

Odd-Number Triangle- (reminder: in the Odd# Triangle, the row with [3 5] is the 2nd row)

1. Write “true” or “false” for each statement. (1 pt each)

- a) In the odd-numbered triangle, the difference between the last term of the n^{th} row and the first term of the n^{th} row is $2n - 1$. _____
- b) The sum of the terms in the n^{th} row of the odd-numbered triangle is n^3 . _____
- c) The sum of the first k cube numbers is a square number. _____

Sequences and Series

2. Find the sum of each expression. Since you don't have a calculator, no need to calculate the actual number. Just give an equivalent numerical expression for each answer. (3 pts each)

a) $13 + 16 + 19 + 22 + \dots + 103 =$

b) Find the sum of the first 10 terms of the following series: $256 + 192 + 144 + 108 + 81 + \dots$

Pascal's Triangle

3. The last 5 terms of the 16th row of Pascal's triangle are: 1820, 560, 120, 16, and 1.
What are the last 5 digits of 11^{16} ? (2 points)

4. Simplify each as a single term, or single binomial coefficient. (2pts each)

a) $\binom{15}{1} + \binom{15}{3} + \binom{15}{5} + \binom{15}{7} + \dots + \binom{15}{15} =$

b) $\binom{42}{0} + \binom{43}{1} + \binom{44}{2} + \binom{45}{3} + \dots + \binom{70}{28} =$

c) $\binom{50}{6} + 2\binom{50}{7} + \binom{50}{8} =$

5. The first 5 rows of triangular pattern is shown below, where all terms are multiples of 3. For reference, the bolded "24" is a_8 , and is the 2nd term of the 4th row, and is also the 3rd term of the 2nd column. The bolded "42" is a_{14} , which is the 4th term of the 5th row, and the 2nd term of the 4th column.

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3
6  9
12 15 18
21 24 27 30
33 36 39 42 45

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a) In which row is a_{201} ? (2pts)

b) What is the 8th term of the 2nd column. (1pt)

c) Find an expression for the n^{th} term of the 2nd column. (3pts)

Fibonacci Numbers

5. $F_{158} = F_a F_b + F_{84} F_{73}$. Find a and b (1 pt)

6. Find a compact expression for: $F_0 - F_1 + F_2 - F_3 + F_4 - \dots - F_{2n-1} + F_{2n}$ (3 pts)

g' d