1. (15 points) Provide short answers (a few sentences) to each of the following questions:

(a) What does it mean to designate a datum or method as public or private? Why should some such members be designated private?
(b) Why must a recursive method contain a base case?
(c) Why must a constructor have no return type?

2. (25 points) Consider writing a method that does the following:

• Prompt the user to enter an integer between the min and max values, inclusive.
• Obtain the user’s input as a String by using the following (assumedly) already written method:
  public static String getTypedInput()
• Attempt to convert the obtained input into an int by calling the following Integer class method:
  public static int parseInt (String s) throws NumberFormatException
• If the user’s input is not convertable to an integer, or if the value entered is outside of the range specified by min and max, prompt the user again until this condition is fulfilled.
• Return the converted int.

Complete this method:
public static int getIntInRange (int min, int max) {

3. (25 points) Consider the following two object classes . . .

```java
public class Alpha {
    protected int _x;

    public Alpha (int x) {
        _x = x;
    }

    public void show1 () {
        System.out.println("Alpha 1: "+_x);
    }

    public static void show2 () {
        System.out.println("Alpha 2");
    }

    public void show3 () {
        this.show2();
    }
}

public class Beta extends Alpha {
    private int _x;

    public Beta (int x) {
        super(x);
        _x = x * 2;
    }

    public void show1 () {
        System.out.println("Beta 1: "+_x+" "+super._x);
    }

    public static void show2 () {
        System.out.println("Beta 2");
    }

    public void show3 () {
        this.show2();
    }
}
```

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...as well as this static class ...

```java
public class Go {
    public static void main (String[] args) {
        Alpha a = new Beta(4);
        a.show1();
        a.show2();
        a.show3();
    }
}
```

Show the output generated when this program is run by invoking:

```
$ java Go
```

1You may provide short explanations of why you chose that particular output.
4. (25 points) Consider the following recursive method:

    public static void doit (int n, char prefix) {
        if (n > 0) {
            System.out.println("a: "+prefix+n);
            doit(n-1, '$');
            System.out.println("b: "+prefix+n);
            doit(n-1, '%');
            System.out.println("c: "+prefix+n);
        }
    }

Show the output generated when this method is called like so:\n
    doit(3, '!');

5. (10 points) Free points suffering through this exam.

\(^2\text{Again, explanations, diagrams, or any other demonstration of your thinking is welcome.}\)