School Of Mechanical & Manufacturing Engineering, NUST

Department of Mechanical Engineering

CS-114 - Fundamental of Programing

Lab 10
(Lab Manual 10)

Course Instructor: Dr Jawad Khan

Lab Instructor: Muhammad Affan

Student Name: **Ahmed Adil Hussain**

CMS ID: **477537**

DATE:

23 December 2023

LAB TASK 1:

1. Iterate Through Vector Using Iterators and print all pushed elements. Next you need to push integer 5 and remove element at that position.

Code:

```cpp
#include <iostream>
#include <vector>

using namespace std;
int main()
{
//  LAB TASK 1
    vector<int> a;

    for (int i=0; i<=100; i+=10)
        {a.push_back(i);}
    cout << "Vector: ";
    for (vector<int>::iterator i = a.begin(); i!=a.end(); i+=1)
        {cout << *i << " ";}
    cout<<endl;
//  adding integer 5
    a.push_back(5);
    cout << "Vector after pushing back integer 5: ";
    for (vector<int>::iterator i = a.begin(); i!=a.end(); i+=1)
        {cout << *i << " ";}
    cout<<endl;
//  removing element at position 5
    a.erase(a.begin()+4);
    cout << "Vector after pushing back integer 5 and removing 5th element: ";
    for (vector<int>::iterator i = a.begin(); i!=a.end(); i+=1)
        {cout << *i << " ";}
    return 0;
}
```

Result:

```
Vector: 0 10 20 30 40 50 60 70 80 90 100
Vector after pushing back integer 5: 0 10 20 30 40 50 60 70 80 90 100 5
Vector after pushing back integer 5 and removing 5th element: 0 10 20 30 50 60 70 80 90 100 5
--------------------------------
Process exited after 0.1315 seconds with return value 0
Press any key to continue . . .
```

LAB TASK 2:

2. Write a complete C++ program that uses 2 vectors, 1 for names (string) and 1 for grades (int)
    a. Ask the user for the number of name/grade pairs that will be entered.
    b. Display the mean of the grades.
    c. Display the median of the grades.
    d. Display the mode of the grades.
    e. Display the names of the students with the mode as their grade.

Code:

```cpp
#include <iostream>
#include <vector>
#include <cstring>

using namespace std;
int main()
{
//  LAB TASK 2
    vector<string> names;
    vector<int> marks;

    int n;
    cout<<"Please enter the number of students: "<<endl;
    cin>>n;
    float n2=n;

    for (int i=0; i<n; i+=1){
        string name;
        int mark=0;
        cout<<"Name:"<<endl;
        cin>>name;
        cout<<"Mark:"<<endl;
        cin>>mark;
        if(mark>100 || mark<0){cout<<"Please enter a valid mark, try again. "; i-=1; continue;}
        names.push_back(name);
        marks.push_back(mark);}
    float mean, median, mode;
    int sum=0;
    for (vector<int>::iterator i = marks.begin(); i!=marks.end(); i+=1){
        sum=sum+*i;}
    mean = sum/n2;
    cout<<"The mean mark is: "<<mean<<endl;

//  median calculation:
    vector<int> bubmarks = marks;
    for (int i=0; i<n - 1; i+=1) {
        for (int j=0; j<n-i-1; j+=1) {
            if (bubmarks[j] > bubmarks[j + 1]) {
                swap(bubmarks[j], bubmarks[j + 1]);
            }}}
    float medpos=(n2/2)-1;
    if(n%2==0){median = (bubmarks[medpos]+bubmarks[medpos+1])/2;}
    if(n%2==1){median = bubmarks[medpos+0.5];}
    cout<<"The median mark is: "<<median<<endl;

//  mode calculation:
    int d=1;
    int dmax=1;
    int modpos;
    vector<int> modpositions;
    vector<int> modpositions2;
    for (int i=0; i<n; i+=1){
        d=1;
        modpositions2.push_back(i);
        for (int j=0; j<n; j+=1){
            if(j==i){continue;}
            if(marks[i]==marks[j]){d+=1; modpositions2.push_back(j);}
            }
        if(d>dmax){dmax=d; mode=marks[i]; modpos=i; modpositions =modpositions2;}
        if(d<=dmax){modpositions2.clear();}
    }
    if(dmax==1){cout<<"There is no mode mark."; return 0;}
    cout<<"The mode mark is: "<<mode<<endl;
    cout<<"The students with the mode as their mark are: "<<endl;
    for (vector<int>::iterator i=modpositions.begin(); i!=modpositions.end(); i+=1){
    cout<<names[*i]<< " ";}
    return 0;
```

Result:

```
Please enter the number of students:
5
Name:
Ahmed
Mark:
100
Name:
Abdullah
Mark:
90
Name:
Ayesha
Mark:
80
Name:
Juveriah
Mark:
100
Name:
Ali
Mark:
56
The mean mark is: 85.2
The median mark is: 90
The mode mark is: 100
The students with the mode as their mark are:
Ahmed Juveriah
--------------------------------
Process exited after 16.8 seconds with return value 0
Press any key to continue . . .
```

LAB TASK 3:

3. Write a program to print the area and perimeter of a triangle having sides of 3 m, 4 m and 5 m by creating a class named 'Triangle' with a function to print the area and perimeter.

Code:

```cpp
#include <iostream>
#include <cmath>
using namespace std;

class triangle {
private:
    double side1, side2, side3;

public:
    triangle(double s1, double s2, double s3) : side1(s1), side2(s2), side3(s3) {}

double calculatePerimeter() {
    return side1 + side2 + side3;
    }

double calculateArea() {
    double s = calculatePerimeter() / 2.0;
    return sqrt(s * (s - side1) * (s - side2) * (s - side3));
    }

void output() {
    cout << "Sides of the triangle: " << side1 << " m, " << side2 << " m, " << side3 << " m\n";
    cout << "Perimeter: " << calculatePerimeter() << " m\n";
    cout << "Area: " << calculateArea() << " square meters\n";
    }
};

int main() {
    triangle triangleinput(3, 4, 5);
    triangleinput.output();

    return 0;
}
```

Result:

```
Sides of the triangle: 3 m, 4 m, 5 m
Perimeter: 12 m
Area: 6 square meters

--------------------------------
Process exited after 0.1626 seconds with return value 0
Press any key to continue . . .
```

LAB TASK 4:

4. Write a structure to store the names, salary, and hours of work per day of 10 employees in a company. Write a program to increase the salary depending on the number of hours of work per day as follows and then print the name of all the employees along with their final salaries.

Hours of work per day	8	10	>=12
Increase in Salary	$50	$100	$150

Code:

```cpp
#include <iostream>
#include <string>
using namespace std;

struct Employee {
    string name;
    double salary;
    int hours;
};

void increase(Employee& emp) {
    if (emp.hours >= 12) {
        emp.salary += 150.0;}
        else{
            if (emp.hours >= 10) {
                emp.salary += 100.0;}
            else{
                if(emp.hours >= 8) {
                    emp.salary += 50.0;}}}
    }
int main() {
    const int num = 10;

    Employee employees[num];

    for (int i = 0; i < num; i+=1) {
        cout<<"Enter details for Employee " << i + 1 << ":\n";
        cout<<"Name: ";
        cin>>employees[i].name;
        cout<<"Salary: ";
        cin >>employees[i].salary;
        cout<<"Hours of work per day: ";
        cin>>employees[i].hours;
        cout<<endl;
    }

    for (int i = 0; i < num; i+=1) {
        increase(employees[i]);
    }

    cout << "Employee Details after Salary Increase:\n";
    for (int i = 0; i < num; i+=1) {
        cout << "Employee " << i + 1 << ": " << employees[i].name << "\n";
        cout << "Final Salary: $" << employees[i].salary << "\n\n";
    }

    return 0;
}
```

Result:

```
Enter details for Employee 1:
Name: a
Salary: 100
Hours of work per day: 8

Enter details for Employee 2:
Name: b
Salary: 100
Hours of work per day: 12

Enter details for Employee 3:
Name: c
Salary: 100
Hours of work per day: 11

Enter details for Employee 4:
Name: d
Salary: 150
Hours of work per day: 7

Enter details for Employee 5:
Name: e
Salary: 79
Hours of work per day: 13

Enter details for Employee 6:
Name: f
Salary: 99
Hours of work per day: 12

Enter details for Employee 7:
Name: g
Salary: 130
Hours of work per day: 8

Enter details for Employee 8:
Name: h
Salary: 89
Hours of work per day: 10

Enter details for Employee 9:
Name: i
Salary: 140
Hours of work per day: 10

Enter details for Employee 10:
Name: i
Salary: 100
```

```
Employee Details after Salary Increase:
Employee 1: a
Final Salary: $150

Employee 2: b
Final Salary: $250

Employee 3: c
Final Salary: $200

Employee 4: d
Final Salary: $150

Employee 5: e
Final Salary: $229

Employee 6: f
Final Salary: $249

Employee 7: g
Final Salary: $180

Employee 8: h
Final Salary: $189

Employee 9: i
Final Salary: $240

Employee 10: i
Final Salary: $200


--------------------------------
Process exited after 82.74 seconds with return value 0
Press any key to continue . . .
```