Experiment No. 3

Aim_:

A. Create a class Time with the data members as hours and minutes. Add Functionality to add and subtract 2 time objects.Test the time class is main().

B. "GreatClock" (A scientific research company) wants advanced time objects which will also provide functionalities of addition and subtraction of seconds and milliseconds along with hours and minutes. How will you add this feature without changing the Time Class?

C. Create a class TimeZone which will add functionality to convert the time from one time zone to another time zone.

Note: Class Time zone uses the Time Object and uses the Add and Subtract methods of Time Class.

Code :

Time.java

```
public class Time {
public class Time {
    int hours, minutes;

    Time() {
    }

    Time(int hours, int minutes) {
        this.hours = hours;
        this.minutes = minutes;
    }

    public String toString() {
        return (this.hours + " " + ":" + " " + this.minutes + " ");
    }

    Time addTime(Time t1) {
        Time t3 = new Time();

        t3.minutes += t1.minutes + this.minutes;

        if (t3.minutes > 59) {
            t3.hours += 1;
            t3.minutes -= 60;
        }

        t3.hours += t1.hours + this.hours;

        if (t3.hours > 23) {
            t3.hours -= 24;
```

```
        }

        return t3;
    }

    Time subTime(Time t1) {
        Time t3 = new Time();

        t3.minutes = t1.minutes - this.minutes;
        t3.hours = t1.hours - this.hours;

        if (t3.minutes < 0 && t3.hours > 0) {
            t3.minutes += 60;
            t3.hours -= 1;
        }

        else if(t3.minutes > 0 && t3.hours < 0){
            t3.minutes = 60 - t3.minutes;
            t3.hours += 1;
        }

        t3.hours = Math.abs(t3.hours);
        t3.minutes = Math.abs(t3.minutes);

        return t3;
    }
}
```

AdvanceTime.java

```
class AdvanceTime extends Time {
    int seconds, miliSeconds;

    AdvanceTime() {
        super();
    }

    AdvanceTime(int hours, int minutes, int seconds, int miliSeconds) {
        super(hours, minutes);

        this.seconds = seconds;
        this.miliSeconds = miliSeconds;
    }

    public String toString() {
```

```
        return (super.toString() + ":" + " " + this.seconds + " " + ":" + " "
+ this.miliSeconds);
    }

    AdvanceTime addTime(AdvanceTime g1) {

        AdvanceTime g3 = new AdvanceTime();

        g3.miliSeconds = g1.miliSeconds + this.miliSeconds;

        if (g3.miliSeconds > 999) {
            g3.seconds += 1;
            g3.miliSeconds -= 1000;
        }

        g3.seconds += g1.seconds + this.seconds;

        if (g3.seconds > 59) {
            g3.minutes += 1;
            g3.seconds -= 60;
        }

        Time t3 = new Time();
        t3 = super.addTime(g1);
        g3.hours = t3.hours;
        g3.minutes += t3.minutes;

        return g3;
    }

    AdvanceTime subTime(AdvanceTime g1) {
        AdvanceTime g3 = new AdvanceTime();

        g3.miliSeconds = g1.miliSeconds - this.miliSeconds;
        g3.seconds = g1.seconds - this.seconds;

        if (g3.miliSeconds < 0 && g3.seconds > 0) {
            g3.miliSeconds += 1000;
            g3.seconds -= 60;
        }

        else if (g3.miliSeconds > 0 && g3.seconds < 0) {
            g3.miliSeconds = 1000 - g3.miliSeconds;
            g3.seconds += 60;
        }

        g3.miliSeconds = Math.abs(g3.miliSeconds);
        g3.seconds = Math.abs(g3.seconds);
```

```
        Time t3 = new Time();
        t3 = super.subTime(g1);

        g3.hours = t3.hours;
        g3.minutes = t3.minutes;

        return g3;
    }
}
```

TimeZone.java

```
public class TimeZone {
    Time time;

    TimeZone(int hours, int minutes) {
        this.time = new Time(hours, minutes);
    }

    void convertTo(TimeZone targetTimeZone) {
        System.out.println("Converted Time: " +
time.addTime(targetTimeZone.time));
    }

    void convertFrom(TimeZone sourceTimeZone) {
        System.out.println("Converted Time: " +
time.subTime(sourceTimeZone.time));
    }

}
```

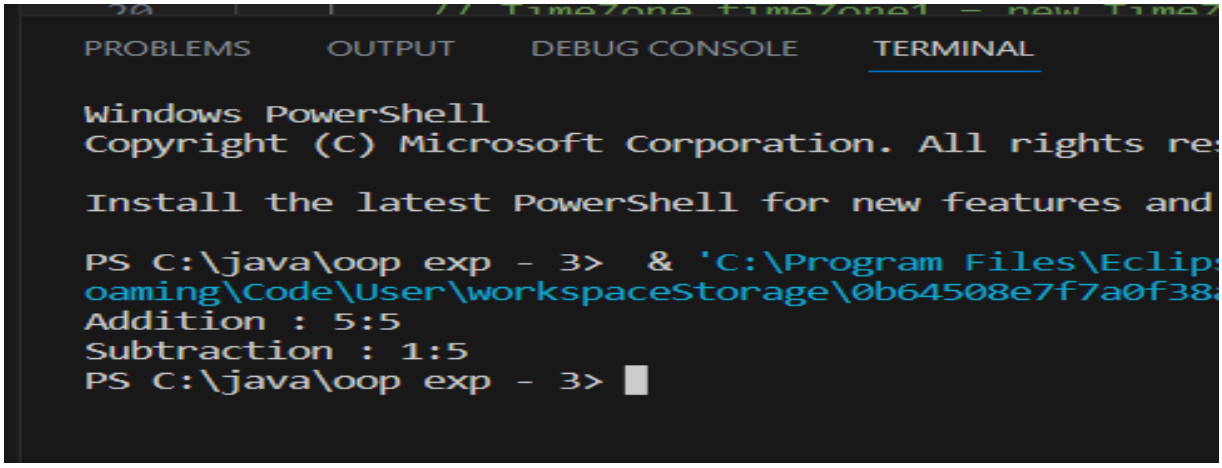
Main.java (Main Method)

```
class Main {
    public static void main(String args[]) {

        Time t1 = new Time(2, 50);
        Time t2 = new Time(3, 45);

        System.out.println("Addition = " + t1.addTime(t2));
        System.out.println("Subtraction = " + t1.subTime(t2));

        AdvanceTime at1 = new AdvanceTime(2, 30, 5, 500);
        AdvanceTime at2 = new AdvanceTime(10, 24, 4, 500);
        AdvanceTime at3 = new AdvanceTime();
```

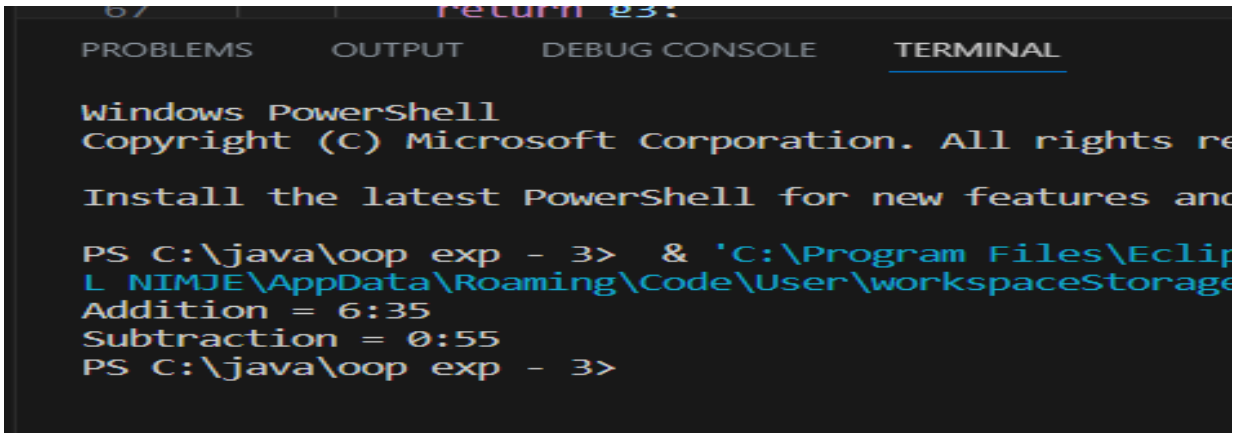
```
        at3 = at1.addTime(at2);
        System.out.println("the addition of two time objects is : " + at3);

        at3 = at1.subTime(at2);
        System.out.println("the subtraction of two time objects is : " + at3);

        TimeZone currentTime = new TimeZone(15, 0);
        TimeZone offset = new TimeZone(5, 30);
        TimeZone timeZone2 = new TimeZone(3, 0);

        // to convert time to another time zone ie + operation
        currentTime.convertTo(offset);

        // to convert time from another time zone ie - operation
        currentTime.convertFrom(offset);
    }
}
```

Test Cases(output ScreenShot) :

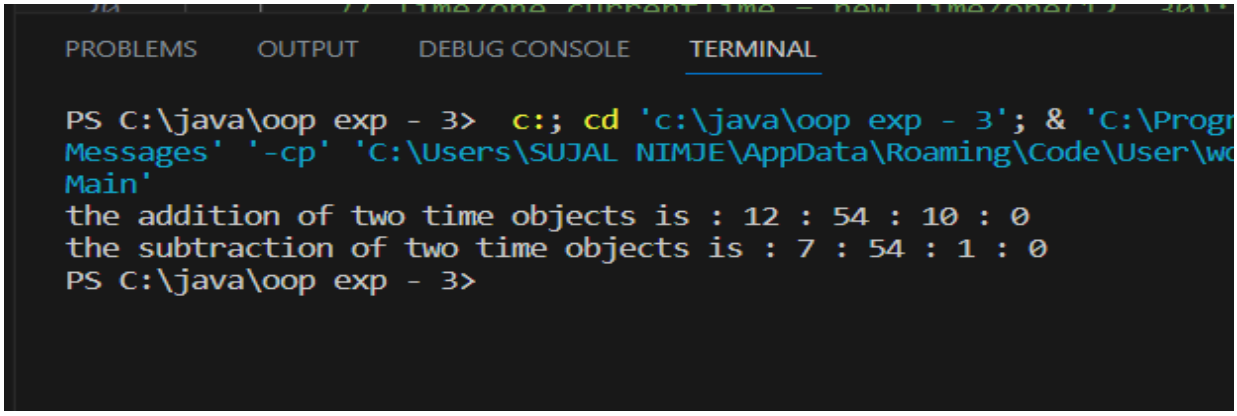
1) Time 1 = 2 , 00 Time 2 = 3 , 05



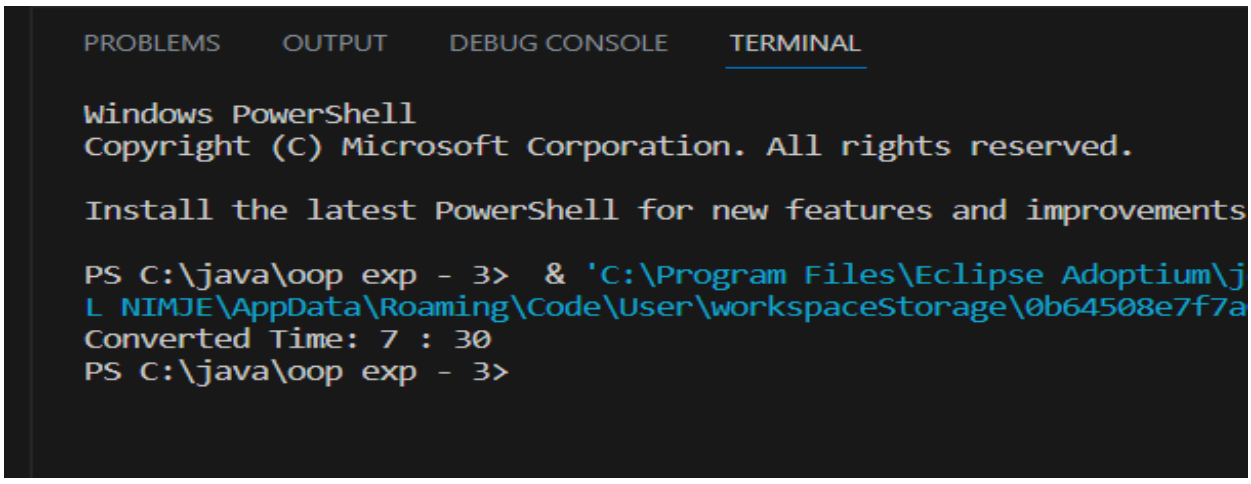
2) Time 1 = 2 , 50 Time 2 = 3 , 45



3) Advanced Time 1 = 2, 30, 05,500 Advanced Time 1 = 10,24,4,500



4) Time = 2, 00 Offset = 5, 30 Operation = plus



5) Time = 15, 00 Offset = 5, 30 Operation=minus