

# Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 026

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

	blue	gray	green	indigo	teal
flower	65	24	48	76	60
pig	44	54	22	37	92
shovel	90	98	63	87	42

- (a) What is the probability a random card is either a flower or indigo (or both)?
- (b) What is the probability a random card is indigo given it is a flower?
- (c) What is the probability a random card is a flower?
- (d) What is the probability a random card is both a flower and gray?
- (e) What is the probability a random card is a pig given it is green?
- (f) What is the probability a random card is green?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a horn is 11.6%. If a horn is drawn, there is a 77.1% chance that it is pink. If a card that is not a horn is drawn, there is a 49.3% chance that it is pink.

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

3. In a very large pile of toothpicks, the mean length is 62.17 millimeters and the standard deviation is 1.32 millimeters. If you randomly sample 125 toothpicks, what is the chance the sample mean is between 62.06 and 62.47 millimeters?

4. In a game, there is a 33% chance to win a round. You will play 217 rounds.
- (a) What is the probability of winning exactly 68 rounds?
  - (b) What is the probability of winning at least 61 but at most 82 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Cistothorus palustris*. You randomly sample 26 adults of *Cistothorus palustris*, resulting in a sample mean of 9.9 grams and a sample standard deviation of 1.14 grams. Determine a 95% confidence interval of the true population mean.



6. A treatment group of size 19 has a mean of 1.1 and standard deviation of 0.141. A control group of size 18 has a mean of 0.947 and standard deviation of 0.183. 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 31.

- (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 6700 individuals was taken. In that sample, 68.8% were blue. 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 24 and a control group of size 68. The results are summarized in the table below.

	treatment	control
organic	7	6
not organic	17	62

Using a significance level of 0.02, determine whether the treatment causes an effect on the proportion of cases that are organic.

- (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?