Bunker Hill Community College

Final Statistics Exam 2019-05-02   **Exam ID 023**

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

	green	orange	teal	white
bike	60	50	10	13
cat	14	52	71	77
flower	73	18	63	16
shovel	89	39	54	25

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

   (b) What is the probability a random card is either a bike or green (or both)?

   (c) What is the probability a random card is both a cat and green?

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

   (e) What is the probability a random card is green given it is a bike?

   (f) What is the probability a random card is a shovel given it is orange?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a wheel is 12.5%. If a wheel is drawn, there is a 31.7% chance that it is blue. If a card that is not a wheel is drawn, there is a 74.6% chance that it is blue.

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

3. In a very large pile of toothpicks, the mean length is 66.17 millimeters and the standard deviation is 1.07 millimeters. If you randomly sample 121 toothpicks, what is the chance the sample mean is between 65.93 and 66.24 millimeters?

4. In a game, there is a 89% chance to win a round. You will play 97 rounds.

    (a) What is the probability of winning exactly 85 rounds?

    (b) What is the probability of winning at least 84 but at most 92 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Geothlypis trichas*. You randomly sample 32 adults of *Geothlypis trichas*, resulting in a sample mean of 10.6 grams and a sample standard deviation of 1.09 grams. Determine a 99% confidence interval of the true population mean.

6. A treatment group of size 28 has a mean of 1210 and standard deviation of 204. A control group of size 35 has a mean of 1030 and standard deviation of 287. 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 60.

   (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 650 individuals was taken. In that sample, 83.5% were super. Determine a 95% 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 221 and a control group of size 234. The results are summarized in the table below.

	treatment	control
cold	103	136
not cold	118	98

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

(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?