



Faculty of Engineering
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REPORT LAB (2)

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Submitted to:

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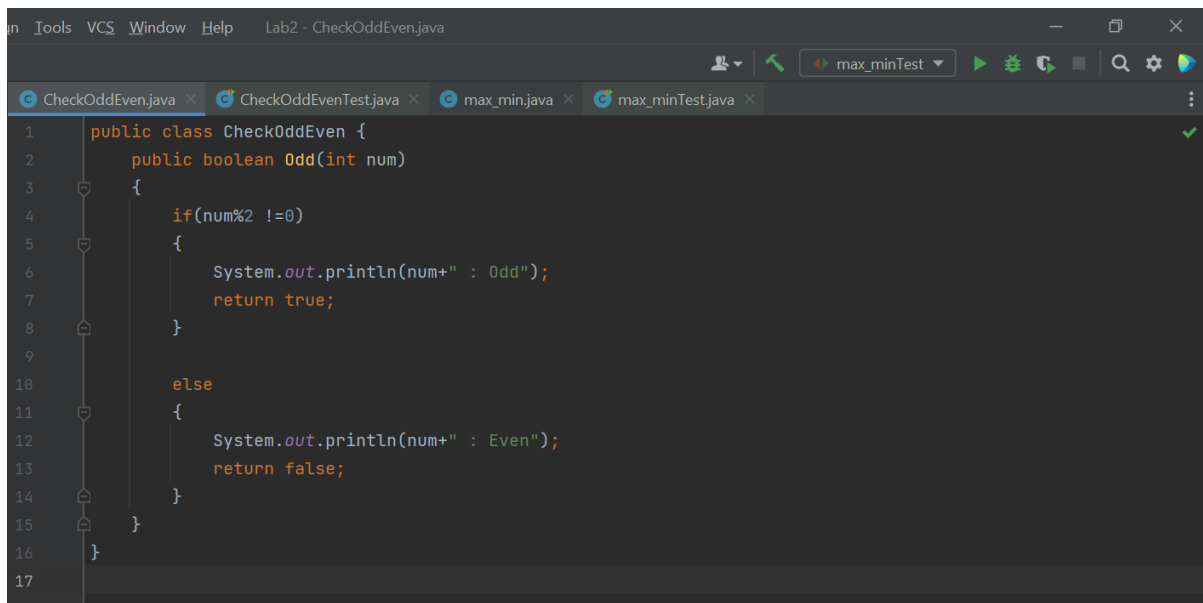
Problem 1:

Check even or odd number.

Solution of Problem 1:

1- The main code:

CheckOddEven.java



```
1 public class CheckOddEven {
2     public boolean Odd(int num)
3     {
4         if(num%2 !=0)
5         {
6             System.out.println(num+" : Odd");
7             return true;
8         }
9
10        else
11        {
12            System.out.println(num+" : Even");
13            return false;
14        }
15    }
16 }
17
```

```
public class CheckOddEven {
    public boolean Odd(int num)
    {
        if(num%2 !=0)
        {
            System.out.println(num+" : Odd");
            return true;
        }

        else
        {
            System.out.println(num+" : Even");
            return false;
        }
    }
}
```

2- Test Cases:

CheckOddEvenTest.java

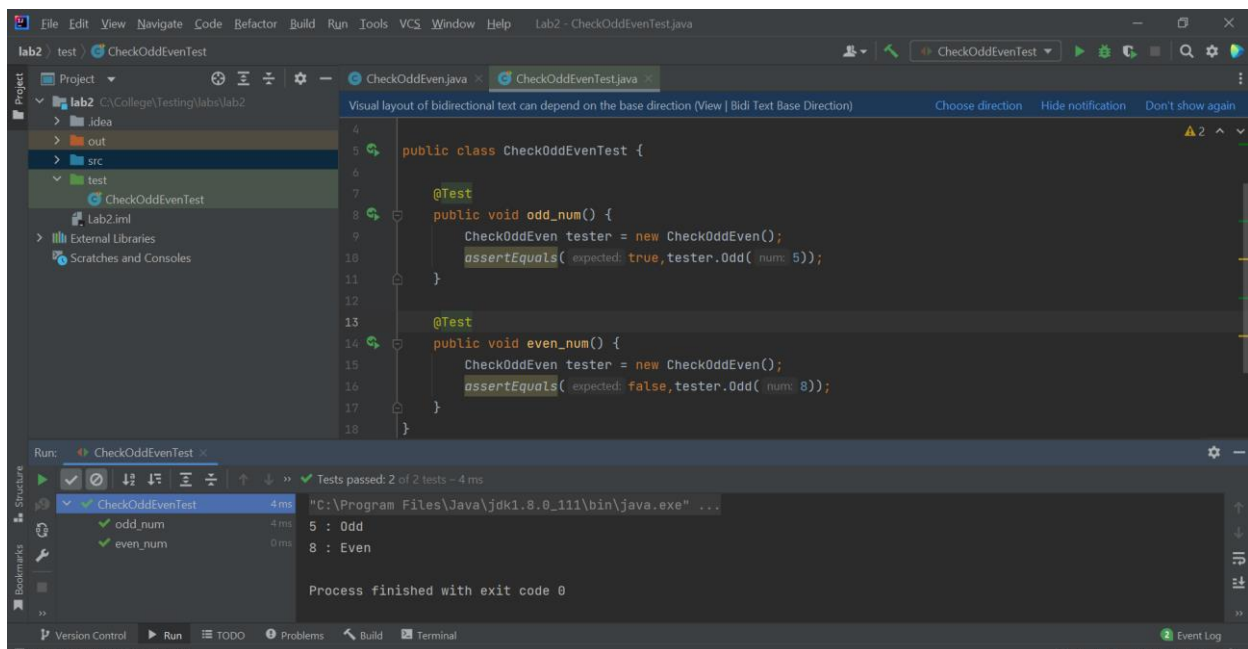
```
import org.junit.Test;
import static org.junit.Assert.*;

public class CheckOddEvenTest {

    @Test
    public void odd_num() {
        CheckOddEven tester = new CheckOddEven();
        assertEquals(true, tester.Odd(5));
    }

    @Test
    public void even_num() {
        CheckOddEven tester = new CheckOddEven();
        assertEquals(false, tester.Odd(8));
    }
}
```

Test Cases “Run” window:



Problem 2:

Finding maximum and minimum number in an array.

Solution of Problem 2:

1- The main code:

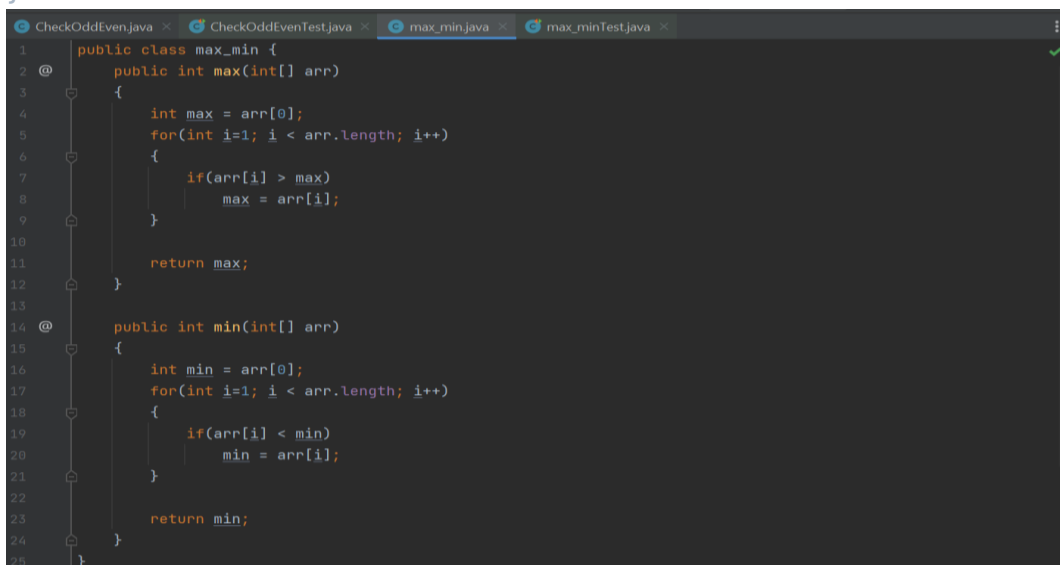
max_min.java

```
public class max_min {
    public int max(int[] arr)
    {
        int max = arr[0];
        for(int i=1; i < arr.length; i++)
        {
            if(arr[i] > max)
                max = arr[i];
        }

        return max;
    }

    public int min(int[] arr)
    {
        int min = arr[0];
        for(int i=1; i < arr.length; i++)
        {
            if(arr[i] < min)
                min = arr[i];
        }

        return min;
    }
}
```

A screenshot of an IDE window titled 'max_min.java'. The code is identical to the one shown in the previous block. The IDE has a dark theme and shows line numbers from 1 to 25. The code is as follows:

```
1 public class max_min {
2     public int max(int[] arr)
3     {
4         int max = arr[0];
5         for(int i=1; i < arr.length; i++)
6         {
7             if(arr[i] > max)
8                 max = arr[i];
9         }
10
11         return max;
12     }
13
14     public int min(int[] arr)
15     {
16         int min = arr[0];
17         for(int i=1; i < arr.length; i++)
18         {
19             if(arr[i] < min)
20                 min = arr[i];
21         }
22
23         return min;
24     }
25 }
```

2- Test Cases:

max_minTest.java

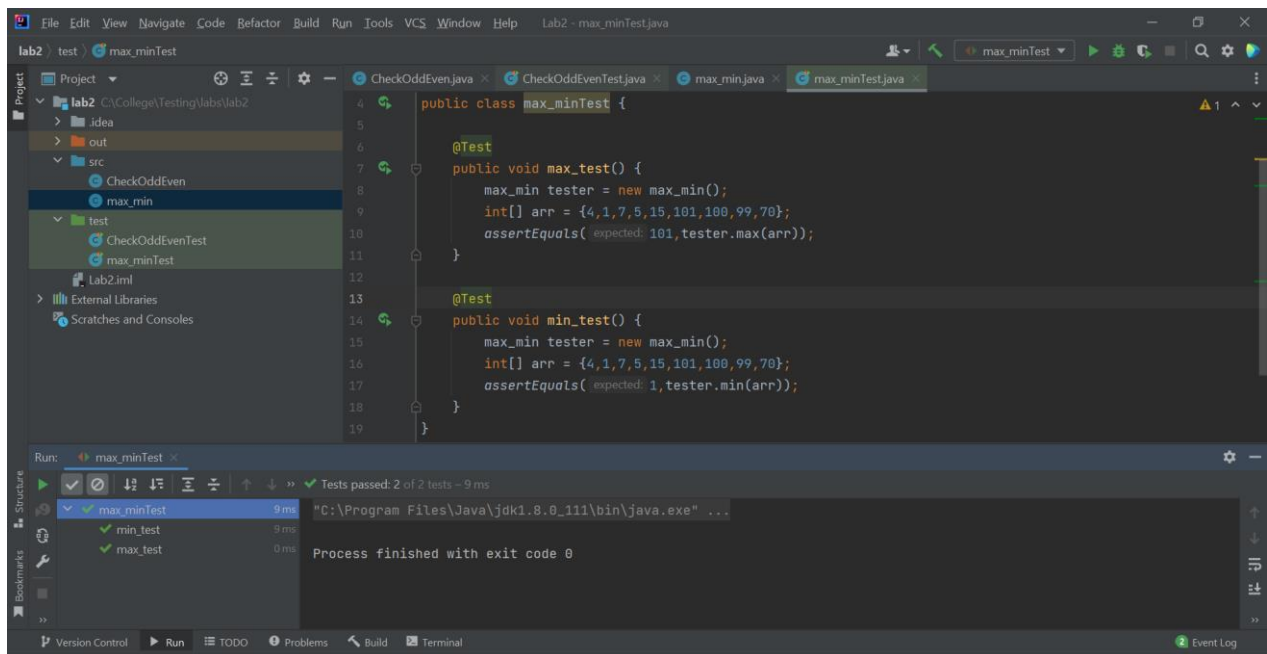
```
import org.junit.Test;
import static org.junit.Assert.*;

public class max_minTest {

    @Test
    public void max_test() {
        max_min tester = new max_min();
        int[] arr = {4,1,7,5,15,101,100,99,70};
        assertEquals(101, tester.max(arr));
    }

    @Test
    public void min_test() {
        max_min tester = new max_min();
        int[] arr = {4,1,7,5,15,101,100,99,70};
        assertEquals(1, tester.min(arr));
    }
}
```

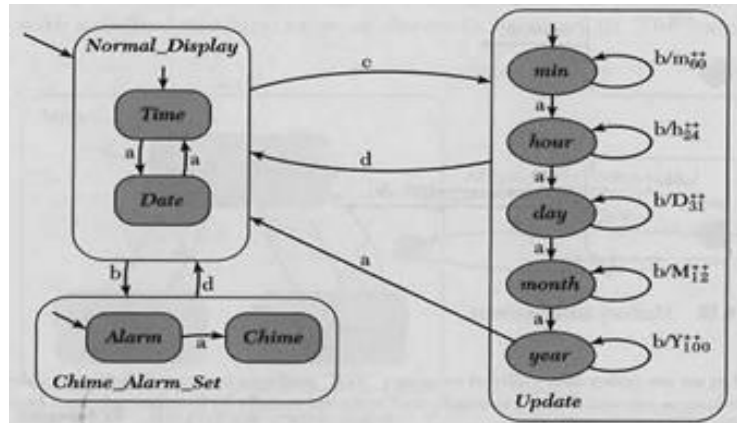
Test Cases “Run” window:



Problem 3:

Sheet3 Q3:

Consider the following state chart for a hand watch that has four buttons *a*, *b*, *c*, *d*. The watch has three modes normal display to display time or date, update or adjust mode, alarm mode to switch the alarm on or off, *M12++* means increase months by one (if current month is 12 it will be 1).



For this problem the following **algorithm** can be used to model the state chart

Input: is either *a*, *b*, *c*, or *d* **output** is a variable showing the current state + the values of current time and current date

Output variables are *m=0, h=0, D=1, M=1, Y=2000*.

Output displayed information are Time, Date .

set state= NORMAL;

set state1=TIME;

set m=0,h=0, D=1,M=1, Y=2000.

For each input do

switch(state)

Case NORMAL: {

If (input ==c) state=UPDATE

If (input ==b) state=ALARM

If (input ==a)

If (state1==TIME)

state1=DATE

```

        else

        state1=TIME

    }

    Case UPDATE: ..

    Case ALARM: ..

}

DisplayDate() {print Y+"-"+M+"-"+D}

DisplayTIME() {print h+"":"+m}

```

1) Completing the algorithm and code it using C/java, so it can be used as a real watch.

RealWatch.java

```

public class RealWatch {

    public String Watch ( String input ){
        int len = input.length();
        int m=0 ,h = 0;
        int D = 1,M = 1;
        int Y = 2000;
        String s;
        String state = "Normal_Display";
        String i1 = "Time";
        String i2 = "Alarm";
        String i3 = "min";

        for(int i=0; i< len; i++){
            switch (state){

                case "Normal_Display" : {
                    if ( input.charAt(i) == 'c' )
                        state = "Update";
                    if ( input.charAt(i) == 'b' )
                        state = "Alarm_Set";
                    if ( input.charAt(i) == 'a' ){
                        if( i1 == "Time")
                            i1 = "Date";
                        else
                            i1 = "Time";
                    }
                    break;

```

```

    }

    case "Alarm_Set" : {
        if ( input.charAt(i) == 'a' ) {
            if (i2 == "Alarm")
                i2 = "Alarm_Set";
        }
        if ( input.charAt(i) == 'd' )
            state = "Normal_Display";
        break;
    }

    case "Update" : {
        if (input.charAt(i) == 'a') {
            if (i3 == "min")
                i3 = "hour";
            else if (i3 == "hour")
                i3 = "day";
            else if (i3 == "day")
                i3 = "month";
            else if (i3 == "month")
                i3 = "year";
            else if (i3 == "year")
                state = "Normal_Display";
        }

        if (input.charAt(i) == 'b'){
            if (i3 == "min") {
                if (m < 60)
                    m++;
                else
                    m=0;
            }
            else if (i3 == "hour")
                if ( h < 24)
                    h++;
                else
                    h=0;
            else if (i3 == "day")
                if ( D < 31)
                    D++;
                else
                    D=1;
            else if (i3 == "month")
                if ( M < 12)
                    M++;
                else
                    M=1;
            else if (i3 == "year")
                if ( Y < 2100)
                    Y++;
        }

        if (input.charAt(i) == 'd')

```



```

        state = "Normal_Display";
        break;
    }
}

if (state == "Normal_Display") {
    s = i1;
}
else if (state == "Alarm_Set"){
    s = i1;
}
else {
    s = i1;
}

return "Current state: " + state + ", the inner state: " + s + " Date: "
+ String.valueOf(D) + " - " + String.valueOf(M) + " - " +String.valueOf(Y) + " Time:
" + String.format("%02d", h) + ":" + String.format("%02d", m);
}
}

```

```

1  public class RealWatch {
2
3  @
4      public String Watch ( String input ){
5          int len = input.length();
6          int m=0 ,h = 0;
7          int D = 1,M = 1;
8          int Y = 2000;
9          String s;
10         String state = "Normal_Display";
11         String i1 = "Time";
12         String i2 = "Alarm";
13         String i3 = "min";
14
15         for(int i=0; i< len; i++){
16             switch (state){
17
18                 case "Normal_Display" : {
19                     if ( input.charAt(i) == 'c' )
20                         state = "Update";
21                     if ( input.charAt(i) == 'b' )
22                         state = "Alarm_Set";
23                     if ( input.charAt(i) == 'a' ){
24                         if( i1 == "Time")
25                             i1 = "Date";

```

```
Tools VCS Window Help Lab2 - RealWatch.java
max_minTest
CheckOddEven.java x CheckOddEvenTest.java x max_min.java x RealWatch.java x max_minTest.java x
25         else
26             i1 = "Time";
27     }
28     break;
29 }
30
31 case "Alarm_Set" : {
32     if ( input.charAt(i) == 'a' ) {
33         if (i2 == "Alarm")
34             i2 = "Alarm_Set";
35     }
36     if ( input.charAt(i) == 'd' )
37         state = "Normal_Display";
38     break;
39 }
40
41 case "Update" : {
42     if (input.charAt(i) == 'a') {
43         if (i3 == "min")
44             i3 = "hour";
45         else if (i3 == "hour")
46             i3 = "day";
47         else if (i3 == "day")
48             i3 = "month";
```

```
Tools VCS Window Help Lab2 - RealWatch.java
max_minTest
CheckOddEven.java x CheckOddEvenTest.java x max_min.java x RealWatch.java x max_minTest.java x
49     else if (i3 == "month")
50         i3 = "year";
51     else if (i3 == "year")
52         state = "Normal_Display";
53 }
54
55 if (input.charAt(i) == 'b'){
56     if (i3 == "min") {
57         if (m < 60)
58             m++;
59         else
60             m=0;
61     }
62     else if (i3 == "hour")
63         if ( h < 24)
64             h++;
65         else
66             h=0;
67     else if (i3 == "day")
68         if ( D < 31)
69             D++;
70         else
71             D=1;
```

```

Tools  VCS  Window  Help  Lab2 - RealWatch.java
max_minTest
CheckOddEven.java × CheckOddEvenTest.java × max_min.java × RealWatch.java × max_minTest.java ×
72         else if (i3 == "month")
73             if ( M < 12)
74                 M++;
75             else
76                 M=1;
77         else if (i3 == "year")
78             if ( Y < 2100)
79                 Y++;
80     }
81
82     if (input.charAt(i) == 'd')
83         state = "Normal_Display";
84     break;
85 }
86 }
87 }
88
89 if (state == "Normal_Display") {
90     s = i1;
91 }
92 else if (state == "Alarm_Set"){
93     s = i1;
94 }

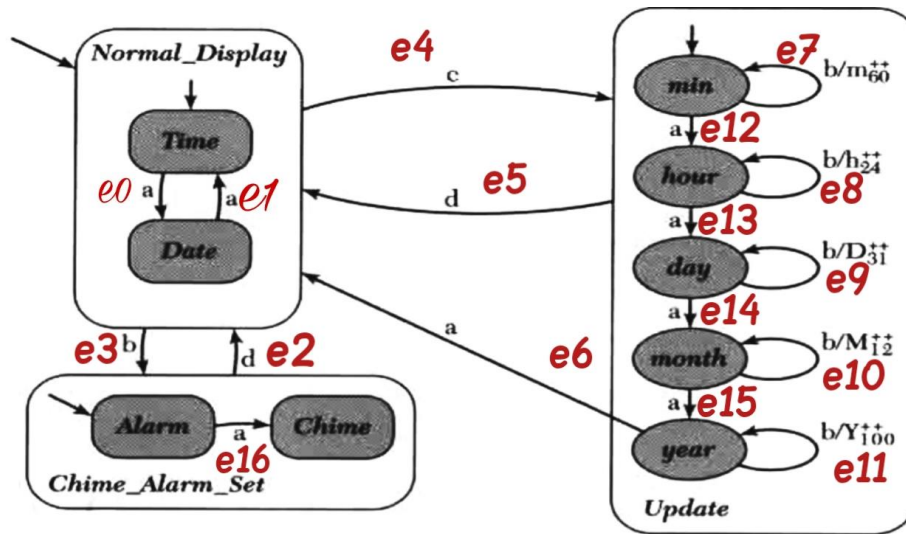
```

```

Tools  VCS  Window  Help  Lab2 - RealWatch.java
max_minTest
CheckOddEven.java × CheckOddEvenTest.java × max_min.java × RealWatch.java × max_minTest.java ×
84         break;
85     }
86 }
87 }
88
89 if (state == "Normal_Display") {
90     s = i1;
91 }
92 else if (state == "Alarm_Set"){
93     s = i1;
94 }
95 else {
96     s = i1;
97 }
98
99 return "Current state: " + state + ", the inner state: " + s + " Date: " +
100     String.valueOf(D) + " - " + String.valueOf(M) + " - " + String.valueOf(Y) +
101     " Time: " + String.format(s: "%02d", h) + ":" + String.format(s: "%02d", m);
102 }
103 }
104

```

2) find test suite for edge coverage, ADUP.



“e” refers to edges numbers.

Edge coverage:

$TC1 = \langle e0, e1 \rangle$

$TC2 = \langle e2, e3 \rangle$

$TC3 = \langle e4, e5 \rangle$

$TC4 = \langle e7, e12, e8, e13, e9, e14, e10, e15, e11, e6 \rangle$

ADUP :

variables are: m = min, h =hour, D = day, M =month, Y =year.

| variable | D | U |
|-----------------|----------|----------|
| m | $e4$ | $e7$ |
| m | $e7$ | $e7$ |
| h | $e12$ | $e8$ |
| h | $e8$ | $e8$ |
| D | $e13$ | $e9$ |
| D | $e9$ | $e9$ |
| M | $e14$ | $e10$ |
| M | $e10$ | $e10$ |
| Y | $e15$ | $e11$ |
| Y | $e11$ | $e11$ |

GitHub Repo:

GitHub Repo Link is:

<https://github.com/Mennah-Ashraf/Testing---LAB2.git>