

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 002

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

	black	gray	green	pink	yellow
cat	52	17	51	55	24
gem	57	64	61	91	42
shovel	77	16	27	56	54

- (a) What is the probability a random card is yellow given it is a shovel?
- (b) What is the probability a random card is either a shovel or yellow (or both)?
- (c) What is the probability a random card is a cat?
- (d) What is the probability a random card is pink?
- (e) What is the probability a random card is both a shovel and green?
- (f) What is the probability a random card is a cat given it is green?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a shovel is 30.4%. If a shovel is drawn, there is a 61.6% chance that it is white. If a card that is not a shovel is drawn, there is a 41.7% chance that it is white.

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

3. In a very large pile of toothpicks, the mean length is 70.53 millimeters and the standard deviation is 1.01 millimeters. If you randomly sample 120 toothpicks, what is the chance the sample mean is between 70.39 and 70.59 millimeters?

4. In a game, there is a 55% chance to win a round. You will play 161 rounds.
- (a) What is the probability of winning exactly 87 rounds?
 - (b) What is the probability of winning at least 76 but at most 85 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Dendroica striata*. You randomly sample 16 adults of *Dendroica striata*, resulting in a sample mean of 13.34 grams and a sample standard deviation of 3.57 grams. Determine a 98% confidence interval of the true population mean.

6. A treatment group of size 28 has a mean of 992 and standard deviation of 258. A control group of size 18 has a mean of 1160 and standard deviation of 211. 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 41.

- (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 360 individuals was taken. In that sample, 36.4% were salty. 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 confidence interval.

8. An experiment is run with a treatment group of size 284 and a control group of size 241. The results are summarized in the table below.

	treatment	control
happy	41	50
not happy	243	191

Using a significance level of 0.1, determine whether the treatment causes an effect on the proportion of cases that are happy.

- (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?