

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 027

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

| | gray | red | teal |
|--------|------|-----|------|
| dog | 44 | 54 | 36 |
| flower | 69 | 19 | 92 |
| shovel | 91 | 78 | 83 |

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

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a kite is 38.4%. If a kite is drawn, there is a 78% chance that it is orange. If a card that is not a kite is drawn, there is a 66.5% chance that it is orange.

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

3. In a very large pile of toothpicks, the mean length is 67.58 millimeters and the standard deviation is 1.2 millimeters. If you randomly sample 225 toothpicks, what is the chance the sample mean is between 67.5 and 67.67 millimeters?

4. In a game, there is a 63% chance to win a round. You will play 112 rounds.
- (a) What is the probability of winning exactly 73 rounds?
 - (b) What is the probability of winning at least 73 but at most 81 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Helmitheros vermivorus*. You randomly sample 23 adults of *Helmitheros vermivorus*, resulting in a sample mean of 16.01 grams and a sample standard deviation of 2.66 grams. Determine a 99.5% confidence interval of the true population mean.

6. A treatment group of size 28 has a mean of 1.06 and standard deviation of 0.108. A control group of size 18 has a mean of 1 and standard deviation of 0.0868. 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 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 8100 individuals was taken. In that sample, 64.1% were angry. Determine a 98% 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 72 and a control group of size 32. The results are summarized in the table below.

| | treatment | control |
|----------------|-----------|---------|
| omnivorous | 47 | 28 |
| not omnivorous | 25 | 4 |

Using a significance level of 0.04, determine whether the treatment causes an effect on the proportion of cases that are omnivorous.

- (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?