

EXAM: Matematisk statistik och diskret matematik D (MVE055/MSG810)

Time and place: Saturday 20 October 2012, morning, V.

Jour: Alexey Lindo , tel. 772 82 94

Aids: Chalmers approved calculator and at most one (double-sided) A4 page of own notes. Tables of appropriate statistical distributions are provided.

Grades: Maximal points : 10. You must score at least 3 points on this exam. For the final grade your score here will be combined with scores from the VLE tests on scale 3: 12 points, 4: 18 points, 5: 24 points.

Motivations: All answers/solutions must be motivated.

Language: There is a Swedish and English version of the questions. You may write your answers in either of these two languages.

1. (4p)

- a) State and prove the Markov's inequality.
- b) State and prove the Chebyshev's inequality.
- c) Suppose that X is a random variable with mean and variance both equal to 20. What can be said about $\mathbb{P}(0 < X < 40)$?
- d) Should Chebyshev's and Markov's inequalities be regarded as theoretical tools or practical methods of estimation? Explain your answer.

2. (4p)

- a) Provide the definition of a generating function and find the generating function of the sequence $\langle 1, 2, 3, 4, \dots \rangle$.
- b) Explain how generating functions can be used to solve counting problems provide an example.
- c) Use a generating function to find the number of ways to choose a dozen bagels from three varieties—egg, salty, and plain—if at least two bagels of each kind but no more than three salty bagels are chosen.

3. (2p) A random sample of 5 women had the following hemoglobin levels in their blood (gram per deciliter)

12.7, 13.0, 14.1, 13.5, 13.6

Calculate a 95% confidence interval for the mean hemoglobin level for the whole population of women, assuming that hemoglobin level is normally distributed.

Lycka till! Good luck!