

NAME : SAFI AHMED

ROLL NO : 22F-BSCS-35

SUBJECT: PROGRAMMING

FUNDAMENTAL

SUBMITTED TO : ENGR. SOFIA HAJANO





DAWOOD UNIVERSITY OF ENGINEERING AND TECHNOLOGY
M.A JINNAH ROAD KARACHI-74800 (PAKISTAN)

PROGRAMMING FUNDAMENTALS

ASSIGNMENT NO:02

1. Write a C++ program that takes input for an array of characters and counts the number of vowels present in the array.

```
Programiz C++ Online Compiler
main.cpp
1 #include <iostream>
2 using namespace std;
3
4 int countVowels(char arr[], int size) {
5     int count = 0;
6     char vowels[] = {'a', 'e', 'i', 'o', 'u'};
7
8     for (int i = 0; i < size; i++) {
9         for (int j = 0; j < 5; j++) {
10            if (arr[i] == vowels[j] || arr[i] == vowels[j] - 32) {
11                count++;
12                break;
13            }
14        }
15    }
16
17    return count;
18 }
19
```

Output

```
/tmp/nSKZaL9haw.o
Enter the size of the array: 5
Enter the elements of the array: a e i o u
Number of vowels in the array: 5
```

Programiz C++ Online Compiler

main.cpp

Run

```
20- int main() {
21-     const int MAX_SIZE = 100;
22-     char arr[MAX_SIZE];
23-     int size;
24-
25-     cout << "Enter the size of the array: ";
26-     cin >> size;
27-
28-     cout << "Enter the elements of the array: ";
29-     for (int i = 0; i < size; i++) {
30-         cin >> arr[i];
31-     }
32-
33-     int vowelCount = countVowels(arr, size);
34-     cout << "Number of vowels in the array: " << vowelCount << endl;
35-
36-     return 0;
37- }
38
```

Output

```
/tmp/nSKZaL9haw.o
Enter the size of the array: 5
Enter the elements of the array: a e i o u
Number of vowels in the array: 5
```

2. Create a C++ program to perform matrix multiplication. Take input for two matrices and display the resulting matrix.

Programiz C++ Online Compiler C++ Certif

main.cpp

Run

```
1 #include <iostream>
2 using namespace std;
3
4 const int MAX_SIZE = 10;
5
6 void matrixMultiplication(int mat1[][MAX_SIZE], int
    mat2[][MAX_SIZE], int result[][MAX_SIZE], int rows1, int cols1,
    int cols2) {
7-     for (int i = 0; i < rows1; i++) {
8-         for (int j = 0; j < cols2; j++) {
9             result[i][j] = 0;
10-            for (int k = 0; k < cols1; k++) {
11-                result[i][j] += mat1[i][k] * mat2[k][j];
12-            }
13-        }
14-    }
15- }
16
17 void displayMatrix(int matrix[][MAX_SIZE], int rows, int cols) {
```

Output

```
/tmp/nSKZaL9haw.o
Enter the number of rows and columns for the first matrix: 2 3
Enter the elements of the first matrix:
1 2 3
4 5 6
Enter the number of rows and columns for the second matrix: 3 2
Enter the elements of the second matrix:
7 8
9 10
11 12
Resulting matrix after multiplication:
58 64
139 154
```

Programiz C++ Online Compiler

C++ Certif

main.cpp

Run

```
17 void displayMatrix(int matrix[MAX_SIZE][MAX_SIZE], int rows, int cols) {
18     for (int i = 0; i < rows; i++) {
19         for (int j = 0; j < cols; j++) {
20             cout << matrix[i][j] << " ";
21         }
22         cout << endl;
23     }
24 }
25
26 int main() {
27     int mat1[MAX_SIZE][MAX_SIZE];
28     int mat2[MAX_SIZE][MAX_SIZE];
29     int result[MAX_SIZE][MAX_SIZE];
30     int rows1, cols1, rows2, cols2;
31
32     cout << "Enter the number of rows and columns for the first
        matrix: ";
33     cin >> rows1 >> cols1;
34
```

Output

/tmp/nSKZaL9haw.o

```
Enter the number of rows and columns for the first matrix: 2 3
Enter the elements of the first matrix:
1 2 3
4 5 6
Enter the number of rows and columns for the second matrix: 3 2
Enter the elements of the second matrix:
7 8
9 10
11 12
Resulting matrix after multiplication:
58 64
139 154
```

Programiz C++ Online Compiler

C++ Certif

main.cpp

Run

```
35     cout << "Enter the elements of the first matrix:" << endl;
36     for (int i = 0; i < rows1; i++) {
37         for (int j = 0; j < cols1; j++) {
38             cin >> mat1[i][j];
39         }
40     }
41
42     cout << "Enter the number of rows and columns for the second
        matrix: ";
43     cin >> rows2 >> cols2;
44
45     cout << "Enter the elements of the second matrix:" << endl;
46     for (int i = 0; i < rows2; i++) {
47         for (int j = 0; j < cols2; j++) {
48             cin >> mat2[i][j];
49         }
50     }
51
52     if (cols1 != rows2) {
```

Output

/tmp/nSKZaL9haw.o

```
Enter the number of rows and columns for the first matrix: 2 3
Enter the elements of the first matrix:
1 2 3
4 5 6
Enter the number of rows and columns for the second matrix: 3 2
Enter the elements of the second matrix:
7 8
9 10
11 12
Resulting matrix after multiplication:
58 64
139 154
```

Programiz C++ Online Compiler C++ Certif

main.cpp

Run

```
46-   for (int i = 0; i < rows2; i++) {
47-       for (int j = 0; j < cols2; j++) {
48-           cin >> mat2[i][j];
49-       }
50-   }
51-
52-   if (cols1 != rows2) {
53-       cout << "Error: Matrix multiplication not possible." << endl;
54-       return 0;
55-   }
56-
57-   matrixMultiplication(mat1, mat2, result, rows1, cols1, cols2);
58-
59-   cout << "Resulting matrix after multiplication:" << endl;
60-   displayMatrix(result, rows1, cols2);
61-
62-   return 0;
63- }
64- }
```

Output

```
/tmp/nSKZaL9haw.o
Enter the number of rows and columns for the first matrix: 2 3
Enter the elements of the first matrix:
1 2 3
4 5 6
Enter the number of rows and columns for the second matrix: 3 2
Enter the elements of the second matrix:
7 8
9 10
11 12
Resulting matrix after multiplication:
58 64
139 154
```

3. Create a C++ program that takes input for an array of strings and sorts them in alphabetical order using the bubble sort algorithm.

Programiz C++ Online Compiler

main.cpp

Run

```
1  #include <iostream>
2  #include <string>
3  using namespace std;
4
5- void bubbleSort(std::string arr[], int size) {
6-     for (int i = 0; i < size - 1; i++) {
7-         for (int j = 0; j < size - i - 1; j++) {
8-             if (arr[j] > arr[j + 1]) {
9-                 swap(arr[j], arr[j + 1]);
10-             }
11-         }
12-     }
13- }
14
15- int main() {
16-     const int MAX_SIZE = 100;
17-     string arr[MAX_SIZE];
18-     int size;
19- }
```

Output

```
/tmp/o3gUkvBgQW.o
Enter the size of the array: 5
Enter the elements of the array:
Safi
Tehmeed
Yousuf
Fasih
Rafay
Sorted array in alphabetical order:
Fasih
Rafay
Safi
Tehmeed
Yousuf
```

```
Programiz C++ Online Compiler

main.cpp Run Output

19
20     cout << "Enter the size of the array: ";
21     cin >> size;
22
23     cout << "Enter the elements of the array:" << endl;
24     for (int i = 0; i < size; i++) {
25         cin >> arr[i];
26     }
27
28     bubbleSort(arr, size);
29
30     cout << "Sorted array in alphabetical order:" << endl;
31     for (int i = 0; i < size; i++) {
32         cout << arr[i] << endl;
33     }
34
35     return 0;
36 }
37
```

```
/tmp/o3gUkvBgQW.o
Enter the size of the array: 5
Enter the elements of the array:
Safi
Tehmeed
Yousuf
Fasih
Rafay
Sorted array in alphabetical order:
Fasih
Rafay
Safi
Tehmeed
Yousuf
```

4. Create a structure called "Person" with fields for name, age, and address. Write a C++ program that takes input for multiple persons, stores them in an array of structures, and then displays their information.

```
Programiz C++ Online Compiler

main.cpp Run Output

1  #include <iostream>
2  #include <string>
3  using namespace std;
4
5  const int MAX_SIZE = 100;
6
7  struct Person {
8      string name;
9      int age;
10     string address;
11 };
12
13 void displayPersons(const Person persons[], int size) {
14     for (int i = 0; i < size; i++) {
15         cout << "Person " << i + 1 << ":" << endl;
16         cout << "Name: " << persons[i].name << endl;
17         cout << "Age: " << persons[i].age << endl;
18         cout << "Address: " << persons[i].address << endl;
19         cout << endl;

```

```
/tmp/o3gUkvBgQW.o
Enter the number of persons: 2
Enter the information for Person 1:
Name: Professor
Age: 26
Address: New York
Enter the information for Person 2:
Name: John Wick
Age: 24
Address: Australia
Displaying information of all persons:
Person 1:
Name: Professor
Age: 26
Address: New York
Person 2:
Name: ohn Wick
Age: 24
```

Programiz C++ Online Compiler

main.cpp

Run

```

20     }
21 }
22
23 int main() {
24     Person persons[MAX_SIZE];
25     int size;
26
27     cout << "Enter the number of persons: ";
28     cin >> size;
29
30     for (int i = 0; i < size; i++) {
31         cout << "Enter the information for Person " << i + 1 << ":"
32             << endl;
33
34         cout << "Name: ";
35         cin.ignore();
36         getline(cin, persons[i].name);
37         cout << "Age: ";

```

/tmp/o3gUkvBgQW.o

Enter the number of persons: 2
Enter the information for Person 1:
Name: Professor
Age: 26
Address: New York
Enter the information for Person 2:
Name: John Wick
Age: 24
Address: Australia
Displaying information of all persons:
Person 1:
Name: Professor
Age: 26
Address: New York
Person 2:
Name: ohn Wick
Age: 24

Programiz C++ Online Compiler

main.cpp

Run

```

34     cin.ignore();
35     getline(cin, persons[i].name);
36
37     cout << "Age: ";
38     cin >> persons[i].age;
39
40     cout << "Address: ";
41     cin.ignore();
42     getline(cin, persons[i].address);
43     cout << endl;
44 }
45
46
47 cout << "Displaying information of all persons:" << endl;
48 displayPersons(persons, size);
49
50 return 0;
51 }
52

```

Name: Professor

Age: 26

Address: New York

Enter the information for Person 2:

Name: John Wick

Age: 24

Address: Australia

Displaying information of all persons:

Person 1:

Name: Professor

Age: 26

Address: New York

Person 2:

Name: John Wick

Age: 24

Address: Australia

- Define a structure called "Employee" with fields for name, designation, and years of service. Write a C++ program that takes input for an employee's years of service, and based on the years of service, assigns the designation as "Junior," "Senior," or "Manager."

```
#include <string>

struct Employee {

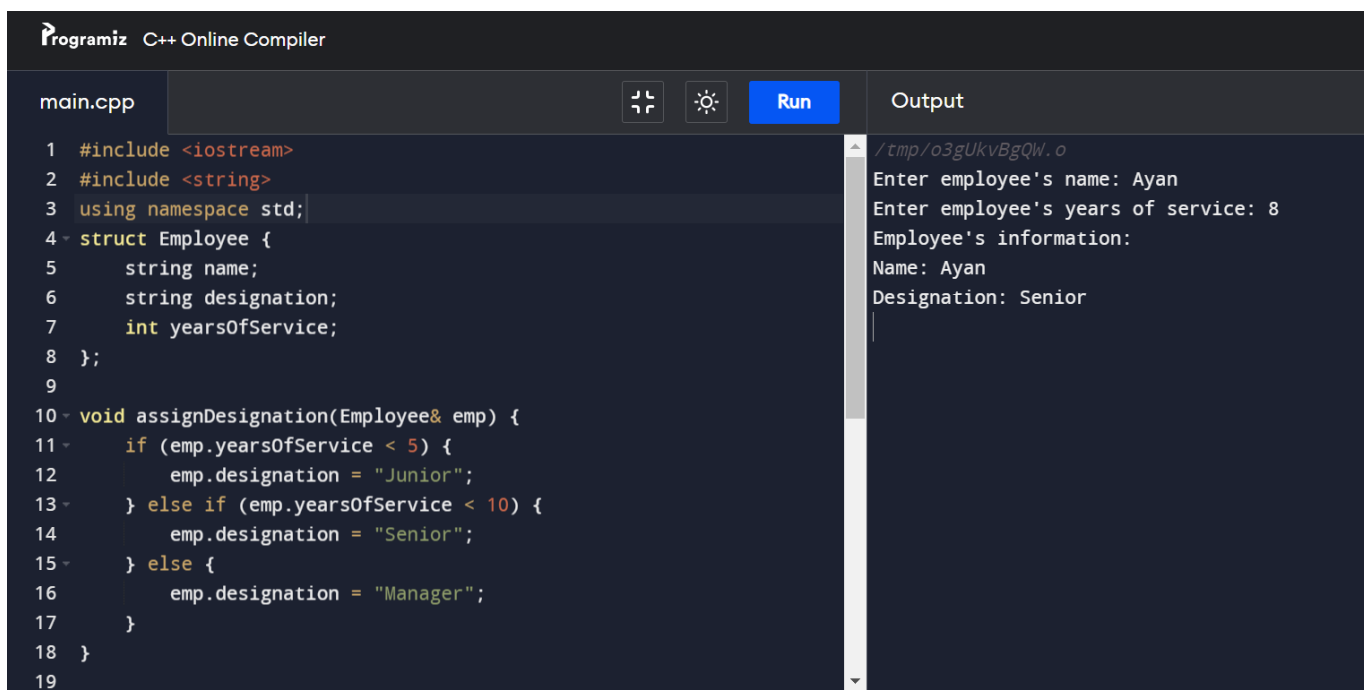
    std::string name;

    std::string designation;

    int yearsOfService;

};
```

- name of type std::string to store the name of the employee.
- designation of type std::string to store the designation of the employee.
- yearsOfService of type int to store the number of years of service of the employee.



The screenshot shows a web-based C++ compiler interface. The top bar includes the 'Programiz' logo and the text 'C++ Online Compiler'. Below this is a header with 'main.cpp', a full-screen icon, a settings icon, and a blue 'Run' button. The main area is split into two panes. The left pane contains C++ code for an Employee struct and a function to assign a designation based on years of service. The right pane shows the output of the program, which includes prompts for name and years of service, followed by the employee's information.

```
main.cpp
1 #include <iostream>
2 #include <string>
3 using namespace std;
4 struct Employee {
5     string name;
6     string designation;
7     int yearsOfService;
8 };
9
10 void assignDesignation(Employee& emp) {
11     if (emp.yearsOfService < 5) {
12         emp.designation = "Junior";
13     } else if (emp.yearsOfService < 10) {
14         emp.designation = "Senior";
15     } else {
16         emp.designation = "Manager";
17     }
18 }
19
```

Output

```
/tmp/o3gUkvBgQW.o
Enter employee's name: Ayan
Enter employee's years of service: 8
Employee's information:
Name: Ayan
Designation: Senior
```


Programiz C++ Online Compiler

```
main.cpp
19
20 int main() {
21     Employee emp;
22
23     cout << "Enter employee's name: ";
24     getline(cin, emp.name);
25
26     cout << "Enter employee's years of service: ";
27     cin >> emp.yearsOfService;
28
29     assignDesignation(emp);
30
31     cout << "Employee's information:" << endl;
32     cout << "Name: " << emp.name << endl;
33     cout << "Designation: " << emp.designation << endl;
34
35     return 0;
36 }
37
```

Output

```
/tmp/o3gUkvBgQW.o
Enter employee's name: Ayan
Enter employee's years of service: 8
Employee's information:
Name: Ayan
Designation: Senior
```

6. Write a C++ program that includes a function to calculate the factorial of a given number. Use this function to find the factorial of a user-inputted number.

Programiz C++ Online Compiler

```
main.cpp
1 #include <iostream>
2 using namespace std;
3
4 int factorial(int n) {
5     if (n <= 1) {
6         return 1;
7     } else {
8         return n * factorial(n - 1);
9     }
10 }
11
12 int main() {
13     int number;
14
15     cout << "Enter a number: ";
16     cin >> number;
17
18     int result = factorial(number);
19
```

Output

```
/tmp/iDy0c8RXuC.o
Enter a number: 5
The factorial of 5 is: 120
```

Programiz C++ Online Compiler

main.cpp

Run

Output

```
7-   } else {
8       return n * factorial(n - 1);
9   }
10 }
11
12- int main() {
13     int number;
14
15     cout << "Enter a number: ";
16     cin >> number;
17
18     int result = factorial(number);
19
20     cout << "The factorial of " << number << " is: " << result
21         << endl;
22
23     return 0;
24 }
```

/tmp/iDy0c8RXuC.o

Enter a number: 5

The factorial of 5 is: 120

7. Create a C++ program that includes a function to find the maximum element in an array.

Programiz C++ Online Compiler

main.cpp

Run

Output

```
1  #include <iostream>
2  using namespace std;
3
4  const int MAX_SIZE = 100;
5
6- int findMaxElement(int arr[], int size) {
7     int maxElement = arr[0];
8
9-     for (int i = 1; i < size; i++) {
10-         if (arr[i] > maxElement) {
11             maxElement = arr[i];
12         }
13     }
14
15     return maxElement;
16 }
17
18- int main() {
19     int arr[MAX_SIZE];
```

/tmp/iDy0c8RXuC.o

Enter the size of the array: 5

Enter the elements of the array: 10 5 8 15 3

The maximum element in the array is: 15

main.cpp



Run

Output

```
19     int arr[MAX_SIZE];
20     int size;
21
22     cout << "Enter the size of the array: ";
23     cin >> size;
24
25     cout << "Enter the elements of the array: ";
26     for (int i = 0; i < size; i++) {
27         cin >> arr[i];
28     }
29
30     int maxElement = findMaxElement(arr, size);
31
32     cout << "The maximum element in the array is: " << maxElement <<
33         endl;
34
35     return 0;
36 }
```

```
/tmp/iDy0c8RXuC.o
Enter the size of the array: 5
Enter the elements of the array: 10 5 8 15 3
The maximum element in the array is: 15
```