

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)
```

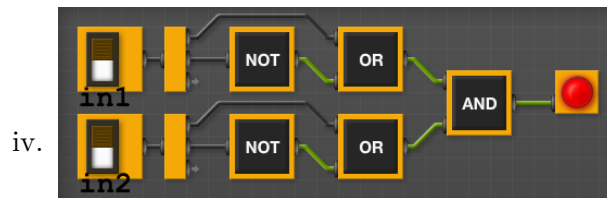
Answer Key:

```
out = True
```

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

Answer Key:

```
out = False
```



in1 = False

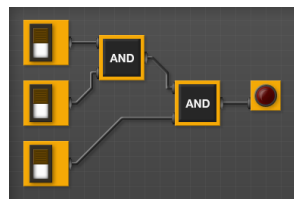
in2 = True

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...
```

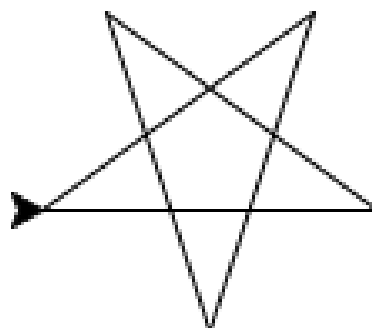
```
import turtle
```

```
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;
}
```