COP 3502- Lab Exercise on structure, file I/O, dynamic memory allocation, and pointer and base conversion

Problem 1

In this problem, you will read a set of student data and their grading information from a file and then process them and then write the requested data to another file.

In a course, there are ***N* number of students**. Each student has to complete **one assignment**, **appear *M* number of quizzes** and **a final exam**. The total score of the student is calculated as follows:

The total score = sum of scores from M quizzes + score in the assignment + score in the final exam

Write a program that will perform the following operation:

- Create a student structure to store **student's last name (one word)**, **scores for one assignment, *M* quizzes** (M is a user input), **final exam, and total**.
- Take number of students ***N*** and number of quizzes ***M*** as the input. Dynamically allocate memory for *N* students. For each student dynamically allocate memory to store scores of ***M*** quizzes. Take input for all the scores for quizzes, assignments, and final exams for all the students. Calculate the total scores for each student and store it in the corresponding structure. Do this whole task in a separate method and return the appropriate pointer.

The function header should look like this:

students readData(FILE *in, int *noOfRecords, int *noofquiz)*

- Display the student(s) details who achieved the highest total score. Also write the same student details into file output.txt

Sample Input: All the inputs, including N and M will come from an input file called input.txt The input file is structured as follows:

3 2 //N and M
adam 10 12 9 45 // last name, assignment score, scors for M number of quizzes, and final exam score
jones 8 11 7 41
Muhammad 10 12 10 45

Sample output.txt:

Name: Muhammad
Assignment: 10
Quizzes: 12 10
Final exam: 45
Total: 77

Problem 2: Base Conversion

In the base conversion problem, the task to be performed is to convert the number of base *n* to decimal. The base of the number can be anything such that all digits are represented using 0 to 9 and A to Z. Value of A is 10, Value for B is 11 and so on. So, write a program to convert a number to decimal.

Example: Input number is given as string and the output is an integer.

Input	->	str = ”1100”, base = “2”
Output	->	12
Input	->	str = ”11A”, base = “16”
Output	->	282

Thus, this is how we convert from a different base to base 10. In general, we can write our conversion as follows:

Consider a number with base b has n digits $d_{n-1}d_{n-2}...d_2d_1d_0$

So, the conversion from the number from base b to the decimal can be written as: $d_{n-1}d_{n-2}...d_2d_1d_{0\ (\text{in base b})} = d_{n-1}xb^{n-1} + d_{n-2}xb^{n-2} + ... + d_2xb^2 + d_1xb + d_0$

Hint: “str” is the input number, “base” is base of the input number.

Decimal equivalent is: str [len-1] x $base^{(len-1)}$ + str [len-2] x $base^{(len-2)}$ + ...

Note that you will need to convert or cast the char to integer before performing the arithmetic operation.

Example calculation: $314_5 = 3 \times 5^2 + 1 \times 5^1 + 4 \times 5^0 = 84_{10}$.