Christian-Albrechts-Universität zu Kiel **Winter term 2015/16**
Mathematisches Seminar
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In-tutorial exercise sheet 4

supporting the lecture Mathematical Statistics

(Discussion in the tutorial on 25. November 2015)

Exercise 1.

Let $X \sim Bin(n, p)$ having density

$$f(k, p) = \binom{n}{k} p^k (1-p)^{n-k}, \qquad k = 0, 1, \ldots, n.$$

with respect to the counting measure on $\mathbb{N}_0$. Determine the maximum-likelihood estimator for $p \in [0, 1]$.

a) Argue why instead of maximizing $f(X, p)$ one can instead maximize $\log(f(X, p))$ over p.

b) Determine the maximum of $\log(f(X, p))$.

c) Define an estimator for p using the method of moments.

Exercise 2.

Let $X_1, \ldots, X_n$ i.i.d $\sim f$ with Lebesque density f. Determine the density of

$$Z := \max\{X_1, \ldots, X_n\}.$$

Hint: Start with calculating the distribution function of Z and then use it to identify the density.