Agnim Gupta

2028083

A23, CSSE

Question 1

WAP to find sort an integer array and a float array, using function template.

```cpp
#include<iostream>
using namespace std;
#define N 10
template <typename T>

void sort(T arr[], int SIZE)
{
    for (int i = 0; i < SIZE;
i++)


    {
        for (int j = i+1; j < SIZE; j++)
        {
            if (arr[i] > arr[j])
            {
                T temp;
                temp = arr[i];
                arr[i] = arr[j];
                arr[j] = temp;
            }
        }
    }
}

int main()
{
    int int_array[N];
    float float_array[N];

    cout<<"Enter integer array elements:"<<endl;
    for (int i = 0; i < N; i++)
```

```cpp
    {
        cin>>int_array[i];
    }

    cout<<"Entner floating array elements:"<<endl;
    for (int i = 0; i < N; i++)
    {
        cin>>float_array[i];
    }

    sort(int_array,N);
    sort(float_array, N);

    cout<<"After sorting they are :"<<endl;
    for (int i = 0; i < N; i++)
    {
        cout<<int_array[i]<<", ";
    }
    cout<<endl;

    for (int i = 0; i < N; i++)
    {
        cout<<float_array[i]<<", ";
    }
    return 0;
}
```

Output

Question 2

WAP to display data of two different types using function template with multiple arguments.

```cpp
#include<iostream>
using namespace std;
template<class T1, class T2>
class Test
{
        T1 a;
        T2 b;
    public:
        Test(T1 x, T2 y)
        {
            a = x;
            b = y;
        }
        void show()
        {
            cout << a << " and " << b << endl;
        }
};


int main()
{

    Test <float, int> test1 (9.99999, 998);
    Test <int, char> test2 (99, 't');
    test1.show();
    test2.show();

    return 0;
}
```

Output

```
PS C:\Users\KIIT\Documents\coding> cd "c:\Users\KII
T\Documents\coding\3rd semister\OOP lab\class 12\"
; if ($?) { g++ class12_q2.cpp -o class12_q2 } ; if
 ($?) { .\class12_q2 }
9.99999 and 998
99 and t
PS C:\Users\KIIT\Documents\coding\3rd semister\OOP
lab\class 12>
```

Question 3

Rewrite program i. using class template

```cpp
#include <iostream>
using namespace std;
const int N = 7;

template <class Type>
class Array{
    private:
        Type arr[N];
    public:
        void read(){
            for(int i = 0; i < N; i++){
                cin>>arr[i];
            }
        }
        void sortArr(){
            Type temp;
            int SIZE = sizeof(arr)/sizeof(Type);
            for(int i = 0; i < SIZE - 1; i++){
                for(int j = i + 1; j < SIZE; j++){
                    if(arr[i] < arr[j]){
                        temp = arr[i];
                        arr[i] = arr[j];
                        arr[j] = temp;
                    }
                }
            }
        }
        void display(){
```

```cpp
            int SIZE = sizeof(arr)/sizeof(Type);
            for(int i = 0; i < SIZE; i++){
                cout<<arr[i]<<" ";
            }
            cout<<endl;
        }
};

int main(){
    Array <int> i_obj;
    Array <float> f_obj;
    cout<<"Enter integer array:";
    i_obj.read();
    cout<<"Enter floating number array:";
    f_obj.read();
    i_obj.sortArr();
    f_obj.sortArr();
    cout<<"Sorted integer array:"<<endl;
    i_obj.display();
    cout<<endl<<"Sorted floating number array:"<<endl;
    f_obj.display();
    return 0;
}
```

Output

```
PS C:\Users\KIIT\Documents\coding> cd "c:\Users\KII
T\Documents\coding\3rd semister\OOP lab\class 12\"
; if ($?) { g++ class12_q2.cpp -o class12_q2 } ; if
 ($?) { .\class12_q2 }
9.99999 and 998
99 and t
PS C:\Users\KIIT\Documents\coding\3rd semister\OOP
lab\class 12> cd "c:\Users\KIIT\Documents\coding\3r
d semister\OOP lab\class 12\" ; if ($?) { g++ tempC
odeRunnerFile.cpp -o tempCodeRunnerFile } ; if ($?)
 { .\tempCodeRunnerFile }
Enter integer array:1 -9 2 -8 3 -7 4 -6 5 0
Enter floating number array:1.0 1.9 1.1 1.8 1.2 1.7
 1.3 1.6 1.4 1.5
Sorted integer array:
4 3 2 1 -7 -8 -9

Sorted floating number array:
5 1.9 1.8 1.1 1 0 -6
PS C:\Users\KIIT\Documents\coding\3rd semister\OOP
lab\class 12> A
```

Question 4

Rewrite program ii. using class template

```cpp
#include<iostream>
using namespace std;
template<class T1, class T2>
class Test
{
        T1 a;
        T2 b;
    public:
        Test(T1 x, T2 y)
        {
            a = x;
            b = y;
        }
        void show()
        {
            cout << a << " and " << b << endl;
        }
};


int main()
{

    Test <float, int> test1 (9.9999, 997);
    Test <int, char> test2 (5599, 't');
    test1.show();
    test2.show();

    return 0;
}
```

Output

```
PS C:\Users\KIIT\Documents\coding> cd "c:\Users\KII
T\Documents\coding\3rd semister\OOP lab\class 12\"
; if ($?) { g++ tempCodeRunnerFile.cpp -o tempCodeR
unnerFile } ; if ($?) { .\tempCodeRunnerFile }
9.9999 and 997
5599 and t
PS C:\Users\KIIT\Documents\coding\3rd semister\OOP
lab\class 12>
```

Question 5

**Write a C++ program using function template to read two matrices of
different data types such as integers and floating point values and find the
sum of the matrices of integers and floating point numbers separately, and
display the total sums of these arrays individually.**

```cpp
#include <iostream>
#include <iomanip>
int const size = 3;
using namespace std;
template < class M, class S>
    void add(M a[][size], S b[][size])
    {
        S c[size][size];
        for (int i = 0; i < size; i++)
            for (int j = 0; j < size; j++)
            {
                c[i][j] = a[i][j] + b[i][j];
            }

        for (int i = 0; i < size; i++)
        {
            for (int j = 0; j < size; j++)
            {
                cout << "\t" << c[i][j];
            }

            cout << endl;
        }
    }
int main()
{
```

```cpp
int x[size][size], y[size][size];
float g[size][size], h[size][size];
int ch;


cout << endl << "Enter values for Integer Matrix (Only Integers): " << endl;
for (int i = 0; i < size; i++)
{
    for (int j = 0; j < size; j++)
    {
        cin >> x[i][j];
    }
}

cout << endl << "Enter values for Float Matrix (Only Float): " << endl;
for (int i = 0; i < size; i++)
{
    for (int j = 0; j < size; j++)
    {
        cin >> g[i][j];
    }
}
cout << endl << endl << "The Integer Matrix by the user:" << endl;
for (int i = 0; i < size; i++)
{
    for (int j = 0; j < size; j++)
    {
        cout << x[i][j] << "   ";
    }

    cout << endl;
}

cout << endl << endl << "The Float Matrix by the user:" << endl;
for (int i = 0; i < size; i++)
{
    for (int j = 0; j < size; j++)
    {
        cout << g[i][j] << "   ";
    }

    cout << endl;
}
cout << "Result of the Matrix Addition is: " << endl;
add(x, g);
```

```
    return 0;
}
```

Output

```
PS C:\Users\KIIT\Documents\coding> cd "c:\Users\KII
T\Documents\coding\3rd semister\OOP lab\class 12\"
; if ($?) { g++ class12_q5.cpp -o class12_q5 } ; if
 ($?) { .\class12_q5 }

Enter values for Integer Matrix (Only Integers):
1 2 3
3
4
5
6
7
8

Enter values for Float Matrix (Only Float):
1.1
1.2
1.3
1.4
1.51
1.6
1.7
1.8
1.9


The Integer Matrix by the user:
1  2  3
3  4  5
6  7  8


The Float Matrix by the user:
1.1  1.2  1.3
1.4  1.51  1.6
1.7  1.8  1.9
Result of the Matrix Addition is:
        2.1      3.2      4.3
        4.4      5.51     6.6
        7.7      8.8      9.9
PS C:\Users\KIIT\Documents\coding\3rd semister\OOP
lab\class 12>
```

Question 6

WAP to throw and handle 'division by zero' exception.

```cpp
#include <iostream>

using namespace std;
float Division(float numerator, float denominator)
{
    if (denominator == 0)
    {
        throw runtime_error("Math error: Attempted to divide by Zero\n");
    }
    return (numerator / denominator);
}
int main()
{
    float numerator, denominator,quotient;
    cout << "Enter the numerator: ";
    cin >> numerator;
    cout << "Enter the denominator: ";
    cin >> denominator;
    try
    {
        quotient = Division(numerator, denominator);
        cout << "The quotient is " <<quotient << endl;
    }
    catch (runtime_error &e)
    {
        cout << "Exception occurred" << endl << e.what();
    }
}
```

Output

```
PS C:\Users\KIIT\Documents\coding> cd "c:\Us
ers\KIIT\Documents\coding\3rd semister\OOP l
ab\class 12\" ; if ($?) { g++ class12_q6.cpp
 -o class12_q6 } ; if ($?) { .\class12_q6 }
Enter the numerator: 81
Enter the denominator: 0
Exception occurred
Math error: Attempted to divide by Zero
PS C:\Users\KIIT\Documents\coding\3rd semist
er\OOP lab\class 12>
```

Question 7

WAP to throw and handle' array out of bound' exception.

```cpp
#include<iostream>
using namespace std;
int main(){
int n;
cout<<"enter size"<<endl;
cin>>n;
int arr[n];
cout<<"enter the values"<<endl;
try
{
    for(int i=0;i<=n;i++)
    {
        if(i<n)
        cin>>arr[i];
        else
        throw i;
    }
}
catch (int a)
{
    cout<<"array out of bound"<<endl;
}
return 0;
}
```

Output

```
PS C:\Users\KIIT\Documents\coding> cd "c:\Users\KII
T\Documents\coding\3rd semister\OOP lab\class 12\"
; if ($?) { g++ class12_q7.cpp -o class12_q7 } ; if
 ($?) { .\class12_q7 }
enter size
3
enter the values
11 22 33 44
array out of bound
PS C:\Users\KIIT\Documents\coding\3rd semister\OOP
lab\class 12>
```

Question 8

WAP to demonstrate multiple catch and catch all

```cpp
#include<iostream>
using namespace std;
void test(int a)
{
    try{
    if(a==1)
      throw a;
    else if (a==0)
      throw 'a';
    else if (a==-1)
      throw 1.0;
    cout << "End of try block";
    }
    catch(char c)
    {
    cout<<"Caught an Character \n";
    }
    catch(int m)
    {
    cout<<"Caught an integer \n";
    }
    catch(double d)
    {
    cout<<"Caught a float \n";
```

```
    }
    cout<<"End of Try -Catch block";
}
int main()
{
test(1);
test(0);
test(-1);
test(2);


}
```

Output