CS111 SI Session
9/9/2015
SI Leader: Cece Tsui

CS111 SI Session: Built-In Functions, CS1Graphics, Functions, and Fun!

I. Built-In Functions

Let (Make sure to run the three lines of code before beginning.):

In [ ]:

```
a = 100
```

In [ ]:

```
b = "cs111"
```

In [ ]:

```
c = 45.6
```

What is the output of the following lines of code?

Try to guess the output first, and then run the code to see the result.

In [ ]:

```
max(a, c)
```

In [ ]:

```
min(c, len(b))
```

In [ ]:

```
type(a)
```

In [ ]:

```
type(b)
```

In [ ]:

```
type(c)
```

In [ ]:

```
round(c)
```

In [ ]:

```

```

```
round(c,1)
```

In [ ]:

```

```

```
print(b)
```

II. Classes and Inheritance

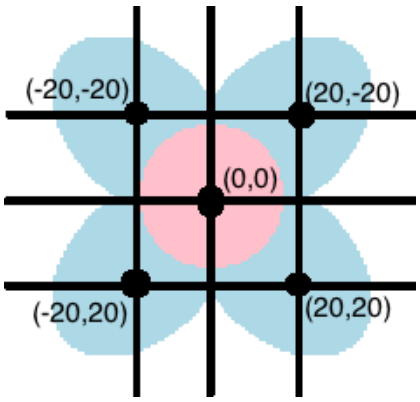
Notes:

III. CS1Graphics & Functions

In order to make a flower, we know that the flower is composed of two parts: 1) The four petals. 2) The pollen in the center.

We know that the four petals can be made using four Ellipses. We also know the pollen (or the center where the petals attach to) can be made of a Circle. A flower should resemble:

a) Let's say the petals should be 40 in width, 60 in height. The pollen should also have a radius of 20. Using cs1graphics, code an instance of this flower. Below is a better look at the placement of the petals and pollen relative to each other. The dots are the center points of the shapes.:



In [ ]:

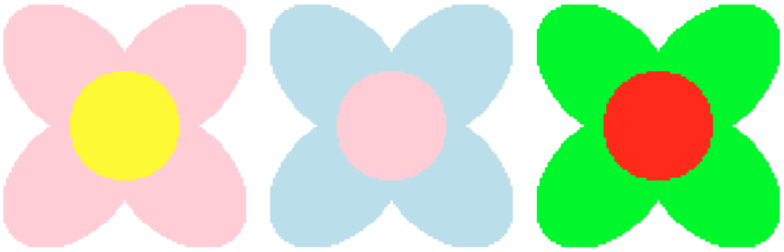
```
from cs1graphics import *
#YOUR CODE GOES HERE
```

b) You notice that your flower is getting lonely. You want to make more flowers, but you want the same exact flower that you made in (a). What can you do to easily make more flowers without needing to code more individual pollen and petals? Edit your code from (a) to make 3 more of the exact flower placed side by side. You can see an example below.

In [ ]:

```
from cs1graphics import *
#YOUR CODE GOES HERE
```

c) Looking at your meadow, you notice that you actually want a more diverse group of flowers, but you don't want to individually code more different colored petals and pollen. Write a function that generalizes the making of your flower. Hint: the parameters of the function should include petalColor and pollenColor. After writing your function, you should be able to make the picture below:



In [ ]:

```
def flower(                              ):
    #CODE YOUR FUNCTION HERE - Make sure to add your parameters!
```

```
```

In [ ]:

```
#CODE THE THREE DIFFERENT COLORED FLOWERS HERE
```

IV. More Function Practice!

a) Define a function, happyBirthday(), that takes in a name as a parameter. When called, the function prints out the lyrics to the Happy Birthday song, but with the name of the

person. For example: happyBirthday("cece") should print: "Happy Birthday to you, Happy Birthday to you, Happy Birthday dear cece, Happy Birthday to you!"

In [ ]:

```
def happyBirthday(                ):
    #CODE HERE - Make sure to add your parameters!
```

b) Define a function, circleArea(), that takes in a circle's radius and returns the value of the circle's area.

In [ ]:

```
def circleArea(             ):
    #CODE HERE - Make sure to add your parameters!


s
```

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Functions!

I. *Return Vs. Print*

Return	Print
Notes:	*Notes:*

II. Function Fun!

For each: First determine if the function is void. Afterwards, write your code under the following prompts.

Warm-Up: Define a function, happyBirthday(),that takes in a name as a parameter. When called, the function prints out the lyrics to the Happy Birthday song, but with the name of the person. For example: happyBirthday("cece") should print: "Happy Birthday to you, Happy Birthday to you, Happy Birthday dear cece, Happy Birthday to you!"

Warm-Up: Define a function, circleArea(), that takes in a circle's radius and returns the value of the circle's area.

Write a function, printEmptySquare() that takes in a number, n, representing the length of a square. When invoked, the function should print out an n x n square, where the perimeter of the square is made up of asterisks. The square should be empty, meaning there are no asterisks within the square. For example, an invocation of printEmptySquare (10) should print:

```
**********
*        *
*        *
*        *
*        *
*        *
*        *
*        *
*        *
**********
```

There is one rule: You can only use the print statement twice.

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Write a function, convertToCelsius() that takes in a float as a parameter that represents degrees in Fahrenheit. When invoked, the function should convert the parameter to Celsius and then return this converted result. (F – 32) (5/9) = C

Write a function, weatherGreeter () that takes in two parameters: a string representing a name and a float representing degrees in Fahrenheit. When invoked, the function should print a statement that greets the name, and indicates the temperature in Celsius. No conversions should be made in this function. (Hint: Use a previous function to help determine the degrees in Celsius.) For example, invoking weatherGreeter ("Cece", 95.0) should print: "Hi Cece. The temperature in degrees Celsius is 35.0."

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Name: _____

Review, Lists, and For Loops!

I. Review – Conditionals and Booleans

a) What is a Boolean?

b) What is a Predicate?

c) How are Booleans and Conditionals connected?

d) Write a function, isSameType(), that takes in two parameters. The function returns true if both of the parameters are of the same type. For example, invoking isSameType("3", 3) should output False.

e) Write a function, letterGrade() that takes in an integer representing the test score of a student and returns the letter grade the student gets. The scores should follow the guidelines below:
   a. 90 – 100: 'A'
   b. 80 – 89: 'B'
   c. 70 – 79: 'C'
   d. 60 – 69: 'D'
   e. 50 – 59: 'F'

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II. Lists & For Loop Fun

a) What is an element? What is a list?

b) Create a list that includes your age, your name, your favorite color, and where you are from (in this order).

c) Given a list a = [“Ed Sheeran”, ”Sam Smith”, “One Direction”, “Maroon 5”]:
   a. What is the length of a?
   b. How would you access “One Direction”?
   c. How would you access “Ed Sheeran”?
   d. How would you check to see if “Usher” was in the list?
   e. How would you represent the list values of a?

d) What list would range(3, 10) give?

e) What list would range(0, 10, 2) give?

f) What does a for loop do?

g) Write a function, addSList(), that takes in a list of strings as a parameter and for each string, prints it, but with “s” added at the end.

h) Write a function, addSString(), that takes in a sentence (string) as a parameter and individually prints the words of the sentence with "s" added at the end. For example, invoking addSString("Hello there") should output:
    Hellos
    theres

i) Write a function, startsWithC(), that takes in a list of strings as a parameter and for each string, prints whether it begins with a "C". For example, invoking startsWithC(["CS","Awesome"]) should output:
    CS starts with a C.
    Awesome does not start with a C.

j)

a. Write a function, isVowel(), that takes in a letter and returns whether the letter is a vowel.

b. Write a function, startsWithVowel(), that takes in a list of strings and for each string, prints whether it begins with a vowel. Use your isVowel() function to help your function.

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More Fun with Lists and Loops!

I. Naming Your Parameters and Functions

II. Warm-Up & Review

1. Write a function, sumList, that takes in a list of integers as a parameter, and returns the sum of all the integers in the list.

2. Write a function, isPartOf, that takes in a word and a sentence. When invoked, the function should return whether or not the word is within the sentence.

3. Write a function, countElements, that takes in a list and returns the number of elements in the list. (Use a for loop for this example.)

II. More About Lists

1. Given the initial list myList = [“Hello”, 5, “CS”, True, [“test”], “Cool”], what is the list after each of the lines below?
    a. myList[1] = myList[1] + 10

b. myList[0] = “Hey”

c. myList.append(“SI”)

d. myList[4].append(“exam”)

e. myList.pop()

f. myList.pop(0)

g. myList.insert(0, “hi”)

h. myList[4].insert(0, “written”)

2. What is the difference between myList[1] = 10 and myList.append(10)?

3. Write a function, filterA, that takes in a list of strings, and returns a new list of all strings in the input list that begin with “a.”

4. Write a function, addTwo, that takes in a list of integers, and returns a new list of all the integers in the input list, but with two added to each.

5. What is the end result after these lines of code are run? Draw memory diagrams for each step!
   myList = [“This”,”Is”, “So”, [“Awesome”,”Cool”,”Helpful”]]
   a = myList
   a.pop()
   myList.pop()
   a[0] = “CS”
   myList.insert(0,”SI”)
   a.append([“Awesome”,”Cool”])

6. Write a function, filterVowels, that takes in a list of letters and returns a new list of all the letters in the input that are vowels.

7. Write a function, addS, that takes in a list of strings and returns a list of all the strings in the input with “s” added to the end.

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Iteration!

I. Review

1. What will be the final output of d[0]? Draw memory diagrams.

```
a = [1,3,5,7,9]
b = [2,4,6,8,10]
c = [5,10,15,20]
d = [10,20,30]
d[0] = a[0]
d[0] += b[4]
b[4] = 20
c[2] = 25
d[0] = c[2]
d[2] = 40
d[0] += d[2] + c[2] + b[4]
```

2. What is a tuple? What operations can you perform on a tuple?

3. How are tuples and strings related? How do they differ?

II. While Loops

1. Write a program that prompts the user to enter in an integer greater than 100. The program should continue to ask the user until the number is valid. If it's valid, the program should print that it is valid to the user. For example, the program should run similar to the output below:

Enter a number: 2
Enter a number: 5
Enter a number: 99
Enter a number: 150
Your number is valid.

2. Write a function, reachTarget, that takes in three parameters: a starting balance, target balance, and monthly interest rate. Each month, the starting balance grows by the monthly interest rate multiplied by the current balance. The function should calculate how many months it takes to reach the target balance with the given starting balance and monthly interest rate.

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III. Nested Loops

1. Write a function, listStudentCourses, that takes in a list of tuples, where the tuples are made up of a student's name, and a list of the courses they are enrolled in. The function should print the student's name and the courses they are taking.
For example, this invocation:

listStudentCourses([("Alex",["Computer Science","Biology"]), ("Cece",["Computer Science", "Chinese"])])

should produce:

Alex is enrolled in:
Computer Science
Biology
Cece is enrolled in:
Computer Science
Chinese

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2. Write a function, printRectangle, that takes in two parameters: row and column. The function should print a rectangle made up of '*' that is row by column. Use nested for loops. For example, an invocation of printRectangle(3,5) should produce:

*****
*****
*****

3. Write a function, printTriangle, that takes in a parameter row. The function should print a right triangle, where two sides of the triangle making the right angle is made up of row '*'. For example, an invocation of printTriangle(3) should produce:

*
**
***

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List Comprehensions!

I. Review

1. Draw an iteration table for the function and it's invocation below:

```
def factorial(n):
    result = 1
    while n > 0:
        result = result * n
        n = n – 1
    return result
```

factorial(5)

Step	n	result
0		
1		
2		
3		
4		
5		

2. How would you open a file to read its contents? How would you read the lines within the file?

3. Write a function, reachTarget, which takes in a starting balance, a target balance, and a monthly saving. The starting balance represents how much is currently in a savings account. The target balance represents the amount you want your savings to reach. The monthly saving represents the amount you add to your savings account each month. The function should return how many months it takes to reach the target balance.

II. List Comprehensions
For the following exercises below, only use list comprehensions.

1. Write a function, filterVowels, that takes in a string and returns a list of the letters in the string that are vowels. For example, an invocation of filterVowels('Eat heat') should produce ['E','a','e','a']

2. Write a function, filterOdd, that takes in a list of integers and returns a new list of only the odd integers from the input list. For example, an invocation of filterOdd([1,4,7,8]) should return [1, 7].

3. Write a function, linesFromFile, that takes in a name of a file, and returns a list of the lines in the file. Use List Comprehensions.

4. Write a function, countStudentYear, which takes in a file name and a list of years in strings. The file should be formatted similar to the cs111fall15.csv file from lecture on 9/29 and contain student information. The function should, for every year in the list of years, count how many years are in the file. For example, an invocation of the function, countStudentYear('cs111fall15.csv', ['2019','2018','2017','2016']) should produce: ['2019 : 33', '2018 : 42', '2017 : 8', '2016 : 9'] .

5. Write a function, filterLastName, which takes in a letter and a file name and returns a list of students (and their information), with the last name beginning with that letter. The file should be formatted similar to the cs111fall15.csv file from lecture on 9/29. For example, the invocation of filterLastName('M') should produce:

['Katy Ma,1,2018,Shafer Hall', 'Chetna Mahajan,1,2018,Beebe Hall', 'Kethural Luxshana Manokaran,1,2018,Munger Hall', 'Jordan Mason Mayfield,1,2018,Pomeroy Hall', 'Thessaly McFall,1,2019,McAfee Hall', 'Emma Elaine McMahon,1,2016,Tower Court West', 'Eliza D. McNair,1,2018,Beebe Hall', 'Eliana Marostica,2,2018,Davis Hall', 'Olivia Jean Moeller,2,2018,Severance Hall', 'Mana Muchaku,2,2018,Cazenove Hall', 'Maleah Peyton Maxie,3,2018,Freeman Hall']

6. Re-write the function, filterVowels, so that any repeated vowels in the string would only appear in the returned list once. All letters in the returned list should be lower case. For example, an invocation of filterVowels('Aaa') should produce ['a']