

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 020

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 1271 cards. Each card has an image and a color. The amounts are shown in the table below.

| | black | green | pink | red | teal |
|--------|-------|-------|------|-----|------|
| bike | 34 | 85 | 68 | 31 | 87 |
| dog | 71 | 24 | 47 | 19 | 32 |
| flower | 20 | 69 | 55 | 88 | 35 |
| horn | 14 | 26 | 65 | 72 | 63 |
| wheel | 51 | 40 | 42 | 89 | 44 |

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

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a gem is 33.5%. If a gem is drawn, there is a 50.6% chance that it is black. If a card that is not a gem is drawn, there is a 71% chance that it is black.

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

3. In a very large pile of toothpicks, the mean length is 72.61 millimeters and the standard deviation is 2.14 millimeters. If you randomly sample 225 toothpicks, what is the chance the sample mean is between 72.47 and 72.81 millimeters?

4. In a game, there is a 51% chance to win a round. You will play 42 rounds.
- (a) What is the probability of winning exactly 20 rounds?
 - (b) What is the probability of winning at least 24 but at most 29 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Dendroica dominica*. You randomly sample 27 adults of *Dendroica dominica*, resulting in a sample mean of 9.87 grams and a sample standard deviation of 1.59 grams. Determine a 90% confidence interval of the true population mean.

6. A treatment group of size 26 has a mean of 1 and standard deviation of 0.0315. A control group of size 29 has a mean of 1.02 and standard deviation of 0.0356. 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 52.

- (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 4000 individuals was taken. In that sample, 53.5% were broken. 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 296 and a control group of size 284. The results are summarized in the table below.

| | treatment | control |
|-----------------|-----------|---------|
| fluorescent | 151 | 124 |
| not fluorescent | 145 | 160 |

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

- (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?