

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 016

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 1027 cards. Each card has an image and a color. The amounts are shown in the table below.

	blue	green	red
bike	61	28	32
cat	95	57	46
dog	78	84	85
gem	86	77	68
wheel	80	91	59

- (a) What is the probability a random card is blue?
- (b) What is the probability a random card is red given it is a gem?
- (c) What is the probability a random card is both a wheel and red?
- (d) What is the probability a random card is either a gem or blue (or both)?
- (e) What is the probability a random card is a gem given it is red?
- (f) What is the probability a random card is a cat?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a cat is 36.1%. If a cat is drawn, there is a 55.5% chance that it is violet. If a card that is not a cat is drawn, there is a 23.9% chance that it is violet.

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

3. In a very large pile of toothpicks, the mean length is 61.02 millimeters and the standard deviation is 1.96 millimeters. If you randomly sample 196 toothpicks, what is the chance the sample mean is between 60.84 and 61.37 millimeters?

4. In a game, there is a 22% chance to win a round. You will play 199 rounds.
- (a) What is the probability of winning exactly 49 rounds?
 - (b) What is the probability of winning at least 46 but at most 54 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Dendroica palmarum*. You randomly sample 13 adults of *Dendroica palmarum*, resulting in a sample mean of 10.01 grams and a sample standard deviation of 1.26 grams. Determine a 99% confidence interval of the true population mean.

6. A treatment group of size 19 has a mean of 1120 and standard deviation of 158. A control group of size 31 has a mean of 999 and standard deviation of 180. If you decided to use a significance 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 42.

- (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 12000 individuals was taken. In that sample, 44% were glowing. Determine a 98% 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 185 and a control group of size 220. The results are summarized in the table below.

	treatment	control
pink	52	42
not pink	133	178

Using a significance level of 0.05, determine whether the treatment causes an effect on the proportion of cases that are pink.

- (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?