Selected Problems

Ibrahim Abou Elenein

May 18, 2021

1 Midterm 2017

1.1 Problem 4 a

Example 1.1. From a deck of 52 cards, a 5-card hand is dealt. Find the number of hands containing exactly one pair without considering the variation of the suits?

1.1.1 Answer

Without considering the suits, my approach would be:
The pair can be one of 13 numbers, i.e. we need to pick 1 out of 13 candidates.
For the remaining 3 cards,3 cards with different numbers. In this case we need to pick 3 out of 12 candidates.

$$\overbrace{{}^{13}C_1}^{\text{number of ways to select one pair}} \times \underbrace{{}^{12}C_3}_{\text{number of ways to select other 3 cards}}$$

1.2 Problem 3 b

Example 1.2. In how many ways can we distribute 9 identical picses of candy to four children, if each child must get at least one piece?

1.2.1 Answer

The first four candies will be distributed to the children. Now we have 5 candies to be distributed to the childern Imagine 3 divisors (or blocks) we will use to group the candies, for each arrangement of the divisors and candies is a distribution. Now we have 8! arrangement but removing the duplicates for the candies 5! and 3! for the divisors

$$\frac{8!}{5!.3!}$$

2 Midterm 16

2.1 Problem 3 b

Example 2.1. Three cards are drawn from a standard deck and lined on a table. Find the probability that the first (leftmost) card is a queen , the seconed is a jack, and the third (rightmost) is not a club.

2.1.1 Answer

First of all proving that choosing one queen or jack is independent of choosing not club

$$P(Q) = \frac{1}{13}; \quad P(!C) = \frac{3}{4}$$

$$P(!C \cap Q) = \frac{3}{52} = P(Q) \times P(!C)$$

So the Probability will be as follows

$$\underbrace{P(Q)}_{\text{Probability of choosing queen}} \times \underbrace{P(J|Q)}_{\text{Probability of choosing jack given queen}} \times \underbrace{P(!C)}_{\text{Probability of choosing not club}}$$

$$\frac{1}{13} \times \frac{3}{51} \times \frac{3}{4}$$