CS 70 Discrete Mathematics and Probability Theory
Spring 2019 Course Notes

DIS 6B

1 Clothing Argument

(a) There are four categories of clothings (shoes, trousers, shirts, hats) and we have ten distinct items in each category. How many distinct outfits are there if we wear one item of each category?

(b) How many outfits are there if we wanted to wear exactly two categories?

(c) How many ways do we have of hanging four of our ten hats in a row on the wall? (Order matters.)

(d) We can pack four hats for travels. How many different possibilities for packing four hats are there? Can you express this number in terms of your answer to part (c)?

2 Strings

What is the number of strings you can construct given:

(a) n ones, and m zeroes?

(b) n_1 A's, n_2 B's and n_3 C's?

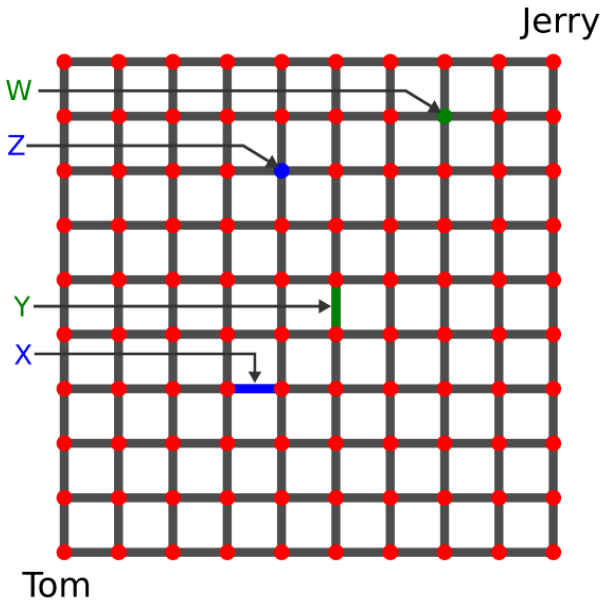
(c) $n_1, n_2, \ldots, n_k$ respectively of k different letters?

3 Bit String

How many bit strings of length 10 contain at least five consecutive 0's?

4 Maze

Let's assume that Tom is located at the bottom left corner of the 9×9 maze below, and Jerry is located at the top right corner. Tom of course wants to get to Jerry by the shortest path possible.



(a) How many such shortest paths exist?

(b) How many shortest paths pass through the edge labeled X?

(c) The edge labeled Y? Both the edges X and Y? Neither edge X nor edge Y?

(d) How many shortest paths pass through the vertex labeled Z? The vertex labeled W? Both the vertices Z and W? Neither vertex Z nor vertex W?