

Examination in ST0201 Statistics with Applications—Appendix
Saturday 2 June 2007

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. A random sample of five newly hatched great tit eggs weigh 1.49, 1.47, 1.62, 1.45 and 1.88 g. Find an estimate of the expected weight of a randomly selected newly hatched great tit egg.

- (a) 1.52 g (b) 1.56 g (c) 1.50 g (d) 1.54 g (e) 1.58 g

Problem 2. Find an estimate of the standard deviation of the weight of a randomly selected newly hatched great tit egg (see the previous problem).

- (a) 0.20 g (b) 0.14 g (c) 0.18 g (d) 0.16 g (e) 0.22 g

Problem 3. We continue with the great tit data. Assume that the weight of a randomly chosen great tit egg is normally distributed. Find a 95 % confidence interval for the expected weight (in g).

- (a) [1.46, 1.70] (b) [1.40, 1.76] (c) [1.36, 1.70] (d) [1.46, 1.80] (e) [1.36, 1.80]

Problem 4. X and Y are independent and standard normally distributed. Find $\text{Var}(X^2 + Y^2)$.

- (a) 2 (b) 4 (c) 1 (d) 8 (e) 6

Problem 5. We have a solution with unknown pH value μ . We measure the pH in 9 samples of the solution and assume that the measurements are normally distributed with expected value μ and known standard deviation of 0.05. The mean of the 9 samples is 5.46. We shall test $H_0: \mu \geq 5.50$ against $H_1: \mu < 5.50$. What is the p -value (significance probability) of the test?

- (a) 0.0082 (b) 0.032 (c) 0.082 (d) 0.11 (e) 0.011

Problem 6. We perform the test from the previous problem with 9 (new) samples and with significance level $\alpha = 0.05$. What is the probability that H_0 is rejected if μ is in fact equal to 5.48?

- (a) 0.78 (b) 0.33 (c) 0.50 (d) 0.67 (e) 0.22

Problem 7. The empirical correlation coefficient of 20 independent binormally distributed pairs of observations is 0,8. Find an approximate 95 % confidence interval for the correlation coefficient ρ .

- (a) [0.55, 0.92] (b) [0.68, 0.92] (c) [0.68, 0.89] (d) [0.71, 0.89] (e) [0.61, 0.89]

Problem 8. Two different reactions to produce a substance were investigated. One reaction (A) was used 15 times, and the other (B) was used 12 times. The yields of the substance (in mg) in each of the 27 reactions were ranked from lowest to highest with ranks from 1 to 27. The rank sum for reaction A was 151, and the rank sum for reaction B was 227. We shall test the null hypothesis that reaction A gives at least as high a yield as reaction B against the alternative hypothesis that reaction B gives a higher yield than reaction A. Perform a suitable test, and find the p -value (significance probability) based on a normal approximation.

- (a) 0.0071 (b) 0.13 (c) 0.041 (d) 0.0020 (e) 0.013

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

Studentnummer	Student number
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Studieprogram	Study program
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Inspektør	Inspector
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