

ICS H22 Homework 1

Due: 10AM, Friday, January 20, 2006

1. Write a *recursive* procedure for method `isOdd` that takes an `int` parameter n and returns a (boolean value) true if and only if n is odd. (You can assume n is always a positive integer.) Your procedure cannot use modulus or division operations.
(Hint: It's OK if your procedure ends up running in time proportional to n itself...)

```
public boolean isOdd( int n)
{
```

```
}
```

2. Provide code to method `diagonalLine` of class `Point` which takes two `Point` objects $p1 = (x1, y1)$, and $p2 = (x2, y2)$ and returns an array of one thousand instances of a `Point` object, whose coordinates range from $(x, y) = (x1, y1)$ to $(x, y) = (x2, y2)$, i.e. the points in the array are evenly spaced on a diagonal line connecting point `p1` and `p2`. Don't worry if the coordinates of the last point in the array is only *approximately* equal to the coordinates of point `p2`. Also, use the `while` construct for a loop, and not the `for` construct.

```
public class Point {
    private double x,y;

    public double getX() { return x; }
    public double getY() { return y; }
    public void setX( double newX ) { x = newX; }
    public void setY( double newY ) { y = newY; }

    public Point[] diagonalLine( Point p1, Point p2 )
    {

    }
}
```

3. What is the output of a call to the method `scopingTest` in the code below? For example, if variable `example` is initialized as an object of type `Scoping`, this method can be invoked by `example.scopingTest()` procedure call. (By the way, it's not a great idea to re-use variable names for both class variables, formal arguments, and local variables, as is done in the code below.)

```
public class Scoping {

    String s = "Tolstoy";

    private void stringMethod1( )
    {
        System.out.println(s);
        s = "Naipul";
    }

    private void stringMethod1(String s)
    {
        System.out.println(s);
        s = "Colette";
    }

    private void stringMethod2( )
    {
        String s = "Mishima";
        System.out.println(s);
        s = "Austen";
    }

    public void scopingTest()
    {
        String s = "Steinbeck";

        stringMethod1( );
        stringMethod1( s );
        stringMethod1( );
        stringMethod2( );
        stringMethod1( );
        System.out.println( s );
        System.out.println( this.s );
    }
}
```

4. What is the output of the function test()?

```
class TestParameterPassing
{
    public void test()
    {
        int[] a = new int[ 10 ];
        int[] b = new int[ 10 ];

        for ( int i = 0; i < a.length; i++ )
        {
            a[ i ] = i;
            b[ i ] = -i;
        }

        System.out.println( a[ 2 ] );
        change1( a );
        System.out.println( a[ 2 ] );
        change2( a[ 2 ] );
        System.out.println( a[ 2 ] );
        change3( a );
        System.out.println( a[ 2 ] );
        a = b;
        System.out.println( a[ 2 ] );
    }

    public void change1( int[] b )
    {
        for ( int i = 0; i < b.length; i++ )
            b[ i ] = b[ i ] * b[ i ];
    }

    public void change2( int b )
    {
        b = b * b;
    }

    public void change3( int[] b )
    {
        int[] a = new int[ b.length ];

        for ( int i = 0; i < b.length; i++ )
            a[ i ] = b[ i ] * b[ i ];
        b = a;
    }
}
```