Three Sets of Sample Free Response Questions Name:

**Sample Solutions**

Answer the following using your create task code. This assignment is only graded on completeness. No feedback will be given.

Sample Solutions for sample create task code below:

A screenshot of a computer program

Description automatically generated

**Written Response 1: Program Design, Function, and Purpose:**

**Below are THREE sample free response questions for Written Response 1: Program Design, Function and Purpose. Answer all three using your create task Personalized Project Reference.**

Describe the problem that your program was created to address or the creative expression it pursues.

**Suppose that a teacher has a text file containing a large number of students and their grade point averages. The teacher wishes to be able to quickly query this database for students with low gpa(less than or equal to 2.0) or high gpa(greater than 2.0). This program is created to solve this problem.**

Explain how you used or could have used feedback, testing, or reflection in the development of your program.

**In the development of this program, I used different techniques for testing the correctness of my program. I used different text files containing different students with different gpas and ran the program many times on these varying inputs and checked that the outputs are correct. In addition, I ran my program with different user keyboard inputs to test the behavior of my program. For example, some of my inputs produce no students satisfying the query and cause the function to return an empty list.**

**During the early part of the development process, my function was returning incorrect values. I hand traced my code and inserted print statements throughout my program to inspect values of my data and other variables. This allowed me to debug and fix some of the logical errors in my code.**

Note: The above answer focus only on the testing portion of the development process. You could, instead, talk about the feedback component of the development process.

Describe one piece of documentation that would be appropriate to include with or in your program. Describe the intended purpose of this documentation by identifying who would use it and what they would do with it.

**An appropriate place to include some documentation is below the header of my function filter\_students. In general, the function documentation identifies the function’s name and the arguments including the arguments’ data types. In addition, the documentation explains the specific task that the function accomplishes and the function outputs, if any. In my code, the filter\_students accepts a list of tuples containing students name and gpa and a query(“low” or “high”) and the function returns a list of names of students satisfying the gpa query.**

**This documentation can be used by another programmer, for example, if they need a segment of code that accomplishes this specific task. The documentation allows the programmer to correctly call the function and use the returned value for their program.**

**Written Response 2(a): Algorithm Development:**

**Below are THREE sample free response questions for Written Response 2(a): Algorithm Development. Answer all three using your create task Personalized Project Reference.**

Consider the code segment in part (ii) of the List section of your Personalized Project Reference that shows how your list is being used. Explain in detailed steps how this code segment works. Your explanation must be detailed enough for someone else to write the code segment.

**This code segment contains two conditional blocks of code depending on the value of argument query. If the query is “low”, iterates through the indices of the items in the list. For each index i, unpack the tuple at this index into two variables: n and g representing the name and gpa of this student. If the value of g is less than or equal to 2.0, add n to the result list.**

**Similarly, if the query is “high”, iterates through the indices of the items in the list. For each index i, unpack the tuple at this index into two variables: n and g representing the name and gpa of this student. If the value of g is greater than 2.0, add n to the result list.**

Consider the first conditional statement included in the Procedure section of your Personalized Project Reference. Write an equivalent Boolean expression for this conditional statement.

**An equivalent boolean expression for the first if conditional statement if query == “low”: is the following expression stored in a boolean variable called condition:**

**condition = (query == “low”)**

Consider the first iteration statement included in the Procedure section of your Personalized Project Reference. Describe the condition(s) that will cause the body of the iteration statement to execute at least once.

**The body of the first for loop will execute at least once if the value of query is equal to “low” and the students list contains at least one item.**

**Written Response 2(b): Errors and Testing:**

**Below are THREE sample free response questions for Written Response 2(b): Errors and Testing. Answer all three using your create task Personalized Project Reference.**

Consider the procedure identified in part (i) of the Procedure section of your Personalized Project Reference. Passing different values as arguments to a procedure can cause different segments of code to execute. Based on one of your arguments, describe where you could insert output statements in your procedure to test whether a block of code is executed or not. If it is not possible for different arguments to cause different segments of code to execute in your procedure, explain why not.

**The three conditional blocks depend on the value of the argument query. I could insert the print statement:**

**print(“low block running”)**

**after the first conditional block “if query == ‘low’” but before the first for loop.**

**Similarly, I could insert the print statement:**

**print(“high block running”)**

**after the second conditional block “if query == ‘high’” but before the second for loop.**

**The else block already has the print(“invalid query’) statement and so it does not need another one. Exactly one of these blocks will run for each function call.**

Consider the procedure identified in part (i) of the Procedure section of your Personalized Project Reference. Identify a strategy, other than using test cases, that you can use to test the correctness of your procedure. Describe how you would use this strategy.

**One strategy is to add print statements to the code to examine the values of variables at different times in the execution of the program. For example, to test that the if query ==**

**‘low’ block is working correctly, I can add two print statements inside the body of that block.**

**Before the if g <= 2.0: conditional statement, I can add print(n, g) to examine the values of the name and gpa of a particular student. I can also add another print statement inside the if g<=2.0 block to print out the value of the list result. This allows me to see whether a student is correctly added(or not added) to the list.**

**Similarly, I can repeat this for the elif query == ‘high’ block.**

Consider the procedure identified in part (i) of the Procedure section of your Personalized Project Reference. Write a call to your procedure with specific argument(s) that you could use for testing this procedure. Describe the program functionality that is related to this call.

**I can test my procedure filter\_students by using the following arguments to the function call:**

**students = [(“Mike Smith”, 3.2), (“Sarah Lee”, 2.5), (“Tim Johnson”, 1.8)]**

**query = “low”**

**The function call is: filter\_students(students, query)**

**Calling the procedure with the above arguments allow me to test that the program will display the correct list of students. In this case, the function should return a list of students whose gpa is less than 2.0 and should contain exactly one student: [“Tim Johnson”].**

**This particular function call fulfills the program functionality and allows the teacher to see that Tim Johnson has a gpa that is less than 2.0.**

**Written Response 2(c): Data and Procedural Abstraction:**

**Below are THREE sample free response questions for Written Response 2(c): Data and Procedural Abstraction. Answer all three using your create task Personalized Project Reference.**

Consider the procedure identified in part (i) of the Procedure section of your Personalized Project Reference. Explain how your program could be written differently if one of your parameters was removed from your procedure.

**Suppose that the query parameter was removed from the procedure. This function can be modified to still satisfy the overall functionality of the program. The entire function will need to be rewritten. Here’s the pseudocode. Initialize two empty lists. One list, call it low\_gpa, will store the names of students with low gpas and the other list, call it high\_gpa, will store the names of students with high gpas. For each student in the list, if the gpa of the student is less than 2.0, add the name of that student to low\_gpa. Otherwise, add the name to high\_gpa. Outside of the loop, return the tuple containing both lists: (low\_gpa, high\_gpa).**

**In addition, we need to modify the function call portion of the code to store this returned tuple:**

**low\_gpa\_list, high\_gpa\_list = filter\_students(students)**

**Depending on whether the user enter “low” or “high”, we can print out the corresponding list.**

Consider the procedure identified in part (i) of the Procedure section of your Personalized Project Reference. Procedures are often used to organize larger problems into subproblems or smaller tasks. Identify the subproblem being solved or task that is being accomplished by your procedure. Explain how the procedure is used to accomplish the overall functionality of your program.

**The overall program works as follows. The program reads in from a text file a list of students containing their names and gpas. The user of the program, a teacher, will be asked to input either “low” or “high”. The program now needs to examine the list containing many students and create a new list containing the students requested by the user. This is the subproblem solved by the function. The returned list from the function is printed to the screen for the user.**

Consider the list identified in the List section of your Personalized Project Reference. Explain how you would need to adjust this part of your program if the list was not included in your code.

Without a list containing the students’ information, one way to do this is to process everything as the data is being read from the text file. I can change the procedure to accepts as arguments the name of the file(instead of the name of the list) and the query. In the body of the procedure, we can do the following. For each line in the file, unpack the line into a name and gpa. If the query is “low” and the gpa is less than or equal to 2.0, print out the name of the student. But if the query is “high” and the gpa is greater than 2.0, print out the name of the student.