Programming Fundamentals
Project

Faculty of Information Technology
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Note:

- ***This is an individual Project.***
- ***You have to perform only one question among the three.***
- ***Each question carries equal marks.***
- ***100 % marks will be given on the basis of No Memory leakage, No dangling pointers, and No extra space should be wasted. Also make use of helper functions where ever required.***
- ***String data type not allowed instead use CString with null termination else you will get 0.***
- ***Only Students without any plagiarism will be given a favor of 3 bonus marks in the project and in one of the instrument after mid in lab.***
- ***Submission will be on portal in Lab under folder named Project_Submissions.***

Question 1: "Pestcouts" is an emerging pesticide (insect killer) research lab. They are aiming at producing environmental friendly pesticides. Currently they are conducting tests for a new formula on a farmhouse. They divided the farmhouse into 4 fields. They have conducted a test and record the success scores. Scores are sent to the system one by one and stored in a table as shown below.

In the below data table, tests are being conducted in 4 fields. Each field corresponds to row and each test value corresponds to column of data.

Field 1	5	1	21	-1	-1	-1
Field 2	-1	-1	-1	-1	-1	-1
Field 3	23	5	20	5	30	-1
Field 4	1	9	5	0	-1	-1

Note: -1 shows that field is empty.

1. Insert a new value in any field of table at first empty location.
2. Count the number of filled locations (values other than -1) in whole table
3. Delete any filled value from any field. (Deletion means replace with -1)
4. Find and display the top two values in whole data (excluding -1) which have maximum occurrences. For example, in given data table above, 5 has maximum occurrence of 4 times while 1 has second maximum occurrence of 2 times.
5. Calculate Average test score of all the field values (excluding empty locations).
6. Tell the field/s no having maximum success scores value

Expected Output 1:

- *Press 1 to **insert new test result.***
- *Press 2 to **display total number of results in table.***
- *Press 3 to **delete any test value from table.***
- *Press 4 to **display the 2 most frequent values in table.***
- *Press 5 to **display average scores of each field.***
- *Press 6 to **display field having maximum success score.***

- *Enter choice: 5*
  Field1 average: 9
  Field2 average: empty field
  Field3 average: 16.6
  Field4 average: 2.5

Expected Output 2:

- *Press 1 to **insert new test result.***
- *Press 2 to **display total number of results in table.***
- *Press 3 to **delete any test value from table.***
- *Press 4 to **display the 2 most frequent values in table.***
- *Press 5 to **display average scores of each field.***
- *Press 6 to **display field having maximum success score.***

- *Enter choice: 6*
  Field3 has the maximum success score.

Expected Output 3:

- *Press 1 to **insert new test result.***
- *Press 2 to **display total number of results in table.***
- *Press 3 to **delete any test value from table.***
- *Press 4 to **display the 2 most frequent values in table.***
- *Press 5 to **display average scores of each field.***
- *Press 6 to **display field having maximum success score.***

- *Enter choice: 2*
  There are 12 test score values entered in table.

Expected Output 4:

- *Press 1 to **insert new test result.***
- *Press 2 to **display total number of results in table.***
- *Press 3 to **delete any test value from table.***
- *Press 4 to **display the 2 most frequent values in table.***
- *Press 5 to **display average scores of each field.***
- *Press 6 to **display field having maximum success score.***

- *Enter choice: 1*
  Enter the field in which you want to enter a value: 1
  Enter the value you want to enter: 12

  12 is entered in field 1 at location 4

Field 1	5	1	21	12	-1	-1
Field 2	-1	-1	-1	-1	-1	-1
Field 3	23	5	20	5	30	-1
Field 4	1	9	5	0	-1	-1

OR

Question 2: Your task is to design a departmental store management system. The store has multiple shelves with numbers on it for placing multiple items, initially the shelf is empty, means that there is no item on the shelf. The store consists of k number of shelves, and each shelf has exactly p number of positions for items to be placed on it. The store wants to design a software to keep the records of item on the shelves. The software should be able to perform the following operations:

1. Insert the item at a particular position in a given shelf, if it's empty else place the item in the first empty location in that shelf, and if there is no location empty on that shelf then do not insert it and display the appropriate message to the user.
2. Display all the items in a given shelf.
3. Remove the item from particular position in a given shelf if it is there.
4. Remove all the item from a given shelf
5. Return total number of the items in the specified shelf
6. Return the total number of items in all the shelves.

7. Find item in the store and return the shelf number and its position if it exists.
8. Update the item at given position (can be empty or filled) by replacing it with the new item.
9. Check if the shelf is empty
10. Check if the shelf is full

Your process will start for asking number of shelves (k) and (p) positions on each shelf (Each shelf can have varying storage positions)

Sample Input/Output:

- *Enter no of shelves: 2*
- *Enter no of positions on each shelf: 4*

  ********** Menu **********
- *Press 1 for **Inserting an item**.*
- *Press 2 for **Displaying all items.***
- *Press 3 for **Remove an item.***
- *Press 4 for **Remove all the items.***
- *Press 5 for **Return total no of items.***
- *Press 6 for **find an item.***
- *Press 7 for **updating an item.***
- *Press 8 to **check if shelf is empty.***
- *Press 9 to **check if shelf is full.***
- *Press 0 to **Quit.***

- *Enter Choice: 1*
  Enter Shelf: 1   Enter Position: 1
  Enter Item: Glass
  Added successfully!

- *Enter Choice: 1*
  Enter Shelf: 1   Enter Position: 2
  Enter Item: Bag
  Added successfully!

- *Enter Choice: 1*
  Enter Shelf: 2   Enter Position: 1

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  Item found at: Shelf: 1   Position: 2

-
  Error! Shelf not found.

- *Enter Choice:* 7
  Enter shelf no to update: 2   *Enter position:* 1
  Enter item to update with: Bottle
  Shelf updated!

-
  Item removed!

-
  Shelf 2 is not full.

-
  All items removed from every shelf!

-
  Shelf 1 is empty.

OR

Question 3: A University has a Computer Science department in which a Student can enroll himself/herself in different number of courses. There are total of 5 courses with minimum 3 credit hours and maximum 4 credit hours. The Department decided to keep the records of student enrollment in a course along with the section. A student can enroll himself in multiple courses and in multiple section but he/she can't study the same course with multiple section.

There is a file containing information related to course code and the credit hours of that course separated with a space.
There are total of 5 sections Name as A, B C, D, E

A portion of this is shown as a sample diagram:

Courses.txt

- *CSCP1011   4 // Programming Fundamentals*
- *CSHU2833   3// Logical Thinking*
- *CSCS2533   3// Digital Logic Design*
- *CSHU1893   3//Pakistan Studies*
- *CSSS1713   3//Calculus 1*

Define the necessary data types or representing this diagram. The software you design should support the following functions:

1. Enroll a student by asking student id and display a list of subjects with credit hours offered and ask him to choose the course, and the section and save the student id, course code, credit hours and Section name in an array if the student is not already enrolled in that particular course in any of the section else display error message. (Note A single row of an array should be containing just single course information, if user has enrolled in multiple courses then multiple rows will be occupied).
2. A student may drop a specified course. The particular record should be deleted from the array
3. List all the courses in which a particular student is enrolled.
4. Update the Course section in which a student is already enrolled.
5. Display total number of students enrolling in a specified course
6. Display the course which is not enrolled by any of the student
7. Search the student with minimum number of courses registered.

Sample Input/Output:

********** **Menu** **********

- *Press 1 for* **Enrollment of the Student in a Course.**
- *Press 2 for* **drop a Specified Course.**
- *Press 3 for* **Display Students Enrolled courses.**
- *Press 4 for* **Update Section of Student for enrolled Course.**
- *Press 5 for* **Display Total number of Students enrolled in particular course.**
- *Press 6 for* **Display course not enrolled by any student.**
- *Press 7 for* **Display the Student with minimum number of registered course.**

- *Enter Choice:* 1
  Enter Student ID: Bscs0025

Choose a course from following course

- CSCP1011   4 // Programming Fundamentals
- CSHU2833   3// Logical Thinking
- CSCS2533   3// Digital Logic Design
- CSHU1893   3//Pakistan Studies
- CSSS1713   3//Calculus 1

  Enter the Section: B
  Student Enrolled Successfully!

- *Enter Choice:* 1
  Enter Student ID: Bscs0178

Choose a course from following course

- CSCP1011   4 // Programming Fundamentals
- CSHU2833   3// Logical Thinking
- CSCS2533   3// Digital Logic Design
- CSHU1893   3//Pakistan Studies
- CSSS1713   3//Calculus 1

  Enter the Section: C
  Student cannot enroll a course in multiple sections!

- *Enter Choice:* 2
  Enter Student ID: Bscs0025
  Enter Course Code: CSHU2833
  Course dropped successfully!

- *Enter Choice: 2*
  Enter Student ID: Bscs1225
  Enter Course Code: CSHU2833
  Student is not registered in this course!

- *Enter Choice: 3*
  Enter Student ID: Bscs1225

Course Code	**Credit hours**	**Section**

- CSCP1011   4   Section A
- CSHU2833   3   Section A
- CSCS2533   3   Section C
- CSHU1893   3   Section B
- CSSS1713   3   Section D

- *Enter Choice: 4*
  Enter Student ID: Bscs0447
  Enter Course Code: CSHU2833
  Enter the New Section: D
  Section is Updated Successfully!

- *Enter Choice: 4*
  Enter Student ID: Bscs0347
  Enter Course Code: CSHU2833
  Enter the New Section: C
  Student is not enrolled in this course!

- *Enter Choice: 5*
  Enter Course Code: CSHU2833
  Total enrolled students for this course are: 32

- *Enter Choice: 6*
  CSHU2833 is not enrolled by any student

- *Enter Choice: 6*
  No course found

- *Enter Choice: 7*
  BSCS0245 has registered only 2 courses