Introduction to Java Section I2

CS9053

Wednesday 6:00 PM – 8:30 PM

Prof. Dean Christakos

Sept 12th, 2024

Due: Sept 19th, 2024 11:59 PM

**Assignment 2**

**Part I – Loops**

The Riemann Zeta function is defined as the sum of all positive integers raised to a complex power

This function is intimately tied into prime numbers in ways I am not going to get into the details of here.

However, it so happens that

Write a method that executes this summation using a loop and figure out how many iterations of n it takes for the sum to estimate within .00001 (

You should print out something like this:

Zeta(2) is estimated as <x> after <y> iterations

Where <x> is the estimation of to within .00001

Because the method estimateZeta2() cannot return both the estimation and the number of iterations, this output should be printed from within the estimateZeta2() method.

**Part II: Arrays**

1. In ArrayProduct.java, you are going to take an integer array arr, and return an array output such that each element at index i of output is equal to the product of all the elements of arr except arr[i].

Input: arr = [1, 2, 3, 4]

Output: output = [24, 12, 8, 6]

Explanation:

24 = 2×3×4

12 = 1×3×4

8 = 1×2×4

6 = 1×2×3

Input: arr = [-1, 1, 0, -3, 3]

Output: output = [0, 0, 9, 0, 0]

In the “leetcode” version of this problem, you wouldn’t be allowed to use division to solve this problem. That’s not important here. But you will get 1 point of extra credit if you solve this problem without using division.

1. Pascal’s Triangle

You’re going to create a Pascal’s triangle which will be stored in an array of arrays.

We have a method createPascalTriangle(int rows) which takes an argument of rows and creates a Pascal’s triangle of that number of rows. You can see that the return type is int[][]. If the input is 5, the output should be:

1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

I’ll make this convenient for you so you don’t have to center-justify the output like you did in math class.

For those who need a review, the *nth* row of a Pascal’s triangle has *n* elements. Row 1 is “1”, row 2 is “1 1” and for each index i of the subsequent row, the first index and last index are 1, and the other indices are given by (i-1) + (i) of the previous row.

A two dimensional array is an array of arrays. Creating a two dimensional array starts with

int[][] pascalTriangle = new int[rows][];

And then for each row of the triangle, you will have to create another array of integers for the number of columns of each row.

After returning the two dimensional array, you should have a nested loop that prints out the pascal’s triangle as in the above example.

**Part III: Strings**

1. Write a Java program that finds the length of the longest substring without repeating characters in a given string.

Here, you should take a string as an input, and return the longest substring of that string that doesn’t have repeating characters.

1. In the class DumbPasswords, we will use loops to generate Strings.

The method printDumbPasswords takes two arguments, m and n.

The format of a dumb password is as follows: number-number-letter-letter-number

Character 1: a digit from **1** to **m (non inclusive)**.

Character 2: a digit from **1** to **m (non inclusive)**.

Character 3: a small letter from the first **n** (inclusive) letters of the alphabet.

Character 4: a small letter from the first **n (**inclusive)letters of the alphabet.

Character 5: a digit from **1** to **m+1 (non inclusive), greater than the first 2 digits**.

printDumbPasswords should print out all the dumb passwords in alphabetical order, separated by a space.

So printDumbPasswords(3, 1) should output

11aa2 11aa3 12aa3 21aa3 22aa3