FINAL EXAM EXERCISE (1) (SECJ1013)
PROGRAMMING TECHNIQUE 1
SECTION 03 & 04, SEM 1, 2020/2021

You are given a C++ program (**`FinalQ1.cpp`**) with errors (syntax errors and/ or logical errors, if any). The program using **pointer concept** is developed to calculate the total marks for three tests (Test 1, Test 2 and Test 3) and to determine the grades for 20 students. The student's information are stored in a dynamically allocated array named **`students`**. The program has two functions:

a) A non-value returning function named **`calc_totalMark()`** that calculate the total marks for each student. The function should apply the pointer of total marks and array of coursework marks as function parameters.
   Note: You must use **pointer arithmetic** to access the array for the function.
b) A value returning function named **`deter_grade()`** that determines and returns each student's grade.

Both functions should not display the output of the total marks and/ or grades. The task to display the output must be done in the **`main()`** function. You are required to debug the errors, compile and run the program. Read the data from the provided input text file named **`input.txt`**. The program should produce the output as in **Figure 1**.
Note: Please make sure that you have released the dynamic memory of **`students`** array.

```
1   //FinalQ1.cpp
2   #include <iostream>
3   #include <fstream>
4   #include <iomanip>
5   #define MAX = 20 //Number of students/ characters
6   using namespace std;
7
8   struct info
9   {
10    float course_marks[3]; //Marks for Test1, Test2 and Test3
11    float total_mark;      //Total mark for all tests
12    char grade;            //Grade
13    char name[MAX];        //Name
14  }
15
16  //Function to calculate total mark for all tests
17  void calc_totalMark (float *TM, float CW[])
18  {
19    TM = 0;
```

```
20
21    for (int i = 0; i < 3; i++)
22      TM += *CW; //Use pointer arithmetic to access array
23  }
24
25  //Function to determine the grades
26  void deter_grade (float TM)
27  {
28    if (TM >= 85)
29      return 'A';
30    else if (TM >= 70)
31      return 'B';
32    else if (TM >= 55)
33      return 'C';
34    else if (TM >= 40)
35      return 'D';
36    else
37      return 'E';
38  }
39
40  int main()
41  {
42    int i, j;
43    info *students; //Declare a pointer variable
44    fstream inp;
45
46    //Dynamic memory allocation for students array
47    students[MAX] = new info;
48
49    inp.open("input.txt", ios|in); //Open an input file
50
51    //Read data from text file
52    for (i = 0; i < MAX; i++)
53    {
54      for (j = 0; j < 3; j++)
55        inp >> students[i].course_marks;
56      inp.getline(students[i].name);
57    }
58
59    //Display output on the screen
60    cout << left << setw(26) << " NAME"
61         << setw(7) << "T1"
62         << setw(7) << "T2"
63         << setw(6) << "T3"
64         << setw(8) << "TOTAL"
65         << "GRADE" << endl;
66
67    for (i = 0; i < MAX; i++)
68    {
69      cout << setw(25) << students[i].name
70           << fixed << setprecision(1);
71      for (j = 0; j < 3; j++)
72        cout << setw(7) << students[i].course_marks;
```

```
73
74      //Call a function to calculate total marks
75      calc_totalMark(students[i].total_mark,
76      students[i].course_marks[]);
77
78      //Call a function to determine the grades
79      students[i].grade = deter_grade(students[i].total_mark);
80
81      cout << setw(10) << students[i].total_mark
82           << students[i].grade << endl;
83    }
84
85    //Free dynamic memory for students array
86    delete students[];
87
88    close(inp); //Close the input file
89    return 0;
90  }
```

```
NAME                    T1     T2     T3     TOTAL    GRADE
Hafiz Ali Abdullah      25.5   20.1   30.8   76.4       B
Fatin Anis Abu          14.5   17.8   23.7   56.0       C
Ravindran Selva         20.8   25.6   32.6   79.0       B
Lee Wee Ting            25.8   25.4   34.7   85.9       A
Ahmad Dafi Hakim        10.7   14.6   11.8   37.1       E
Syafiq Hasbullah        27.8   23.5   32.8   84.1       B
Hartini Yaakob          23.9   19.7   27.9   71.5       B
Atiqah Salim            24.0   27.0   31.9   82.9       B
Zahid Amin Rashid       26.7   28.5   34.9   90.1       A
Wong Beng Hee           25.5   23.7   32.3   81.5       B
Hakim Rosli             19.4   24.6   28.6   72.6       B
Amin Hakimi Shafie      24.7   18.3   28.7   71.7       B
Raiqal Ahmad Hadi       19.4   16.5   23.3   59.2       C
Hamimah Hussin          24.6   23.4   27.5   75.5       B
Raudah Kamil            20.8   23.4   27.8   72.0       B
Hassan Hanifah          26.6   25.6   24.3   76.5       B
Shatilla Prabu          15.5   18.5   16.8   50.8       D
Rahman Rahim            29.7   25.6   32.6   87.9       A
Ng Ting Ting            23.7   25.9   28.5   78.1       B
Asri Haziq Talib        23.5   24.6   27.5   75.6       B
```

Figure 1: Sample output