ELEC 2543 Object-Oriented Programming and Data Structures

Programming Exercise 10

Topics: Recursion

Released: April 9, 2021 (Friday)

Due Date: 9:30am, Apr 23, 2021 (Tuesday)

**Part I: Pascal’s Triangle**

Pascal’s triangle tells the binomial coefficients of different binomial powers. Please refer to the wiki page for an illustrative animation. The first five rows are shown below:

1st row: 1

2nd row: 1 1

3rd row: 1 2 1

4th row: 1 3 3 1

5th row: 1 4 6 4 1

Use recursion to compute the *k*th row in the Pascal’s Triangle in method public static int[] computePT(int k) in class PascalTriangle. The returned array should contain the numbers on the *k*th row. (Hint: Row *k*+1 can be developed from Row *k*).

The driver program PascalTriangleDriver.java has been provided. You have to input the *k* you want as the command-line argument.

To reduce the complexity (time needed to run a program), you should minimize the number of recursive calls. We will test your program using *k* = 30. If you find your program takes a long time to run, you should examine whether you are calling computePT(k-1) several times for each computePT(k) call.

No credit is given if method computePT is not a recursive method or it takes more than 5 seconds to generate the result. You cannot define other methods. The output of *k* = 10 is:

1 9 36 84 126 126 84 36 9 1

**Part II: Binary Search**

Implement method binSearch in class BinarySearch using recursion. You can assume parameter Comparable[] list is always sorted in ascending order. The driver program BinarySearchDriver is provided to test your program. The output of the program is:

-2 is not in the array.

-1 is not in the array.

0 is in the array.

1 is in the array.

2 is in the array.

3 is in the array.

4 is in the array.

5 is in the array.

6 is in the array.

7 is in the array.

8 is in the array.

9 is in the array.

10 is not in the array.

11 is not in the array.

Handin

Follow the instructions on Moodle.