

Row:	SEAT:

MOCK FINAL EXAM
 CSci 127: Introduction to Computer Science
 Hunter College, City University of New York
 17 May 2022

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, earbuds, or other electronic device.
- **Do not open this exam 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.									
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ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	`
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
2	2	[START OF TEXT]	34	22	"	66	42	B	98	62	b
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	c
4	4	[END OF TRANSMISSION]	36	24	\$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27	'	71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	(	72	48	H	104	68	h
9	9	[HORIZONTAL TAB]	41	29	)	73	49	I	105	69	i
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	j
11	B	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	l
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[ENG OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

(Image from wikipedia commons)

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

i. `a = "Jan&Feb&Mar&Apr&May&Jun"`
`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 ligorio  staff      5308 Mar 21 14:38 quizzes.html
-rw-r--r--  1 ligorio  staff         413 Apr 20 18:57 zoneDist.csv
-rw-r--r--@ 1 ligorio  staff      519 Apr 22 15:14 zoneMap.py
-rw-r--r--  1 ligorio  staff 16455174 Mar 20 19:02 zoning2.html
-rw-r--r--  1 ligorio  staff 17343896 Mar 20 18:58 zoningIDS.json
```

i. What is the output for:

```
$ ls *zz*
```

Output:

ii. What is the output for:

```
$ ls -l | grep "Apr"
```

Output:

iii. What is the output for:

```
$ ls -l | grep "Apr" | wc -l
```

Output:

2. (a) For each row below containing a binary, decimal, and hexadecimal number, circle the **largest value** in the row (or “All Equal” if all three entries have the same value):

	Binary:	Decimal:	Hexadecimal:	All Equal
a)	10	2	2	<i>All Equal</i>
b)	1100	12	C	<i>All Equal</i>
c)	10010	18	12	<i>All Equal</i>
d)	100000	34	19	<i>All Equal</i>
e)	1111110	250	FE	<i>All Equal</i>

- (b) Fill in the code below to make an image in which a pixel is white if it has an entry of 0 in the array `elevations`. Otherwise, the pixel should be colored green.

```
# Takes elevation data of NYC and displays coastlines
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]):

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

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

in1 = True
 i. in2 = False
 out = (not in1) and (not in2)

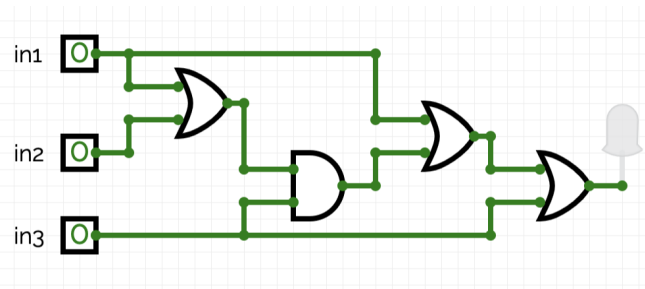
out =

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

out =

iii. in1 = not False
 in2 = not False or False
 in3 = not in1 or not in2
 out = not in2 and not in3

out =



iv.

in1 = False
 in2 = True
 in3 = False

out =

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

$(\text{not } (\text{in1 or in2}) \text{ and } (\text{not in2})) \text{ or } (((\text{in2 and not in3}) \text{ or } \text{in3}) \text{ and } \text{not in3})$

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

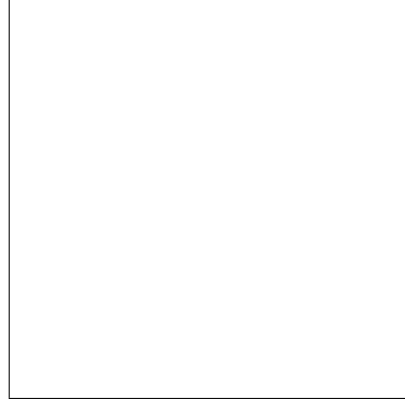
```
import turtle
```

```
def mystery1(tess, x, y):  
    for i in range(2):  
        tess.forward(x)  
        tess.left(90)  
        tess.forward(y)  
        tess.left(90)
```

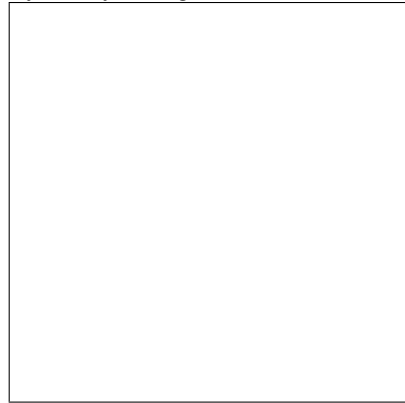
```
def mystery2(tina, s):  
    mystery1(tina, s, s)
```

```
taj = turtle.Turtle()
```

- i. `mystery1(taj, 100, 20)`



- ii. `mystery2(taj, 100)`



- (b) Given the function definitions:

```
def enigma(n):  
    for i in range(1,n+1):  
        help(i)  
        print()
```

```
def help(x):  
    for j in range(x):  
        print((x+j)*2, end=' ')
```

- i. What is the output for `enigma(5)`?

5. Design an algorithm that asks the user for the name of a text file containing a grid of numbers and loads it into a 2D array of integers (think like an image without the color channel), then outputs the index (`row`, `col`) of the SMALLEST number in the array.

Libraries:

Input:

Output:

Design Pattern:

- Search Find Min Find Max Find All

Principal Mechanisms (select all that apply):

- Single Loop Nested Loop Conditional (if/else) statement
 Indexing / Slicing `split()` `input()`

Process (as a concise and precise LIST OF STEPS / pseudocode):

(Assume libraries have already been imported.)

6. Write a **complete Python program** that asks the user for the name of a .png (image) file and displays the upper right 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 maps GIS data from NYC OpenData CSV files:

- `getData()`: asks the user for the name of the CSV and returns a DataFrame of the contents.
- `getLocale()`: asks the user for latitude and longitude of the user's current location and returns those floating points numbers, and
- `computeDist()`: computes the squared distance between two points (x_1, y_1) and (x_2, y_2) :

$$(x_1 - x_2)^2 + (y_1 - y_2)^2$$

```
import pandas as pd
```

```
def getData():
```

```
    """
```

```
    Asks the user for the name of the CSV and
```

```
    Returns a dataframe of the contents.
```

```
    """
```

```
def getLocale():
```

```
    """
```

```
    Asks the user for latitude and longitude of the user's current location and
```

```
    Returns those floating points numbers.
```

```
    """
```

```
def computeDist(x1,y1,x2,y2):
```

```
    """
```

```
    Computes the squared distance between two points  $(x_1, y_1)$  and  $(x_2, y_2)$  and
```

```
    Returns  $(x_1 - x_2)^2 + (y_1 - y_2)^2$ 
```

```
    """
```

8. (a) What is printed by the MIPS program below:

Output:

- (b) Modify the program to print out 99 copies of the character '!'. Shade in the box for each line that needs to be changed and rewrite the instruction below.

- ADDI \$sp, \$sp, -6 # Set up stack

- ADDI \$s3, \$zero, 1 # Store 1 in a register

- ADDI \$t0, \$zero, 33 # Set \$t0 at 33 (!)

- ADDI \$s2, \$zero, 5 # Use to test when you reach 5

- SETUP: SB \$t0, 0(\$sp) # Next letter in \$t0

- ADDI \$sp, \$sp, 1 # Increment the stack

- SUB \$s2, \$s2, \$s3 # Decrease the counter by 1

- BEQ \$s2, \$zero, DONE # Jump to done if \$s0 == 0

- 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, -5 # 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. Fill in the C++ programs below to produce the Output on the right.

```

#include <iostream>
using namespace std;
int main()
{
    for(int i = 0; i <=30; ) {
        cout << i*2 << endl;
    }
    return 0;
}

```

(a)

Output:

0
20
40
60

```

#include <iostream>
using namespace std;
int main()
{
    int count = 5;
    int num = 2;
    while(count  && num ) {
        cout << count << " " << num << endl;
        count -=1;
        if(count % 2 == 0)
            num -=1;
    }
    return 0;
}

```

(b)

Output:

5 2
4 1
3 1
2 0
1 0

```

#include <iostream>
using namespace std;
int main(){
    for (int i = 5; ; i--){
        cout << "Still counting!" << endl;
    }
    return 0;
}

```

(c)

Output:

Still counting!
Still counting!
Still counting!
Still counting!
Still counting!
Still counting!
Still counting!
Still counting!
Still counting!
Still counting!

10. (a) Translate the following program into a **complete C++ program**:

```
#Python Loops, V3:  
for i in range(0,50,5):  
    print(i)
```

- (b) Write a **complete C++ program** to compute the ticket price to enter the Museum of Natural History. Your program must ask the user for their age and print “Child: \$12.50” if the age entered is 12 or less, “Adult: \$22.00” if the age entered is less than 65, and “Senior: \$17.00” otherwise.