

CS 118 — Programming Fundamentals

Assignment #4

Due Date: Tuesday, October 1st at 11:55pm on Google Classroom.

Instructions: Assignments are to be done individually. **No late assignments will be accepted.** You must complete this assignment by yourself. You cannot work with anyone else in the class or with someone outside of the class. The code you write must be your own. You are encouraged to get help from the instructional staff. You may post general questions on Piazza. Do not post more than one line of code when using Piazza.

You must **submit a single zip file** containing your code and documentation on Google Classroom named `<your_student_id>.zip` where `<your_student_id>` is something like `i19-XXXX`. This means that you must submit only **one file named `i19-XXXX.zip` containing only your source files**. Each file that you submit **must contain your name, student-id, and assignment#** on top of the file in comments. Your submission must NOT contain multiple `main()` functions, otherwise it will not compile for grading. Test your program on a lab machine before submission.

Follow the instructions. Assignments not following the instructions will be awarded zero points.

Assignment Statement:

Pascal's triangle displays a triangular array of the binomial coefficients.

```
row 0 ->                1
row 1 ->              1    1
row 2 ->            1    2    1
row 3 ->          1    3    3    1
row 4 ->        1    4    6    4    1
          .    .    .    .    .
          .    .    .    .    .
```

This is often referred to as **n choose r** . Given **n** items how many ways can you choose **r** things. For example, given items *a*, *b* and *c*, how many combinations can we create of the the following sizes:

- 0: only one way to choose 0 items $\{\}$
- 1: 3 possible combinations $\{a\} \{b\} \{c\}$
- 2: again 3 ways $\{a, b\} \{b, c\} \{a, c\}$
- 3: only $\{a, b, c\}$

It so happens that row 3 of the Pascal's triangle is 1 3 3 1. As it turns out, we can use this on every level.

For this assignment you will be printing the Pascal's triangle using recursion. The objective of this assignment is to practice recursion. You are not supposed to use loops while writing this program. Submissions with any loop will be marked as zero.

In this assignment you will write a program to create and print out a given number of rows of the Pascal's Triangle. The sample programs (`pascal3.txt`, `pascal7.txt`, and `pascal14.txt`) show 3 runs from my solution to this problem for three different values. Note the spaces in the output files.

Program output for a seven row triangle is given below:

Enter the number of rows in Pascal's Triangle: 7

```

      1
     1 1
    1 2 1
   1 3 3 1
  1 4 6 4 1
 1 5 10 10 5 1
1 6 15 20 15 6 1
```

Program output for a four row triangle is given below:

Enter the number of rows in Pascal's Triangle: 4

```

      1
     1 1
    1 2 1
   1 3 3 1
```

Style issues. We will grade program hygiene as well as correctness. Did you provide a good structure to the program using functions? Did you minimize the scope of variables to the smallest necessary? Did you use meaningful identifiers? Did you provide consistent tabbing and spacing for code inside functions and if statements? Did you provide comments for your functions? **A program containing any loop will be awarded zero.**

Honor Policy

This assignment is a individual learning opportunity that will be evaluated based on your ability to think independently, work through a problem in a logical manner solve the problems on your own. You may however discuss verbally or via email the general nature of the conceptual problem to be solved with your classmates or the course instructor, but you are to complete the actual assignment without resorting to help from any other person or other resources that are not authorized as part of this course. If in doubt, ask the course instructor. You may use the Internet to search for possible solutions to the problem.