NATIONAL UNIVERSITY OF SCIENCES AND TECHNOLOGY

School of Electrical Engineering and Computer Sciences

COURSE NAME: Object-Oriented Programming (CS-212)

Lab 9: Open-Ended Lab

SUBMITTED BY:	**Arooj Fatima**	**Irfa Farooq**	**Sataish Elahi**
CMS ID:	**423365**	**412564**	**423621**
CLASS:	**BEE-14D**		
INSTRUCTOR:	**Miss Mehreen Tahir**		
LAB INSTRUCTOR:	**Miss Mehwish Kiran**		
DATE:	**26th November, 2023**		

Introduction:

In this lab, you will implement a real-world scenario to apply concepts of OOP including Inheritances, Friend Functions, Friend Classes, and Static Variables.

Task:

A software-based startup company has two software development teams. Each team has four employees. After completion of each successful project delivered to the client, a bonus is given to the team that has completed the project. Each year the CEO of the company announces performance-based increments (based on the annual profit of the company) which is added in the basic salary of each employee.

Create a set of classes to implement the above scenario by using appropriate OOP concepts wherever applicable.

You have to keep track of the number of projects completed by the company and the overall profit after deducting the salaries of staff and miscellaneous expenditures.

In the driver class, create an object of Company and add employees. The programming interface should have provisions to include/organize employees in development teams, assign projects to a development team and print salaries after performance-based increments.

Code:

1. Company Header File:

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

class team1;
class team2;

class Company {
protected:
    int employees;
    double base_salary;
    int projects;
    double Totalprofit;
    double bonusSalary;

public:
    Company();
    void setsalary();
    void setbonusSalary();
    void setEmployees(team1, team2);
    void setprojects(team1, team2);
    void displayCompanyData();
};
```

2. Team A Header File:

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

class team1 : protected Company {
public:
    void setprojectsTeam1();
    void setEmployeesTeam1();
    friend void Company::setEmployees(team1, team2);
    friend void Company::setprojects(team1, team2);
};
```

3. Team B Header File:

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

class team2 : protected Company {
public:
    void setprojectsTeam2();
    void setEmployeesTeam2();
    friend void Company::setEmployees(team1, team2);
    friend void Company::setprojects(team1, team2);
};
```

4. Company Source File:

```
#include <iostream>
#include <string>
#include "Organization.h"
#include "TeamA.h"
#include "TeamB.h"
using namespace std;

Company::Company() : employees(0), base_salary(0), projects(0), Totalprofit(0), 
bonusSalary(0) {
    cout << "Company Constructor Called!!!!!!" << endl;
}

void Company::setsalary() {
    cout << "Enter Salary of each Employee: ";
    cin >> base_salary;
}

void Company::setbonusSalary() {
    bonusSalary = ((0.1 * Totalprofit) / employees) + base_salary; // 10% of Company 
Profit is shared amongst employees
}

void Company::setEmployees(team1 t1, team2 t2) {
    employees = t1.employees + t1.employees;
}
```

```
void Company::setprojects(team1 t1, team2 t2) {
    projects = t1.projects + t2.projects;
    Totalprofit = t1.Totalprofit + t2.Totalprofit;
}

void Company::displayCompanyData() {
    cout << "\n\nTotal number of Projects : " << projects << endl;
    cout << "Total number of Employees : " << employees << endl;
    cout << "Basic Salary per Employee: $ " << base_salary << endl;
    cout << "Salary with Bonus (Per Employee): $ " << bonusSalary << endl;
}
```

5. Team A Source File:

```
#include <iostream>
#include <string>
#include "Organization.h"
#include "TeamA.h"
using namespace std;

void team1::setprojectsTeam1() {
    double totalSale = 0;
    cout << "\nEnter the Number of Projects for Team 1 : ";
    cin >> projects;
    for (int i = 0; i < projects; i++) {
        int projectsalePrice;
        cout << "Enter the Sale Price of project " << i << " for Team 1 : ";
        cin >> projectsalePrice;
       totalSale = totalSale + projectsalePrice;
    }
    Totalprofit = totalSale - (base_salary * 8) - rand() % 10;
}

void team1::setEmployeesTeam1() {
    cout << "\nEnter Number of Employees for Team 1 : ";
    cin >> employees;
}
```

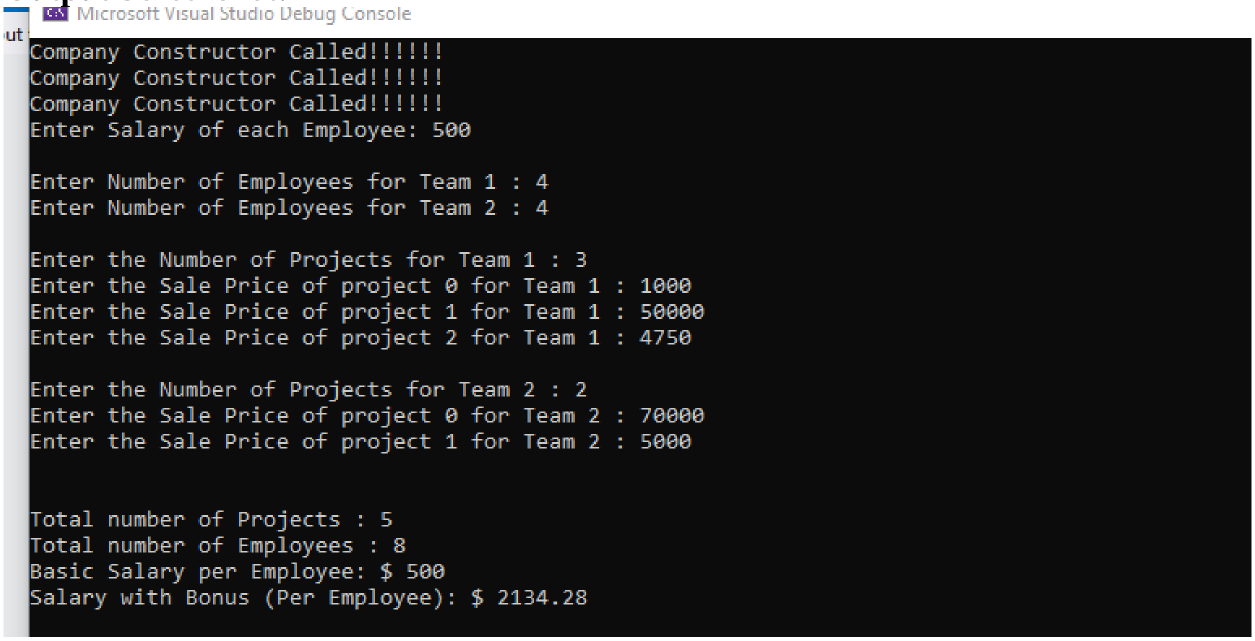
6. Team B Source File:

```
#include <iostream>
#include <string>
#include "Organization.h"
#include "TeamB.h"
using namespace std;

void team2::setprojectsTeam2() {
    double totalSale = 0;
    cout << "\nEnter the Number of Projects for Team 2 : ";
    cin >> projects;
    for (int i = 0; i < projects; i++) {
        int projectSalePrice;
        cout << "Enter the Sale Price of project " << i << " for Team 2 : ";
        cin >> projectSalePrice;
        totalSale = totalSale + projectSalePrice;
    }
    Totalprofit = totalSale - (base_salary * 8) - rand() % 10;
}

void team2::setEmployeesTeam2() {
    cout << "Enter Number of Employees for Team 2 : ";
    cin >> employees;
}
```

7. Test File:

```
#include <iostream>
#include <string>
#include "Organization.h"
#include "TeamA.h"
#include "TeamB.h"
using namespace std;

int main() {
        team1 t1;
        team2 t2;
        Company c;
        c.setsalary();
        t1.setEmployeesTeam1();
        t2.setEmployeesTeam2();
        c.setEmployees(t1, t2);
        t1.setprojectsTeam1();
        t2.setprojectsTeam2();
        c.setprojects(t1, t2);
        c.setbonusSalary();
        c.displayCompanyData();
      return 0;
}
```

Output Screenshot:



```
Company Constructor Called!!!!!!
Company Constructor Called!!!!!!
Company Constructor Called!!!!!!
Enter Salary of each Employee: 500

Enter Number of Employees for Team 1 : 4
Enter Number of Employees for Team 2 : 4

Enter the Number of Projects for Team 1 : 3
Enter the Sale Price of project 0 for Team 1 : 1000
Enter the Sale Price of project 1 for Team 1 : 50000
Enter the Sale Price of project 2 for Team 1 : 4750

Enter the Number of Projects for Team 2 : 2
Enter the Sale Price of project 0 for Team 2 : 70000
Enter the Sale Price of project 1 for Team 2 : 5000


Total number of Projects : 5
Total number of Employees : 8
Basic Salary per Employee: $ 500
Salary with Bonus (Per Employee): $ 2134.28
```

Conclusion:

In this lab, we implemented a real-world scenario using OOP Concepts. The concept of friend functions was particularly important in protected inheritance as those data members couldn’t be accessed without using friend functions.