BUSINESS
PROFESSIONALS
of AMERICA
Giving Purpose to Potential

PYTHON PROGRAMMING
~PILOT~
(355)

STATE 2021

PRODUCTION PORTION:

Program 1: Variance   _____ (310 points)

               TOTAL POINTS   _____ *(310 points)*

Test Time: 90 minutes

GENERAL GUIDELINES:

Failure to adhere to any of the following rules will result in disqualification:
1. Contestant must hand in this test booklet and all printouts if any. Failure to do so will result in disqualification.
2. No equipment, supplies, or materials other than those specified for this event are allowed in the testing area. No previous BPA tests and/or sample tests (handwritten, photocopied, or keyed) are allowed in the testing area.
3. Electronic devices will be monitored according to ACT standards.

INSTRUCTIONS:

You will have 90 minutes to complete your work.

Your name and/or school name should *not* appear on work you submit for grading.

1. Create a folder on the flash drive provided using your contestant number as the name of the folder.
2. Copy your entire solution/project into this folder.
3. Submit your entire solution/project so that the graders may open your project to review the source code.
4. Ensure that the files required to run your program are present and will execute on the flash drive provided.

   *Note that the flash drive letter may *not* be the same when the program is graded as it was when you created the program.

   *It is recommended that you use relative paths rather than absolute paths to ensure that the program will run regardless of the flash drive letter.

   The graders will *not* compile or alter your source code to correct for this.
   Submissions that do *not* contain source code will *not* be graded.

Assumptions to make when taking this assessment:

- The user will *not* enter invalid input.
- The input files will *only* contain valid input integers for temperature.

Development Standards:

- Your code must use a consistent variable naming convention.
- All functions (if any) must be documented with comments explaining the purpose of the method, the input parameters (if any), and the output (if any).
- If you create a class, then you must use document the class and its methods.

Variance Testing Using Standard Deviation:

The company that you work for, Global Outdoor Kitchens, has asked you to write a program that will help test the quality control of their new product. The new product is a smoker/grill that needs to be tested for temperature control.

Input:

The program will read a series of temperatures from five different files all in the same execution cycle of the program.. Each file will have 99 temperature values. The file names will be Grill_1.txt, Grill_2.txt, Grill_3.txt, Grill_4.txt and Grill_5.txt.

Calculation Process:

This company requires all developers to write efficient and modular code. Your program will need to contain a function called "Calculate". The main program will open the file as input and pass the open file to the "Calculate" function. There the function will read all numbers into a list. It will need to determine the lowest and highest temperature. It will need to calculate the mean (average) and then the standard deviation of the list. The steps for calculating the standard deviation will be provided in Figure 1 for those who need them. Keep in mind that you are allowed to use any and all functions provided by the Python language. The engineers have determined that for our grills to be up to our high-quality standards, they must meet the following criteria. No one temperature shall be two or more standard deviations above or below the mean. This can be determined by subtracting the mean from the temperature, and checking that it is less than or equal to the standard deviation multiplied by 2. There are four possible outcomes. The grills could pass, fail due to a the temperature dropping too low, fail due to the temperature rising too high, or fail due to a temperature rising too high and a temperature dropping too low.

Manual Calculation of Standard Deviation
1. Solve for the mean (average) of the list of temperatures.
2. Subtract each temperature in the list from the mean and square the result.
3. Calculate the mean for all the squared differences in step 2.
4. Calculate the square root of the result from step 3.

Figure 1

Output:

All calculated output must come from the "Calculate" function. The output from this program may eventually be used in subsequent programs, so the output must match the sample provided in Figure 2.

Grill 1:
Min: 343
Max: 357
Mean: 349.5050505050505
Standard Deviation of temps is 4.656296455456491
Pass!

Grill 2:
Min: 0
Max: 700
Mean: 349.6363636363636
Standard Deviation of temps is 50.38311479086703
Too Hot and Too Cold: Fail!

Grill 3:
Min: 342
Max: 355
Mean: 349.3838383838384
Standard Deviation of temps is 3.154870128013845
Too Cold: Fail!

Grill 4:
Min: 346
Max: 362
Mean: 352.7070707070707
Standard Deviation of temps is 4.336020288689744
Too Hot: Fail!

Grill 5:
Min: 348
Max: 354
Mean: 351.07070707070704
Standard Deviation of temps is 2.1056412337227766
Pass!

Figure 2

Requirements:

1. You must create an application called Variance.
2. Your program will contain a function for reading the values, calculating, and printing the output.
3. All input files must be opened and closed properly.
4. Your contestant number must appear as a comment at the top of the main source code file.
5. The program will display the output like the example above.
6. Hardcoding the output will *not* be accepted.
7. All logic and calculations are required to be commented.

The project is present on the flash drive   _____   15 points

The project is named Variance   _____   15 points

Program Execution

The program runs from the USB flash drive   _____   15 points

If the program does not execute, then the remaining items in this section receive a score of zero.

The program runs to completion with no error codes   _____   20 points

There are five output segments   _____   20 points

Output matches required format.   _____   30 points

Source Code Review

The source code is properly commented
       A comment containing the contestant number is present   _____   10 points

Functions and code sections are commented   _____   20 points

There is one function named Calculate used for all calculations   _____   30 points

Average, Min and Max calculated correctly   _____   30 points

Input files are opened in the main program area and passed to the function

     _____   25 points

Logic is present to determine "Pass or Fail"

     _____   40 points

All files are opened and closed properly   _____   30 points

Code uses a consistent variable naming convention   _____   10 points

Total Points = _____ / 310 points