

FINAL EXAM, VERSION 2  
CSci 127: Introduction to Computer Science  
Hunter College, City University of New York

13 December 2017

**Answer Key:**

1. (a) What will the following Python code print:

```
s = "history.biology.science."  
num = s.count(".")  
subjects = s[:-1].split(".")  
print("There are", num, \  
      "important subjects in school.")  
mess = subjects[:-1]:  
for item in mess:  
    print("Don't know much about", item)  
print("But I do know that", \  
      "I love computer " + subjects[2])
```

**Answer Key:**

```
There are 3 important subjects in school.  
Don't know much about history  
Don't know much about biology  
But I do know that I love computer science
```

- (b) Consider the following shell command and resulting output:

```
ls *.py  
averageImage.py          copenhagenTransit.py      gcContent.py  
averageImageAnswer.py   cropImage.py             growingSpiral.py  
blueImage.py            cropImage2.py            triangles.py
```

- i. What is the output for:  
ls \*wing\*.py

**Answer Key:**

```
growingSpiral.py
```

- ii. What is the output for:  
`ls *.py | grep age`

**Answer Key:**

```
averageImage.py
averageImageAnswer.py
blueImage.py
copenhagenTransit.py
cropImage.py
cropImage2.py
```

2. (a) After executing the Python code, write the name of the turtle:  
i. which is white:

**Answer Key:**

amy

```
import turtle
turtle.colormode(255)
```

```
amy = turtle.Turtle()
amy.color("#FFFFFF")
```

```
beth = turtle.Turtle()
beth.color(0,255,255)
```

```
meg = turtle.Turtle()
meg.color("#FF0000")
```

```
lisa = turtle.Turtle()
lisa.color(100,100,100)
```

- ii. which is gray:

**Answer Key:**

lisa

- iii. which is teal (blue-green):

**Answer Key:**

beth

- iv. which is brightest red:

**Answer Key:**

meg

- (b) Write the Python code for the following algorithm:

```
function makeUpperCase(inMsg)
    create an empty message
    for each letter in inMsg:
```

```
code = the Unicode of the letter
if code >= 97
    code = code - 32
convert the code to the corresponding Unicode character
concatenate the character to the beginning of the message
return the message
```

**Answer Key:**

```
def makeUpperCase(inMsg):
    mess = ""
    for letter in inMsg:
        code = ord(letter)
        if code >= 97:
            code = code - 32
        ch = chr(code)
        mess = mess + ch
    return(mess)
```

3. (a) What is the value (True/False) of out:

```
in1 = True
i. in2 = False
out = in1 or in2
```

**Answer Key:**

```
out = True
```

```
in1 = True
ii. in2 = False
out = in1 and not (in1 or in2)
```

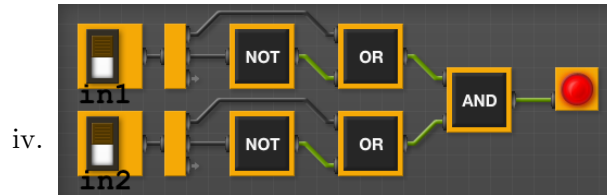
**Answer Key:**

```
out = False
```

```
in1 = True
in2 = True
iii. in3 = (in1 or in2)
out = in1 and not in3
```

**Answer Key:**

```
out = False
```



in1 = False

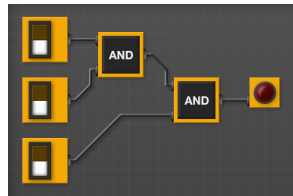
in2 = True

**Answer Key:**

out = True

(b) Design a circuit that takes three inputs that:

- returns true if all three inputs are true, and
- returns false otherwise.



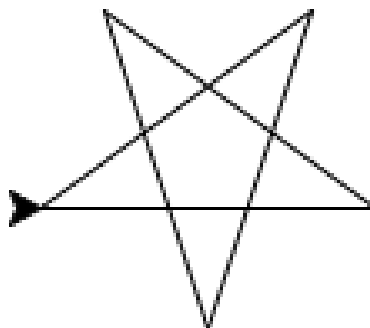
**Answer Key:**

4. (a) Draw the output of the program:

```
#Mystery program...
import turtle
```

```
tH = turtle.Turtle()
```

```
for i in range(5):
    tH.forward(100)
    tH.left(720/5)
```



**Answer Key:**

(b) What is the output:

i. For `truncate([10,2])`?

**Answer Key:**

2  
Best is 2

`#Mystery program`

```
def select(nums):
    m = nums[0]
    for n in nums:
        if n < m:
            m = n
            print(m)
    return(m)

def truncate(userList):
    if len(userList) < 5:
        best = select(userList)
    else:
        best = select(userList[2:])
    print("Best is", best)
```

ii. For `truncate([7,2,0,1])`?

**Answer Key:**

2  
0  
Best is 0

iii. For `truncate([0,2,10,9,1,-1])`?

**Answer Key:**

9  
1  
-1  
Best is -1

5. Write a **complete Python program** that

- asks the user for the name of a png file and
- prints the number of pixels that are very purple (the fraction of red and the fraction of blue are both above 0.75 and the fraction of green is below 0.25).

**Answer Key:**

```
#Name: CSci 127 Teaching Staff
#Date: Fall 2017
#Count number of purple pixels in an image

#Import the packages for images and arrays:
import matplotlib.pyplot as plt
import numpy as np
```

```

fileName = input('Enter file name: ')
img = plt.imread(fileName) #Read in image
countPurple = 0 #Number of pixels that are purple

#For every pixel:
for i in range(img.shape[0]):
    for j in range(img.shape[1]):
        if (img[i,j,0] > 0.75) and (img[i,j,1] < 0.25) and (img[i,j,2] > 0.75):
            countPurple = countPurple + 1

print("Purple count is", countPurple)

```

6. Write a **complete Python program** that will read:

- prompt the user for the name of a CSV file,
- prompt the user for the name of a column in that CSV file, and
- print out the minimum and maximum values of that column.

**Answer Key:**

```

#Prints the minimum and maximum values of inputted column
import pandas as pd

fileName = input('Enter file name: ')
colName = input('Enter column name: ')
df = pd.read_csv(fileName)
min = df[colName].min()
max = df[colName].max()
print("Minimum is ", min)
print("Maximum is ", max)

```

7. Fill in the following functions that maps GIS data from NYC OpenData CSV files:

- `getLocale()`: asks and returns the user for latitude and longitude,
- `makeMap()`: returns a map, centered at the current location, and
- `addMarkers()`: adds markers, from the GIS locations in a DataFrame to the map.

**Answer Key:**

```

import pandas as pd
import folium

def getLocale():
    """
    Asks the user for latitude and longitude of the user's current location and
    Returns those floating points numbers.
    """

```

```

    """
    lat = float(input('Enter current latitude: '))
    lon = float(input('Enter current longitude: '))
    return(lat, lon)

def makeMap(x,y):
    """
    Makes a map, m, centered at (x,y) and
    Returns m
    """
    m = folium.Map(location=[x, y], zoom_start=10)
    return m

def addMarkers(m,df):
    """
    Adds to map, m, markers for locations in columns df['Lat'] and df['Lon']
    Returns m
    """
    for index,row in df.iterrows():
        lat = df["Lat"]
        lon = df["Lon"]
        newMarker = folium.Marker([lat, lon])
        newMarker.add_to(m)
    return m

```

8. (a) What are the values of register, \$s0 for the run of this MIPS program:

```

#Sample program that loops from 50 down to 0
ADDI $s0, $zero, 50 #set s0 to 50
ADDI $s1, $zero, 10 #use to decrement counter, $s0
AGAIN: SUB $s0, $s0, $s1
BEQ $s0, $zero, DONE
J AGAIN
DONE: #To break out of the loop

```

**Values of \$s0:**

**Answer Key:**

50  
40  
30  
20  
10  
0

- (b) Write a MIPS program where the register, \$s0 loops through the values: 1,3,5,7

**Answer Key:**

```

#Program that loops from 1 up to 7, by twos
ADDI $s0, $zero, 1 #set s0 to 1
ADDI $s1, $zero, 2 #use to increment counter, s0
ADDI $s2, $zero, 7 #set s2 to use for comparison
AGAIN: ADD $s0, $s0, $s1
BEQ $s0, $s2, DONE
J AGAIN
DONE: #To break out of the loop

```

9. What is the output of the following C++ programs?

```

//Derek Bok
#include <iostream>
using namespace std;
int main()
(a) {
    cout << "If you think education" << endl;
    cout << " is expensive,\n Try ";
    cout << "ignorance.\n";
}

```

**Answer Key:**

```

If you think education
 is expensive,
Try ignorance. --Derek Bok

```

```

//Mystery C++, #2
#include <iostream>
using namespace std;
int main()
{
    int count = 0;
(b) while (count < 4) {
        cout << count<< endl;
        count = count + 2;
    }
    cout<<"Up!\n";
}

```

**Answer Key:**

```

0
2
Up!

```



```

//Mystery C++, #3
#include <iostream>
using namespace std;
int main()
{
    for (int i = 0; i < 5; i++) {
(c)    for (int j = 0; j < 5; j++)
        if ((i+j) % 2 == 0)
            cout << "+";
        else
            cout << "-";
        cout << endl;
    }
}

```

**Answer Key:**

```

+--+
-+--+
+--+
-+--+
+--+

```

10. (a) Write a **complete Python program** to print the fine for speeding. The program must read the speed from user input, then compute and print the fine. The fine is \$10 for each mph over 55 and less than or equal to 65, and \$15 for each additional mph over 65. For example, if the speed is 58 mph, then the fine would be \$30 = \$10 x 3. If the speed is 67 mph, then the fine would be \$130 = \$10 x 10 + \$15 x 2.

**Answer Key:**

```

def answer1():
    speed = eval(input("Enter the speed in mph:"))
    if (speed<55):
        print("No fine")
    else:
        fine = (speed - 55) * 10
        if speed > 65:
            fine = fine + (speed - 65) * 5
        print("The fine is", fine)

```

- (b) Write a **complete C++ program** that repeatedly prompts the user for their planned graduation year as a number until they enter a number that is 2017 or larger. Your program should print out the final number the user entered:

**Answer Key:**

```

//Checks input for positive number
#include <iostream>

```

```
using namespace std;
int main()
{
    int year;
    cout << "Please enter your planned graduation year: ";
    cin >> year;
    while (year < 2017) {
        cout << "You entered a year in the past.\n";
        cout << "Please enter your planned graduation year: ";
        cin >> year;
    }
    cout << "Year you are planning to graduate: " << year;
    return 0;
}
```