PROBABILITY
FAMNIT, UNIVERSITY OF PRIMORSKA

Instructions for the oral exam

The aim of the oral exam is to go over basic concepts and definitions of probability. Questions range from definitions given in the lectures, understanding definitions in a particular setting to the understanding of the theorems. You will be asked to provide ideas for proofs but not the details. Your final grade will depend on the oral exam. See the "Rules" on the web page of the course for details.

Possible questions

1. Elementary concepts of probability.

   - Conditional probabilities, law of total probabilities, independence of events, Bayes formula, the inclusion-exclusion formula.
   - Discrete random variables and their distributions, standard discrete distributions (binomial, hiper-geometric, negative binomial, Poisson).
   - Expectation, linearity of expectation.
   - Joint distribution of discrete random variables, independence, criteria for independence, expectation of the type $E[f(X, Y)]$.
   - Conditional distributions, formula for total expectation.
   - Continuous distributions, densities, joint densities, independence for continuous joint distributions.

2. Functions of random variables.

   - Sums of discrete randoma variables.
   - Transformation formula for continuous random vectors and its derivatives.
   - Examples of results derived from the transformation formula.

3. Expectation in general.

   – Expectation for continuous random variables.
   – Variance and covariance, variance of sums.
   – Conditional expectation.

4. Generating functions.

   – Definitions, basic properties, sums of a random number of random variables.
   – Branching processes.

5. Central limit theorem.

   – Formulation of the central limit theorem, idea of the proof.
   – Applications of the central limit theorem.