

# Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 029

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

	black	pink	red	yellow
bike	76	71	55	49
flower	84	74	68	22
gem	33	11	21	10
pig	73	56	48	79
wheel	67	12	24	34

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

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a wheel is 33%. If a wheel is drawn, there is a 53.1% chance that it is orange. If a card that is not a wheel is drawn, there is a 81.2% chance that it is orange.

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

3. In a very large pile of toothpicks, the mean length is 62.01 millimeters and the standard deviation is 1.69 millimeters. If you randomly sample 120 toothpicks, what is the chance the sample mean is between 61.92 and 62.35 millimeters?

4. In a game, there is a 10% chance to win a round. You will play 189 rounds.
- (a) What is the probability of winning exactly 17 rounds?
  - (b) What is the probability of winning at least 13 but at most 25 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Oporornis formosus*. You randomly sample 36 adults of *Oporornis formosus*, resulting in a sample mean of 15.75 grams and a sample standard deviation of 2.9 grams. Determine a 99% confidence interval of the true population mean.



6. A treatment group of size 10 has a mean of 119 and standard deviation of 15.2. A control group of size 18 has a mean of 103 and standard deviation of 18.7. 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 22.

- (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 9200 individuals was taken. In that sample, 32% were frigid. Determine a 95% 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 68 and a control group of size 95. The results are summarized in the table below.

	treatment	control
omnivorous	38	67
not omnivorous	30	28

Using a significance level of 0.1, 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  $z_{\text{obs}}$  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?