

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 025

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

	black	teal	yellow
dog	78	60	51
flower	64	29	66
gem	73	96	81
horn	13	99	52
tree	95	57	79

- (a) What is the probability a random card is both a horn and yellow?
- (b) What is the probability a random card is a dog?
- (c) What is the probability a random card is a flower given it is black?
- (d) What is the probability a random card is yellow?
- (e) What is the probability a random card is teal given it is a gem?
- (f) What is the probability a random card is either a flower or yellow (or both)?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a ring is 19.9%. If a ring is drawn, there is a 44.6% chance that it is teal. If a card that is not a ring is drawn, there is a 87.6% chance that it is teal.

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

3. In a very large pile of toothpicks, the mean length is 68.73 millimeters and the standard deviation is 3.51 millimeters. If you randomly sample 100 toothpicks, what is the chance the sample mean is between 68.3 and 69.42 millimeters?

4. In a game, there is a 56% chance to win a round. You will play 159 rounds.
- (a) What is the probability of winning exactly 88 rounds?
 - (b) What is the probability of winning at least 87 but at most 103 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Zonotrichia albicollis*. You randomly sample 24 adults of *Zonotrichia albicollis*, resulting in a sample mean of 24.51 grams and a sample standard deviation of 1.93 grams. Determine a 96% confidence interval of the true population mean.

6. A treatment group of size 27 has a mean of 994 and standard deviation of 46.3. A control group of size 16 has a mean of 1030 and standard deviation of 62.1. If you decided to use a significance 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 24.

- (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?

7. From a very large population, a random sample of 970 individuals was taken. In that sample, 60.4% were super. 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 confidence interval.

8. An experiment is run with a treatment group of size 189 and a control group of size 217. The results are summarized in the table below.

	treatment	control
organic	103	133
not organic	86	84

Using a significance level of 0.2, determine whether the treatment causes an effect on the proportion of cases that are organic.

- (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?