

**COMP 322: Fundamentals of Parallel Programming (Spring 2014)**  
**Instructor: Vivek Sarkar**  
**Worksheet 9: due at end of class today**

**Name:** \_\_\_\_\_ **Netid:** \_\_\_\_\_

*Honor Code Policy: You are free to discuss all aspects of in-class worksheets with your other classmates, the teaching assistants and the professor during the class. You can work in a group and write down the solution that you obtained as a group. If you use any material from external sources, you must provide proper attribution.*

**Parallelizing Pascal's Triangle with Futures and Memoization**

1. Download the file, PascalsTriangleMemoized.java.  
There are four variants provided in four different methods:
  - a. Sequential Recursive without Memoization (`chooseRecursiveSeq()`)
  - b. Parallel Recursive without Memoization (`chooseRecursivePar()`)
  - c. Sequential Recursive with Memoization (`chooseMemoizedSeq()`)
  - d. Parallel Recursive with Memoization (`chooseMemoizedPar()`)Your task is to use futures to implement variants (b) and (d), i.e., to parallelize the non-memoized and memoized versions.
2. Run the PascalsTriangleMemoized program in parallel with  $N = 8$  and  $K = 5$ .  
Complete the table below with the abstract metrics from a run of your solution:

<u>Variant</u>	<u>Work</u>	<u>CPL</u>	<u>Ideal Parallelism</u>
<code>chooseRecursiveSeq</code>	111		
<code>chooseRecursivePar</code>			
<code>chooseMemoizedSeq</code>	63		
<code>chooseMemoizedPar</code>			

Note: The work values should be equal for

- (i) `chooseRecursiveSeq` and `chooseRecursivePar`
  - (ii) `chooseMemoizedSeq` and `chooseMemoizedPar`
3. Do you agree with the following statement: "Inefficient parallel programs have more ideal parallelism than efficient parallel programs" in the context of this worksheet?