

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

11 July 2018

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.
- Only write on the front side of each page (backs of pages are not scanned nor graded).

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

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:

i. `a = "Jul^Aug^Sep^Oct^Nov^Dec"`
`print(a.count("^"))`

Output:

ii. `b = a.split("^")`
`print(b[0])`

Output:

iii. `mo = b[-1].upper()`
`print(mo)`

Output:

iv. `for c in mo:`
`print(c.lower())`

Output:

(b) Consider the following shell commands:

```
$ ls -l
-rw-r--r--@ 1 stjohn  staff      5308 Mar 21 14:38 quizzes.html
-rw-r--r--  1 stjohn  staff      54013 Apr 20 18:57 zoneDist.csv
-rw-r--r--@ 1 stjohn  staff      1519 Apr 22 15:14 zoneMap.py
-rw-r--r--  1 stjohn  staff    16455174 Mar 20 19:02 zoning2.html
-rw-r--r--  1 stjohn  staff    17343896 Mar 20 18:58 zoningIDS.json
```

i. What is the output for:

```
$ ls *IDS*
```

Output:

ii. What is the output for:

```
$ ls *zo* | grep "ing"
```

Output:

iii. What is the output for:

```
$ ls *zo* | grep "ing" | wc -l
```

Output:

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

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

i. which is red:

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

ii. which is pink:

```
yasmeen = turtle.Turtle()
yasmeen.color(1.0,0,0)
```

iii. which is green:

```
jakub = turtle.Turtle()
jakub.color("#AAAAAA")
```

iv. which is gray:

```
nicky = turtle.Turtle()
nicky.color("#880000")
```

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

```
Ask user for a number, and store in decNum.
Set binString = "".
While decNum > 0:
    If decNum is even:
        Set lead to be "0"
    else
        Set lead to be "1"
    Let binString be lead + binString
    Set decNum to be half of decNum.
Print binString
```

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

in1 = False

i. in2 = True

out = in1 or in2

out =

in1 = False

ii. in2 = False

out = not in1 or (in2 and in1)

out =

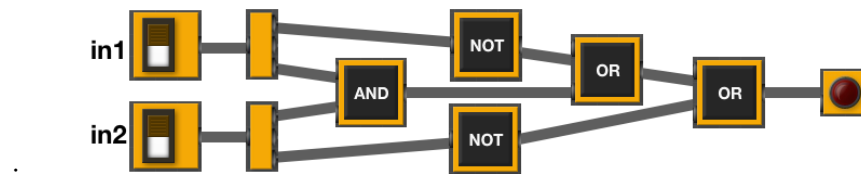
in1 = True

iii. in2 = False or not in1

in3 = in1 and in2

out = in1 or not in3

out =



iv.

in1 = False

in2 = False

out =

(b) Design a circuit that implements the logical expression:

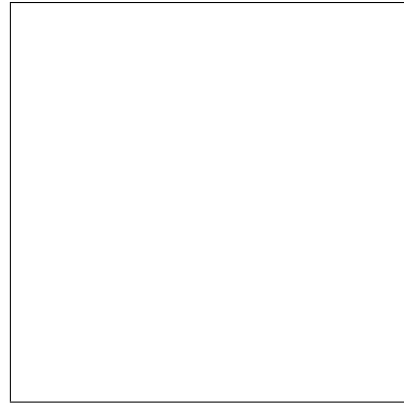
$((in1 \text{ or } in2) \text{ and } (in1 \text{ or } in3)) \text{ and } (in2 \text{ or } in3)$

4. (a) Draw the output for the function calls:

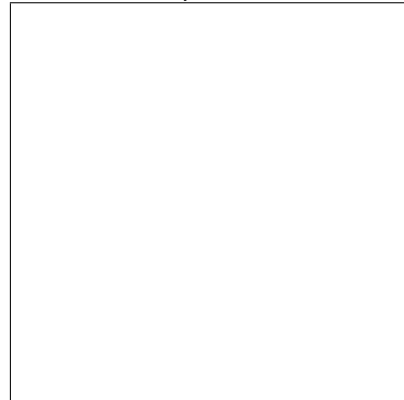
```
import turtle
tess = turtle.Turtle()
tess.shape("turtle")

def ramble(t,side):
    if side == 0:
        t.stamp()
    else:
        for i in range(side):
            t.forward(50)
            t.left(360/side)
```

i. `ramble(tess,0)`



ii. `ramble(tess,8)`



(b) For the following code:

```
def v4(antonio, carol):
    if antonio + carol < 10:
        return antonio
    else:
        return -1
```

```
def start():
    jack = 5
    dandan = 20
    ekaterina = v4(jack,dandan)
    return ekaterina
```

i. What are the formal parameters for `v4()`:

ii. What are the formal parameters for `start()`:

iii. What value does `start()` return:

5. Write a **complete Python program** that asks the user for nouns (separated by spaces) and prints the number that are plural.

To simplify the program, assume that all plural nouns end in “s”.

For example:

- If the user entered: `shoe socks sweater suits`
- Your program should print: `2`

6. Write a **complete Python program** that asks the user for the name of a .png (image) file and displays the lower left quarter of the image.

For example if the image is `hunterLogo.png` (left), the displayed image would be (right):



7. Fill in the following functions that are part of a program that analyzes NYC Urban Forest of street trees (from NYC OpenData):

- `getData()`: asks the user for the name of the CSV file and returns a DataFrame of the contents.
- `biggestDiameter()`: returns the largest diameter (`tree_dbh`) in the DataFrame, and
- `makeGraph()`: makes a plot of the x versus y columns specified.

```
import pandas as pd
```

```
def getData():
```

```
    """
```

```
    Asks the user for the name of the CSV and  
    Returns a dataframe of the contents.
```

```
    """
```

```
def biggestDiameter(df):
```

```
    """
```

```
    Takes a DataFrame as input.  
    Returns the maximum value in the column, tree_dbh..
```

```
    """
```

```
def makeGraph(df, xCol, yCol):
```

```
    """
```

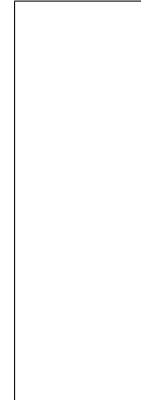
```
    Makes a pyplot plot of x versus y columns of DataFrame df
```

```
    """
```


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

```
#Sample program that loops from 10 down to 2
ADDI $s0, $zero, 10 #set s0 to 10
ADDI $s1, $zero, 2  #use to decrement counter, $s0
ADDI $s2, $zero, 2  #use to compare for branching
AGAIN: SUB $s0, $s0, $s1
BEQ $s0, $s2, DONE
J AGAIN
DONE:  #To break out of the loop
```

Values of \$s0:



- (b) Write a MIPS program where the register, \$s0 loops through the values: 2,6,10,14

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

```
//Walt Whitman
#include <iostream>
using namespace std;
int main()
{
    cout << "The future is\nno more";
    cout << " unctain than" << endl;
(a)  cout << "the present."<< endl;
    cout << "--W. Whitman";
}
```

Output:

```
//Greetings!
#include <iostream>
using namespace std;
int main()
{
    cout << "Begin" << endl;
    int x = 2;
(b)  while (x > 2) {
        cout <<"Again\n";
        x--;
    }
    cout << "End"
}
```

Output:

```
//Pluses and minuses
#include <iostream>
using namespace std;
int main()
{
    int i, j;
    for (i = 1; i <= 5; i++)
    {
(c)  for (j = 1; j <= 5; j++)
        if ((i+j) % 2 == 0)
            cout << "+";
        else
            cout << "-";
        cout << endl;
    }
}
```

Output:

10. (a) Write a **complete Python program** that prompts the user for a password. If the user entered a string with fewer than 8 characters, the program repeatedly asks until a string with 8 or more characters is entered. The program then prints the string that was entered.

- (b) Write a **complete C++ program** that prints the change in population of predator and prey following the Lotka-Volterra model:

$$\begin{aligned}r &= 1.5r - .2rf \\f &= 0.95f + .1rf\end{aligned}$$

where r is the number of prey (such as rabbits) each year and f is the number of predators (such as foxes) each year. The rabbit population increases by 50% each year, but $\frac{rf}{5}$ are eaten by foxes. The fox population decreases by 5% due to old age but increases in proportion to the food supply, $\frac{rf}{10}$. Assume that the starting population of prey (rabbits) is 500 and starting population of predators (foxes) is 10. Your program should print for the first 10 years: the year, the number of prey and the number of predators.