Question 1 ......................................................... (20 points)

(a) Specify (by writing either true or false alongside each statement) the values of four int and four boolean variables computed as follows:

```java
int i1 = 5;
int i2 = i1/5*6;
int i3 = i1/6*5;
int i4 = i1*5/6;
boolean b1 = i1!=5 && i1<10;
boolean b2 = i1!=5 || i1<10;
boolean b3 = i1==5 && i1>10;
boolean b4 = i1==5 || i1>10;
```

(b) What is printed by the following program fragment?

```java
int n = 8;
while (n>0) {
    int m = n%3;
    System.out.println("m="+m+" n="+n);
    n -= 2;
}
```

(c) Rewrite the fragment above using for instead of while.
Question 2 ................................................................. (14 points)
Complete the Java methods described below.

(a) Uses the specified Graphics g to draw an isosceles triangle like this one:

```
  △
```

The horizontal base has length equal to the panel width \( w \) and height equal to the panel height \( h \), with apex centered at the top of the panel.

```java
public static void drawTriangle(int w, int h, Graphics g) {
}
```

(b) Returns (without printing) the largest of the values in the specified array.

```java
public static float max(float[] a) {
}
```

(c) Returns the index of the first negative value in the specified array; or, if all values are non-negative, returns -1.

```java
public static int indexOfNegative(float[] a) {
}
```

(d) Uses the previous method `indexOfNegative` in only one statement to return `true` if the specified array has at least one negative value; `false`, otherwise.

```java
public static boolean hasNegative(float[] a) {
}
```
Question 3.......................................................... (16 points)

Consider a Java class that represents a 2D vector with components \((x, y)\).

(a) Complete the following implementation of this class.

```java
import static java.lang.Math.*;
public class Vector {

    /** Constructs a vector with specified components. */
    public Vector(double x, double y) {

    }

    /** Returns the length (magnitude) of this vector. */
    public double length() {

    }

    /** Scales components of this vector by the specified factor s. */
    public void scale(double s) {

    }

    /** Returns true iff this vector equals the specified vector v. */
    public boolean equals(Vector v) {

    }

    /** Returns a text string that represents this vector. */
    public String toString() {

    }

    // private fields

}
```
(b) Complete the following Java program, which might be used to test your implementation of the class Vector.

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

        // Construct two vectors, v1 and v2, not equal, but with equal lengths.

        // Compare v1 and v2 to confirm (print) that they are not equal.

        // Compare v1 and v2 to confirm (print) that their lengths are equal.

        // Scale the vector v2 so that its length is half that of v1.

        // Print vectors v1 and v2.
    }
}
```