

Name: **Muhammad Anas Baig**Enrollment No.: **01-134152-037**Section: **BS(CS)-4A****LAB-JOURNAL-1****Exercise 1:**

Write a C++ function which accepts an array of integers and the size of the array and finds:

- Sum of the elements in the array
- Average of the array elements
- Minimum and maximum values in the array

In the main program, declare an array of 10 integers using dynamic memory allocation and call the aforementioned function. Display the output of the function within the main. (Use call by reference for output values).

Solution:**main.cpp File:**

```
1. #include <iostream>
2. #include "conio.h"
3. using namespace std;
4.
5. void calculation(int *arr, int size, int &sum, int &avg, int &min, int &max)
6. {
7.     sum = 0;
8.     for(int i=0; i<size; i++) //loop for sum
9.     {
10.         sum = sum + arr[i];
11.     }
12.     avg = sum/size; //avg logic
13.     min = arr[0];
14.     max = arr[0];
15.     for(int j=1; j<size; j++)
16.     {
17.         if(arr[j] < min) //minimum logic
18.         {
19.             min = arr[j];
20.         }
21.         if(arr[j] > max) //maximum logic
22.         {
23.             max = arr[j];
24.         }
25.     }
26. };
27.
28. void main()
29. {
30.     int *arr; arr = new int [10]; int sum, avg, min, max;
31.     cout<<"Enter Array of 10 Integers:"<<endl;
32.     for( int i=0; i<10; i++)
33.     {
34.         cin>>arr[i];
```

```

35.     }
36.     calculation(arr,10, sum, avg, min, max); cout<<endl;
37.     cout<<"===== "<<endl;
38.     cout<<" OUTPUT-RESULT"<<endl;
39.     cout<<"===== "<<endl;
40.     cout<<"Sum: "<<sum<<endl; //sum
41.     cout<<"Average: "<<avg<<endl; //average
42.     cout<<"Minimum: "<<min<<endl; //minimum
43.     cout<<"Maximum: "<<max<<endl; //maximum
44.     getch();
45. }

```

Output:

```

C:\Users\Administrator\documents\visual studio 2010\Projects\Testing_Modules\Debug\Testing_M...
Enter Array of 10 Integers:
0
1
2
3
4
5
60
70
80
90

===== 
OUTPUT-RESULT
===== 
Sum: 315
Average: 31
Minimum: 0
Maximum: 90

```

Exercise 2:

Write a program with a function which accepts an array of integers and a key value. The function should return the sum of all the multiples of the key value in the array. For example, for the array {1, 4, 10, 12, 15, 20, 22} and the key value 5, the function should return the sum 10+15+20.

Solution:

main.cpp File:

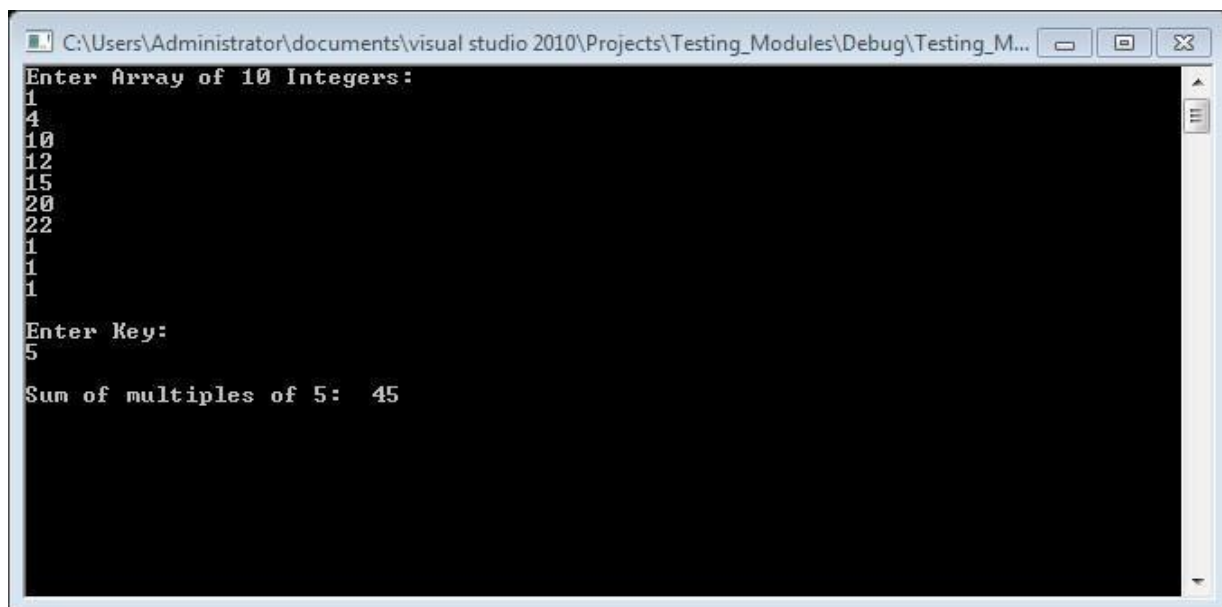
```

1. #include <iostream>
2. #include "conio.h"
3. using namespace std;
4.
5. int calculation(int *arr,int size, int key)
6. {
7.     int sum =0;
8.     for(int i=1; i<size; i++)
9.     {
10.         if( (arr[i] % key) == 0 )
11.         {
12.             sum = sum + arr[i];
13.         }
14.     }

```

```
15.     return sum;
16. };
17.
18. void main()
19. {
20.     int *arr, key; arr = new int [10];
21.     cout<<"Enter Array of 10 Integers:"<<endl;
22.     for( int i=0; i<10; i++)
23.     {
24.         cin>>arr[i];
25.     }
26.     cout<<endl<<"Enter Key:"<<endl; cin>>key;
27.     calculation(arr,10, 5);
28.     cout<<endl<<"Sum of multiples of "<<key<<": "<<calculation (arr, 10, 5);
29.     getch();
30. }
```

Output:



Exercise 3:

Create a class Matrix to model 2x2 matrices. Provide a default and parameterized constructor to assign values to the matrix. Using a member function, overload the '+' operator to add two matrices. Likewise, overload the '~' operator to find the determinant of the matrix. Also provide a display() member function to print the matrix. In the main program, create an object of class Matrix and call its member functions.

Solution:

matrix.h File:

```
1. #pragma once
2. class matrix
3. {
4. private:
5.     int a, b, x, y;
6. public:
7.     matrix(void);
8.     matrix(int, int, int, int);
9.     matrix operator + (matrix);
```

```
10.     int operator ~ ();
11.     void display();
12. };
```

matrix.cpp File:

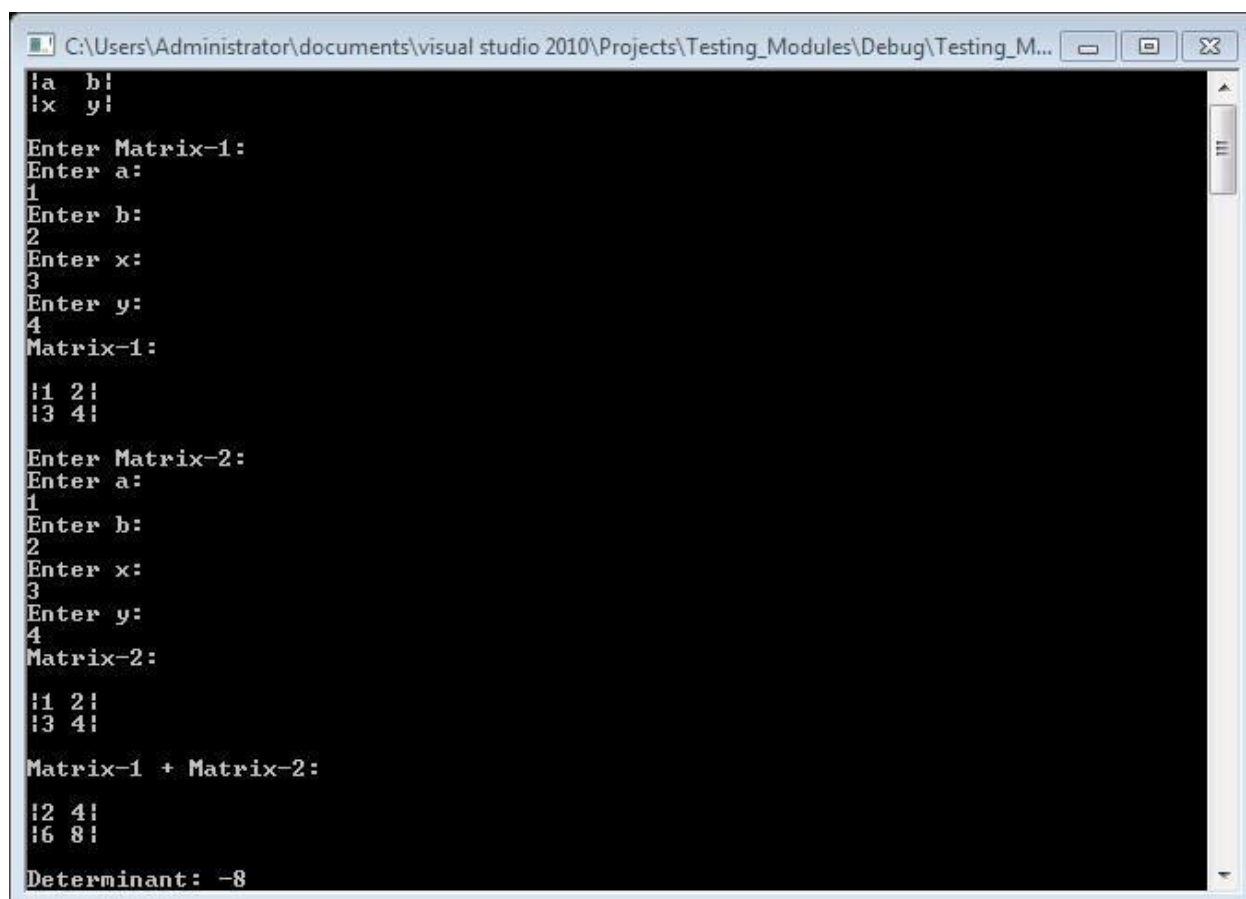
```
1. #include "matrix.h"
2. #include <iostream>
3. using namespace std;
4.
5. matrix::matrix(void)
6. {
7.     this->a = 0; this->b = 0; this->x = 0; this->y = 0;
8. }
9.
10. matrix::matrix(int a, int b, int x, int y)
11. {
12.     this->a = a; this->b = b; this->x = x; this->y = y;
13. }
14.
15. matrix matrix::operator + (matrix m)
16. {
17.     matrix result;
18.     result.a = a + m.a;
19.     result.b = b + m.b;
20.     result.x = x + m.x;
21.     result.y = y + m.y;
22.     return result;
23. }
24.
25. int matrix::operator ~ ()
26. {
27.     return ( (a*y) - (b*x) );
28. }
29.
30. void matrix::display()
31. {
32.     cout<<endl;
33.     cout<<"| "<<a<<" "<<b<<"| "<<endl;
34.     cout<<"| "<<x<<" "<<y<<"| "<<endl;
35. }
```

main.cpp File:

```
1. #include "matrix.h"
2. #include "conio.h"
3. #include <iostream>
4. using namespace std;
5.
6. void main()
7. {
8.     int a, b, x, y;
9.     cout<<"|a b|"<<endl;
10.    cout<<"|x y|"<<endl;
11.    cout<<endl;
12.    cout<<"Enter Matrix-1:"<<endl;
13.    cout<<"Enter a:"<<endl;
14.    cin>>a;
15.    cout<<"Enter b:"<<endl;
16.    cin>>b;
17.    cout<<"Enter x:"<<endl;
18.    cin>>x;
```

```
19.     cout<<"Enter y:"<<endl;
20.     cin>>y;
21.     matrix m1(a, b, x, y);
22.     cout<<"Matrix-1:"<<endl;
23.     m1.display();
24.     cout<<endl;
25.
26.     cout<<"Enter Matrix-2:"<<endl;
27.     cout<<"Enter a:"<<endl;
28.     cin>>a;
29.     cout<<"Enter b:"<<endl;
30.     cin>>b;
31.     cout<<"Enter x:"<<endl;
32.     cin>>x;
33.     cout<<"Enter y:"<<endl;
34.     cin>>y;
35.     matrix m2(a, b, x, y);
36.     cout<<"Matrix-2:"<<endl;
37.     m2.display();
38.     matrix m3 = m1 + m2;
39.     cout<<endl;
40.
41.     cout<<"Matrix-1 + Matrix-2:"<<endl;
42.     m3.display();
43.     cout<<endl;
44.
45.     cout<<"Determinant: "<<m3;
46.     getch();
47. }
```

Output:



```
C:\Users\Administrator\documents\visual studio 2010\Projects\Testing_Modules\Debug\Testing_M...
|a  b|
|x  y|

Enter Matrix-1:
Enter a:
1
Enter b:
2
Enter x:
3
Enter y:
4
Matrix-1:

|1 2|
|3 4|

Enter Matrix-2:
Enter a:
1
Enter b:
2
Enter x:
3
Enter y:
4
Matrix-2:

|1 2|
|3 4|

Matrix-1 + Matrix-2:

|2 4|
|6 8|

Determinant: -8
```

Exercise 4:

Write a program that writes elements of an array (one by one) to a file using an ofstream object and 'write()' function. In the same program, declare another array (of same size) and read the values written in the file using the 'read()' function of an ifstream object. Display the values read from the file.

Solution:

matrix.h File:

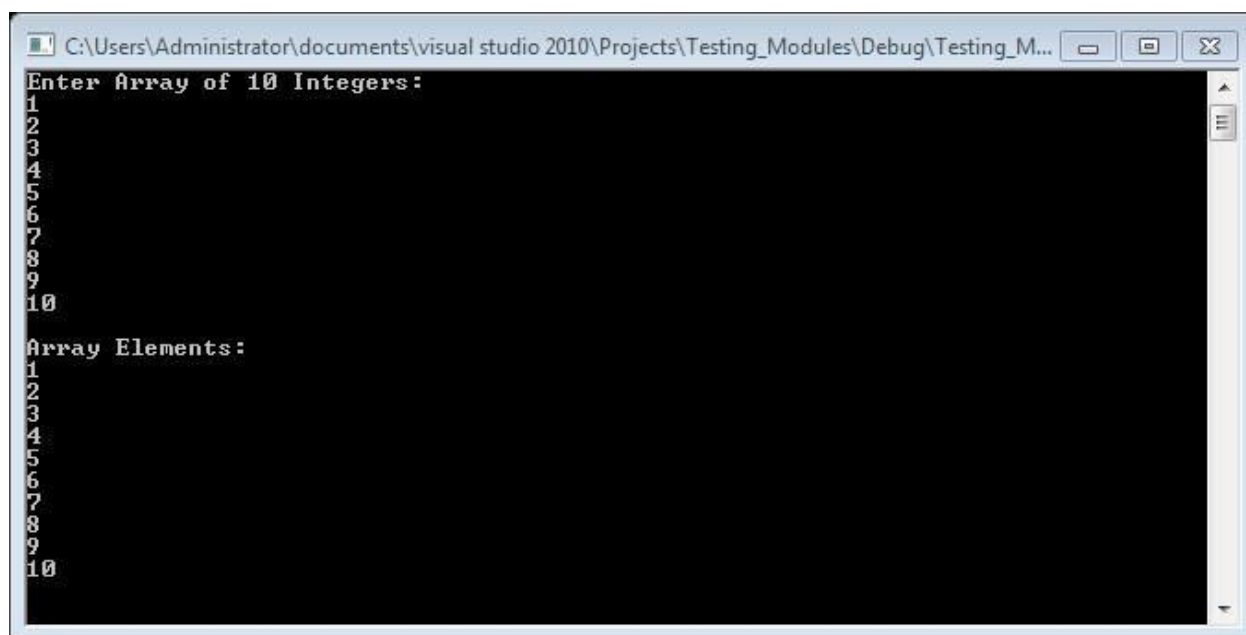
```
1. #pragma once
2. class matrix
3. {
4. private:
5.     int a, b, x, y;
6. public:
7.     matrix(void);
8.     matrix(int, int, int, int);
9.     matrix operator + (matrix);
10.    int operator ~ ();
11.    void display();
12. };
```

matrix.cpp File:

```
1. #include "matrix.h"
2. #include <iostream>
3. using namespace std;
4.
5. matrix::matrix(void)
6. {
7.     this->a = 0; this->b = 0; this->x = 0; this->y = 0;
8. }
9.
10. matrix::matrix(int a, int b, int x, int y)
11. {
12.     this->a = a; this->b = b; this->x = x; this->y = y;
13. }
14.
15. matrix matrix::operator + (matrix m)
16. {
17.     matrix result;
18.     result.a = a + m.a;
19.     result.b = b + m.b;
20.     result.x = x + m.x;
21.     result.y = y + m.y;
22.     return result;
23. }
24.
25. int matrix::operator ~ ()
26. {
27.     return ( a*y ) - ( b*x );
28. }
29.
30. void matrix::display()
31. {
32.     cout<<endl;
33.     cout<<"| "<<a<<" "<<b<<"| "<<endl;
34.     cout<<"| "<<x<<" "<<y<<"| "<<endl;
35. }
```

main.cpp File:

```
1. #include "matrix.h"
2. #include <fstream>
3. #include "conio.h"
4. #include <iostream>
5. using namespace std;
6.
7. void main()
8. {
9.     int *arr1;
10.    arr1 = new int [10];
11.
12.    cout<<"Enter Array of 10 Integers:"<<endl;
13.    for( int i=0; i<10; i++)
14.    {
15.        cin>>arr1[i];
16.    }
17.    ofstream write_file("anas_file.txt");
18.    write_file.write(reinterpret_cast<char*>(&arr1), sizeof(*arr1));
19.    write_file.close();
20.    int *arr2;
21.    arr2 = new int [10];
22.    ifstream read_file("anas_file.txt");
23.    read_file.read(reinterpret_cast<char*>(&arr2), sizeof(*arr2));
24.    read_file.close();
25.    cout<<endl;
26.    cout<<"Array Elements:"<<endl;
27.    for(int i=0; i<10; i++)
28.    {
29.        cout<<arr2[i]<<endl;
30.    }
31.    getch();
32. }
```

Output:

```
C:\Users\Administrator\documents\visual studio 2010\Projects\Testing_Modules\Debug\Testing_M...
Enter Array of 10 Integers:
1
2
3
4
5
6
7
8
9
10
Array Elements:
1
2
3
4
5
6
7
8
9
10
```