

60-140-01 ASSIGNMENT #6 SOLUTION
Handed Out: Thurs. Nov 12, 2015 for (60-140-01 and 60-140-02)
Due: Thurs Nov 19, 2015 for (60-140-01 and 60-140-02)

Total: 50 marks Objective of Assignment: To write a C program to solve a problem using functions and function calls, decision, repetition instructions, and with arrays. Also, continue to practice on use of internal documentation.

Scope: Assignment covers materials up until end of chapter 8.

Other Things to learn from Assignment: How to specify array parameters in function prototypes, function calls and function definitions as well as how to navigate through rows and columns of array data using repetition instructions.

Electronic Assignment Submission:

03-60-140-1 students: email script file to cs140_01@cs.uwindsor.ca with subject including: Name, student id, lecture section, lab [section], assignment #6 (in the subject of the mail submission of script file).

03-60-140-2 students: email script file to cs140_02@cs.uwindsor.ca with subject including: Name, student id, lecture section, lab [section], assignment #6 (in the subject of the mail submission of script file).

*Only the assignments currently due that are submitted to this site within two days before and by the due date, are retrieved for marking. Others are deleted soon after

Problem

Write a C program using top-down design approach (that is, with functions) to calculate students' grades based on their scores on a class quiz. The class quiz consists of 20 True/False questions. There are 30 students who wrote the test but to be able to test your program, you can assume there are only 4 students. You are required to write a program to calculate the students' grades based on the highest score in the class given that:

Grade

- A will range from the highest score, to the highest score minus 3.
- B from the highest score minus 4, to the highest score minus 5.
- C from the highest score minus 6, to the highest score minus 7.
- D from the highest score minus 8, to the highest score minus 9.
- F will be anything below highest score minus 9.

Each student's Name (a character string) and student's test answers (integers) as well as the teachers test answers (or answer key also integers) will be entered as input data. The

output will be each student's Name, number of answers student got correct, and student's grade, along with the single highest score for the class.

Hint: You can use four one-dimensional arrays with any other needed data structures.

You are required to provide only the C program solution that is properly documented, using functions following the given structure chart, using appropriate data structures, which compiles and executes to produce desired results. Thus, you do not need to provide flowcharts nor tracing of the program.

Sample Input:

Type student name and hit enter

Smith

Type the student's answers in order

0 1 0 0 1 1 1 0 0 1 1 1 0 0 0 1 1 0 0 1

Type student name and hit enter

Tony

Type the student's answers in order

0 1 0 0 1 1 1 0 0 0 0 0 1 1 1 0 0 1 1 1

Type student name and hit enter

Patty

Type the student's answers in order

1 1 0 0 1 1 1 0 0 0 0 0 1 1 1 0 0 1 1 1

Type student name and hit enter

Meg

Type the student's answers in order

1 0 1 1 0 1 1 0 0 1 1 1 0 0 0 1 1 0 0 0

Type the teacher's answer key in order

0 1 0 0 1 1 1 0 0 1 1 1 0 0 0 1 1 0 0 0

Sample Output is:

Name	Student Answers	Answers-Correct	Grade
Smith	0 1 0 0 1 1 1 0 0 1 1 1 0 0 0 1 1 0 0 1	19	A
Tony	0 1 0 0 1 1 1 0 0 0 0 0 1 1 1 0 0 1 1 1	9	F
Patty	1 1 0 0 1 1 1 0 0 0 0 0 1 1 1 0 0 1 1 1	8	F
Meg	1 0 1 1 0 1 1 0 0 1 1 1 0 0 0 1 1 0 0 0	15	B
	answer key	highest score	
	0 1 0 0 1 1 1 0 0 1 1 1 0 0 0 1 1 0 0 0	19	

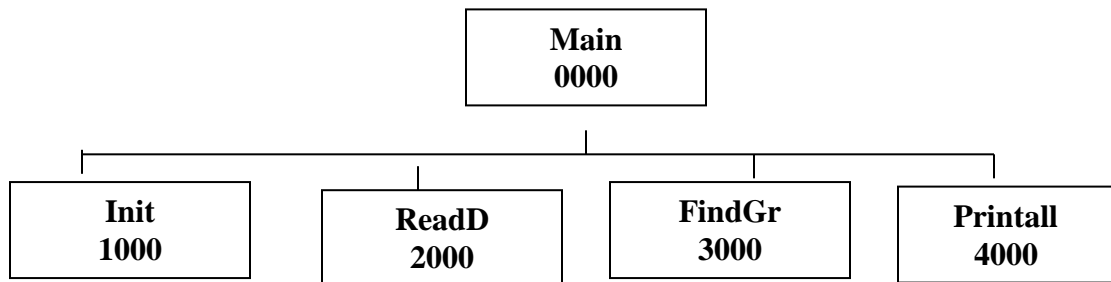
***** End of Input and Output *****

Hints

Grade formula for the above set of input data is:

highestscore to (highestscore - 3)	: A	-> [19 to 16]
(highestscore - 4) to (highestscore - 5)	: B	-> [15 to 14]
(highestscore - 6) to (highestscore - 7)	: C	-> [13 to 12]
(highestscore - 8) to (highestscore - 9)	: D	-> [11 to 10]
below (highestscore - 9)	: F	-> [9 - 0]

Solve Using the following structure chart



- Use the Init function to initialize Numcrrt array to 0.
- Use the ReadD function to read input data (Name, Answer, Anskey).
- Use the FindGr function to compute the grade for each student and the highest score.
- Use the function Printall to print all output.

Steps to follow, in solving the above problem:

Hand in your script file (userid_script6.txt) for the program which you should create as follows:

```
script userid_script6.txt
cat userid_asn6.c
cc userid_asn6.c
./a.out
(when prompted, type in the input data in the correct order)
exit
```

Type the C program solution into a source file called your userid_asn6.c and Compile your C program with cc userid_asn6.c. Then, run (execute it with ./a.out). When your program is running with no errors, then, create a script file called userid_script6.txt and hand in your script file for marking. Your script file should show your source program, the compilation of your program, the running of your program with the input and output data shown as above.

The following marking scheme will be used:

Use of Parameters & functions	-----	5 marks
Program	-----	20 marks
(5 marks for each function for a total of 15 marks, and 5 marks for correct main and use of function calls).		
Use of appropriate data structure (arrays)	-----	10 marks
Internal documentation	-----	5 marks
Correct compilation and execution with input data	-----	5 marks
Printing correct output	-----	5 marks

Solution

The solution is as given in the following script file.

```
Script started on Sat 07 Nov 2015 10:07:49 PM EST
cezeife@charlie:~/fall115/assignmt$ cat ^V[Kcezeife_asn6.c
/*
```

```
This program computes the grades of students on a class
quiz given the students' ids and their test answers as
well as the teacher's answers. The letter grade is
computed based on the highest score in the class.
To be able to test the program, I am substituting
4 for 30 students and may be 5 for 20 questions. Thus,
30 students write 20 True/False questions
*Calculate grades based on the highest score in the class
*A: from the highest score to the highest score-3
*B: from the highest score-4 to the highest score-5
*C: from the highest score-6 to the highest score-7
*D: from the highest score-8 to the highest score-9
*F: below the highest score-9
```

Program written by Dr. C.I. Ezeife, Nov. 7, 2015.

```
Program uses four functions called by main function.
The Init function is used to initialize the array variable
Numcurrt, while the ReadD function is used to read all
input array data. The FindGr function is used to compute
the students' grades and the function PrintAll prints
the input and output data in the desired format.
*/
```

```
#include <stdio.h>
```

```
/*declare function prototypes*/
void Init (int []);
void ReadD (char [][][10], int [][][20], int []);
int FindGr (int [][][20], int [], int [], char []);
void PrintAll (char [][][10], int [][][20], int [], char [], int [],
int);
```

```

void main ()
{
    int csize, numcrprt[4], highestsc;
    char Name[4][10], grade[4];
    int answers[4][20], anskey[20];

    Init (numcrprt);
    ReadD (Name, answers, anskey);
    highestsc = FindGr (answers, anskey, numcrprt, grade);
    PrintAll (Name, answers, numcrprt, grade, anskey, highestsc);
}

/*initiate number of correct answer array*/
void Init (int numcrprt[])
{
    int r;
    for (r=0; r<4; r++)
        numcrprt[r] = 0;
}

/*read data into array of student Name, answers, answer key*/
void ReadD (char Name[][10], int answers[][20], int anskey[])
{
    int r, c;
    for (r=0; r<4; r++)
    {
        printf("Type student name and hit enter\n");
        scanf ("%s", Name[r]);
        printf("Type the student answers in order\n");
        for (c=0; c<20; c++){
            scanf ("%d", &answers[r][c]);
        }
        printf("Type the teacher's answer key in order\n");
        for (c=0; c<20; c++)
            scanf ("%d", &anskey[c]);
    }
}

/*calculate grade of each student*/
int FindGr (int answers[][20], int anskey[], int numcrprt[], char
grade[])
{
    int r, c, bestsc;
    bestsc = 0;

    /*find highest score*/
    for (r=0; r<4; r=r+1)
    {
        for (c=0; c<20; c=c+1)
            if (answers[r][c] == anskey[c])
                numcrprt[r] = numcrprt[r] +1;
        if (numcrprt[r] > bestsc)
            bestsc = numcrprt[r];
    }
}

```

```

/*calculate grade of each student*/
for (r=0; r<4; r=r+1)
{
    if (numcrtrt[r] >= bestsc-3)
        grade[r] = 'A';
    else if (numcrtrt[r] >= bestsc-5)
        grade[r] = 'B';
    else if (numcrtrt[r] >= bestsc-7)
        grade[r] = 'C';
    else if (numcrtrt[r] >= bestsc-9)
        grade[r] = 'D';
    else
        grade[r] = 'F';
}
return bestsc;    /*return the highest score*/
}

/*print result*/
void PrintAll (char Name[][10], int answers[][20], int numcrtrt[],
char grade[], int anskey[], int bestsc)
{
    int r, c;
    printf ("Name \t Student Answers \t\t\t Answers-Correct \t\t Grade
\n");
    for (r=0; r<4; r++)
    {
        printf("%s \t", Name[r]);
        for (c = 0; c<20; c++)
        {
            printf("%d ", answers[r][c]);
        }
        printf("\t");
        printf ("%d \t %6c\n", numcrtrt[r], grade[r]);
    }
    printf("\n \t\t answer key \t\t\t highest score \n");
    for (c = 0; c < 20; c++)
        printf("%d ", anskey[c]);
    printf("\t\t %d \n", bestsc);
}

```

```
cezeife@charlie:~/fall15/assignmt$ cc cezeife_asn6.c
```

```
cezeife@charlie:~/fall15/assignmt$ ./a.out
```

```
Type student name and hit enter
```

```
Smith
```

```
Type the student answers in order
```

```
0 1 0 0 1 1 1 0 0 1 1 1 0 0 0 1 1 0 0 1
```

```
Type student name and hit enter
```

```
Tony
```

```
Type the student answers in order
```

```
0 1 0 0 1 1 1 0 0 0 0 0 1 1 1 0 0 1 1 1
```

```
Type student name and hit enter
```

```
Patty
```

```
Type the student answers in order
```

1 1 0 0 1 1 1 0 0 0 0 0 1 1 1 0 0 1 1 1

Type student name and hit enter

Meg

Type the student answers in order

1 0 1 1 0 1 1 0 0 1 1 1 0 0 0 1 1 0 0 0

Type the teacher's answer key in order

0 1 0 0 1 1 1 0 0 1 1 1 0 0 0 1 1 0 0 0

Name	Student Answers	Answers-Correct	Grade
Smith	0 1 0 0 1 1 1 0 0 1 1 1 0 0 0 1 1 0 0 1	19	A
Tony	0 1 0 0 1 1 1 0 0 0 0 0 1 1 1 0 0 1 1 1	9	F
Patty	1 1 0 0 1 1 1 0 0 0 0 0 1 1 1 0 0 1 1 1	8	F
Meg	1 0 1 1 0 1 1 0 0 1 1 1 0 0 0 1 1 0 0 0	15	B

answer key

highest score

0 1 0 0 1 1 1 0 0 1 1 1 0 0 0 1 1 0 0 0

19

cezeife@charlie:~/fall15/assignmt\$ exit

exit

Script done on Sat 07 Nov 2015 10:12:12 PM EST