

Theory Assignment-2
due for submission on Moodle by 26th Feb

- 1) Eight different scented Dior perfumes, three different scented Chanel perfumes, four different scented Fragonard perfumes and six different scented Gucci perfumes to be arranged on a shelf. How many different arrangements are possible if
- a) the perfumes of the same brand must all stand together?
 - b) only the Dior must stand together?
 - c) Chanel and Fragonard stand on shelf 1, and Dior and Gucci stand on shelf 2?
 - d) Chanel and Fragonard stand on one of the 2 horizontally together shelves, and Dior and Gucci stand on the other?

- 2) Circular permutation

Mayank is given a task by her mother to put 6 indistinguishable plates on a circular table separated by 6 distinguishable napkins. What is the number of possible permutations possible for arranging napkins and plates?

- 3) a) Prove $(2n)! / (2^n \cdot n!) = (2n-1)(2n-3) \cdots 3 \cdot 1$.
b) Illustrate the equation using an example/ situation i.e STORY PROOF.

$$\binom{m+n}{k} = \sum_{j=0}^k \binom{m}{j} \binom{n}{k-j}$$

- 4) A goldsmith designs a hollow cylindrical gold disc (with height much smaller than the diameter). Say he fills it half with molten copper, seals it and hands it over to you. One side of the chip has Lotus engraved and the other plain. You toss the disc and say it falls on the engraved side. You repeat the toss (say infinite times). What can you say about the frequency of the plain side?
- 5) There is a single Amoeba in a pond. At every unit time interval, it either (a) dies (b) stays as it is (c) splits into two. If the probability of occurrence of (a) is twice the probability of (b) which is one-fourth the sum of (a) and (c), what is the probability that the amoeba population will die out?
- 6) Suppose that a box contains one green ball and four red balls, labeled A, B, C, and D. Now two of the five balls are selected at random, without replacement. (i) If it is known that ball C has been selected, what is the probability that both balls are red? (ii) If it is known that at least one red ball has been selected, what is the probability that both balls are red?