CSCA20 Fall 2023 Final Exam
Duration — 2 hours and 50 minutes
Aids allowed: Printed Material Only,
No Electronic Devices

Student Number: ____________________

UTORid: ____________________

Family Name: ____________________ **Given Name:** ____________________

Read and follow all instructions on this page, and fill in all fields appropriately.

*Do **not** turn this page until you have received the signal to start.*
(Please fill out the identification section above, and read the instructions below.)
Good Luck!

This exam is double-sided, and consists of 7 questions on 16 page (including this one). When you receive the signal to start, please make sure that you have all pages.

- Write your details on the top of the first page.
- If you use any space for rough work, indicate clearly what you want marked.
- Write as clearly and legibly as possible. No marks will be awarded to unreadable answers.

Skills Demonstrated

	Foundational					Core					Advanced			Extension	
	User I/O	Variables	While Loops	For Loops	Selection	Loops + Ifs	Loops + Lists	Nesting Loops	Strings+Lists	Functions	Data Structs	File I/O	Dictionaries	Ext Tools	SQL
Q1			▨		▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Q2	▨	▨		▨		▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Q3	▨	▨	▨	▨	▨		▨		▨	▨	▨	▨	▨	▨	▨
Q4	▨	▨	▨	▨	▨	▨		▨			▨	▨	▨	▨	▨
Q5	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨				▨	▨
Q6	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			▨
Q7	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Total															

```
What is your name?: Brian
Where do we start the countdown?: 5
Blastoff in 5
Blastoff in 4
Blastoff in 3
Blastoff in 2
Blastoff in 1
Go Brian Go!
```

Question 1.

Completion of this question demonstrates the skills of User I/O, Variables and For Loops

In the space below, write code that asks the user for their name, and a number. Then prints a countdown from that number, followed by an encouraging message personalized to them. An example input and output is given on the opposite page. (Hint: Remember that Python always reads user input as a string, and that print only takes strings)

```
Enter a target number: 42

Enter a guess: 20
Target is higher
Enter a guess: 50
Target is lower
Enter a guess 40
Target is higher
Enter a guess: 45
Target is lower
Enter a guess: 120
Guesses must be between 1-100
Enter a guess: 42
CORRECT! it took you 5 guesses
```

Question 2.

Completion of this question demonstrates the skills of While Loops and Selection

In the space below, write a program that plays a guessing game. The first user will input a target number. The second user will then guess numbers, being told if the number is higher or lower than the target until they get it correct. If the user guesses a value below 0 or over 100, the program should tell them that is an invalid guess. The game then outputs the total number of guesses required to find the target number. A sample input/output is given on the opposite page.

```
How many courses are in a semester?: 4
Enter grade for course 1: A
Enter grade for course 2: F
I'm sorry, you didn't pass all of your courses
Enter grade for course 1: B
Enter grade for course 2: C
Enter grade for course 3: D
Enter grade for course 4: C
I'm sorry, you didn't get B or above in at least half of your courses
Enter grade for course 1: A
Enter grade for course 2: B
Enter grade for course 3: A
Enter grade for course 4: C
Congratulations: You got B or above in over half of your courses
```

Question 3.

Completion of this question demonstrates the skills of Loops + Selection, and Nesting Loops In the space below, write a program that asks the user how many courses are in a semester. Then the program will ask them for their grades for each course until they get a B or above in at least half of their courses for a semester, at which point the program congratulates them and exits. If at any time the student fails any course, the program stops asking for grades for that semester and moves on to the next semester. A sample input/output is given on the opposite page.

```
test_list = ['Apple', 'Bear', 'Apple', 'Car']
count = replace_words(test_list, 'Apple', 'Zebra')
print(count) #<-- this will print 2
print(test_list) #<-- this will print ['Zebra', 'Bear', 'Zebra', 'Car']
```

Question 4.

Completion of this question demonstrates the skills of Looping over lists, manipulating lists and strings, and functions

In the space below, write a function that takes a list of strings, a keyword, and a replacement word. The function will count the number of occurrences of the keyword in the list, and also replace all occurrences of that keyword with the replacement word. Example code calling the function is given on the page opposite. To demonstrate the skill of functions, your function must include proper documentation.

categories.txt

```
ANIMAL:Antelope,Bear,Cat,Dog
FOOD:Apple,Banana,Carrot,Doughnut,Carrot
CITY:Ankra,Bangkok,Cairo,Dublin,Ankra
ANIMAL:Cat,Elephant
```

Example of dictionary created from categories.txt

```
{'ANIMAL':{'Antelope', 'Bear', 'Cat', 'Dog','Elephant'},
'FOOD':{'Apple','Banana','Carrot','Doughnut'},
'CITY':{'Ankra','Bangkok','Cairo','Dublin'}}
```

story.txt

```
The ANIMAL went to CITY
The ANIMAL ate FOOD
The FOOD in CITY is great
```

output.txt

```
The Bear went to Dublin
The Dog ate Carrot
The Apple in Cairo is great
```

Question 5.

Completion of this question demonstrates the skills of Data Structures, File I/O, and Dictionaries

In the space below, write a program that asks the user for the names of input and output files. The first input file will consist of lines with a category followed by examples of that category. Note that both categories and examples can appear multiple times in the input file. From this file your code should build a dictionary mapping the category to the set of examples. The program should then read through a story file, replacing examples of the categories with random elements from the set of examples from that category (hint: you may want to use set's `pop` method for this), and produces an output file. Example input and output files can be found on the opposite page.

Example text from movies.csv

```
year,category,winner,film
2017,BEST PICTURE,False,Lady Bird
2017,BEST PICTURE,False,The Post
2017,BEST PICTURE,True,The Shape of Water
2017,MUSIC,False,Dunkirk
2017,MUSIC,False,Phantom Thread
2017,MUSIC,True,The Shape of Water
2016,DIRECTING,False,Arrival
2016,DIRECTING,False,Hacksaw Ridge
2016,DIRECTING,True,La La Land
2016,BEST PICTURE,False,La La Land
2016,BEST PICTURE,False,Lion
2016,BEST PICTURE,False,Manchester by the Sea
2016,BEST PICTURE,True,Moonlight
```

Example code from matplotlib: scatter

```
import matplotlib.pyplot as plt
import numpy as np

plt.style.use('_mpl-gallery')

# make the data
np.random.seed(3)
x = 4 + np.random.normal(0, 2, 24)
y = 4 + np.random.normal(0, 2, len(x))
# size and color:
sizes = np.random.uniform(15, 80, len(x))
colors = np.random.uniform(15, 80, len(x))

# plot
fig, ax = plt.subplots()

ax.scatter(x, y, s=sizes, c=colors, vmin=0, vmax=100)

ax.set(xlim=(0, 8), xticks=np.arange(1, 8),
       ylim=(0, 8), yticks=np.arange(1, 8))

plt.show()
```

Example code from csv.DictReader

```
reader = csv.DictReader(csvfile)
for row in reader:
    print(row['first_name'], row['last_name'])
```

Question 6.

Completion of this question demonstrates the skills of Dictionaries and External Tools

In the space below, write a program that import csv and uses its DictReader method to open and read a file formatted as on the previous page, and creates two dictionaries: one mapping film titles to the list of categories in which they were nominated for an award, and another that maps film titles into the list of categories in which they won an award.

Then, using that dictionary, and matplotlib, create a scatter plot showing the number of wins that a film has vs its number of nominations. Some potentially helpful example code is given on the previous page.

Movie

movie_id	title	year	rating
1	The Shawshank Redemption	1994	AA
2	The Godfather	1972	AA
3	Forrest Gump	1994	PG
4	City of God	2002	R
5	The Dark Knight	2008	PG

Actor

actor_id	name	birth_year
1	Alexandre Rodrigues	1983
2	Morgan Freeman	1937
3	Diane Keaton	1946

Role

actor_id	movie_id	character_name	screen_time
1	4	Rocket	45
2	1	Ellis Redding	30
2	5	Lucius Fox	50

Question 7.

Completion of this question demonstrates the skills of SQL

Given the database with tables depicted on the opposite page. Write a program that asks the user if they would like to limit their query by movie year, actor birth year and/or minutes of character screen time (the user should be able to select any combination of limits or no limits at all). For each limit, ask the user for the minimum and maximum values to use.

Your program should then print an SQL query (you do not need to actually run the query, just print it for the user) to find actor names, character names, and movie titles that fall within their limitations.