

FINAL EXAM, VERSION 1
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 = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
print("There are", num, "fun days in a week")
mess = days[0]
print("Two of them are", mess, days[-1])
result = ""
for i in range(len(mess)):
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Answer Key:

There are 3 fun days in a week
Two of them are Friday Sunday
My favorite day is Saturday.

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

```
ls *.html
closestCUNY.html      nycMap.html           t.html                th.html
cunySenior.html       recyc.html            tc.html               trash.html
```

- i. What is the output for:
ls *p.html

Answer Key:

```
nycMap.html
```

- ii. What is the output for:
`ls *.html | grep r | grep e`

Answer Key:

```
cunySenior.html  
recyc.html
```

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

Answer Key:

```
matt
```

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

- ii. which is pink:

Answer Key:

```
harmon
```

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

```
matt = turtle.Turtle()  
matt.color(0,0,0)
```

- iii. which is the brightest green:

Answer Key:

```
dennis
```

```
tim = turtle.Turtle()  
tim.color("#CCCCCC")
```

```
harmon = turtle.Turtle()  
harmon.color("#110000")
```

- iv. which is gray:

Answer Key:

```
tim
```

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

```
function makeLowerCase(inMsg)  
    create an empty message  
    for each letter in inMsg:  
        code = the Unicode of the letter  
        if code <= 90
```

```
        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 makeLowerCase(inMsg):
    mess = ""
    for letter in inMsg:
        code = ord(letter)
        if code <= 90:
            code = code + 32
        ch = chr(code)
        mess = mess + ch
    return(mess)
```

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

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

Answer Key:

```
out = True
```

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

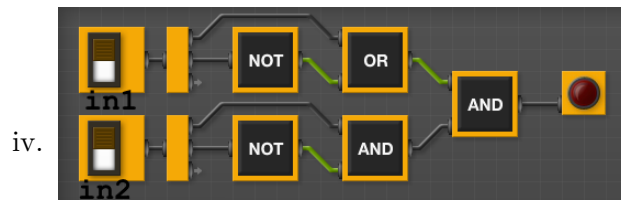
Answer Key:

```
out = True
```

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

Answer Key:

```
out = True
```



in1 = True

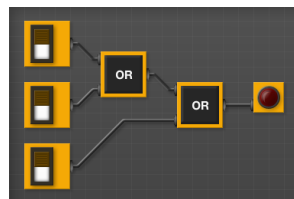
in2 = True

Answer Key:

out = False

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

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



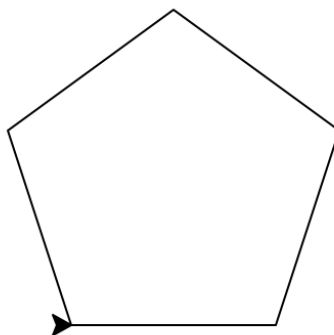
Answer Key:

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(360/5)
```



Answer Key:

(b) What is the output:

i. For `truncate([10,20])`?

Answer Key:

20

Best is 20

`#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) < 4:`

`best = select(userList)`

`else:`

`best = select(userList[:4])`

`print("Best is", best)`

ii. For `truncate([1,3,5,4])`?

Answer Key:

3

5

Best is 5

iii. For `truncate([1,2,3,4,100])`?

Answer Key:

2

3

4

Best is 4

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 bright red (the fraction of red is above 0.75 and the fraction of green, and the fraction of blue are below 0.25).

Answer Key:

`#Name: CSci 127 Teaching Staff`

`#Date: Fall 2017`

`#Count number of red 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
countRed = 0                  #Number of pixels that are bright red

#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] < 0.25):
            countRed = countRed + 1

print("Red count is", countRed)

```

6. Using folium, write a **complete Python program** that asks the user for name of the output file, and creates a map with markers for the following locations:

- Hunter College (latitude: 40.768731 and longitude: -73.964915)
- Empire State Building (latitude: 40.748441 and longitude: -73.985664)
- Statue of Liberty (latitude: 40.689249 and longitude: -74.0445)

Each marker should include a pop-up message with the name of the location.

Answer Key:

```

#Map locations:
import folium

outF = input('Enter output file: ')

mapNYC = folium.Map(location=[40.768731, -73.964915], tiles="Cartodb Positron", zoom_start=12)

hc = folium.Marker([40.768731, -73.964915], popup="Hunter College")
hc.add_to(mapNYC)
esb = folium.Marker([40.748441, -73.985664], popup="Empire State Building")
esb.add_to(mapNYC)
sol = folium.Marker([40.689249, -74.0445], popup="Statue of Liberty")
sol.add_to(mapNYC)

mapNYC.save(outfile=outF)

```

7. Fill in the following functions that creates a graph of the fraction of population over time:

- `getData()`: asks the user for the name of the CSV and returns a DataFrame of the contents,
- `makeFraction()`: creates a column of the fraction of the borough population, and
- `makeGraph()`: makes a graph of the x versus y columns specified.

Answer Key:

```
import pandas as pd
import matplotlib.pyplot as plt

def getData():
    """
    Asks the user for the name of the CSV. Returns a DataFrame of the contents.
    """
    fName = input('Enter current latitude: ')
    df = pd.read_csv(fName)
    return(df)

def makeFraction(df,top,total,frac):
    """
    Makes a new column, frac, of df that is df[top]/df[total]
    Returns the DataFrame, df
    """
    df[frac] = df[top]/df[total]
    return df

def makeGraph(df,xCol,yCol):
    """
    Makes a pyplot plot of x versus y column in DataFrame df
    """
    df.plot(x = xCol, y = yCol)
```

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

```
#Sample program that loops from 20 down to 0
ADDI $s0, $zero, 20 #set s0 to 20
ADDI $s1, $zero, 5  #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:

20
15
10
5
0

- (b) Write a MIPS program where the register, \$s0 loops through the values: 2,4,6,8,10

Answer Key:

```
#Program that loops from 2 up to 10, by twos
ADDI $s0, $zero, 2 #set s0 to 2
ADDI $s1, $zero, 2 #use to increment counter, s0
ADDI $s2, $zero, 10 #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?

```
//William Bulter Yeats
#include <iostream>
using namespace std;
int main()
{
(a)   cout << "Education is not " << endl;
      cout << "the filling of a pail,\n but ";
      cout << "the lighting of a fire.\n";
}
```

Answer Key:

```
Education is not
the filling of a pail,
but the lighting of a fire.
```

```
//Mystery C++, #2
#include <iostream>
using namespace std;
int main()
{
(b)   float count = 8.0;
      while (count > 2) {
          cout << count << "\n";
          count = count/2;
      }
      count << "Boom!\n";
}
```

Answer Key:

```
8.0
4.0
Boom!
```



```

//Mystery C++, #3
#include <iostream>
using namespace std;
int main()
{
    for (int i = 0; i < 5; i++) {
        for (int j = 5; j > i; j--) {
(c)      if (j % 2 == 1)
            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 \$15 for each mph over 60 and less than or equal to 70, and \$20 for each additional mph over 70. For example, if the speed is 63 mph, then the fine would be \$45 = \$15 x 3. If the speed is 72 mph, then the fine would be \$190 = \$15 x 10 + \$20 x 2.

Answer Key:

```

def answer1():
    speed = eval(input("Enter the speed in mph:"))
    if (speed < 60):
        print("No fine")
    else:
        fine = (speed - 60) * 15
        if speed > 70:
            fine = fine + (speed - 70) * 5
        print("The fine is", fine)

```

- (b) Write a **complete C++ program** that repeatedly prompts the user for the year they were born until they enter a number that is 2017 or smaller. 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 the year you were born: ";
    cin >> year;
    while (year > 2017) {
        cout << "You entered a year in the future.\n";
        cout << "Please enter the year you were born: ";
        cin >> year;
    }
    cout << "Year your were born: " << year;
    return 0;
}
```