

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 023

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

| | pink | red | yellow |
|--------|------|-----|--------|
| bike | 95 | 86 | 64 |
| cat | 11 | 22 | 69 |
| pig | 51 | 55 | 72 |
| shovel | 17 | 29 | 24 |
| wheel | 37 | 30 | 63 |

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

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a wheel is 27.7%. If a wheel is drawn, there is a 47.4% chance that it is pink. If a card that is not a wheel is drawn, there is a 63% chance that it is pink.

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

3. In a very large pile of toothpicks, the mean length is 71.13 millimeters and the standard deviation is 1.26 millimeters. If you randomly sample 225 toothpicks, what is the chance the sample mean is between 71.02 and 71.32 millimeters?

4. In a game, there is a 6% chance to win a round. You will play 181 rounds.
- (a) What is the probability of winning exactly 12 rounds?
 - (b) What is the probability of winning at least 7 but at most 14 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Catharus ustulatus*. You randomly sample 19 adults of *Catharus ustulatus*, resulting in a sample mean of 36.09 grams and a sample standard deviation of 5.24 grams. Determine a 99.5% confidence interval of the true population mean.

6. A treatment group of size 20 has a mean of 114 and standard deviation of 21.4. A control group of size 19 has a mean of 101 and standard deviation of 21.1. If you decided to use a significance level of 0.05, 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 36.

- (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 80000 individuals was taken. In that sample, 24% were salty. Determine a 80% 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 62 and a control group of size 69. The results are summarized in the table below.

| | treatment | control |
|----------|-----------|---------|
| cold | 38 | 26 |
| not cold | 24 | 43 |

Using a significance level of 0.01, determine whether the treatment causes an effect on the proportion of cases that are cold.

- (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?