Worksheet – 3

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Github link:

https://github.com/crishtina01/cpp_Worksheet

1. Create a Time class to store hours and minutes. Implement:
    1. Overload the + operator to add two Time objects
    2. Overload the > operator to compare two Time objects
    3. Handle invalid time (>24 hours or >60 minutes) by throwing a custom exception

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

class InvalidTimeError

{

public:

  string message;
  InvalidTimeError(string msg) : message(msg) {}

};

class Time
{
```

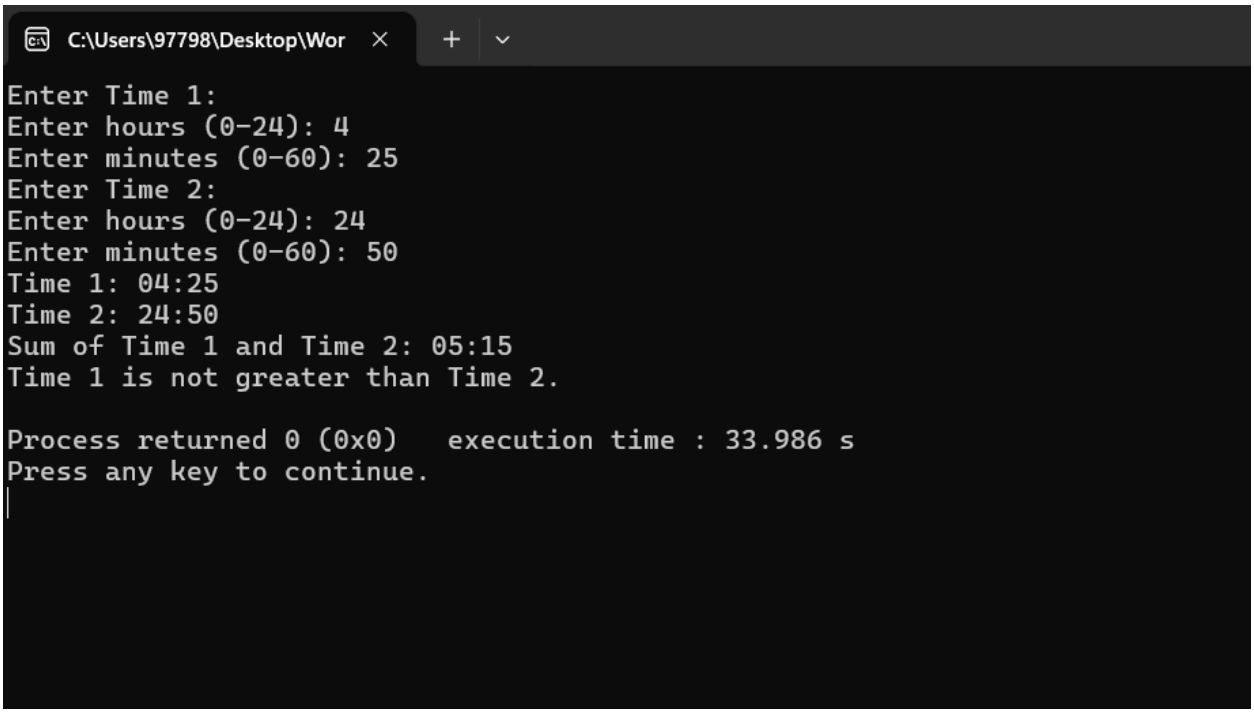
```
private:
   int hours;
   int minutes;

public:

   Time()

   {
      cout << "Enter time in hours (0-24): ";
      cin >> hours;

      cout << "Enter time in minutes (0-60): ";
      cin >> minutes;

      if (hours < 0 || hours > 24 || minutes < 0 || minutes > 60)

         {

            throw InvalidTimeError("Invalid time! Hours must be between 0 and 23, and
minutes must be between 0 and 59.");
         }
   }
```

```
Time add(const Time& other) const

{
   int totalMinutes = (hours * 60 + minutes) + (other.hours * 60 + other.minutes);

   int newHours = (totalMinutes / 60) % 24;

   int newMinutes = totalMinutes % 60;

   return Time(newHours, newMinutes);
}

Time(int h, int m) : hours(h), minutes(m) {}


bool isGreaterThan(const Time& other) const

{
   int thisTotalMinutes = hours * 60 + minutes;

   int otherTotalMinutes = other.hours * 60 + other.minutes;

   return thisTotalMinutes > otherTotalMinutes;
}
```

```
    void display() const

    {
        cout << (hours < 10 ? "0" : "") << hours << ":"
            << (minutes < 10 ? "0" : "") << minutes << endl;
    }
};

int main()

{
    try

        {
            cout << "Enter Time 1:" << endl;
            Time time1;

            cout << "Enter Time 2:" << endl;
            Time time2;

            cout << "Time 1: ";
            time1.display();

            cout << "Time 2: ";
            time2.display();
```

```
        Time sumTime = time1.add(time2);
        cout << "Sum of Time 1 and Time 2: ";
        sumTime.display();

    if (time1.isGreaterThan(time2))

        {

            cout << "Time 1 is greater than Time 2." << endl;
        }

    else

        {

        cout << "Time 2 is greater than Time 1." << endl;

        }

    }

catch (InvalidTimeError& e)

    {
```

```
        cout << "Error: " << e.message << endl;
    }


  return 0;
}
```



2. Create a base class Vehicle and two derived classes Car and Bike:
    1. Vehicle has registration number and color
    2. Car adds number of seats
    3. Bike adds engine capacity
    4. Each class should have its own method to write its details to a file
    5. Include proper inheritance and method overriding

```
#include <iostream>


#include <fstream>
```

```
#include <string>

using namespace std;

class Vehicle

{

protected:

   string registrationNumber;
   string color;

public:

   Vehicle(string regNo, string col)
   {
      registrationNumber = regNo;

      color = col;
   }

   virtual void display()

   {
```

```
        cout << "Registration Number: " << registrationNumber << endl;
        cout << "Color: " << color << endl;
    }

    virtual void writeToFile(ofstream& file)

    {
        file << "Registration Number: " << registrationNumber << endl;

        file << "Color: " << color << endl;

    }

    virtual ~Vehicle() {}
};

class Car : public Vehicle

{

private:

    int numberOfSeats;

public:
    Car(string regNo, string col, int seats) : Vehicle(regNo, col)
```

```
{

    numberOfSeats = seats;

}

void display() override

{
    cout << "\n--- Car Details ---" << endl;

    cout << "Vehicle Type: Car" << endl;
    Vehicle::display();

    cout << "Number of Seats: " << numberOfSeats << endl;
}

void writeToFile(ofstream& file) override

{
    file << "\n--- Car Details ---" << endl;

    file << "Vehicle Type: Car" << endl;

    Vehicle::writeToFile(file);
```

```
        file << "Number of Seats: " << numberOfSeats << endl;
    }
};

class Bike : public Vehicle

{

private:

    double engineCapacity;

public:

    Bike(string regNo, string col, double capacity) : Vehicle(regNo, col)

    {

        engineCapacity = capacity;

    }

    void display() override

    {
```

```
        cout << "\n--- Bike Details ---" << endl;
        cout << "Vehicle Type: Bike" << endl;

        Vehicle::display();

        cout << "Capacity of engine: " << engineCapacity << " cc" << endl;
    }

    void writeToFile(ofstream& file) override

    {
        file << "\n--- Bike Details ---" << endl;

        file << "Vehicle Type: Bike" << endl;

        Vehicle::writeToFile(file);

        file << "Engine Capacity: " << engineCapacity << " cc" << endl;
    }
};

int main()

{
    int choice;
```

```
ofstream file("vehicle_details.txt", ios::app);

if (!file)

  {

  cout << "Error: Unable to open your file for writing." << endl;

  return 1;
}

while (true)

  {
    cout << "\nVehicle Menu:\n";
    cout << "1. Add Car Details\n";
    cout << "2. Add Bike Details\n";
    cout << "3. Display All Vehicle Details\n";
    cout << "4. Exit\n";

    cout << "Enter your choice: ";

    cin >> choice;

  if (choice == 1)
```

```
  {
    string regNo, color;

    int seats;

    cout << "Enter Car details:\n";

    cout << "Registration Number: ";

    cin >> regNo;
    cout << "Color: ";

    cin >> color;
    cout << "Number of Seats: ";

    cin >> seats;

    Car car(regNo, color, seats);
    car.writeToFile(file);
    car.display();

  }
else if (choice == 2)

  {
    string regNo, color;
```

```
        double capacity;

        cout << "Enter Bike details:\n";

        cout << "Registration Number: ";
        cin >> regNo;

        cout << "Color: ";
        cin >> color;

        cout << "Capacity of engine(in cc): ";
        cin >> capacity;

        Bike bike(regNo, color, capacity);
        bike.writeToFile(file);
        bike.display();

    }

else if (choice == 3)

    {
        cout << "\n--- All Vehicle Details ---\n";

        ifstream inputFile("vehicle_details.txt");
```

```
    if (!inputFile)
      {
        cout << "Error: Unable to open file for reading." << endl;

        return 1;
      }

      string line;

    while (getline(inputFile, line))

      {

        cout << line << endl;

      }

    inputFile.close();

  }

  else if (choice == 4)

    {
      cout << "Exiting the program.\n";
```

```
            break;



        }

      else

        {

            cout << "Please try again,Invalid choice.\n";

        }
    }

    file.close();
    return 0;
}
```

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```
Vehicle Menu:
1. Add Car Details
2. Add Bike Details
3. Display All Vehicle Details
4. Exit
Enter your choice: 1
Enter Car details:
Registration Number: 00001
Color: blue
Number of Seats: 5

--- Car Details ---
Vehicle Type: Car
Registration Number: 00001
Color: blue
Number of Seats: 5

Vehicle Menu:
1. Add Car Details
2. Add Bike Details
3. Display All Vehicle Details
4. Exit
Enter your choice: 2
Enter Bike details:
Registration Number: 30216
Color: black
Engine Capacity (in cc): 250

--- Bike Details ---
Vehicle Type: Bike
Registration Number: 30216
Color: black
Engine Capacity: 250 cc
```

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```
--- Car Details ---
Vehicle Type: Car
Vehicle Registration Number: fhgf
Vehicle Color: uhuh
Number of Seats: 0
----------------------

--- Bike Details ---
Vehicle Type: Bike
Vehicle Registration Number: fhgf
Vehicle Color: uhuh
Engine Capacity: 2.0795e-317 cc
----------------------

--- Car Details ---
Vehicle Type: Car
Registration Number: 001022
Color: red
Number of Seats: 8

--- Bike Details ---
Vehicle Type: Bike
Registration Number: 90087
Color: blue
Engine Capacity: 200 cc

--- Car Details ---
Vehicle Type: Car
Registration Number: 00001
Color: blue
Number of Seats: 5

--- Bike Details ---
Vehicle Type: Bike
Registration Number: 30216
Color: black
Engine Capacity: 250 cc
```

```
Vehicle Menu:
1. Add Car Details
2. Add Bike Details
3. Display All Vehicle Details
4. Exit
Enter your choice: 4
Exiting the program.

Process returned 0 (0x0)   execution time : 349.309 s
Press any key to continue.
```

1. Create a program that:
    1. Reads student records (roll, name, marks) from a text file
    2. Throws an exception if marks are not between 0 and 100
    3. Allows adding new records with proper validation
    4. Saves modified records back to file

```
#include <iostream>

#include <fstream>

#include <string>

#include <stdexcept>

#include <vector>

#include <sstream>

using namespace std;

class Student

{

private:

  int roll;
```

```
    string name;

    int marks;

public:

    class InvalidMarksException : public exception

    {

    public:
        const char* what() const noexcept override

        {

            return "Invalid marks! Marks must be between 0 and 100.";

        }
    };

    Student(int r, string n, int m) : roll(r), name(n), marks(m)

    {
        if (m < 0 || m > 100)
```

```
    {

        throw InvalidMarksException();
    }
}

int getRoll() const

{

    return roll;

}

string getName() const

{
   return name;

}
int getMarks() const

{

    return marks;
```

```
}

void display() const

{

    cout << "Roll: " << roll << ", Name: " << name << ", Marks: " << marks << endl;

}

void saveToFile(ofstream& file) const

{

    file << roll << " " << name << " " << marks << endl;

}

static Student readFromFile(const string& line)

{
    int r;

    string n;

    int m;
```

```
        stringstream ss(line);

        ss >> r >> n >> m;

        return Student(r, n, m);
    }
};

void readStudentRecords(const string& filename, vector<Student>& students)

{

    ifstream file(filename);

    if (!file.is_open())

        {

        cout << "Error: Could not open your file for reading!" << endl;

        return;
    }

    string line;
```

```
while (getline(file, line))

    {

    if (!line.empty())

    {
        try

            {

                Student s = Student::readFromFile(line);
                students.push_back(s);

            }

        catch (const Student::InvalidMarksException& e)

            {

                cout << "Error in record: " << line << " - " << e.what() << endl;

            }
    }
}
```

```
    file.close();
}

void addStudentRecord(vector<Student>& students)

{
    int roll;
    string name;
    int marks;

    cout << "Enter Roll Number: ";
    cin >> roll;

    cout << "Enter Name: ";
    cin.ignore();

    getline(cin, name);

    cout << "Enter Marks: ";
    cin >> marks;

    try

      {

          students.push_back(Student(roll, name, marks));
```

```
        }

    catch (const Student::InvalidMarksException& e)

        {

            cout << e.what() << endl;
        }
}

void saveStudentRecords(const string& filename, const vector<Student>& students)

{
    ofstream file(filename, ios::trunc);

    if (!file.is_open())

        {

        cout << "Error: Could not open your file for writing!" << endl;
        return;

        }

    for (const auto& student : students)
```

```
        {

            student.saveToFile(file);

        }

    file.close();
}

void displayAllRecords(const vector<Student>& students)

{
    cout << "\nStudent Records:\n";

    for (const auto& student : students)

        {

            student.display();
        }
}

int main()
```

```
{
    string filename = "students.txt";
    vector<Student> students;

    try

      {

          readStudentRecords(filename, students);

      int choice;

      while (true)

        {
            cout << "\nMenu:\n";

            cout << "1. Display All Student Records\n";

            cout << "2. Add New Student Record\n";

            cout << "3. Save and Exit\n";

            cout << "Enter your choice: ";
```

```
    cin >> choice;

if (choice == 1)

    {

        displayAllRecords(students);

    }

else if (choice == 2)

    {

        addStudentRecord(students);
    }
else if (choice == 3)

    {
        saveStudentRecords(filename, students);

        cout << "Records have been saved successfully!\n";

        break;

    }
```

```
        else

          {

            cout << "!!!invalid !!!  Enter correct choice.\n";

          }
      }

    }

    catch (const Student::InvalidMarksException& e)

      {

        cout << e.what() << endl;
      }

    return 0;
}
```

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```
Menu:
1. Display All Student Records
2. Add New Student Record
3. Save and Exit
Enter your choice: 1

Student Records:
Roll: 998, Name: abc, Marks: 98

Menu:
1. Display All Student Records
2. Add New Student Record
3. Save and Exit
Enter your choice: 2
Enter Roll Number: 7
Enter Name: crishtina
Enter Marks: 80

Menu:
1. Display All Student Records
2. Add New Student Record
3. Save and Exit
Enter your choice: 3
Records saved successfully!

Process returned 0 (0x0)   execution time : 42.721 s
Press any key to continue.
```