Probability Calculus 2018/2019, Homework 3 (three problems)

Name and Surname .... Student's number ....

In the problems below, please use the following: as k – the sum of digits in your student's number; as m – the sum of the two largest digits in your student's number; and as n – the smallest digit in your student's number plus 1. For example, if an index number is 609999: $k = 42$, $m = 18$, $n = 1$.
Please write down the solutions (transformations, substitutions etc.), and additionally provide the final answer in the space specified (the answer should be a number in decimal notation, rounded to four digits).

6. There are $k(m + 1)$ boys and $2(n + 5)(m + 1)$ girls attending school S_1, while in school S_2 there are $6mk$ boys and a number of girls. We conduct the following two-stage procedure: 1) we select a school in such a way that school S_1 is chosen with probability n/k, and school S_2 is chosen with probability $1 - n/k$; 2) we randomly pick a pupil from the selected school. We know that the events: $A = \{$school S_1 was chosen$\}$ and $B = \{$the selected pupil is a boy$\}$ are independent. How many girls are there in school S_2?

ANSWER:

Solution:

7. Two student groups: G_1 and G_2, each having a limit of 10 participants, are opened for a course in probability calculus. There will be 20 students enrolling for the subject. Upon registration, each student will provide the number of the group she wishes to attend; the request will be fulfilled immediately, if only there will be free places in the group specified. Based on data for previous years, the Dean's office predicts that group G_1 will be preferred with probability m/k, and grup G_2 will be chosen with probability $1-m/k$. Calculate the probability that when one of the groups becomes full, there will be $n+2$ free places remaining in the other group.

ANSWER:

Solution:

8. There are km streets in city X; Upper Street is one of them. Each day, an inspector randomly chooses three streets (the choice of each triple has the same probability, choices on different days are independent) and inspects the quality of the surface of each of them. For each inspected street, the probability that the inspector finds damage in the surface amounts to $1/(n+20)$. If damage is revealed, the street is repaired on the same day. Making use of the Poisson Theorem, approximate the probability that during $km(m+10)$ subsequent days, Upper Street will be repaired at least twice.

ANSWER:

Solution: