Combinatorics HW 1.2

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

Let us represent the four digits with four variables:

1. First, let us choose the last digit. We have 5 options: 1, 3, 5, 7, 9.
2. After this, we have 8 options for, as we cannot choose 0 or.
3. After this, we have 8 options for, as we cannot chooseor.
4. After this, we have 7 options for, as we cannot choose,or.

Using the *multiplication principle*, the result is

1. **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?**

The number of all 7-digit numbers with distinct digits drawn from:

Let us regard the complement set: 7-digit numbers with distinct digits where 5 and 6 appear consecutively. To enumerate this set, let us regard 5 and 6 as one unit :

The number of ways to choose the remaining 5 digits from :

Finally, the number of permutations of these 6 units is. Applying the *multiplication principle*, the number of all such numbers is

Another way to calculate this would be to first get the permutations for the 5 remaining digits, then putin one of the 6 slots between these numbers:

To get the target set, we use the *subtraction principle*:

Thus, **there are 151,200 7-digit numbers with distinct digits drawn fromwhere the digits 5 and 6 do not appear consecutively.**

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

Using the formula from the lecture:

Here we have

Thus, the number of different lattice paths between these the points is

*Explanation:* Basically, we need to arrange→ symbols and↑ symbols in some order, where

We haveslots and we need to choosefor the → symbols, the number of ways we can do this is