CMSC 201 SAMPLE FINAL EXAM

Section 1 – Multiple Choice/True-False. 15 questions; 4 points each. 60 points

1. Like lists, dictionaries are immutable objects in Python. They cannot be changed once created.
    a. True
    b. False
2. Keys used in Python dictionaries must be:
    a. Unique and immutable
    b. Unique and mutable
    c. Unique and either mutable or immutable
    d. None of the above
3. Values used in Python dictionaries must be:
    a. Unique and immutable
    b. Unique and mutable
    c. Unique and either mutable or immutable
    d. None of the above
4. Every problem that can be solved with recursion can also be solved iteratively. It's just that some problems and solutions can be better expressed recursively.
    a. True
    b. False
5. Every problem that can be solved with a "for" loop can also be solved with a "while" loop, but the reverse is not true.
    a. True
    b. False
6. If you import a module into your Python program, you can use any function that exists in that module, but you CANNOT use code that exists in that module's main program.
    a. True
    b. False
7. String s = "UMBC Retriever". What happens when you execute the statement s[0] = "C"?
    a. s becomes equal to "CMBC Retriever"
    b. a new location in memory is allocated and gets the value "CMBC Retriever"
    c. an error message is generated that tells you strings are immutable and you can't change an individual character in a string
    d. None of the above
8. If a = 0x14FF32, what do I know about a?
    a. It's a binary number because Python uses 0x to indicate that the number is binary
    b. It's a string because letters can only exist in strings, not integers, floats or booleans
    c. It's a hexadecimal number because Python uses 0x to indicate that the number is base-16
    d. An error will result, because this is a string but the single-quotes or double-quotes are missing

9. Suppose that you have a dictionary defined in Python as follows:

   north = {'ravens': 1, 'steelers':2, 'browns':3, 'bengals':4}

   what will be the result of the following statement:

   print(north.get('saints', 1))
   a. An error because the Saints are not in the AFC North.
   b. 1 because that's the value to return if the key is not found
   c. 'ravens' because that's the key associated with the value '1'
   d. None of the above

10. You can import into your Python program as a module any program that ends in .py, as long as it is on the search path and can be found.
    a. True
    b. False
11. A primary difference between Python lists and dictionaries is:
    a. Lists are mutable but dictionaries are immutable
    b. Dictionaries have an order, but lists do not
    c. Lists establish a relationship between a Value and an Order or Index, while dictionaries establish a relationship between a Value and Key
    d. Lists can be multi-dimensional, but dictionaries cannot
12. Which of the following is *NOT* a good reason for using constants instead of magic numbers and string literals in your Python code?
    a. Your code will be more understandable to you and other reviewers and thus easier to debug
    b. Your code will be easier to modify if a "constant" value has to change for new run of the program
    c. Constants improve code modularity
    d. Constants make your code clearer and thus make it easier to convince a reviewer that your code is correct
13. Four types of program control logic we have covered in this course are:
    a. Sequential, conditional. Iterative and functions
    b. While, for, if, and elif
    c. Sequential, recursive, iterative and functions
    d. North, south, east and west
14. What must be true about a list before binary search can be used to efficiently find an element in the list (or find that the element is not in the list)?
    a. The list must be defined and assigned a value
    b. The list must be a list of integers
    c. The list must be sorted
    d. A. and C.

15. The call stack in a python program is:
    a. The data structure showing what function is executing now and what part of the code will be executing when this function returns
    b. The list of all symbols – variable names, constants, and functions – that have been defined in the program
    c. The array of memory used to store temporary variables while a function is executing
    d. None of the above

Section 2 – Debugging – 2 problems, 10 points each, 20 points

16. Identify five errors in the following Python program, and tell what you would do to fix the error. You get one point for each error identified, and one point for correctly describing how to fix it. – 10 points

```
If __name__ == "__maine__":
        #create an empty dictionary
        dict = ()
        print("this is an empty dictionary: ", dict)
        #now add elements to the dictionary, one at a time
        dict[0] = "Maine"
        dict[2] = "Florida"
        dict(4) = "California"
        dict[6] = "Washington"
        #now add two more values to the dictionary
        Dict["non-CONUS"] = ["Alaska", "Hawai"I"]
        print("Current dictionary value: ", dict)
        # update a value
        dict[4] = "Nevada"
        dict["non-CONUS"] = ["Alaska", "Hawai'I", "Puerto Rico", "Guam", "Northern Marianas"]
        print("The final dictionary is: " dict)
```

17. Identify five errors in the following Python program, and tell what you would do to fix the error. You get one point for each error identified, and one point for correctly describing how to fix it. – 10 points

```
#This program identifies the species of an iris based on properties of the plant
# Constants
SEPAL == 0
PETAL = 1
#start with a function that does the identification
def identifyiris(iris):
```

```
        if iris[SEPAL] > 0.5:
        return("Setosa")
        elif iris[PETAL] > 0.1:
                return("Versicolour")
        else
                return("Virginica")
if __name__ == "__main__":
        plant = []
        plant.append(input("Enter the plant sepal length"))
        plant.append(input("Enter the plant petal width"))
        answer = identify_iris(answer)
        print("This plant is: ", answer)
```

Section 3 – Short Answer – 8 questions; 7 or 8 points each – 60 points

18. Bubble Sort has complexity Big O(n2) and QuickSort is also Big O(n2). Yet QuickSort almost always runs much faster, both in terms of time and in terms of number of comparisons. Explain why.

19. Give two reasons why a 'while' loop might be an infinite loop.

20. Strings are immutable and lists are mutable. Use that fact to explain why, if l is a list and s is a string, l[0] = 'A' is legal in Python but s[0] = 'A' is not.

21. Write a function, "getfile" that takes as a parameter a string representing the name of a file; reads the data from that file into a single string; and returns that string.

22. What is "NoneType?"

23. Below is code for a new kind of sort routine called "Insertion sort." The idea is that you pick an element and put it into a list, called "arr" in the code, in its proper place. You "insert" the new item where it belongs, shifting existing list elements to make room for it. What is Big O of insertion sort? Why?

```
def insertionSort(arr):

    # Traverse through 1 to len(arr)
```

```
for i in range(1, len(arr)):

    key = arr[i]

    # Move elements of arr[0..i-1], that are
    # greater than key, to one position ahead
    # of their current position
    j = i-1
    while j >=0 and key < arr[j] :
            arr[j+1] = arr[j]
            j -= 1
    arr[j+1] = key
```

24. Suppose that you've written a program called Project2.py which contains a function you defined with

    def readcsv(filename):

    That function reads in a Comma-Separated Value file, gets rid of commas and newlines, gets rid of header rows, and returns a nicely-formatted 2D list of the data in the initial file. Now suppose that you want to use that same function in Project 3, but you want to do it the cool, Pythonic way instead of just copying and pasting the code. Write an import statement and a function call that you would put in Project3.py that would enable you to use this cool function you wrote.

25. How are binary and hexadecimal numbers represented in Python?

Section 4 – Programming – 3 problems; 20 points each – 60 points

26. Write a Python program that prompts the user to enter an integer into the keyboard, and checks to see if that integer is positive or zero. (You do not have to validate that it is an integer.) If the integer is less than zero, the program continues prompting the user until the user enters an integer that is positive or zero. Once the user has entered a valid number, the program will tell the user what the value of that integer is in binary and in hexadecimal.

27. Suppose that you have a file that contains the following data:

    1 4 9 25 36

    49 64 81 100 121

    144 169 196 225 256

The data values are separated by Tabs.

Write a Python function that takes as a parameter the name of this file. The function must then read in the data from that file and return a list of integers containing the data. You DO NOT have to write the main program – just the function!!!

28. The Python module math contains a function that calculates the mean of a list of numbers. Write a Python program that:
    - Creates a dictionary with key/value pairs: “Cubs”:84; “Reds”:75; “Brewers”:89; “Cardianls”:91; and “Pirates”:69
    - Use the mean function from the math library to calculate the mean number of games each team won in 2019, and print out that number with appropriate explanatory text

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