

CSCI 127: Joy and Beauty of Data

Snowmester 2020

Practice Final Exam

Friday, January 8, 2021
Instructor: Reese Pearsall

Print your name: _____

Print your Net ID: _____

By submitting this exam, I make the following truthful statements:

- I have not received, I have not given, nor will I give or receive, any assistance to another student taking this exam, nor have I discussed this exam with past students of this course.
- I will not use any non-instructor approved materials to assist me on this exam.
- I will not plagiarize someone else's work and turn it in as my own.
- I understand that acts of academic dishonesty may be penalized to the full extent allowed by the Montana State University Student Code of Conduct, including receiving a failing grade for the exam and/or course. I recognize that I am responsible for understanding the provisions of the Montana State University Student Code of Conduct as they relate to this academic exercise.

Submission Instructions

This exam will be due to D2L by 11:59 PM on Friday, January 8th, 2021. This is a **hard** deadline. Late submissions will receive an automatic 0 for this exam..

The first four pages (**This page and question 1**) will be submitted to the appropriate D2L dropbox as a PDF

- You may print out the exam, fill out the first four pages by hand, scan it/take a picture, and submit as a PDF.
- Or you may fill out the first four pages virtually (i.e. in Word, PDF editor, etc) and save your answers as a PDF.

Problems 2, 3, 4, 5 will be submitted to a separate D2L dropbox. You will develop a python solution for each of those problems. You may have one single .py file for your all your answers, or you may have a separate .py file for each of those problems.

Make sure you name your files accordingly and place your name at the top of each of your .py file in a comment.

You may use notes, lecture slides, in class examples, previous labs/programs, the textbook, lecture recordings, and your computer on this exam.

You CAN NOT use search engines to access external resources (Youtube, Stack Overflow, W3Schools, etc), GroupMe, or other students (previous or current).

Be sure to attempt every problem. Even if you cannot fully solve one of the programming problems, you should try to get as much done as you can. I will give out as much partial credit as I can.

Read each question carefully and make sure that you answer everything asked for.

Question 1 (Multiple Choice) (20 pts)

1.1) Which of the following data types **cannot** be a key in a Python dictionary?

- a. string
- b. integer
- c. object
- d. list

1.2) What will be the output of the python program given below?

```
def func1(x,y):  
    x += 2  
  
def main():  
    x = 3  
    y = 1  
    func1(x,y)  
    print(x)  
  
main()
```

- a. 2
- b. 3
- c. 5
- d. The program will result in an error

1.3) What will be the output of the python program given below?

```
class Dog():  
    def __init__(self,name,breed):  
        self.name = name  
        self.breed = breed  
  
    def getName(self):  
        return self.breed  
  
dog1 = Dog("Fido","Pug")  
print(dog1.getName())
```

- a. Fido
- b. Pug
- c. self
- d. It will print out the location of the object in memory

1.4) What are the two requirements for a recursive function? Write in your answer

- 1.
- 2.

1.5) The following code will produce an error. Why? (You can assume there are **no** indentation errors)

```
import numpy as np
array = np.zeros(5, dtype=int)

array[2] = "Hello There"
print(array[2])
```

- a. Because the array can only hold integers.
- b. Because you can't update the values in the array
- c. Because the array is empty, so index 2 does not exist
- d. Because you can only add to an array using .append

1.6) True/False: You can have duplicate keys in a Python Dictionary

- a. True
- b. False

1.7) An object can be an input parameter to a function

- a. True
- b. False

1.8) The following code will result in errors. Briefly explain why and how to fix it

```
class Bike():
    def __init__(self, color, wheels):
        self.color = color
        self.wheels = wheels

    def get_color():
        return color

    def get_wheels():
        return wheels

my_bike = Bike("red", 2)
print(my_bike.get_color())
```

Write your answer in this box

1.9) Which of the following Python lines would create an array of size 10 that is filled with zeros:

- a. `a = np.zeros(10, dtype=int)`
- b. `a = np.array([0,0,0,0,0,0,0,0,0,0])`
- c. `a = np.zeros(10)`
- d. All of the above are correct

1.10) What will be the output of the python program given below?

```
food = {"Popcorn":5.99, "Soda":1.99, "Nachos":3.88}

food["Soda"] += 2

print(food["Soda"])
```


- a. 1.99
- b. 3.99
- c. 2
- d. The following program will result in an error

Question 2 (20 pts)

Consider a dictionary that contains information about a $N \times N$ matrix where N is a positive number. The keys of the dictionary (tuple) represent the location of a spot in the matrix, and the values (integers) are going to be the number that exists at that spot.

For example, the following dictionary represents the 3×3 matrix seen below

```
matrix = {(1,1): 5, (1,2): 8, (1,3): 2,  
          (2,1): 3, (2,2): 7, (2,3): 9,  
          (3,1): 1, (3,2): 4, (3,3): 3 }
```



5	8	2
3	7	9
1	4	3

Using the provided code below, write a function that will calculate the diagonal (highlighted in yellow) of some $N \times N$ matrix. In the example above, the sum of the diagonal should be 15 ($5 + 7 + 3$). While this question is about matrices, **you should not use numpy**

Your function should go above this line. Do not change anything below

```
matrix = {(1,1): 5, (1,2): 8, (1,3): 2,  
          (2,1): 3, (2,2): 7, (2,3): 9,  
          (3,1): 1, (3,2): 4, (3,3): 3 }  
  
answer = calculate_diagonal(matrix)  
print("The diagonal of the matrix is",answer)
```

Note: Your solution should work for **any** $N \times N$ matrix. It should work for 1×1 , 10×10 , 1000×1000 , etc.

Question 3 (20 pts)

Supply the missing code below using object-oriented programming. When the program runs, it should generate the following output:

```
Movie Name: Star Wars
Release Year: 1977
List of Cast Members
-----
1. Mark Hamill
2. Carrie Fisher
3. James Earl Jones
```

```
Movie Name: Raiders of the Lost Ark
Release Year: 1981
List of Cast Members
-----
1. Harrison Ford
```

Your code should go above this line. Do not change anything below

```
def main():

    starwars = Movie("Star Wars", 1970)
    starwars.add_cast_member("Mark Hamill")
    starwars.add_cast_member("Carrie Fisher")
    starwars.add_cast_member("James Earl Jones")
    starwars.set_year(1977)

    print(starwars)

    indy = Movie("Raiders of the Lost Ark",1981)
    indy.add_cast_member("Harrison Ford")

    print(indy)

main()
```

Question 4 (20 pts)

Supply the missing class and its methods such that when the program executes, it produces the desired output. The solution should be high quality; comments are not necessary. Notice that the code given imports the numpy module. This tells you that you will need to create and use an array at some points

Do not make any changes to the code that appears on this page.

Desired Output:

My Schedule

CSCI 127

M 171

WRIT 101

```
import numpy as np
# -----

# Your code will go here. Do not change anything below
# -----

def main():

    my_courses = Course_Schedule(3)
    course_1 = Course("CSCI", 127)
    my_courses.add(course_1)

    course_2 = Course("M", 171)
    my_courses.add(course_2)

    course_3 = Course("WRIT", 101)
    my_courses.add(course_3)

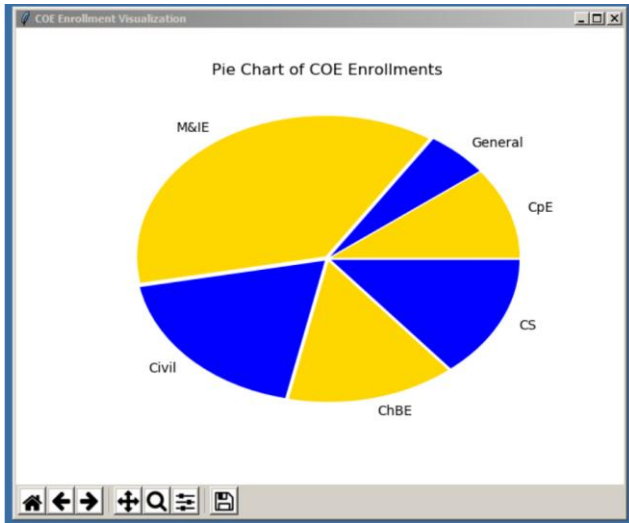
    print(my_courses)

# -----
main()
```

Question 5 (20 pts)

Complete the Python program below such that the following visualization is produced. The pie wedge color for CS, Civil and General is blue. The other pie wedge color is gold. Notice that there is a small gap between each pie wedge.

Hint: Read the documentation for `matplotlib.pyplot.pie`



```
import numpy as np # Do not import anything else
import matplotlib.pyplot as plt

units = ["CS", "ChBE", "Civil", "M&IE", "General", "CpE"] # See question 1 for a
description
enrollments = [552, 563, 731, 1463, 210, 410] # See question 1 for a description

# Write the missing statements below this comment
```