

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 (order doesn't matter). How many different possibilities for packing four hats are there? Can you express this number in terms of your answer to part (c)?

- (e) Now we've packed four distinct hats. Suppose we are on a 3-day trip and need to pick a hat to wear every day (we can wear the same hat for multiple days). How many different hat-wearing schedules are there?

2 Counting Practice

- (a) If you shuffle two (identical) decks of cards together, you get a stack of 104 cards, where each different card type is included twice. How many different ways are there to order this stack of cards?

- (b) How many different anagrams of GHOST are there if: (1) H is the right neighbor of G; (2) G is on the left of H (and not necessarily H's neighbor)?

- (c) There are 20 socks in a drawer, none of which match. How many different ways are there to pair up these socks? (Assume that any sock can be paired with any other sock.)

3 Bit String

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

4 Counting on Graphs

- (a) How many distinct undirected graphs are there with n labeled vertices? Assume that there can be at most one edge between any two vertices, and there are no edges from a vertex to itself. The graphs do not have to be connected.
- (b) How many ways are there to color a bracelet with n beads using n colors, such that each bead has a different color? Note: two colorings are considered the same if one of them can be obtained by rotating the other.
- (c) How many ways are there to color the faces of a cube using exactly 6 colors, such that each face has a different color? Note: two colorings are considered the same if one can be obtained from the other by rotating the cube in any way.