

# Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 013

**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.*

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

	gray	red	teal
bike	28	46	78
flower	44	63	91
horn	61	76	22
pig	74	92	33
wheel	41	97	88

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

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a bike is 29.8%. If a bike is drawn, there is a 61.5% chance that it is pink. If a card that is not a bike is drawn, there is a 79% chance that it is pink.

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

3. In a very large pile of toothpicks, the mean length is 71.93 millimeters and the standard deviation is 3.43 millimeters. If you randomly sample 196 toothpicks, what is the chance the sample mean is between 71.77 and 72.25 millimeters?

4. In a game, there is a 60% chance to win a round. You will play 126 rounds.
- (a) What is the probability of winning exactly 74 rounds?
  - (b) What is the probability of winning at least 72 but at most 83 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Dumetella carolinensis*. You randomly sample 36 adults of *Dumetella carolinensis*, resulting in a sample mean of 38.4 grams and a sample standard deviation of 3.69 grams. Determine a 90% confidence interval of the true population mean.



6. A treatment group of size 19 has a mean of 0.967 and standard deviation of 0.117. A control group of size 13 has a mean of 1.08 and standard deviation of 0.115. If you decided to use a significance level of 0.01, 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 26.

- (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  $z_{\text{obs}}$  or  $t_{\text{obs}}$ . 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 680 individuals was taken. In that sample, 17.6% were super. Determine a 99% 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 171 and a control group of size 189. The results are summarized in the table below.

	treatment	control
pink	152	149
not pink	19	40

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  $z_{\text{obs}}$  or  $t_{\text{obs}}$ . 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?