

Bunker Hill Community College

Final Statistics Exam 2019-05-02

Exam ID 014

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

	black	indigo	red
cat	12	49	35
flower	89	16	32
pig	54	81	11
shovel	53	71	96

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

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a shovel is 42.8%. If a shovel is drawn, there is a 80.5% chance that it is violet. If a card that is not a shovel is drawn, there is a 19.7% chance that it is violet.

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

3. In a very large pile of toothpicks, the mean length is 73.52 millimeters and the standard deviation is 3.5 millimeters. If you randomly sample 144 toothpicks, what is the chance the sample mean is between 72.76 and 73.89 millimeters?

4. In a game, there is a 64% chance to win a round. You will play 40 rounds.
- (a) What is the probability of winning exactly 26 rounds?
 - (b) What is the probability of winning at least 21 but at most 26 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Passerina cyanea*. You randomly sample 30 adults of *Passerina cyanea*, resulting in a sample mean of 15.38 grams and a sample standard deviation of 2.38 grams. Determine a 95% confidence interval of the true population mean.

6. A treatment group of size 38 has a mean of 11.5 and standard deviation of 2.46. A control group of size 30 has a mean of 9.58 and standard deviation of 3.03. 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 55.

- (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 4800 individuals was taken. In that sample, 94% were happy. 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 184 and a control group of size 137. The results are summarized in the table below.

	treatment	control
pink	29	31
not pink	155	106

Using a significance level of 0.2, determine whether the treatment causes an effect on the proportion of cases that are pink.

- (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?