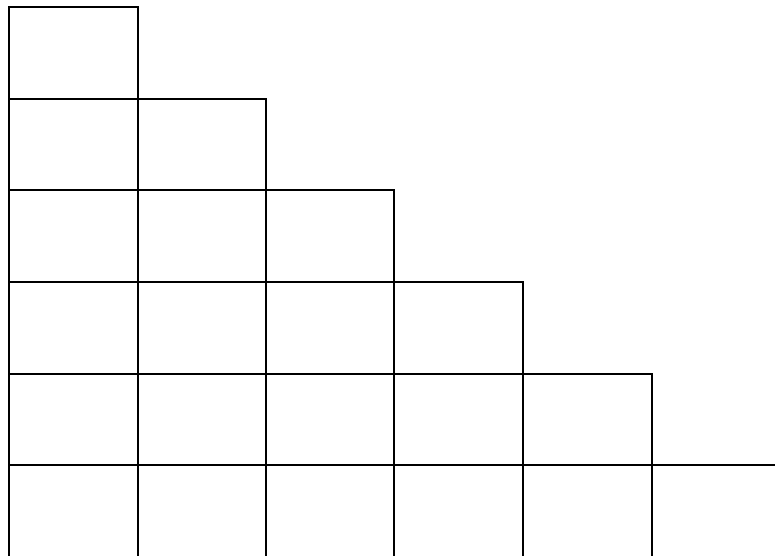# The Williston Northampton School

Required Math Summer Review Homework

Discrete Mathematics

Please complete the problems below and bring them with you the first day of class

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1. How many 1 x 1 boxes are there? (That is, boxes 1 unit wide and 1 unit high

2. How many squares of all sizes are there on this grid?

3. In Discrete Math we will often use small examples to suggest the general case. Suppose we had a similar triangular stack with 70 squares on the bottom row. Now how many 1 x 1 squares would there be in this triangular shape?

4. Find a formula in terms of *n* for the number of 1 x 1 boxes if there are *n* squares in the bottom row.

5. Suppose each 1x1 square in the triangular grid is colored red or blue. How many different coloring patterns are possible?

1					
2	3				
4	5	6			
7	8	9	10		
11	12	13	14	15	
16	17	18	19	20	21

O

6. Now we've written the whole numbers in the grid starting at the top and moving row-by-row from left to right. If we did this for a triangular array with 100 rows, what number would be written in the box by the origin in the bottom row?

7. Imagine the grid lines of a piece of graph paper represent roads and that n cars leave the origin moving in the positive y direction. At every intersection have the cars continue moving upwards and half the cars turn to the right.   If 1000 cars leave the origin, for example, 500 cars end up at (0, 1) and 500 at (1, 0).

    a)   In terms of n, how many cars end up at (0, 10)?

    b)   In terms of n, how many cars end up at (1, 2)?

    c)   In terms of n, how many cars end up at (2, 2)?

8. A whole number is a multiple of 7 if when divided by 7 the remainder is zero. How many of the numbers from 1 to 1000 are multiples of 7?

9. How many of the numbers from 1 to 1000 have one or more sevens as digits. For example, you want to count 87 and 707 and 976, but not 420.

10.   How many times is the digit 7 used in writing out the numbers from 1 to 1000? Now count 17 as one seven, 77 as two sevens, and count 787 as two sevens.