Question –

Write a program that prints a table indicating the number of occurrences of each alphabet in the text.

Code –

```cpp
#include <iostream>
#include <map>
#include <cctype>

using namespace std;

int main() {
    string text;
    cout << "Enter the text: ";
    getline(cin, text);

    map<char, int> freq;

    for (char c : text) {
        if (isalpha(c)) {
            freq[tolower(c)]++;
        }
    }

    cout << "\nAlphabet Frequency Table:\n";
    for (char ch = 'a'; ch <= 'z'; ch++) {
        if (freq[ch] > 0) {
            cout << ch << " : " << freq[ch] << endl;
        }
    }

    return 0;
}
```

Output –

```
Enter the text: Ore wa Kami

Alphabet Frequency Table:
a : 2
e : 1
i : 1
k : 1
m : 1
o : 1
r : 1
w : 1
```

Question –

Create a class TRIANGLE. Add an error check to ensure the following conditions -

1. All sides are greater than 0.
2. Sum of any 2 sides is greater than the 3rd side.

The class should have overloaded functions for calculating area of right angled triangle as well as Herons formula for calculating area of any type of triangle.

Code –

```cpp
#include <iostream>
#include <cmath>
#include <stdexcept>

using namespace std;

class TRIANGLE
{
private:
    double a, b, c;

    void validate()
    {
        if (a <= 0 || b <= 0 || c <= 0)
            throw invalid_argument("All sides must be greater than 0.");
        if (a + b <= c || a + c <= b || b + c <= a)
```

```
            throw invalid_argument("Sum of any two sides must be greater than the
third side.");
    }

public:
    TRIANGLE(double x, double y, double z) : a(x), b(y), c(z)
    {
        validate();
    }

    double area()
    {
        double s = (a + b + c) / 2;
        return sqrt(s * (s - a) * (s - b) * (s - c));
    }

    double area(double base, double height)
    {
        return 0.5 * base * height;
    }
};

int main()
{
    try
    {
        double a, b, c;
        cout << "Enter three sides of the triangle: ";
        cin >> a >> b >> c;
        TRIANGLE t(a, b, c);
        cout << "Area using Heron's formula: " << t.area() << endl;

        double base, height;
        cout << "\nEnter base and height for right-angled triangle: ";
        cin >> base >> height;
        cout << "Area of right-angled triangle: " << t.area(base, height) <<
endl;
    }
    catch (const exception &e)
    {
        cerr << "Error: " << e.what() << endl;
    }

    return 0;
}
```

Output –

```
Enter three sides of the triangle: 5
5
3
Area using Heron's formula: 7.15454
```

```
Enter three sides of the triangle: 4
7
12
Error: Sum of any two sides must be greater than the third side.
```

Question –

Define a class PERSON having name as data member. Inherit 2 classes Student and Employee from PERSON. Student has additional attributes as course, marks and year. Employee has department and salary. Write display() function in all 3 classes to display attributes.

Code –

```cpp
#include <iostream>
#include <string>

using namespace std;

class PERSON
{
protected:
    string name;

public:
    PERSON(string n) : name(n) {}
    virtual void display()
    {
        cout << "Name: " << name << endl;
    }
};
```

```cpp
class STUDENT : public PERSON
{
private:
    string course;
    int marks;
    int year;

public:
    STUDENT(string n, string c, int m, int y) : PERSON(n), course(c), marks(m),
year(y) {}
    void display() override
    {
        PERSON::display();
        cout << "Course: " << course << "\nMarks: " << marks << "\nYear: " <<
year << endl;
    }
};

class EMPLOYEE : public PERSON
{
private:
    string department;
    double salary;

public:
    EMPLOYEE(string n, string d, double s) : PERSON(n), department(d), salary(s)
{}
    void display() override
    {
        PERSON::display();
        cout << "Department: " << department << "\nSalary: " << salary << endl;
    }
};

int main()
{
    STUDENT s("Alice", "Computer Science", 90, 2024);
    EMPLOYEE e("Bob", "HR", 50000);

    cout << "Student Details:\n";
    s.display();
    cout << "\nEmployee Details:\n";
    e.display();

    return 0;
```

```
}
```

Output –

```
Student Details:
Name: Alice
Course: Computer Science
Marks: 90
Year: 2024

Employee Details:
Name: Bob
Department: HR
Salary: 50000
```