

Blackboard exam 5, Mathematics Mathematics 3501, Section ETY6
Starts: 6:55 pm, Thurs, May 6; ends: 7:45 pm (late submission loses points).
Instructor: Attila Máté

Follow these instructions carefully:

Show all your work. Your explanations count for much more than simple correct answers. Your wording must be your own; using my words will not earn any credit; your explanations must indicate that you understand the material, not simply copy the explanations from somewhere else.

Do not change the notation in the question. Changing the notation can result in a serious loss of points. In important cases, you may get zero points for changing the notation. This is especially true for proofs that you may find online or in a textbook with a different notation. Changing the notation to a notation you may find in a publicly available source may be taken as evidence of illegitimate copying, and you may be penalized appropriately.

You must work on your own; collaboration will inevitably show up with similar wordings of the explanations and invalidate your answer. Clear signs of cheating will be taken seriously.

Blackboard allows, but will indicate, late submissions. In case of multiple submissions, only the last one will count.

1. A fair die is tossed 450 times. Let X denote the number of times that a number ≤ 4 is obtained.

- a) Write a formula for the probability $P(X = k)$ ($0 \leq k \leq 450$).
- b) Write the sum describing the probability $P(X \leq 305)$
- c) Find a numerical approximation for the probability $P(X \leq 305)$; make sure to write the formula you are using to obtain the approximation. (Use an approximation that dates back to before computers, and do not evaluate the formula you wrote in Part b on computer. You can use the table given at the website for the course.)

2. Let n be a positive integer. Show that

$$\sum_{k=2n}^{4n} \binom{4n}{k} \left(\frac{1}{4}\right)^k \left(\frac{3}{4}\right)^{4n-k} < \frac{3}{4n}.$$

(Hint: an argument similar to the one used in the proof of the Weierstrass approximation theorem in the notes can be used.)