

# Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 025

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

	black	teal	violet
pig	10	35	26
shovel	32	42	91
wheel	25	46	68

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

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a ring is 20.3%. If a ring is drawn, there is a 48% chance that it is green. If a card that is not a ring is drawn, there is a 59.6% chance that it is green.

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

3. In a very large pile of toothpicks, the mean length is 66.17 millimeters and the standard deviation is 1.17 millimeters. If you randomly sample 175 toothpicks, what is the chance the sample mean is between 65.97 and 66.22 millimeters?

4. In a game, there is a 56% chance to win a round. You will play 60 rounds.
- (a) What is the probability of winning exactly 33 rounds?
  - (b) What is the probability of winning at least 29 but at most 40 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Oporornis formosus*. You randomly sample 13 adults of *Oporornis formosus*, resulting in a sample mean of 17 grams and a sample standard deviation of 1.92 grams. Determine a 99.5% confidence interval of the true population mean.



6. A treatment group of size 9 has a mean of 1040 and standard deviation of 59.5. A control group of size 40 has a mean of 978 and standard deviation of 60.6. If you decided to use a significance level of 0.02, 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 12.

- (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 76000 individuals was taken. In that sample, 29.7% were cold. Determine a 96% 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 78 and a control group of size 96. The results are summarized in the table below.

	treatment	control
glossy	25	18
not glossy	53	78

Using a significance level of 0.05, determine whether the treatment causes an effect on the proportion of cases that are glossy.

- (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?