alysis Quiz 2019-20 What we have a quiz today??? **I Fib-ya-not-G** Alan Lee

Period D

+20/30 Awesome!

[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 11

13 15 17 19 21 23

25 27 29 31 33 35 37 39

1. Above, draw the 4th row. [2 points]

2. How many terms would be in the 81st row? $81 \cdot 2 = 162$ [2]

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

12961 [4]

1, 5, 13, 25 →

4 8 12

4 4

$2 \cdot 81 \cdot 81 - 162 + 1$

$2 \cdot 6561 - 161$

$13122 - 161$

12961

$2x^2 - 2x + 1$

$ax^2 + bx + c$

$a+b+c = 1$

$4a+2b+c = 5$

$9a+3b+c = 13$

$3a + b = 4$

$5a + b = 8$

$2a = 4$

$a = 2$

$b = -2$

$c = 1$

4. $80 \cdot 81/2 + 1$

$= 12961$

Pascal's Triangle

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

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

$\binom{3}{3} + \binom{4}{3} + \binom{5}{3} \cdots \binom{10}{3} = \binom{11}{4}$

13

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

$\binom{80}{27} - \binom{81}{28}$

$= \binom{80}{27} - \binom{80}{27} - \binom{79}{27} - \binom{78}{27} \ldots$

$= -\left(\binom{79}{27} + \binom{78}{27} \ldots\right)$

$= -\binom{80}{28}$

6. $\binom{100}{0} + \binom{100}{1} + \binom{100}{2} + \cdots + \binom{100}{99} + \binom{100}{100} =$ 2^{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?

NO y/n Briefly explain why using words and/or pictures. [4]

missing 1 so the sum would be 1 less than desired

3/4

$3+6+10 \neq 20$

If you missed any values, such as the 1 on the diagram on the left, the sums would not match up.

Fibonacci Numbers

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

a) Express F_9 in terms of F_4 and F_5 $5F_5 + 3F_4$ [3]

$F_9 = F_8 + F_7 = 2F_7 + F_6 = 3F_6 + 2F_5 = 5F_5 + 3F_4$

1, 1, 2, 3, 5, 8, 13, 21, 34

$34 = 5 \cdot 5 + 3 \cdot 3$

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

$5F_{317} + 3F_{316} = 2F_{317} + 3(F_{317} + F_{316})$

t = 321

$= 2F_{317} + 3(F_{318}) =$

$F_{318} + 2(F_{318} + F_{317}) =$

$F_{318} + 2F_{319} = F_{319} + F_{320} = F_{321}$ TY