

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 014

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

| | orange | red | teal |
|--------|--------|-----|------|
| dog | 75 | 41 | 96 |
| gem | 63 | 25 | 52 |
| horn | 94 | 21 | 83 |
| shovel | 15 | 42 | 72 |
| wheel | 45 | 61 | 33 |

- (a) What is the probability a random card is either a horn or red (or both)?
- (b) What is the probability a random card is a horn?
- (c) What is the probability a random card is both a wheel and red?
- (d) What is the probability a random card is orange?
- (e) What is the probability a random card is a shovel given it is orange?
- (f) What is the probability a random card is teal given it is a dog?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a tree is 23%. If a tree is drawn, there is a 10.9% chance that it is green. If a card that is not a tree is drawn, there is a 58% chance that it is green.

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

3. In a very large pile of toothpicks, the mean length is 62.13 millimeters and the standard deviation is 3.02 millimeters. If you randomly sample 196 toothpicks, what is the chance the sample mean is between 61.96 and 62.41 millimeters?

4. In a game, there is a 75% chance to win a round. You will play 45 rounds.
- (a) What is the probability of winning exactly 32 rounds?
 - (b) What is the probability of winning at least 29 but at most 35 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Dendroica coronata*. You randomly sample 14 adults of *Dendroica coronata*, resulting in a sample mean of 12.09 grams and a sample standard deviation of 1.54 grams. Determine a 80% confidence interval of the true population mean.

6. A treatment group of size 19 has a mean of 1.12 and standard deviation of 0.166. A control group of size 25 has a mean of 1.03 and standard deviation of 0.155. If you decided to use a significance level of 0.04, 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 37.

- (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 6300 individuals was taken. In that sample, 50.6% were angry. Determine a 90% 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 55 and a control group of size 14. The results are summarized in the table below.

| | treatment | control |
|-----------|-----------|---------|
| happy | 14 | 9 |
| not happy | 41 | 5 |

Using a significance level of 0.005, 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?