Bunker Hill Community College

Final Statistics Exam 2019-05-02   **Exam ID 019**

Name: _____

This take-home exam is due **Wednesday, May 8**, at the beginning of class.

You may use any notes, textbook, or online tools; however, you may not request help from any other human.

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)

   (c)

   (d)

   (e)

   (f)

2.

3.

4. (a)

   (b)

5.

6. (a)

   (b)

   (c)

   (d)

   (e)

   (f)

   (g)

7. (a)

   (b)

8. (a)

(b)

(c)

(d)

(e)

(f)

(g)

1. In a deck of strange cards, there are 895 cards. Each card has an image and a color. The amounts are shown in the table below.

	gray	red	white
bike	87	71	85
cat	22	12	56
dog	58	42	94
flower	68	70	76
tree	81	10	63

   (a) What is the probability a random card is either a cat or white (or both)?

   (b) What is the probability a random card is white?

   (c) What is the probability a random card is a tree given it is white?

   (d) What is the probability a random card is red given it is a dog?

   (e) What is the probability a random card is both a dog and white?

   (f) What is the probability a random card is a bike?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a ring is 37.2%. If a ring is drawn, there is a 84.4% chance that it is violet. If a card that is not a ring is drawn, there is a 20.8% chance that it is violet.

   Now, someone draws a random card and reveals it is violet. What is the chance the card is a ring?

3. In a very large pile of toothpicks, the mean length is 67.52 millimeters and the standard deviation is 3.17 millimeters. If you randomly sample 121 toothpicks, what is the chance the sample mean is between 67.06 and 67.88 millimeters?

4. In a game, there is a 17% chance to win a round. You will play 216 rounds.

   (a) What is the probability of winning exactly 37 rounds?

   (b) What is the probability of winning at least 37 but at most 50 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Dendroica coronata*. You randomly sample 24 adults of *Dendroica coronata*, resulting in a sample mean of 11.99 grams and a sample standard deviation of 1.25 grams. Determine a 99.5% confidence interval of the true population mean.

6. A treatment group of size 37 has a mean of 9.96 and standard deviation of 2.22. A control group of size 26 has a mean of 10.9 and standard deviation of 1.93. If you decided to use a signficance level of 0.1, is there sufficient evidence to conclude the treatment causes an effect?

   By using the Welch-Satterthwaite equation, I've calculated the degrees of freedom should be 58.

   (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?

7. From a very large population, a random sample of 7600 individuals was taken. In that sample, 8.61% were glowing. 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.

8. An experiment is run with a treatment group of size 23 and a control group of size 43. The results are summarized in the table below.

	treatment	control
special	11	7
not special	12	36

Using a significance level of 0.005, 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?