

[30 points] (two points for writing your name and period so don't forget!)

Non TI n-spires ok but not necessary.

Since you aren't allowed a calculator, you can leave your answers in calculator ready form.

Consider the Pyramid below (with only odd numbers) starting from row 1.

		1		3		
	5		7		9	
		13		15		17
			19		21	
				23		

1. Above, draw the 4<sup>th</sup> row. [2 points]

2. How many terms would be in the 81st row? \_\_\_\_\_ [2]

3. What would be the first term in the 81<sup>st</sup> row? Show the work that leads to your answer

\_\_\_\_\_ [4]

\_\_\_\_\_

### Pascal's Triangle

Simplify the following. Leave your answer as a binomial coefficient, or a simplified number.

4.  $\binom{k}{k} + \binom{k+1}{k} + \dots + \binom{k+m}{k} =$  \_\_\_\_\_ [3]



5.  $\binom{80}{27} - \binom{81}{28} =$  \_\_\_\_\_ [3]

6.  $\binom{100}{0} + \binom{100}{1} + \binom{100}{2} + \dots + \binom{100}{99} + \binom{100}{100} =$  \_\_\_\_\_ [3]

7. Would the hockey stick pattern in Pascal's triangle be valid if you didn't start with a "1" on the outside?

\_\_\_\_\_ y/n Briefly explain why using words and/or pictures. [4]

### Fibonacci Numbers

8. For the Fibonacci numbers  $F_1, F_2, F_3, \dots$

a) Express  $F_9$  in terms of  $F_4$  and  $F_5$  \_\_\_\_\_ [3]

b) Find  $t$ , given that  $F_t = 5F_{317} + 3F_{316}$  Show the work that leads to your answer. [4]

$t =$  \_\_\_\_\_