Introduction to Programming

Labs – Week 7

Exercise 1

Write a program `WordCount.java` that reads in text from standard input and prints out the number of words in the text. For the purpose of this exercise, a word is a sequence of non-whitespace characters that is surrounded by whitespace. Use your program to count number of words in the novel *War and Peace by Chales Dickens* (attached).

Hint: The method `StdIn.readString()` or `sc.next()` returns next word from the standard-input.

Exercise 2

The *marla* is a traditional unit of area that is commonly used in Pakistan. Write a program `Marla2Yards.java` that generates the following table for converting area in marla to square yards. Note that there are 30.25 square yards in one marla. You must use one loop and a single `System.out.println()` statement.

```
5 marla = 151.25 square yards
10 marla = 302.5 square yards
15 marla = 453.75 square yards
20 marla = 605.0 square yards
25 marla = 756.25 square yards
30 marla = 907.5 square yards
```

Exercise 3

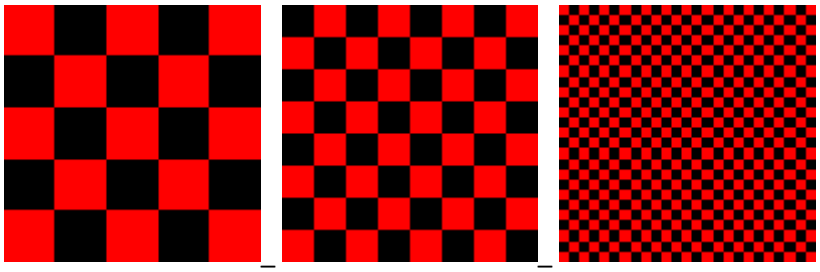
Write a program `Interpolate.java` that given an array of `n` real numbers, create a new array of size `n+(n−1)` in which an average value is inserted between every two contiguous values of the original array. For example, if array `a = {1.0, 4.0, 6.0, 9.0}`, then your program should create a new array `b` containing `{1.0, 2.5, 4.0, 5.0, 6.0, 7.5, 9.0}`.

Exercise 4

Write a program called `isMagicSquare` that accepts a two-dimensional array of integers as a input and prints `true` if it is a magic square. A square matrix is a magic square if it is square in shape (same number of rows as columns, and every row the same length), and all of its row, column, and diagonal sums are equal. For example, `{{2, 7, 6}, {9, 5, 1}, {4, 3, 8}}` is a magic square because all eight of the sums are exactly `15`.

Exercise 5

Write a program `Checkerboard.java` that takes a command-line argument `n` and plots an `n`-by-`n` checkerboard with red and black squares. Color the lower-left square red. The checker boards for `n=5`, `n=8`, and `n=25` are shown below.



Notes

- It would be helpful to set the `x`-axis and `y`-axis scale with `StdDraw.setXscale(0,N)` and `StdDraw.setYscale(0,N)` respectively.
- Color can be set as follows: `StdDraw.setPenColor(StdDraw.BLACK)` or `StdDraw.setPenColor(StdDraw.RED)`
- Use `StdDraw.filledSquare(x,y,r)` to draw filled square of radius `r` centered at point `(x,y)`.

Exercise 6

Write a program `Circles.java` that draws filled circles of random size at random positions in the unit square, producing images like those below. Your program should take four command-line arguments: the number of circles, the probability that each circle is black, the minimum radius, and the maximum radius.