Exam Rules

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

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:  

Email:

Signature:
## ASCII TABLE

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</table>
1. (a) What will the following Python code print:

```python
pioneers="Asimov%Isaac#Shelley%Mary#Gibson%William"
num = pioneers.count('%')
num = num + pioneers.count('#') + 2
print(pioneers[len(pioneers)-num:].lower())
```

Output:

```bash
count('%')
```

```bash
num = num + pioneers.count('#') + 2
```

```bash
print(pioneers[len(pioneers)-num:].lower())
```

Output:

```bash
names = pioneers.split('#')
m = names[1]
print(m[-4]+'. '+m[:7])
```

Output:

```bash
for n in names:
    print(n.split('%')[0][0])
```

Output:

(b) Consider the following shell commands:

```
$ pwd
/Users/login/temp
$ ls
csBridge.png Elevations.csv p25.py p27.py
```

i. What is the output for:

```
$ mkdir hwk
$ mv *.p* hwk
$ ls
```

Output:

```
csBridge.png Elevations.csv
```

ii. What is the output for:

```
$ cd hwk
$ ls | grep ^p | wc -l
```

Output:

```
```

iii. What is the output for:

```
$ pwd
$ cd ../
$ pwd
```

Output:
2. (a) Consider the code:

```python
import turtle
thomasH = turtle.Turtle()
```

i. After the command: `thomasH.color("#1B1B1B")`, what color is `thomasH`?

□ black  □ red  □ white  □ gray  □ teal

ii. After the command: `thomasH.color("#00AAAA")`, what color is `thomasH`?

□ black  □ red  □ white  □ gray  □ teal

iii. Fill in the code below to change `thomasH` to be the color white:

```python
thomasH.color("#\_
```

iv. Fill in the code below to change `thomasH` to be the brightest purple:

```python
thomasH.color("#
```

(b) Fill in the code to produce the output on the right:

i. ```python
for i in range(\_
```

   ```python
   print(i, end=" ")
```

   ```python
   Output:
   0 1 2 3 4 5 6 7 8 9
   ```

ii. ```python
for j in range(\_,\_,\_):
```

   ```python
   print(i, end=" ")
```

   ```python
   Output:
   -2 0 2 4 6
   ```

iii. ```python
import numpy as np
import matplotlib.pyplot as plt
im = np.ones((10,10,3))
im[\_,\_:5,\_] = 0
plt.imshow(im)
plt.show()
```

iv. ```python
import numpy as np
import matplotlib.pyplot as plt
im = np.ones((10,10,3))
im[0:\_,\_:2,\_] = 0
plt.imshow(im)
plt.show()
```
3. (a) What is the value (True/False):

\[
\text{in1} = \text{False} \\
\text{i. in2} = \text{True} \\
\text{out} = \text{in1 or in2} \\
\text{□ True} \quad \text{□ False}
\]

\[
\text{in1} = \text{True} \\
\text{ii. in2} = \text{True} \\
\text{out} = \text{not in1 or (in2 and not in2)} \\
\text{□ True} \quad \text{□ False}
\]

\[
\text{in1} = \text{True} \\
\text{iii. in2} = \text{True or not in1} \\
\text{in3} = \text{in1 or in2} \\
\text{out} = \text{in1 and not in3} \\
\text{□ True} \quad \text{□ False}
\]

\[
\text{iv. in1} = \text{True} \\
\text{in2} = \text{False} \\
\text{in3} = \text{False} \\
\text{□ True} \quad \text{□ False}
\]

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

\[((\text{in1 or in2}) \text{ and (not in2))}\]

(c) Fill in the circuit that implements the logical expression:

\[(((\text{in1 or (in1 and not in2)})) \text{ and (in3 or not in3))}\]
4. (a) Draw the output for the function calls:

```
1: import turtle
2: tess = turtle.Turtle()
3: tess.shape('turtle')

4: def ramble(t, len):
   5: if len <= 10:
      6: t.stamp()
   7: elif len%2 == 0:
      8: t.left(90)
      9: t.forward(len)
     10: ramble(t, len//2)
   11: else:
      12: t.right(90)
      13: t.forward(len)
     14: ramble(t, len//2)
```

i. `ramble(tess, 8)`

ii. `ramble(tess, 180)`

(b) What are the formal parameters for `ramble()`:

(c) If you call `ramble(tess, 8)`, which branches of the function are tested (check all that apply):

- [ ] The block of code at Line 6.
- [ ] The block of code at Lines 8-10.
- [ ] The block of code at Lines 12-14.
- [x] None of these blocks of code (lines 6, 8-10, 12-14) are visited from this invocation (call).

(d) If you call `ramble(tess, 180)`, which branches of the function are tested:

- [ ] The block of code at Line 6.
- [x] The block of code at Lines 8-10.
- [ ] The block of code at Lines 12-14.
- [x] None of these blocks of code (lines 6, 8-10, 12-14) are visited from this invocation (call).
Consider the driving times from Hunter College to LaGuardia Airport using the different routes which factors in delays due to traffic ($x$ cars) already en route:

- $T_{RFK}(x) = 14 + \frac{x}{10000}$, the time, in minutes, for the Triborough/RFK bridge route.
- $T_{KQB}(x) = 18 + \frac{x}{5000}$, the time, in minutes, for the Koch Queensboro bridge route.
- $T_{Tun}(x) = 16 + \frac{x}{10000}$, the time, in minutes, for the Queens Midtown Tunnel route.

Design an algorithm that, given the current status of traffic at any given moment, suggests the best route.

- **Input:**

- **Output:**

- **Process (as a list of steps):**
6. Given the YouTube dataset of top-trending videos in 2017, a snapshot given in the image below:

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<th>title</th>
<th>channel_title</th>
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<th>likes</th>
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<td>17.14.11</td>
<td>Racist Superi Rudy Mancuso</td>
<td>2017-11-12T19:05:23</td>
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Fill in the Python program below:

#P6, Mock: extracts data about indifferent views and about videos
#with highest number of likes
#Import the libraries for data frames and plotting data:

def extract_data():
    #Prompt user for input file name:
    csvFile = input("Enter CSV file name: ")
    #Read input data into data frame:
    youtube = pd.read_csv(csvFile)
    #Calculate a new column for the number of indifferent views
    #(i.e. those views that did not like nor dislike)
    youtube['indifferent_views'] = youtube['likes'] - youtube['dislikes']
    #Print the maximum number of indifferent views on a video
    print(youtube['indifferent_views'].max())
    #Group videos by channel to find out the maximum number of likes on each channel
    channelLikes = youtube.groupby(['channel_title', 'likes']).max()
    #Print the top 5 channels with largest number of likes
    print(channelLikes)
7. Write a complete Python program that prompts the user for the name of an .png (image) file and prints the fraction of pixels that are grayscale, or a shade of gray. Recall that a pixel is a shade of gray if the red, green, and blue values are all equal.
8. (a) What does the following MIPS program print:

**Output:**

(b) Modify the program to print out 10 consecutive letters starting with 'K'. Shade in the box for each line that needs to be changed and rewrite the instruction in the space below.

- ADDI $sp, $sp, -6  # Set up stack
- ADDI $t0, $zero, 75  # Start $t0 at 75 (K)
- ADDI $s2, $zero, 83  # Use to test when you reach 83 (S)
- SETUP: SB $t0, 0($sp)  # Next letter in $t0
- ADDI $sp, $sp, 1  # Increment the stack
- ADDI $t0, $t0, 2  # Increase the letter by 2
- BEQ $t0, $s2, DONE  # Jump to done if $t0 == 83
- J SETUP  # If not, jump back to SETUP for loop
- DONE: ADDI $t0, $zero, 0  # Null (0) to terminate string
- SB $t0, 0($sp)  # Add null to stack
- ADDI $sp, $sp, -6  # Set up stack to print
- ADDI $v0, $zero, 4  # 4 is for print string
- ADDI $a0, $sp, 0  # Set $a0 to stack pointer for printing
- syscall  # Print to the log
9. What is the output of the following C++ programs?

(a) //Quote by Mary Shelley
#include <iostream>
using namespace std;
int main()
{
    cout<>"Invention, it must be ";
    cout<>"humbly admitted, does not ";
    cout<>"consist in ";
    cout<>"creating"<>endl<>"out of ";
    cout<>"void, but out of chaos. ";
    cout<>"M.S.";
    return 0;
}

(b) 
#include <iostream>
using namespace std;
int main()
{
    double tot = 0;
    cout <>"Please enter amount \n";
    cin >> tot;
    while (tot > 100) {
        tot = tot - (tot * 0.5);
        cout << tot << endl;
    }
    return 0;
}

(c) 
#include <iostream>
using namespace std;
int main()
{
    int i, j;
    for (i = 1; i < 6; i++){
        for (j = 1; j < 6; j++){
            if(j % 2 == 1)
                cout <> i;
            else
                cout <> j;
        }
    cout <> endl;
    return 0;
}
10. Write a complete C++ program that repeatedly asks the user for their score on a programming assignment until the entered score is a negative number. The program then prints the average programming assignment score. The negative number simply indicates that the user has finished entering scores and it is not included in the average.