

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 020

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.

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 1175 cards. Each card has an image and a color. The amounts are shown in the table below.

	indigo	red	teal	yellow
cat	22	94	72	49
dog	26	61	48	16
flower	73	14	93	58
pig	69	78	37	21
shovel	83	89	92	80

- (a) What is the probability a random card is a cat?
- (b) What is the probability a random card is either a cat or yellow (or both)?
- (c) What is the probability a random card is red?
- (d) What is the probability a random card is both a pig and yellow?
- (e) What is the probability a random card is a pig given it is teal?
- (f) What is the probability a random card is indigo given it is a pig?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a tree is 20.8%. If a tree is drawn, there is a 81.6% chance that it is indigo. If a card that is not a tree is drawn, there is a 58.3% chance that it is indigo.

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

3. In a very large pile of toothpicks, the mean length is 66.81 millimeters and the standard deviation is 1.95 millimeters. If you randomly sample 200 toothpicks, what is the chance the sample mean is between 66.65 and 66.98 millimeters?

4. In a game, there is a 44% chance to win a round. You will play 88 rounds.
- (a) What is the probability of winning exactly 39 rounds?
 - (b) What is the probability of winning at least 30 but at most 45 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Wilsonia citrina*. You randomly sample 28 adults of *Wilsonia citrina*, resulting in a sample mean of 10.14 grams and a sample standard deviation of 1.98 grams. Determine a 96% confidence interval of the true population mean.

6. A treatment group of size 32 has a mean of 112 and standard deviation of 20.7. A control group of size 12 has a mean of 97.8 and standard deviation of 21.2. If you decided to use a significance level of 0.1, 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 19.

- (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_{obs} or t_{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 4000 individuals was taken. In that sample, 43.8% were purple. 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 50 and a control group of size 84. The results are summarized in the table below.

	treatment	control
sorry	6	23
not sorry	44	61

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

- (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_{obs} or t_{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?