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COURSE CODE: CT-159

ASSIGNMENT: DSA LAB#01

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Q1.

SOURCE CODE:

```
1  #include<iostream>
2  using namespace std;
3
4  int main(){
5      int rows, cols;
6      cout<<"Enter rows:";
7      cin>>rows;
8      cout<<"Enter columns:";
9      cin>>cols;
10
11     int arr[rows][cols];
12     int oned[rows];
13     int k=0;
14
15     cout<<"Enter elements of 2D array:"<<endl;
16     for(int i=0;i<rows;i++){
17         for(int j=0;j<cols;j++){
18             cin>>arr[i][j];
19         }
20     }
21
```

```

22  □   for(int j=0;j<cols;j++){
23  □       for(int i=0;i<rows;i++){
24  |           oned[k]=arr[i][j];
25  |           k++;
26  |       }
27  |   }
28
29  |   cout<<"1D array in Column Major Order:"<<endl;
30  □   for(int i=0;i<rows*cols;i++){
31  |       cout<<oned[i]<<" ";
32  |   }
33
34  |   return 0;
35  | }

```

OUTPUT:

```

Enter rows:3
Enter columns:3
Enter elements of 2D array:
2
1
2
3
4
2
2
2
2
1D array in Column Major Order:
2 3 2 1 4 2 2 2 2
-----
Process exited after 12.49 seconds with return value 0
Press any key to continue . . .

```

Q2.

SOURCE CODE:

```
1  #include<iostream>
2  using namespace std;
3
4  int main(void){
5      int credithour=3;
6      string students[5]={"ALI","HIBA","ASMA","ZAIN","FAISAL"};
7      float grades[5][5] = {
8          {3.66, 3.33, 4.0, 3.0, 2.66},
9          {3.33, 3.0, 3.66, 3.0, -1},
10         {4.0, 3.66, 2.66, -1, -1},
11         {2.66, 2.33, 4.0, -1, -1},
12         {3.33, 3.66, 4.0, 3.0, 3.33}
13     };
14
15     for(int i=0;i<5;i++){
16         float gpa=0;
17         int totalcredithours=0;
18         for(int j=0;j<5;j++){
19             float gpaofsubject=grades[i][j];
20             if(gpaofsubject!=-1){
21                 totalcredithours+=credithour;
22                 gpa+=gpaofsubject*credithour;
23             }
24         }
25         float cgpa;
26         cgpa=gpa/totalcredithours;
27         cout<<students[i]<<"'s GPA:"<<cgpa<<endl;
28     }
29     return 0;
30 }
```

OUTPUT:

```
ALI's GPA:3.33
HIBA's GPA:3.2475
ASMA's GPA:3.44
ZAIN's GPA:2.99667
FAISAL's GPA:3.464

-----
Process exited after 8.459 seconds with return value 0
Press any key to continue . . .
```

Q3.

SOURCE CODE:

```
1  #include<iostream>
2  using namespace std;
3
4  class MedianFinder{
5  private:
6      int arr[50000];
7      int size;
8  public:
9      MedianFinder(){
10         size=0;
11     }
12
13     void addnum(int num){
14         int i=size-1;
15         while(i>=0 && arr[i]>num){
16             arr[i+1]=arr[i];
17             i--;
18         }
19         arr[i+1]=num;
20         size++;
21     }
22
23     double findmedian(){
24         if(size%2==1){
25             return arr[size/2];
26         }
27         else{
28             int mid=size/2;
29             return (arr[mid-1]+arr[mid])/2.0;
30         }
31     }
32 };
33
34 int main(void){
35     MedianFinder mf;
36     mf.addnum(1);
37     mf.addnum(2);
38     cout<<mf.findmedian()<<endl;
39     mf.addnum(3);
40     cout<<mf.findmedian()<<endl;
41     return 0;
42 }
```

OUTPUT:

```
1.5
2
```

```
-----
Process exited after 7.884 seconds with return value 0
Press any key to continue . . .
```

Q4.

SOURCE CODE:

```
1  #include<iostream>
2  using namespace std;
3
4  int search(int nums[], int size, int target){
5      int low = 0;
6      int high = size - 1;
7
8      while(low <= high){
9          int mid = (low + high) / 2;
10
11         if(nums[mid] == target){
12             return mid;
13         }
14         else if(nums[mid] < target){
15             low = mid + 1;
16         }
17         else{
18             high = mid - 1;
19         }
20     }
21     return -1;
22 }
23
24 int main(void){
25     int nums[] = {-1, 0, 3, 5, 9, 12};
26     int size = sizeof(nums) / sizeof(nums[0]);
27     int target1 = 9;
28     int target2 = 2;
29
30     cout << "INDEX OF TARGET 1: " << search(nums, size, target1) << endl;
31     cout << "INDEX OF TARGET 2: " << search(nums, size, target2) << endl;
32
33     return 0;
34 }
```

OUTPUT:

```
INDEX OF TARGET 1:4
INDEX OF TARGET 2:-1
```

```
-----
Process exited after 7.994 seconds with return value 0
Press any key to continue . . .
```

Q5.

SOURCE CODE:

```
1  #include<iostream>
2  #include<vector>
3  using namespace std;
4
5  bool searchMatrix(vector<vector<int>>&matrix,int target){
6      int m=matrix.size();
7      int n=matrix[0].size();
8
9      int low=0;
10     int high=m*n-1;
11
12     while(low<=high) {
13         int mid=(low+high)/2;
14         int row=mid / n;
15         int col=mid % n;
16         int value=matrix[row][col];
17
18         if(value==target){
19             return true;
20         }
21         else if(value<target){
22             low=mid+1;
23         }
24         else {
25             high=mid-1;
26         }
27     }
28     return false;
29 }
```

```

31  int main() {
32      vector<vector<int>>matrix={
33          {1,3,5,7},
34          {10,11,16,20},
35          {23,30,34,60}
36      };
37      int target=3;
38
39      if(searchMatrix(matrix, target)){
40          cout<<"True"<<endl;
41      } else {
42          cout<<"False"<<endl;
43      }
44      return 0;
45  }

```

OUTPUT:

True

```

-----
Process exited after 0.01497 seconds with return value 0
Press any key to continue . . .

```