Short Test Probability Theory, February 25, 2021

16.30-17.15 (extra time: 16.30-17.25)

- Please write your answers on a sheet of paper, mention your name and student number. After the test, upload your answers as one single pdf via Canvas within 10 minutes.
- You may use a simple calculator for this test, but this is not necessary. You don't have to work out powers, fractions, binomial coefficients, products, etc.
- You have to keep track of the time yourself. Make sure that you stop at 17.15 (or 10 minutes later if you have extra time).
- If you want to stop before the end of the test, ask permission of the TA via the chat. Upload your answers within 10 minutes and let the TA know in the chat when you have finished uploading.
- Your grade is given by 1+ number of points.
- Explain your answers clearly, use notation and explanation, don't just write numbers!

Exercise 1 Mrs. Q. has two drawers with socks. The first drawer contains 4 white socks and 3 black socks. The second drawer contains 5 white socks and 2 black socks. Firstly, Mrs. Q. chooses a drawer. This is done in such a way that the first drawer is chosen with probability $\frac{2}{3}$ and the second drawer is chosen with probability $\frac{1}{3}$. Secondly, she randomly draws (without replacement) three socks from the chosen drawer.
(a) [2 points] Determine the probability that she obtains at least two black socks.
(b) [3 points] Compute the conditional probability that the first drawer was chosen given the event that all three drawn socks have the same colour.

Exercise 2 Suppose that A and B are events associated to some experiment and that $P(A) = 0.4$, $P(B) = 0.3$, and $P(A \cup B) = 0.5$.
(a) [2 points] Are A and B independent?
(b) [2 points] Compute $P(A^c \cap B^c)$.