Q 1. What are the differences between an abstract class and an interface? [20 pts]

Q 2. [class, array] Both array and class can contain a collection of elements. Explain what are the differences between array and class? [20 pts]

Q 3. [loops] Complete the following method print(int num) to print a triangle whose height is num as illustrated by the following examples. [20 pts](To make the problem easier, you can add an auxiliary method to get around of nested loop)

```
num = 2
*
**

num = 4
*
**
***
****
```
Q 4. What’s the output of the following program? [20 pts]

// TestClass TestClass.java
public class TestClass
{
    int dumb;
    public void Increment()
    {
        int dumb = this.dumb;
        dumb++;
    }
}
// main program Main.java
public class Main
{
    public static void main(String[] args)
    {
        TestClass tc = new TestClass();
        tc.dumb = 2;
        int dumb = 10;
        tc.Increment();
        dumb++;
        System.out.println(tc.dumb);
        tc.Increment();
        dumb++;
        System.out.println(dumb);
    }
}

Q 5. Design program to reverse an integer. You may assume that there is no leading or trailing zeros in the input integer. For example, if the input is 123, the result should be 321. [20 pts]

public int reverse(int input)
{
Q 6. Implement the following method to sort a String array. [30 pts]

```java
public void sort(String[] elements)
{
}
```

Q 7. [modifiers] final can appear as a modifier in class, method and variable declarations, explain what are the meanings of final in each context. [20 pts]

Q 8. [inheritance] Suppose we have shape of Triangle with height property and draw method, and shape of Rectangle with height and length properties, and draw method. Design a program with three classes: Shape, Triangle and Rectangle. Give the implementation of each class. Make sure that you use correct modifiers: abstract, public, protected, private, final. [50 pts]