

MTH U481: Spring 2009: Prof. C. King

Assignment 10

Due date: Wednesday March 25.

Reading: Section 4.3.

Problems:

1). p.355, #1, #4, #7.

2). Review the Poisson distribution defined on p. 281. Suppose that X is a Poisson random variable with parameter λ , and Y is an independent Poisson random variable with parameter 2λ . Define the estimator

$$\hat{\lambda} = aX + (1 - a)\frac{Y}{2}$$

Find the value of a which minimizes the mean square error of the estimator $\hat{\lambda}$ (and hence gives the “best” estimate for λ).

3).

Reading: ps. 363 – 375, Interval estimation.

A crude weighing scale gives a reading equal to the true weight plus a random error that is normally distributed with mean 0 and standard deviation $\sigma = 0.1$. Suppose five successive weighings of the same object produce the results 3.142, 3.163, 3.155, 3.150, 3.141.

a) Determine a 95% two-sided confidence interval estimate of the true weight.

b) Determine a 99% two-sided confidence interval estimate of the true weight.

c) Determine a 95% one-sided lower confidence interval estimate of the true weight.

d) Find the smallest number of additional weighings needed in order to determine the true weight to within ± 0.01 with 95% certainty.

4).

Reading: ps. 369 – 372 on Binomial margin of error

Problems: the following problem is similar to the example from class:

“75% of 10,000 voters interviewed supported gun control.”

Find a number x so that the following statement is true:

“in 19 out of 20 cases, if the same poll (of 10,000 voters) were conducted again, the percentage of voters who support gun control would differ from the true percentage by at most $x\%$.”

5).

Problems: p. 375, #5.3.3, #5.3.8