Bunker Hill Community College

Final Statistics Exam 2019-05-02 **Exam ID 001**

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 764 cards. Each card has an image and a color. The amounts are shown in the table below.

	black	gray	orange	red	violet
cat	45	97	48	19	17
dog	82	32	54	27	91
wheel	43	47	64	72	26

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

   (b) What is the probability a random card is either a wheel or gray (or both)?

   (c) What is the probability a random card is violet given it is a wheel?

   (d) What is the probability a random card is orange?

   (e) What is the probability a random card is a cat?

   (f) What is the probability a random card is both a cat and orange?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a kite is 17.9%. If a kite is drawn, there is a 54.2% chance that it is gray. If a card that is not a kite is drawn, there is a 87.7% chance that it is gray.

   Now, someone draws a random card and reveals it is gray. What is the chance the card is not a kite?

3. In a very large pile of toothpicks, the mean length is 68.61 millimeters and the standard deviation is 2.92 millimeters. If you randomly sample 200 toothpicks, what is the chance the sample mean is between 68.39 and 68.91 millimeters?

4. In a game, there is a 31% chance to win a round. You will play 65 rounds.
   (a) What is the probability of winning exactly 19 rounds?
   (b) What is the probability of winning at least 13 but at most 25 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Vireo olivaceus*. You randomly sample 20 adults of *Vireo olivaceus*, resulting in a sample mean of 18.75 grams and a sample standard deviation of 2.6 grams. Determine a 99% confidence interval of the true population mean.

6. A treatment group of size 15 has a mean of 123 and standard deviation of 22.6. A control group of size 32 has a mean of 103 and standard deviation of 31. If you decided to use a signficance level of 0.01, 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 36.

   (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 1100 individuals was taken. In that sample, 73.6% were special. 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 34 and a control group of size 35. The results are summarized in the table below.

	treatment	control
omnivorous	4	13
not omnivorous	30	22

Using a significance level of 0.01, determine whether the treatment causes an effect on the proportion of cases that are omnivorous.

(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?