Obj1		Obj2		Obj3		Obj4		Obj5		Obj6		Obj7		Obj8	
	20		10		15		15		10		10		15		10

CENG 1004 FINAL EXAM

Name

1) Write a method named triangleType having three integer arguments representing the lengths of the sides of a triangle and returns what type of triangle it is. (10 Pts)

a) The method should return the corresponding type based on the conditions given in the following table (5 Pts.) (Objective -1)

Condition	**Type**
All three sides have the same length	Equilateral
Two sides have the same length	Isosceles
All three sides have different lengths	Scalene

b) Your method should throw an IllegalArgumentException if the longest edge is longer than or equal to the sum of the other two, or if any edge is less than or equal to zero.(5 Pts.) (Objective - 7)

2) What is the expected output of the following code? (5 Pts) (Objective -1)

```
public class Question3 {

    int x;
    public static void main(String[] args) {
        Question3 q3 = new Question3();
        int a = 3;
        q3.x = a;
        int b = increment(a, q3, q3.x);

        System.out.println("a= " + a + ", b= " + b + ", q3.x= " + q3.x);
    }

    private static int increment(int a, Question3 q, int c){
        return a++ + q.x++ + c++;
    }
}
```

3) Write a recursive method for the following function definition (10 Pts.) (Objective -2)

```
F(0) = 1,
F(n) = 1 + 1 / F(n-1)
```

4) Write a method that returns the second largest value in a given array of positive integers? If there is no second largest then return -1 (10 Pts) (Objective -1)

5) What is the expected output of the following code? (5 Pts.) (Objective - 5)

```
import java.util.ArrayList;
import java.util.Collection;
public class Question5 {
    public static void main(String[] args) {
        Collection<Integer> list = new ArrayList<>();
        list.add(4);
        list.add(3);
        list.add(2);
        list.add(1);
        list.add(0);
        for (int i = 0; i < list.size(); i++) {
            list.remove(i);
        }
        System.out.println(list);
    }
}
```

6) Implement Time class to represent time between 00:00:00 and 23:59:59. The constructor should take three parameters to set the hour, minute and second and should throw IllegalArgumentException if the given parameters are not valid. Also implement the incrementSecond method to add one second to the time instance. (15 Pts.) (Objective 3, 7)

7) What is the expected output of the following code? (5 Pts.) (Objective - 7)

```
        public static void main(String[] args) {
        try {
            Integer a = null;
            badMethod(a);
            System.out.print("A");
        } catch (ArithmeticException ex) {
            System.out.print("B");
        } catch (RuntimeException ex1) {
            System.out.print("C");
        } catch (Exception ex1) {
            System.out.print("D");
        } finally {
            System.out.print("E");
        }
        System.out.print("F");

    }
    public static void badMethod(Integer a) {
         int x = 0;
         int y = a / x;
    }
```

8) What is the expected output of the following code? (5 Pts.) (Objective - 5)

```
import java.util.Comparator;
import java.util.Map;
import java.util.TreeMap;

public class Question8  implements Comparator<String> {
    public int compare(String q1, String q2) {
        return q1.length() - q2.length();
    }

    public static void main(String[] args) {
        Map<String, Integer> map = new TreeMap<>(new Question8());
        map.put("abc", 1);
        map.put("a", 3);
        map.put("ab", 1);
        map.put("bc", 2);
        System.out.println(map);
    }
}
```

9) You are given the following interface to implement binary tree node. (15 Pts.)

a) Modify the interface to support Generics. (5 Pts.) (Objective - 6)

b) Provide an implementation for the interface. (10 Pts.) (Objective - 4,6)

```
public interface BinaryTreeNode {
    BinaryTreeNode getLeft();
    void setLeft(BinaryTreeNode left);
    BinaryTreeNode getRight();
    void setRight(BinaryTreeNode right);
    Object getValue();
    void setValue(Object value);
}
```

10) Below contents of tab separated Country.txt file is given. (25 Pts.)

Country.txt		**SortedCountry.txt**	
Country	Area sq.km.	Country	Area sq.km.
Russia	17,075,200	Zambia	752,614
Colombia	1,138,910	Nigeria	923,768
Canada	9,984,670	Egypt	1,001,450
Egypt	1,001,450	Colombia	1,138,910
USA	9,826,630	Brazil	8,511,965
Zambia	752,614	China	9,596,960
China	9,596,960	USA	9,826,630
Nigeria	923,768	Canada	9,984,670
Brazil	8,511,965	Russia	17,075,200

a) Write a Country class for country objects . (5 Pts.) (Objective - 3)
b) Overide equals and hashcode methods in Country class. (5 Pts.)(Objective - 4)
c) Implement the Comparable interface (5 Pts.) (Objective - 4)
d) Write method which reads the Country.txt and and generates the SortedCountry.txt in which countries are sorted by their areas. (10 Pts.) (Obj. -8)