Combinatorics HW 1.2

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1. How many odd numbers between 1000 and 9999 whose digits are distinct with each other?

Consider the ones' place, there are 5 odd numbers to choose from, i.e. {1, 3, 5, 7, 9}. Consider the thousands' place, there are 8 numbers to choose from, i.e. {1, 2, 3, 4, 5, 6, 7, 8, 9} – {odd number at ones' place}. Now the hundreds' place, there are 8 numbers to choose from i.e. {0, 1, 2, 3, 4, 5, 6, 7, 8, 9} – {ones' place & thousands' place}. By the same logic, there are 7 numbers to choose from in the tens' place.

5 x 8 x 8 x 7 = 2240

2. How many 7-digit numbers are there such that the digits are distinct integers taken from {1, 2, …, 9} and such that the digits 5 and 6 do not appear consecutively in either order?

Set 1: 7-digit numbers whose digits are distinct integers taken from {1, 2, …, 9}

| Set 1 | = 9! ÷ 2! = 181440

Set 2: {Set 1} ∩ {digits 5 and 6 DO appear consecutively in either order}
| Set 2 | = 2 x 6 x P (7, 5) = 30240

| Set 1 | - | Set 2 | = 151200

3. How many different lattice paths from (-1,1) to (5,4)?

Assume we can only move in 1 direction along x-axis and y-axis, e.g. no loop or go up and down etc. allowed.

(5,4) - (-1,1) = (6,3)
C (9, 6) = 84