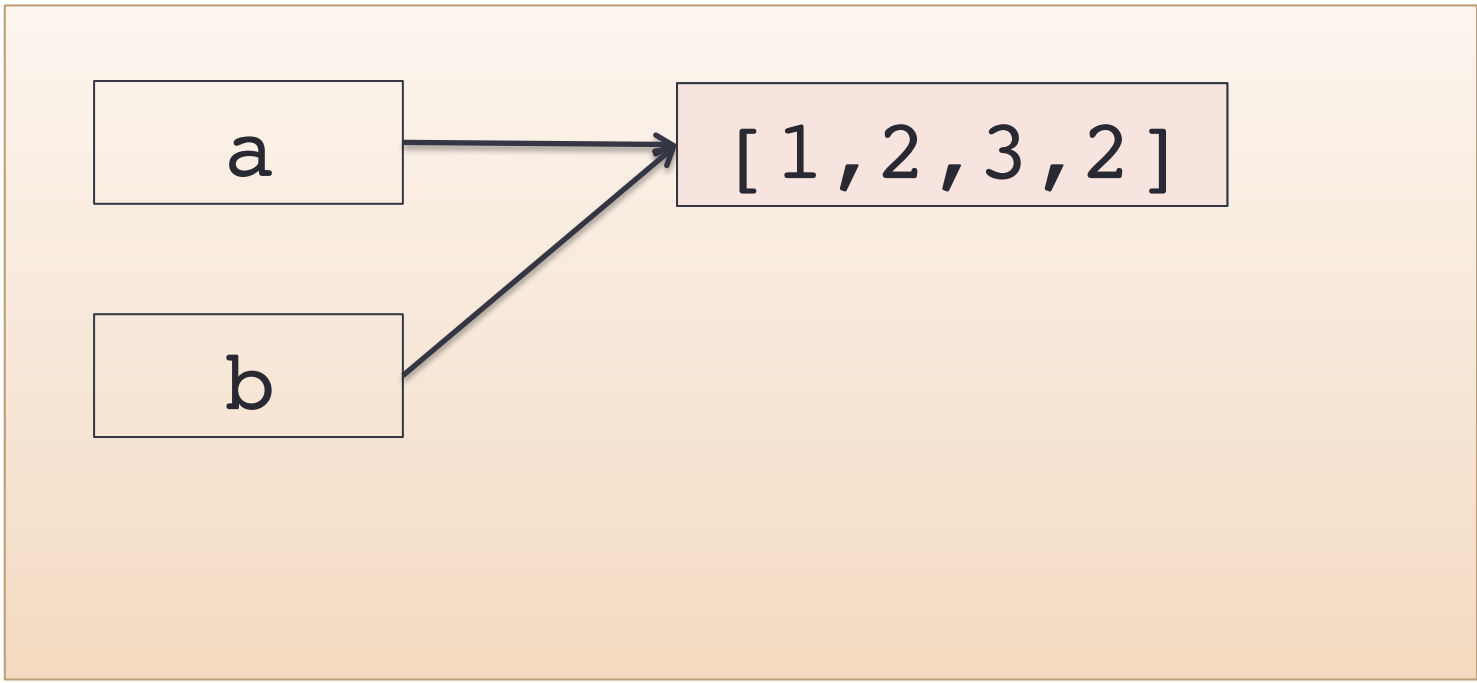


Aliasing

- One memory location has two names.
- Only ***mutable*** types can be aliased.
- Aliasing causes mutable types to behave ***very*** differently.

Implications of Aliasing

```
a=[1,2,3,4]
b=a
b[-1]=2
```



```
x=[3,2,1]
y=x
y.sort()
x.append(0)
```

What is the final value of x?

a) `[3,2,1]`

b) `[1,2,3]`

c) `[1,2,3,0]`

d) `[0,1,2,3]`

```
y=[3,2,1]
x=y.append(5)
y[-1]=3
```

What is the final value of x?

a) `[3,2,1,3]`

b) `[3,2,1,5]`

c) `[3,2,1,5,3]`

d) `None`

DANGER!! DANGER!!

- The *sort* and *append* methods modify the list ***itself!***
- This means they **RETURN NONE**

```
x=[1,2,3,4]
x=x.append(5)
print type(x)
```

Mutable arguments

- Mutability causes lists to work differently with functions.
- Lists used as arguments ***can be modified by the function.***
- This is very useful.

Mutable arguments

```
def fun(q):
  q.append(3)

a=[]
for i in range(3):
  fun(a)
print a
```

Example

```
def readfile(fname,a):
  for line in open(fname):
    a.append(line)

all_lines=[]
readfile(“file1”,all_lines)
readfile(“file2”,all_lines)
```

Example

```
def readfile(fname,a):
  for line in open(fname):
    a.append(line)

all_lines=[]
for f in open("filenames.txt"):
  readfile(f,all_lines)
```

Copying Lists

- What if we want a fresh, independent copy of our list (i.e. NOT an alias?)
- ***Slicing*** creates a new list.
- Slice the ***entire*** list to create a copy.

```
x=[3,2,1]
y=x[:]
y.sort()
print x
```

Example

```
x=[1,2,3]
y=x[:]
y.append(4)
print x==y
```

Split

- *split* is a string method that returns a ***list***.
- Takes a single string argument.
  - Used as a delimiter

```
name=“Ryan M. Cunningham”
m=name.split(“ “)
print m[-1]
```

```
x="A+B+C"
y=x.split("+")
```

What is the value of `x`?

a) `"ABCD"`

b) `["A","B","C"]`

c) `["+","+","+"]`

d) `None`

Join

- A ***string*** method that operates on a ***list.***
- Returns a ***string*** of list elements joined together.

```
names=[“Ryan”,”Dave”,”Michael”]
‘,‘.join(names)
```

```
a=["X","A","G"]
b=a[:]
a.sort()
x=",".join(b)
```

What is the value of `x`?

a) "XAG"

b) "X,A,G"

c) "A,G,X"

d) None

TUPLES

Tuple

- A tuple is an ***immutable*** sequence of any type.
  - An immutable version of a list.
- Literal: item in the tuple separated by commas (can add parentheses)

```
t=(1,3.14,"Hi")
```

```
t=(1,3.14,”Hi”)
t[0:2]
t[-2]
len(t)
1 in t
t[2][1]
```

Why tuples?

- Less useful version of lists?
- No! They make our solutions more elegant!
- Allow us to ***group*** items together in our code.

Tuple assignment

- A tuple can go on the ***left side*** of an assignment statement
- Allows us to make ***multiple assignment***s at once

```
one,pi,hello=(1,3.14,"Hi")
```

- Convenient for swapping values:

```
x,y=y,x
```

Tuple return values

- A tuple can be used in a return statement
- Allows us to ***return multiple values*** at once

```
def fun():
   return (1,2,3)
```

- When calling, can use tuple assignment

```
a,b,c=fun()
```

String formatting with tuples

- We can use tuples on the ***right side*** of the string formatting operator
- Allows us to insert ***multiple values*** into the string

```
“%i %i %i” % (1,2,3)
```

```
s=???
x=10
y="Hello"
z=3.14
print s % x,y,z
```

a)"%i %f %s"
b)"%f %s %i"
c)"%i %s %f"
d)None of the above.