

Peergrade Assignment #5

Mai Lise Ajspur

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Exercise 1. You have a standard deck of 52 cards. It has 13 cards of each of the four suits. The 13 cards of each suit have different ranks (A,2,3,4,5,6,7,8,9,10,J,Q,K).

Answer the following questions and justify your answer using the (generalised) pigeonhole principle.

1. You draw cards from the deck at random. What is the minimum number of cards you have to draw to be sure to have at least two cards of the same suit?
2. You draw cards from the deck at random. What is the minimum number of cards you have to draw to be sure to have four cards of the same rank?

Exercise 2. In winter, Adam takes the train at the same time each morning to go to work. If it doesn't snow then the train will arrive outside his work on time with a likelihood of 96%. However, if it snows, then it will arrive on time with a likelihood of only 72%. The train is the only reason, why Adam would be late for work.

The weather forecast predicts that it is 65% likely that it will snow on Monday.

1. What is the likelihood that Adam will arrive on time at his work on Monday?
2. On Monday, Adam arrives late at work. What is the likelihood that it was snowing?

Exercise 3. A restaurant has a menu card with tapas. It contains 5 vegetarian dishes, 4 fish dishes and 7 meat dishes. You decide to have a meal consisting of 6 different dishes.

1. How many different meals can you choose from?
2. If the waiter chooses 6 different dishes for you at random, what is the probability that the resulting menu consists of 2 dishes from each category (ie. 2 vegetarian dishes, 2 fish dishes, and 2 meat dishes)?
3. You take a look at the prices. The vegetarian dishes costs 3€ each, the fish dishes costs 5€ each, and the meat dishes costs 6€ each. Suppose you choose two meat dishes, one fish dish and one vegetarian dish yourself, and the waiter chooses two random dishes for you among the ones you didn't already choose. Then what is the expected price of your meal? To answer this question, please identify a (relevant) sample space, a random variable and its distribution.