

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.

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

	orange	pink	red	white
bike	23	65	33	34
cat	94	42	75	99
gem	29	64	21	50
tree	84	88	70	38

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

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a kite is 43.2%. If a kite is drawn, there is a 20.9% chance that it is blue. If a card that is not a kite is drawn, there is a 63.8% chance that it is blue.

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

3. In a very large pile of toothpicks, the mean length is 74.16 millimeters and the standard deviation is 1.73 millimeters. If you randomly sample 196 toothpicks, what is the chance the sample mean is between 73.88 and 74.3 millimeters?

4. In a game, there is a 85% chance to win a round. You will play 240 rounds.
- (a) What is the probability of winning exactly 206 rounds?
 - (b) What is the probability of winning at least 200 but at most 210 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Dolichonyx orizivorus*. You randomly sample 34 adults of *Dolichonyx orizivorus*, resulting in a sample mean of 33.38 grams and a sample standard deviation of 9.28 grams. Determine a 98% confidence interval of the true population mean.

6. A treatment group of size 16 has a mean of 1190 and standard deviation of 245. A control group of size 19 has a mean of 1030 and standard deviation of 228. If you decided to use a significance level of 0.04, 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_{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 20000 individuals was taken. In that sample, 96.3% were angry. Determine a 90% 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 201 and a control group of size 226. The results are summarized in the table below.

	treatment	control
happy	36	23
not happy	165	203

Using a significance level of 0.04, determine whether the treatment causes an effect on the proportion of cases that are happy.

- (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?