

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 009

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

	gray	orange	red
bike	56	99	55
flower	77	64	24
gem	27	40	83
tree	62	48	74
wheel	14	44	49

- (a) What is the probability a random card is a tree given it is orange?
- (b) What is the probability a random card is both a wheel and gray?
- (c) What is the probability a random card is either a wheel or orange (or both)?
- (d) What is the probability a random card is a flower?
- (e) What is the probability a random card is orange?
- (f) What is the probability a random card is gray given it is a gem?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a gem is 31.4%. If a gem is drawn, there is a 15.7% chance that it is pink. If a card that is not a gem is drawn, there is a 73.4% chance that it is pink.

Now, someone draws a random card and reveals it is pink. What is the chance the card is a gem?

3. In a very large pile of toothpicks, the mean length is 70.54 millimeters and the standard deviation is 1.35 millimeters. If you randomly sample 150 toothpicks, what is the chance the sample mean is between 70.39 and 70.68 millimeters?

4. In a game, there is a 53% chance to win a round. You will play 178 rounds.
- (a) What is the probability of winning exactly 97 rounds?
 - (b) What is the probability of winning at least 78 but at most 96 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Vermivora peregrina*. You randomly sample 23 adults of *Vermivora peregrina*, resulting in a sample mean of 12.52 grams and a sample standard deviation of 1.24 grams. Determine a 95% confidence interval of the true population mean.

6. A treatment group of size 14 has a mean of 98.5 and standard deviation of 16.4. A control group of size 16 has a mean of 110 and standard deviation of 11.3. If you decided to use a significance level of 0.02, 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 22.

- (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 5000 individuals was taken. In that sample, 68.2% were blue. 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 273 and a control group of size 275. The results are summarized in the table below.

	treatment	control
pink	238	257
not pink	35	18

Using a significance level of 0.02, 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?