Exam 1, Mathematics 2501, Section TR3 21 copies
3:40–4:50 pm, February 26, 2026, IH-1105
Instructor: Attila Máté

Follow these instructions carefully:

Work on the paper provided; do not use your own paper. *Work only on one problem on each sheet (you should not work on two different problems on the two sides of the same sheet).* On the top of each page, *print* your name (*encircle your last name*) and indicate the number of the problem you are working on by writing e.g. *"Problem #4".* Always *encircle* your final answer. If there are several parts to a problem, always indicate the part that you are answering, e.g. by writing *"Answer to Part b)"* (the number of the problem should be on the top of the page). Do not use a *red* pen or a *red* pencil. Do not write in the corner covered up by the staple (top left corner on the front side, top right corner on the back side). Each problem is worth the *same* amount of credit. **Show all your work.**

1. Let A and B be two events such that $\mathrm{P}(A) = .5$, $\mathrm{P}(B) = .4$, and $\mathrm{P}(A \cap B) = .2$.

a) Find $\mathrm{P}(A \cup B)$.
b) Find $\mathrm{P}(A \setminus B)$.

2.*a*) From an urn containing 4 red balls and 6 green balls, 6 balls are taken without replacement. Determine the probability that 2 of the balls are red and 4 of them are green.

b) Give the probability if the same experiment is performed with replacement, and the same outcome is obtained.

3.*a*) In a factory, parts are manufactured by three machines, M_1, M_2, and M_3 in proportions $25 : 30 : 45$. The percentages 8%, 4%, and 6% of these parts are defective, respectively. Find the probability that a randomly chosen part is defective.

b) Find the probability that a defective part was manufactured on the third machine.

4.*a*) From an urn with 8 red balls and 4 green balls, one ball is drawn with replacement until a green ball is obtained. Let X be a random variable whose value is the number of tries for a green ball to be drawn. Find the distribution of X; that is, find the probability that $X = k$ ($k = 1, 2, 3, \dots$).

b) Find the probability $\mathrm{P}(X \geq 4)$ for the random variable X described in part *a*) of this problem.

5. Three hunters shoot at the same deer simultaneously. They hit or miss independently of each other. The first hunter hits with probability 1/5, the second one with probability 1/6, and the third one with probability 1/7. Calculate the probability that the deer will be hit at least once. *Hint:* Consider the complement of the event in question, that is, the event that no hunter will hit the deer.