More Exercises with Loops
Turtle Graphics

CS 8: Introduction to Computer Science, Spring 2019
Lecture #8

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• No homework this week!

• Lab03 – due on Sunday by midnight (11:59 pm) on Gradescope!

• Midterm Exam #1 is on Wednesday!
Midterm #1 Exam

- **May 2\textsuperscript{nd}, 2:00 – 3:15 PM** in THIS classroom (unless you are a DSP student)
- Come **10 MINUTES EARLY** as there might be pre-assigned seating
- **CLOSED BOOK!** But you can bring **1 page of notes**
  - Single-side only, 8.5” x 11”
  - Hand-written or computer printed is OK!
  - Must turn it in **with the exam when done**
  - No calculators / cell phones / any type of computer
- Bring your **UCSB ID** with you. **NO EXCEPTIONS.**
Midterm #1 Exam

WHAT’S ON IT?!

• Everything
  – Review ALL lectures
  – Review ALL readings
  – Review ALL labs
  – Review ALL homework
Midterm #1 Exam

SAMPLE QUESTIONS?!?!?!?!?!?!

• Yes! See Study Guide on the class website!
Lecture Outline

• More exercise with loops using **for** and **while**
Re: Mutability of Variables

- Remember that “immutable” variables are not “unchangeable”
  - Eg. int, str, float, etc…

- They CAN be changed, if they are RE-ASSIGNED
  - INSIDE a function

- Whatever changes we make inside a function will remain inside the function
  - But we can always RETURN these variables so that the changes are reflected outside the function
def swap(a, b):
    temp = a
    a = b
    b = temp

x = 3
y = 33
swap(x, y)
# what’s x? y?

def swap(a, b):
    temp = a
    a = b
    b = temp
    return a, b

x = 3
y = 33
x, y = swap(x, y)
# what’s x? y?
Introducing Turtle Graphics!

• A nice way to get introduced to simple graphics using Python
• You have to first `import turtle`
• You can then use it as per the demo I’m about to give…
import turtle

# Set the turtle object, call it timmy!
timmy = turtle.Turtle()

timmy.forward(100)  # Draw forwards 100 pixels

timmy.right(90)  # Turn the turtle 90 degrees to the right

timmy.backwards(50)  # Draw backwards 50 pixels

timmy.left(45)  # Turn the turtle 45 degrees to the left

timmy.color("blue")  # Make timmy blue

# Set the width of the pen

# Put pen up (can move it w/o drawing)

# Put pen down (can draw again)
What Will These Do?

```python
import turtle
boris = turtle.Turtle()
boris.color("blue")
boris.forward(100)
boris.right(90)
boris.forward(100)
boris.right(90)
boris.forward(100)
boris.right(90)
boris.forward(100)
boris.right(90)
```

```python
import turtle
natascha = turtle.Turtle()
natascha.color("red")
natascha.forward(100)
natascha.left(60)
natascha.forward(100)
natascha.left(60)
natascha.forward(100)
natascha.left(60)
natascha.forward(100)
natascha.left(60)
natascha.forward(100)
natascha.left(60)
```
Simpler Drawing By Repetition

- Drawing a *square* using Turtle and loops!

```python
def drawSquare2(myTurtle, sideLength):
    for i in range(4):
        myTurtle.forward(sideLength)
        myTurtle.right(90)
```

Let’s try these out!
More Drawing Abstraction

- **Drawing a triangle using Turtle and loops!**

```python
def drawTriangle(myTurtle, sideLength):
    for i in range(3):  # draw 3 sides, not 4
        myTurtle.forward(sideLength)
        myTurtle.right(120)  # 120°× 3
```

Let’s try these out!
More Drawing Abstraction

- Drawing any **regular polygon** using Turtle and loops!

```python
def drawPolygon(myTurtle, sideLength, numSides):
    turnAngle = 360 / numSides
    for i in range(numSides):
        myTurtle.forward(sideLength)
        myTurtle.right(turnAngle)
```

Let’s try these out!
Simpler Drawing By Repetition

- Drawing a **spiral using Turtle and loops**!

```python
def drawSpiral(myTurtle, maxSide):
    for sideLength in range(1, maxSide+1, 5):
        myTurtle.forward(sideLength)
        myTurtle.right(90)
```

Let’s try these out!
Example for Loop using a String

• What do you think this code does?

s = "Take me home, country roads"
for c in s:
    if c in ('a', 'e', 'i', 'o', 'u'):
        print("Vowel found: ", c)
Example for loop using string

- What do you think this code does?

```python
s = "Take me home, country roads"
t = 0  # Set-up for an accumulated sum
for c in s:
    if c in ('a', 'e', 'i', 'o', 'u'):
        t += 1  # Accumulated sum
print("There were", t, "vowels found")
```
Example for loop using string

- What do you think this code does?

```python
s = "TAKE ME HOME, COUNTRY ROADS"
t = 0  # Set-up for an accumulated sum
for c in s:
    if c in ('a', 'e', 'i', 'o', 'u'):
        t += 1  # Accumulated sum
print("There were", t, "vowels found")
```
Nested Loops

• What will this code do?

```python
for p in range(2):
    for q in range(3):
        print("z", end="")
```
Nested Loops

• What would this do?

```python
listX = [ [1, 2, 3],
          [4, 5, 6, 7, 8, 9],
          ["a", "b", "c"] ]
for i in listX:
    for j in i:
        print(j, end="")
```
YOUR TO-DOs

- Study for the midterm!
- No **Homework** this week!
- Finish **Lab3** *(turn it in by **Sunday**)*
- Ensure *(smiles − frowns) > 0*
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