Bunker Hill Community College

Third Statistics Exam 2019-04-25 **Exam ID 006**

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 *Agelaius Phoeniceus*. You randomly capture 24 adults of *Agelaius Phoeniceus*, resulting in a sample mean of 46.27 grams and a sample standard deviation of 6.72 grams. You decide to report a 99% confidence interval.

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

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

2. A teacher has 6 students who have each taken two quizzes. Perform a two-tail test with significance level 0.04 to determine whether students' performance changed on average.

	student1	student2	student3	student4	student5	student6
quiz 1:	86.1	54.2	60.5	59.8	57	69.8
quiz 2:	87.9	50.4	54.6	52.7	55.6	63

(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?

3. You are interested in whether a treatment causes an effect on a continuously measurable attribute. You use a treatment group with 7 cases and a control group with 7 cases. You decide to run a hypothesis test with a significance level of 0.01. Your data is below. Please use 11 for the degrees of freedom (calculated with the Welch-Satterthwaite equation).

treatment	control
108	124
60	130
92	125
101	103
90	76
82	134
78	132

(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 6500 individuals was taken. In that sample, 94.3% were angry. Determine a 96% 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 shiny. She also wants to guarantee that the margin of error of a 95% confidence interval will be less than 0.005 (which is 0.5 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 181 and a control group of size 205. The results are summarized in the table below.

	treatment	control
special	134	173
not special	47	32

Using a significance level of 0.02, determine whether the treatment causes an effect on the proportion of cases that are special.

(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?