

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

December 05, 2023

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 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:

Signature:

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:

```
wList = "Mon&Tues&Wednes&Thurs&Fri&Satur&Sun"
weeks = wList.split("&")
tgit = weeks[3]
print(tgit.upper())
print(weeks[-1])
for i in range(0,6,2):
    day = weeks[i]+"day"
    print(i,day)
```

Output:

- (b) Consider the following shell commands:

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

- i. What is the output for:

Output:

```
$ ls -l *z* | grep ".html"
```

- ii. What is the output for:

Output:

```
$ ls -l *z* | grep ".html" | wc -l
```

2. (a) Select the correct option.

i. What color is tina after this command? `tina.color(103, 103, 103)`

☐ black ☐ red ☐ white ☐ gray ☐ green

ii. Select the LARGEST Binary number:

☐ 1011 ☐ 1101 ☐ 0111 ☐ 1010 ☐ 0110

iii. Select the LARGEST Hexadecimal number:

☐ AA ☐ EA ☐ EF ☐ FC ☐ CD

iv. What is the binary number equivalent to decimal 9?

☐ 1011 ☐ 1001 ☐ 1100 ☐ 1010 ☐ 1110

v. What is the hexadecimal number equivalent to decimal 43?

☐ 34 ☐ A2 ☐ B4 ☐ 2B ☐ CD

(b) Fill in the code below to make an image in which a pixel is blue if it has an entry of 10 or less in the array `elevations`. Otherwise, the pixel should be colored green.

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

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

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

i. $\text{in1} = \text{True}$
 $\text{in2} = \text{False}$
 $\text{out} = \text{in1 and in2}$

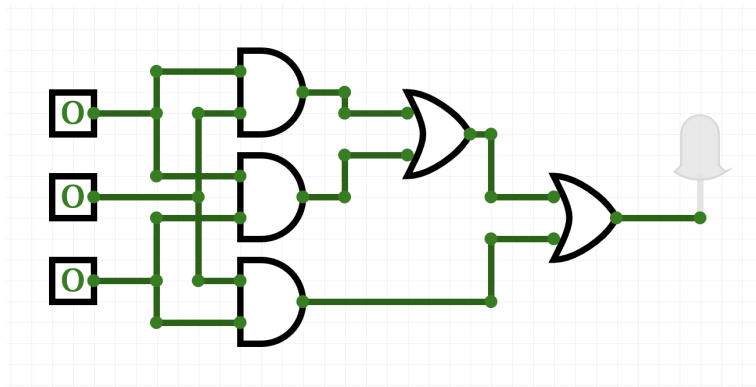
out =

ii. $\text{in1} = \text{False}$
 $\text{in2} = \text{True}$
 $\text{out} = \text{not in1 and (in2 or not in1)}$

out =

iii. $\text{in1} = \text{True}$
 $\text{in2} = \text{False or not in1}$
 $\text{in3} = \text{in1 and in2}$
 $\text{out} = \text{in1 or not in3}$

out =



iv. $\text{in1} = \text{False}$
 $\text{in2} = \text{False}$
 $\text{in2} = \text{False}$

out =

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

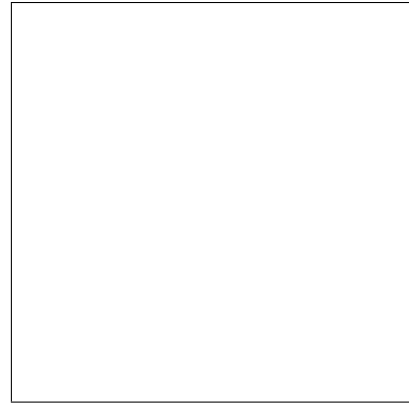
$((\text{not in1}) \text{ and } (\text{in1 or in2})) \text{ or } (\text{not in3})$

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

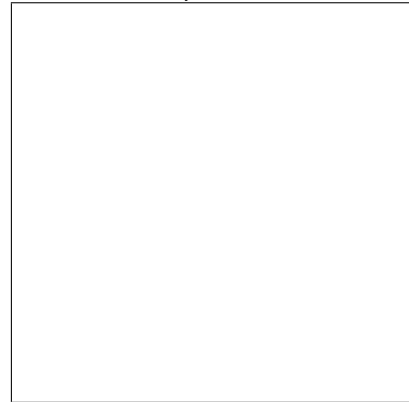
```
import turtle
tess = turtle.Turtle()
tess.shape("turtle")

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,4)`



- (b) What is the output:

```
#Another mystery program...
#mystery
def mystery(num):
    send = chr(num)
    if num < ord("k"):
        send = send + send
    return send

def enigma(letters):
    mess = ""
    for l in letters:
        n = ord(l)
        c = mystery(n)
        mess = mess + c
    return mess

word = input("Enter a word: ")
s = enigma(word)
print("Output is:", s)
```

- i. When the user enters: `aa`?

Output:

- ii. When the user enters: `cab`?

Output:

- iii. When the user enters: `alice`?

Output:

5. Write a **complete Python program** that asks the user for numbers (separated by spaces) and prints the how many end in 5.

For example:

- If the user entered: 101 15 50 645
- Your program should print: 2

6. 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.
- `totalTrees()`: returns the number of trees (length) in the DataFrame, and
- `biggestDiameter()`: returns the largest diameter (`tree_dbh`) in the DataFrame.

```
import pandas as pd
def getData():
    """
    Asks the user for the name of the CSV and
    Returns a dataframe of the contents.
    """
```

```
def totalTrees(df):
    """
    Takes a DataFrame as input.
    Returns the length of the DataFrame.
    """
```

```
def biggestDiameter(df):
    """
    Takes a DataFrame as input.
    Returns the maximum value in the column, tree_dbh..
    """
```


7. 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):



8. (a) Consider the following MIPS program:

```
ADDI $s0, $zero, 1
ADD $s1, $s0, $s0
ADD $s2, $s1, $s1
ADD $s3, $s2, $s2
```

After the program runs, what is the value stored in:

- i. register \$s1

- ii. register \$s2

- iii. register \$s3

- (b) What is the output for a run of this MIPS program:

Output:

```
#Loop through six letters:
ADDI $sp, $sp, -7          # Set up stack
ADDI $t0, $zero, 70        # Start $t0 at 70 (F)
ADDI $s2, $zero, 76        # Use to test when you reach 76 (L)
SETUP: SB $t0, 0($sp)      # Next letter in $t0
ADDI $sp, $sp, 1           # Increment the stack
ADDI $t0, $t0, 1           # Increment the letter
BEQ $t0, $s2, DONE         # Jump to done if $t0 == 76
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)

```
//Eleanor Roosevelt
#include <iostream>
using namespace std;
int main() {
    cout << "Do one thing, every " << endl;
    cout << "day,\n that";
    cout << "scares you.\n";
}
```

Output:

(b)

```
//Mystery C++, #2
#include <iostream>
using namespace std;
int main() {
    int sum = 1;
    while (sum < 10) {
        cout << sum;
        sum = sum + sum;
    }
}
```

Output:

(c)

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

Output:

10. (a) Write a **complete C++ program** that asks the user for the year they were born. If they enter a number before 1900, the program continues to ask for the year they were born. The program then prints the year that was entered.

- (b) Write a **complete C++ program** that prints the change in population of the state of New Jersey:

$$p = p + Bp - Dp$$

where p is the population, B is the birth rate of 12 births for every 1000 people ($\frac{12}{1000}$) each year, and D is the death rate of 7.8 for every 1000 people ($\frac{7.8}{1000}$). In 2021, the population of New Jersey was 9.27 million. Your program should print expected population for the years 2021 to 2030. Each line should have: the year and the population (in millions).