NUST-SMME-

CS-114 Fundamentals of Programming LAB MANUAL#10

All tasks

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LAB TASKS:

Task 1: -

Q1. Iterate Through Vector Using Iterators and print all pushed elements. Next you need to push integer 5 and remove the element at that position.

Code: -

```cpp
#include<bits/stdc++.h>
#include<string>
using namespace std;
int main(){
cout<<"TASK 1 \n";
 vector<int> v1;
    cout<<"How many elements do u want in ur vector? \n";
    int num;
    cin>>num;
    cout << "\nPlease enter your elements in the vector:\n";
    int element;
    for (int i=0; i<num; i++) {
        cin>>element;
        v1.push_back(element);
    }
    cout<<"Your vector is: -\n";
    // Iterating through and displaying vector
    for (auto i = v1.begin(); i != v1.end(); ++i) {
        cout << *i << ' ';
    }
    cout << endl;

     //Replacing an element with '5'
    cout << "Enter the index of the element you want to replace 5 with: ";
    int index;
    cin >> index;
    if (index >= 0 && index < v1.size()) {
        v1[index] = 5;  // Replace the element at index 'index' with 5
    }
    cout<<"Your final modified vector displayed is; "
    // Displaying modified vector
    for (auto itr = v1.begin(); itr != v1.end(); ++itr) {
        cout << *itr << ' ';
    }
    cout << endl;
```

Output: -

```
TASK 1
How many elements do u want in ur vector?
5

Please enter your elements in the vector:
1
12
3
4
5
Your vector is: -
1 12 3 4 5
Enter the index of the element you want to replace 5 with:
1
Your final modified vector displayed is; 1 5 3 4 5


** Process exited - Return Code: 0 **
```

Task 2: -

Q2. Write a complete C++ program that uses 2 vectors, 1 for names (string) and 1 for grades (int)

- Ask the user for the number of name/grade pairs that will be entered.
- Display the mean of the grades.
- Display the median of the grades.
- Display the mode of the grades.
- Display the names of the students with the mode as their grade.

Code: -

```
33
34  //FINDING MEAN, MODE AND MEDIAN OF A DATASET
35  cout<<"TASK 2 \n";
36  vector <string> names;
37  vector <int> grades;
38  cout<<"How many name/grade pairs to be entered?\n";
39  int n1;
40  cin>>n1;
41  cout<<"\n Please enter name and grade of each student respectively \n";
42  //ENTERING NAMES AND GRADES IN 2 VECTORS RESPECTIVELY
43  for(int i=0; i<n1; i++){
44      string d;
45      int e;
46      cin>>d;
47      cin>>e;
48      names.push_back(d);
49      grades.push_back(e);
50      cout<<endl;
51  }
52  //DISPLAYING NAMES AND GRADES
53  for(int i=0; i<n1; i++){
54      cout<<"Name:-  "<<names[i]<<"  Grade:- "<<grades[i];
55      cout<<endl;
56  }
57  //FINDING MEAN
58  float sum=0;
59  for(int i=0; i<n1; i++){
60      sum = sum + grades[i];
61  }
62  float mean;
63  mean = sum/n1;
64  cout<<"The mean of all grades is:- "<<mean;
65
66  //FINDING MEDIAN
67  //first sorting dataset from smallest to largest
68  bool swapped;
69   for (int i=0; i<n1-1; ++i) {
```

```
72  //first sorting dataset from smallest to largest
73  bool swapped;
74   for (int i=0; i<n1-1; ++i) {
75          swapped = false;
76          for (int j = 0; j < n1-i-1; ++j) {
77              if (grades[j] > grades[j + 1]) {
78                  // Swap the elements
79                  int temp = grades[j];
80                  grades[j] = grades[j + 1];
81                  grades[j + 1] = temp;
82                  swapped = true;
83              }
84          }
85
86          //If no two elements were swapped in the inner loop,
87          //it means the array is already sorted
88          if (!swapped) {
89              break;
90          }
91      }
92      //Median Case for even number of elements. Mean of two middle terms
93  if(n1%2==0){
94      float med;
95      med = (grades[n1/2 - 1] + grades[n1/2]) / 2;
96      cout<<"\n The median of all grades is:- "<<med;
97  }
98      //Case for odd number of elements. Middle term
99  else{
100 cout<<"\n The median of all grades is:- "<<grades[(n1-1)/2]; }
```

```
97  }
98      //Case for odd number of elements. Middle term
99  else{
100 cout<<"\n The median of all grades is:- "<<grades[(n1-1)/2]; }
101
102
103 //FINDING MODE
104   int mode = grades[0];
105 int maxcount = 1;
106 //count increases as loop detects repititon in the if statement
107     for(int i = 0; i <n1; ++i) {
108         int count = 1;
109
110         for(int j = i + 1; j <n1; ++j) {
111             if (grades[i] == grades[j]) {
112                 ++count;
113             }
114         }
115
116         if(count > maxcount){
117             maxcount=count;
118             mode =grades[i];
119         }
120     }
121 //mode gets replaced as a more frequent occurring term is encountered
122     cout<<"\n Mode of all grades is: - "<<mode<<endl;
123
124
125
126     return 0;
127 }
```

Output: -

```
TASK 2
How many name/grade pairs to be entered?
5

 Please enter name and grade of each student respectively
Abdullah
99

Juveriah
59

Ahmed
88

Fajan
59

SikandarAli
69

Name:-  Abdullah  Grade:- 99
Name:-  Juveriah  Grade:- 59
Name:-  Ahmed  Grade:- 88
Name:-  Fajan  Grade:- 59
Name:-  SikandarAli  Grade:- 69
The mean of all grades is:- 74.8
 The median of all grades is:- 69
 Mode of all grades is: - 59

--------------------------------
Process exited after 73.99 seconds with return value 0
Press any key to continue . . .
```

Task 3: -

Q3. 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
//TASK 3
#include <iostream>
#include <cmath>
using namespace std;
// Class representing a triangle
class Triangle {
private:
    double side1;
    double side2;
    double side3;
public:
    // Constructor to initialize the triangle with side lengths
    Triangle(double s1, double s2, double s3){
        side1 = s1;
        side2 = s2;
        side3 = s3;
    }
    // Function to calculate the perimeter of the triangle
    double calculatePerimeter() {
        return side1 + side2 + side3;
    }
    // Function to calculate the area of the triangle using Heron's formula
    double calculateArea() {
        double semiPerimeter = calculatePerimeter() / 2;
        return sqrt(semiPerimeter * (semiPerimeter - side1) * (semiPerimeter - side2) * (semiPerimeter - side3));
    }
    // Function to print the triangle's information
    void printInfo() {
        cout << "Triangle Information:" <<endl;
        cout << "Side 1: " << side1<<" m"<<endl;
```

```cpp
        return sqrt(semiPerimeter * (semiPerimeter - side1) * (semiPerimeter - side2) * (semiPerimeter - side3));
    }
    // Function to print the triangle's information
    void printInfo() {
        cout << "Triangle Information:" <<endl;
        cout << "Side 1: " << side1<<" m"<<endl;
        cout << "Side 2: " << side2 << " m" <<endl;
        cout<<"Side 3: "<<side3 << " m" <<endl;
        cout << "Perimeter: " << calculatePerimeter() << " m" <<endl;
        cout << "Area: " << calculateArea() << " square meters" <<endl;
    }
};
int main() {
    // Create a Triangle object with side lengths of 3, 4, and 5
    Triangle triangle(3, 4, 5);
    triangle.printInfo();
    return 0;
}
```

Output: -

```
Triangle Information:
Side 1: 3 m
Side 2: 4 m
Side 3: 5 m
Perimeter: 12 m
Area: 6 square meters

--------------------------------
Process exited after 0.408 seconds with return value 0
Press any key to continue . . .
```

Task 4: -

Q4. 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
//TASK4
#include <iostream>
#include <string>
using namespace std;
//Structure to store employee information
struct Employee {
    string name;
    double salary;
    int hoursWorked;
};
// Function to increase the salary based on hours worked
void increaseSalary(Employee& employee) {
    if (employee.hoursWorked >= 12) {
        employee.salary += 150;
    } else if (employee.hoursWorked >= 10) {
        employee.salary += 100;
    } else if (employee.hoursWorked >= 8) {
        employee.salary += 50;
    }
}

int main() {
    const int numEmployees = 10;
    Employee employees[numEmployees];

    // Input employee information
    for (int i = 0; i < numEmployees; i++) {
        cout << "Enter name of employee " << i + 1 << ": ";
        getline(cin >>ws, employees[i].name);
```

```
30      //Prompt for employee salary
31          cout<<"Enter salary of employee " << i + 1 << ": $";
32          cin>>employees[i].salary;
33
34      //Prompt for hours worked per day
35          cout<<"Enter hours worked per day of employee " << i + 1 << ": ";
36          cin>>employees[i].hoursWorked;
37
38          cout<<endl;
39      }
40
41      //Increase salaries based on hours worked
42      for (int i = 0; i < numEmployees; i++) {
43          increaseSalary(employees[i]);
44      }
45
46      //Print employee names and final salaries
47      cout<<"Employee Salaries:"<<endl;
48      for (int i = 0; i<numEmployees; i++) {
49          cout<<"Name: "<<employees[i].name<<"\tSalary: $"<<employees[i].salary<<endl;
50      }
51
52      return 0;
53  }
```

Output: -

```
Enter name of employee 1: Abdullah
Enter salary of employee 1: $1000
Enter hours worked per day of employee 1: 12

Enter name of employee 2: Juveriah
Enter salary of employee 2: $850
Enter hours worked per day of employee 2: 8

Enter name of employee 3: Mathew
Enter salary of employee 3: $200
Enter hours worked per day of employee 3: 9

Enter name of employee 4: Lucas
Enter salary of employee 4: $450
Enter hours worked per day of employee 4: 10

Enter name of employee 5: Ahmed
Enter salary of employee 5: $330
Enter hours worked per day of employee 5: 10

Enter name of employee 6: Tahseen
Enter salary of employee 6: $1050
Enter hours worked per day of employee 6: 10

Enter name of employee 7: Suleiman
Enter salary of employee 7: $750
Enter hours worked per day of employee 7: 8

Enter name of employee 8: Hassaan
Enter salary of employee 8: $600
Enter hours worked per day of employee 8: 10

Enter name of employee 9: E
Enter salary of employee 9: $100
Enter hours worked per day of employee 9: 4
```

```
Enter hours worked per day of employee 8: 10

Enter name of employee 9: E
Enter salary of employee 9: $100
Enter hours worked per day of employee 9: 4

Enter name of employee 10: Hulu
Enter salary of employee 10: $75
Enter hours worked per day of employee 10: 6

Employee Salaries:
Name: Abdullah  Salary: $1150
Name: Juveriah  Salary: $900
Name: Mathew    Salary: $250
Name: Lucas     Salary: $550
Name: Ahmed     Salary: $430
Name: Tahseen   Salary: $1150
Name: Suleiman  Salary: $800
Name: Hassaan   Salary: $700
Name: E Salary: $100
Name: Hulu      Salary: $75

--------------------------------
Process exited after 170.6 seconds with return value 0
Press any key to continue . . .
```