More Exercises with Loops
Turtle Graphics

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

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Administrative

- 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 2nd, 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

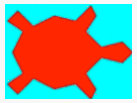
Re: Mutability of Variables

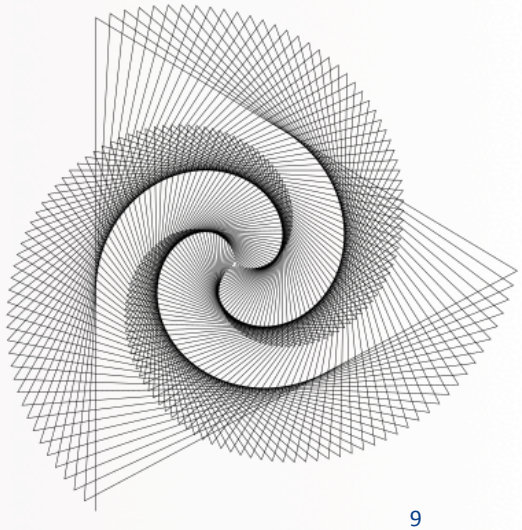
```
def swap(a,b):
    temp = a
    a = b
    b = temp

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…





Basic Turtle Commands

```
import turtle
timmy = turtle.Turtle()  # Set the turtle object, call it timmy!
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
timmy.pensize(3)      # Set the width of the pen
timmy.penup()         # Put pen up (can move it w/o drawing)
timmy.pendown()       # Put pen down (can draw again)
```

What Will These Do?

```
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)
```

```
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)
natascha.forward(100)
natascha.left(60)
```

Simpler Drawing By Repetition

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

```
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!***

```
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!***

```
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!***

```
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?

```
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?

```
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?

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

Nested Loops

- What would this do?

```
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`

</LECTURE>