Bunker Hill Community College

Third Statistics Exam 2019-04-25

Exam ID 052

Name: _____

This take-home exam is due **Monday, April 29** at the beginning of class.

You may use any notes, textbook, or online tools; however, you may not request help from any other human. If you believe a question is ambiguous, unanswerable, or erroneous, please let me know.

You will show your work on the pages with questions. When you are sure of your answers, you will put those answers in the boxes on the first few pages.

Unless you have an objection to doing so, please copy the honor-code text below and sign.

I understand that outside help is NOT allowed on this exam. On my honor, the work herein is my own.

_____

_____

_____

Signature: _____

1. (a) [ ]

   (b) [ ]

2. (a) [ ]

   (b) [ ]

   (c) [ ]

   (d) [ ]

   (e) [ ]

   (f) [ ]

   (g) [ ]

3. (a) [ ]

   (b) [ ]

   (c) [ ]

   (d) [ ]

   (e) [ ]

   (f) [ ]

   (g) [ ]

4. (a) [ ]

   (b) [ ]

5. [ ]

6. (a) [ ]

(b)

(c)

(d)

(e)

(f)

(g)

1. As an ornithologist, you wish to determine the average body mass of *Cuculus americanus*. You randomly capture 34 adults of *Cuculus americanus*, resulting in a sample mean of 73.26 grams and a sample standard deviation of 14.4 grams. You decide to report a 95% confidence interval.

   (a) Determine the lower bound of the confidence interval.
   (b) Determine the upper bound of the confidence interval.

2. A teacher has 7 students who have each taken two quizzes. Perform a two-tail test with significance level 0.1 to determine whether students' performance changed on average.

	student1	student2	student3	student4	student5	student6	student7
quiz 1:	77	89.4	84.1	68.3	56.2	72.1	55.4
quiz 2:	80.4	92	80.9	70.2	55.6	78.7	62.9

(a) State the null hypothesis.

(b) State the alternative hypothesis.

(c) Evaluate the critical value. (The critical value is either z^* or t^*. Determine its value.)

(d) Determine the standard error of the relevant sampling distribution.

(e) Evaluate the absolute value of the test statistic. (The test statistic is either z_{obs} or t_{obs}. Determine its absolute value.)

(f) If possible, evaluate the p-value. Otherwise, describe an interval containing the p-value.

(g) Do we reject or retain the null?

3. You are interested in whether a treatment causes an effect on a continuously measurable attribute. You use a treatment group with 6 cases and a control group with 6 cases. You decide to run a hypothesis test with a significance level of 0.1. Your data is below. Please use 6 for the degrees of freedom (calculated with the Welch-Satterthwaite equation).

treatment	control
43	37
27	24
42	31
63	31
34	29
39	38

(a) State the null hypothesis.

(b) State the alternative hypothesis.

(c) Evaluate the critical value. (The critical value is either $z^\star$ or $t^\star$. Determine its value.)

(d) Determine the standard error of the relevant sampling distribution.

(e) Evaluate the absolute value of the test statistic. (The test statistic is either z_{obs} or t_{obs}. Determine its absolute value.)

(f) If possible, evaluate the p-value. Otherwise, describe an interval containing the p-value.

(g) Do we reject or retain the null?

4. From a very large population, a random sample of 36000 individuals was taken. In that sample, 33.3% were shiny. Determine a 99.5% confidence interval of the population proportion.

   (a) Find the lower bound of the confidence interval.

   (b) Find the upper bound of the condifence interval.

5. Your boss wants to know what proportion of a very large population is special. She also wants to guarantee that the margin of error of a 90% confidence interval will be less than 0.004 (which is 0.4 percentage points). How large of a sample is needed? Please round up, using only 2 significant digits.

6. An experiment is run with a treatment group of size 109 and a control group of size 144. The results are summarized in the table below.

	treatment	control
happy	68	73
not happy	41	71

Using a significance level of 0.1, determine whether the treatment causes an effect on the proportion of cases that are happy.

(a) State the null hypothesis.

(b) State the alternative hypothesis.

(c) Evaluate the critical value. (The critical value is either $z^\star$ or $t^\star$. Determine its value.)

(d) Determine the standard error of the relevant sampling distribution.

(e) Evaluate the absolute value of the test statistic. (The test statistic is either z_{obs} or t_{obs}. Determine its absolute value.)

(f) If possible, evaluate the p-value. Otherwise, describe an interval containing the p-value.

(g) Do we reject or retain the null?