

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

Fall 2017

Exam Rules

- Show all your work. Your grade will be based on the work shown.
- The exam is closed book and closed notes.
- When taking the exam, you may have with you pens, pencils, and an 8 1/2" x 11" piece of paper filled with notes, programs, etc.
- You may not use a computer, calculator, tablet, smart watch, or other electronic device.
- Do not open this exams until instructed to do so.

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I understand that all cases of academic dishonesty will be reported to the Dean of Students and will result in sanctions.

Name:

EmpID:

Signature:

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

```
months = ["Jan","Feb","Mar","Apr","May",\
"Jun","Jul","Aug","Sep","Oct","Nov","Dec"]
half = months[6]
print(half.upper())
print(half[0])
print(months[-1].lower())
print(months[2:4])
start = 9
print(months[start-1])
term = 3
print(months[(start+term-1)%12])
```

Answer Key:

```
JUL
J
dec
['Mar', 'Apr']
Sep
Dec
```

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

```
ls t*
t.html          test.png        trash.html      turtle2.py
tc.htmk         testSubprocess.py trashCans.csv   turtle3.py
tc.html         th.html         triangles.py

test:
herd.py         makeDirs*      projectFiles/
```

- i. What is the output for:
`ls t*.png`

Answer Key:

```
test.png
```

- ii. What is the output for:
`ls t* | grep ".p" | sort`

Answer Key:

```
herd.py
test.png
```

```
testSubprocess.py
triangles.py
turtle2.py
turtle3.py
```

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

Answer Key:

banana

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

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

```
banana = turtle.Turtle()
banana.color(255,255,255)
```

```
cherry = turtle.Turtle()
cherry.color("#AA00AA")
```

```
date = turtle.Turtle()
date.color("#0000FF")
```

- ii. which is black:

Answer Key:

apple

- iii. which is the brightest blue:

Answer Key:

date

- iv. which is purple:

Answer Key:

cherry

- (b) Fill in the code below to make an image in which a pixel is blue if it has a non-positive entry in the array `elevations`. Otherwise, the pixel should be colored green.

```
# Takes elevation data of NYC and displays a map
import numpy as np
import matplotlib.pyplot as plt
elevations = np.loadtxt('elevationsNYC.txt')
#Base image size on shape (dimensions) of the elevations:
mapShape = elevations.shape + (3,)
floodMap = np.zeros(mapShape)

for row in range(mapShape[0]):
```

```
for col in range(mapShape[1]):
```

Answer Key:

```
    if elevations[row,col] <= 0:
        #Below sea level
        floodMap[row,col,2] = 1.0      #Set the blue channel to 100%
    else:
        #Above sea level
        floodMap[row,col,1] = 1.0     #Set the green channel to 100%

#Save the image:
plt.imsave('floodMap.png', floodMap)
```

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

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

Answer Key:

```
out = False
```

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

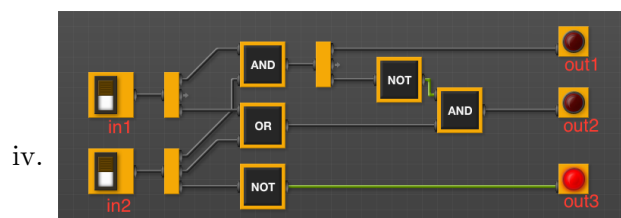
Answer Key:

```
out = True
```

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

Answer Key:

```
out = False
```



```
in1 = False
in2 = False
```

Answer Key:

```
out1 = False
```

```
out2 = False
```

- (b) Design a circuit that takes a single input and always outputs True.

**Answer Key:**

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

```
#Mystery program...
```

```
import turtle
```

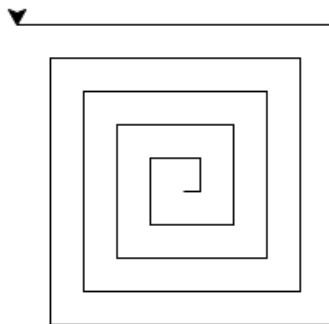
```
tH = turtle.Turtle()
```

```
for i in range(10,255,10):
```

```
    tH.color((i,i,i))
```

```
    tH.forward(i)
```

```
    th.left(90)
```

**Answer Key:**

- (b) What is the output:

```
#Another mystery program...
```

```
def rest(s, num):
```

```
    b = 16
```

```
    while b > 0.5:
```

```
        if num >= b:
```

```
            s = s + "1"
```

```
        else:
```

```
            s = s + "0"
```

```
        num = num % b
```

```
        b = b / 2
```

```
    return(s)
```

```
def convert(n):
```

```
    returnS = ""
```

```
    if n < 0:
```

```
        returnS = rest("1", n+32)
```

```
    else:
```

```
        returnS = rest("0", n)
```

```
    return(returnS)
```

```
n = int(input("Enter a number: "))
```

```
s = convert(n)
```

```
print("Output is", s)
```

i. When the user enters: 2?

Answer Key: Output is 000010

ii. When the user enters: 31?

Answer Key: Output is 011111

iii. When the user enters: -1?

Answer Key: Output is 111111

5. 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 average and standard deviation.

Answer Key:

```
#Computes average and standard deviation of inputted column
```

```
import pandas as pd
```

```
fileName = input('Enter file name: ')
```

```
colName = input('Enter column name: ')
```

```
df = pd.read_csv(fileName)
```

```
ave = df[colName].mean()
```

```
std = df[colName].std()
```

```
print("Average is ", ave)
```

```
print("Standard deviation is ", std)
```

6. Using **folium** and **pandas**, write a **complete Python program** that asks the user for the name of a CSV file, name of the output file, and creates a map with markers for all the 311 complaints from the input file.

Answer Key:

```
#Collisions program
import folium
import pandas as pd

inF = input('Enter CSV file name: ')
outF = input('Enter output file: ')
df = pd.read_csv(inF)

map311 = folium.Map(location=[40.768731, -73.964915], tiles="Cartodb Positron", zoom_start=12)

for index, row in df.iterrows():
    lat = row["LATITUDE"]
    lon = row["LONGITUDE"]
    name = row["TIME"]
    newMarker = folium.Marker([lat, lon], popup=name)
    newMarker.add_to(map311)

map311.save(outfile=outF)
```

7. Complete the following Python program, which creates a green turtle, draws a decagon (10-sided figure) to the window, and then prints a closing message. That is, write the functions `setUp()`, `drawDecagon()`, and `conclusion()`:

```
import turtle

def main():
    t = setUp()      #creates a green turtle
    drawDecagon(t)   #draws a decagon using the turtle
    conclusion()     #prints goodbye

if __name__ == "__main__":
    main()
```

Answer Key:

```
def setUp():
    trey = turtle.Turtle()
    trey.color("green")
    return(trey)

def drawDecagon(t):
    for i in range(10):
        t.forward(100)
        t.right(360/10)

def conclusion():
```

```
print("Goodbye!")
```

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

```
#Sample program that loops from 10 down to 0
ADDI $s0, $zero, 10 #set s0 to 10
ADDI $s1, $zero, 2  #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:

10
8
6
4
2
0

- (b) Write a MIPS program where the register, \$s0 loops through the values: 1,2,3,4,5

Answer Key:

```
#Program that loops from 1 upto 5
ADDI $s0, $zero, 1  #set s0 to 1
ADDI $s1, $zero, 1  #use to increment counter, s0
ADDI $s2, $zero, 5  #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?

```
//Mystery C++
#include <iostream>
using namespace std;
int main()
(a) {
    cout << "Get your education" << endl;
    cout << "Don't forget from ";
    cout << "whence you came\n";
}
```

Answer Key:


```

Get your education
Don't forget from whence you came

//Mystery C++, #2
#include <iostream>
using namespace std;
int main()
{
(b)   int count = 0;
      while (count < 8) {
          cout << "The world turned upside down\n";
          count = count + 2;
      }
}

```

Answer Key:

```

The world turned upside down...
The world turned upside down...
The world turned upside down...
The world turned upside down...

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

```

Answer Key:

```

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

```

10. (a) Write a **complete Python program** that prompts the user to enter 5 numbers and prints out the total of the numbers entered.

Answer Key:

```
#Asks for 5 numbers and prints total
total = 0
for i in range(5):
    n = float(input('Enter a number: '))
    total = total + n
print("Total is", total)
```

- (b) Write a **complete C++ program** that repeatedly prompts the user for a number until one that is strictly larger than 0 is entered. 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()
{
    cout << "Please enter age: ";
    int age = 0;
    cin >> age;
    while (age < 0) {
        cout << "You entered a negative number.\n";
        cout << "Please enter age: ";
        cin >> age;
    }
    cout << "You entered your age as: " << age;
    return 0;
}
```