

CMSC 201 Section 60

Fall 2021

Sample Exam #2

Note: this exam is worth 125 points, weighted as follows:

Multiple Choice & True/False: 40 points – 10 questions, 4 points each, no partial credit

Short answer: 40 points – 5 questions, 8 points each – partial credit is given

Programming: 45 points – 3 questions; 15 points each – partial credit is given

Section 1: T/F – M/C Section.

1. True or False: A recursive function in Python can have two separate recursive cases.
2. True or false: the best way to develop a complex computer program is to write the code for several functions at once, then test them at the end. There's no need to test as you go if you never make mistakes, is there?
3. The difference between opening a file for writing ('w' mode) and opening a file for appending ('a' mode) in Python is:
 - a. Opening for writing erases all previous contents of the file, while opening for appending keeps the previous contents and starts writing at the end
 - b. If the file does not exist, 'w' mode creates a new file for you while 'a' mode returns an error message saying the file doesn't exist
 - c. 'a' mode allows you to write strings, integers, floats and Booleans to the file while 'w' mode only allows you to write strings
 - d. 'w' mode only allows you to write to the file, while 'a' mode allows you to both read from and write to the file.

4. Suppose I had the following dictionary defined in a Python program:

```
senators = {"New York": "Schumer", "Maryland": "Cardin", "Kentucky": "Paul",  
            "Virginia": "Warner"}
```

How could you insert Kristen Gillibrand as another Senator from New York WITHOUT deleting the entry for Chuck Schumer?

- a. `senators["New York"] = "Gillibrand"`
- b. `senators["New York"] = ["Schumer", "Gillibrand"]`
- c. `senators.insert("New York": "Gillibrand")`
- d. `senators.get("New York", "Gillibrand")`

5. If you have a Python 2D list, `l`, that has `r` rows. Which of the following is a true statement?

- a. `len(l)` yields the number of columns in each row
- b. if you want to access the element in row `i`, column `j`, you would use `l[i,j]`
- c. You can manipulate an entire column at a time with a single statement, but rows can only be manipulated in loops
- d. None of the other statements is true.

6. True or False – if there is a return statement in a function, but it never gets executed, the function has no return value.

7. Suppose we have the following program:

```
Def find_area(base, height):
```

```
    Area = (base * height)/3
```

```
    Return area
```

```
If __name__ == "__main__":
```

```
    Height = 3
```

```
    Radius = 4
```

```
    Volume = find_area(height, radius)
```

```
    Print (volume)
```

What value gets assigned to the parameter "height" when the function `find_area` is called?

- a. 3
- b. 4
- c. $2 * \pi / 3$
- d. None of the above

8 What happens if you do not specify a mode in your file open statement in Python? That is, suppose your command is:

with open("data.txt") as myfile:

- a. This will be an error and your program will crash
- b. Python defaults to opening the file for reading
- c. Python defaults to opening the file for both reading and writing
- d. None of the above answers is correct

9. True or false: every problem that can be solved with recursion can also be solved iteratively (without using recursion), but the opposite is not true.

10. True or false: When you read in a file using read(), readline(), or readlines(), everything you read in is treated as a string or a list of strings.

Section 2: Short Answer Section

11. Suppose we have the following dictionary defined:

```
governors = {"Maryland": "Hogan", "Virginia": "Northam", "Louisiana": "Edwards",  
             "Massachusetts": "Baker" }
```

How would I check to see if the Governor of California was defined in the dictionary, if I wanted to make sure that the program would NOT crash if Gavin Newsom wasn't there? You can either answer with a line or two of code, or with a prose answer.

12. Write a Python function that calculates the volume of a right circular cone, which is given as $v = \frac{\text{height of the cone} \times \pi \times \text{radius}^2}{3}$. Presume the function takes two parameters, height and radius, which are floats. The function returns the volume, which is a float. You do NOT need to write a main program; just the function will do.

13. Here's a recursive function that calculates the sum of the digits in a number, which is passed in as a parameter:

```
Def sum_digits(number):
```

```
    If number < 10:
```

```
        Return number
```

```
    Else:
```

```
        This_number = number % 10
```

```
        New_number = number // 10
```

Return `this_number + sum_digits(new_number)`

Using the concept of the stack frame, explain how Python knows exactly what value of `this_number` to use at any given time.

14. Write code that uses the `split()` and `join()` functions to change the string “Probably Secure Operating System” to “Provably Secure Operating System”.

15. Suppose you wanted to create a 2D list of the first 100 integers – from 0 through 99 - in 10 rows and 10 columns. Write code that will create such a 2D list.

Section 3: Programming Section.

16. I have a file, `cities.txt`, containing a list of the ten largest cities in the world and the population of each. There is one entry per line, and the name of the city is separated by a tab from the population. The file looks like this:

Tokyo 37400000

Delhi 28514000

Shanghai 25582000

Sao Paola 21650000

Mexico City 21581000

Cairo 10076000

Mumbai 19980000

Beijing 19618000

Dhaka 19578000

Osaka 19281000

Write a Python program that reads in this `cities.txt` file and calculates the arithmetic mean – the average – of the city populations. Print out that number, with an appropriate label. You can presume this file is in your current directory or path; you do not need to specify a path to it. You must write the entire program. You do not need to use functions; you can do everything in the main program if you wish.

17. Write a Python program with a recursive function that determines the number of characters in a string. Yes, we know you can determine the number of characters in a string by calling the `len()` function, but that’s not the point. 😊 Write the full program – main program and recursive function. Be sure to include both the base and recursive cases.

18. Write a Python program that fills a dictionary by taking input from the user. Your program should initialize an empty dictionary. Then enter a loop where you ask the user for a key, then a value; and then you enter the key:value pair into your dictionary. Stay in this loop until the user types "Q" as the key value. Presume all keys and values are strings.