Examination in ST0201 Statistics with Applications—Appendix
Tuesday 20 May 2008

Permitted aids: Any written and printed material. One calculator.

Mark one answer for each problem on the form overleaf. You will score one point for each right answer and zero points for each wrong answer. Multiple answers will score zero.

Note: There is text on both sides of the sheet. All problems have five alternative answers.

Problem 1. We are trying two kinds of horseshoes, A and B, on 10 horses. Both kinds were tried on all the horses. 7 of the horses ran fastest with shoe B, 3 with shoe A. We shall test the null hypothesis that the horses run at least as fast with shoe A as with shoe B against the alternative hypothesis that the horses run faster with shoe B. What is the p-value if we use a two-sample sign test?

(a) 0.38 **(b)** 0.17 **(c)** 0.01 **(d)** 0.05 **(e)** 0.001

Problem 2. The expected (mean) weight of an egg of a bird species is μ g. The standard deviation is known, $\sigma = 0.7$. We want to test $H_0\colon \mu \leq 13.5$ against $H_1\colon \mu > 13.5$. We collect 100 eggs, and the average weight of the eggs is 13.64. Find the p-value.

(a) 0.01 **(b)** 0.04 **(c)** 0.05 **(d)** 0.03 **(e)** 0.02

Problem 3. We perform the test of the previous problem with 100 (new) samples and with significance level $\alpha = 0.05$. What is the probability that H_0 will be rejected if μ is in fact equal to 13.6?

(a) 0.5 **(b)** 0.2 **(c)** 0.3 **(d)** 0.4 **(e)** 0.1

Problem 4. A method for age determination of molybdenum ore gives results that are normally distributed with mean (expected value) μ, which is the true age of the ore, and standard deviation σ. Four samples had their ages determined to 985, 941, 975 and 1049 million years. Find an estimate of the true age of the samples (i million years).

(a) 987.5 **(b)** 899.5 **(c)** 1148.3 **(d)** 1234.4 **(e)** 1005.2

Problem 5. Find an estimate of the standard deviation of the previous problem.

(a) 2036 **(b)** 1629 **(c)** 45.1 **(d)** 40.4 **(e)** 286.8

Problem 6. We assume that the strengths of earthquakes in Tokyo are exponentially distributed with expected (mean) strength $1/\lambda$. A random sample of 40 earthquakes had an average strength of 7.02. Find a 95 % confidence interval for $1/\lambda$.

(a) $[5.3, 9.8]$ **(b)** $[0.10, 0.19]$ **(c)** $[4.7, 11.5]$ **(d)** $[5.0, 9.0]$ **(e)** $[0.09, 0.21]$

Problem 7. In total 19 measurements of sulphur dioxide emissions were done at 4 power plants. The data were analyzes by one-way analysis of variance. With the units that were used, the error sum of squares in the four groups was $\mathrm{SS_E} = 305$ and the total sum of squares $\mathrm{SS_T} = 683$. What was the F value?

(a) 1.9 **(b)** 2.2 **(c)** 1.2 **(d)** 11.2 **(e)** 6.2

Problem 8. We shall use a chi-square test to test whether the proportion of the population having low, mean and high alcohol intake is dependent on gender. How many degrees of freedom does the test statistic have?

(a) 5 **(b)** 3 **(c)** 2 **(d)** 4 **(e)** 6

Problem	a	b	c	d	e
1					
2					
3					
4					
5					
6					
7					
8					

Studentnummer Student number

Studieprogram Study program

Inspektør Inspector