

# Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 008

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

	blue	gray	red	teal
flower	98	87	64	89
horn	27	48	16	88
pig	55	44	71	10
wheel	61	78	57	73

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

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a pig is 38.7%. If a pig is drawn, there is a 52.7% chance that it is yellow. If a card that is not a pig is drawn, there is a 15.4% chance that it is yellow.

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

3. In a very large pile of toothpicks, the mean length is 69.91 millimeters and the standard deviation is 2.89 millimeters. If you randomly sample 169 toothpicks, what is the chance the sample mean is between 69.67 and 70.23 millimeters?

4. In a game, there is a 23% chance to win a round. You will play 158 rounds.
- (a) What is the probability of winning exactly 37 rounds?
  - (b) What is the probability of winning at least 35 but at most 48 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Seiurus noveboracensis*. You randomly sample 33 adults of *Seiurus noveboracensis*, resulting in a sample mean of 20.51 grams and a sample standard deviation of 3.64 grams. Determine a 98% confidence interval of the true population mean.



6. A treatment group of size 33 has a mean of 102 and standard deviation of 15.4. A control group of size 40 has a mean of 109 and standard deviation of 18.1. 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 70.

- (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 49000 individuals was taken. In that sample, 93.6% were asleep. 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 204 and a control group of size 243. The results are summarized in the table below.

	treatment	control
glossy	185	232
not glossy	19	11

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?