

ST3009 Weekly Questions 1

Ryan Barron

28-01-2019

Question 1

a) There are 10 distinct letters in the cipher, so there are $10!$ possible permutations, which is equal to 3628800

b) There are 9 possible places for E and F to appear together in the cipher, and for each there are two possibilities whether E or F is first. On top of that, the other 8 letters can always be permuted in any manner, so that is $8!$ permutation, so in total : $8! * 2 * 9 = 72760$

c) There are 6 letters so $6!$ permutations, but there are two groups in which the order does not matter. There 3 As, and 2 Ns, so, we can ignore duplicate permutations where only the order of these changes. In the end, we get: $\frac{6!}{3!2!} = 60$

d) We care only about the different combinations, so the order does not matter, this is trivial: $\binom{5}{3}$

Question 2

a) There are four die and each die has 6 possible roll, so all the possible sequences of throws is equal to $6^4 = 1296$

b) Among the four rolls, two of them must roll a 3 in any combination, so that is $\binom{4}{2}$, for the other 2 remaining rolls, they can any roll any of 5 other result, so for them, there are 5^2 possibilities. In total, there are $\binom{4}{2 \times 5^2 = 150}$

c) Out of all the possibilities, we need all the ones with no 3s, and the rolls with exactly one 3. So that is 5^4 possibilities of no 3, and $5^3 \times 4$ possibilities with only one 3, so that is $6^4 - 5^4 - 5^3 \times 4 = 171$

Question 3

a) There are 8 cards, so 8 permutations in total, but each is in a group with its copy in the other deck. So for each group, we divide by $2!$, we get $\frac{8!}{2!2!2!2!} = 2520$

b) We can be dealt with 4 cards and then with 3 distinct card. On top of that, we do not care about the order so we only care about half of the outcomes, so we have: $\frac{4 \times 3}{2!} = 6$

c) We can get Hearts/Hearts, Hearts/Diamond, Diamond/Hearts and Diamond/Diamond. Since we do not care about order, we can eliminate one of the distinct pair and we see that there are only 3 possible combination of "good cards"