Bunker Hill Community College

Final Statistics Exam 2019-05-02 Exam ID 030

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

	gray	orange	pink	white
bike	54	45	85	77
dog	53	24	61	39
horn	16	72	55	56
wheel	23	73	31	26

   (a) What is the probability a random card is both a horn and orange?

   (b) What is the probability a random card is either a wheel or white (or both)?

   (c) What is the probability a random card is white?

   (d) What is the probability a random card is a bike given it is orange?

   (e) What is the probability a random card is a dog?

   (f) What is the probability a random card is pink given it is a dog?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a gem is 45.1%. If a gem is drawn, there is a 87% chance that it is red. If a card that is not a gem is drawn, there is a 21.5% chance that it is red.

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

3. In a very large pile of toothpicks, the mean length is 65.72 millimeters and the standard deviation is 3.84 millimeters. If you randomly sample 169 toothpicks, what is the chance the sample mean is between 64.96 and 65.89 millimeters?

4. In a game, there is a 13% chance to win a round. You will play 206 rounds.
   (a) What is the probability of winning exactly 24 rounds?
   (b) What is the probability of winning at least 18 but at most 35 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Piranga rubra*. You randomly sample 31 adults of *Piranga rubra*, resulting in a sample mean of 37.46 grams and a sample standard deviation of 6.73 grams. Determine a 99.5% confidence interval of the true population mean.

6. A treatment group of size 31 has a mean of 9.94 and standard deviation of 0.647. A control group of size 19 has a mean of 10.3 and standard deviation of 0.477. If you decided to use a signficance level of 0.02, 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 46.

   (a) State the null hypothesis.

   (b) State the alternative hypothesis.

   (c) Evaluate the critical value. (The critical value is either $z^\star$ or $t^\star$. 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 91000 individuals was taken. In that sample, 62.9% were cold. Determine a 99.5% confidence interval of the population proportion.

   (a) Find the lower bound of the confidence interval.

   (b) Find the upper bound of the condifence interval.

8. An experiment is run with a treatment group of size 168 and a control group of size 194. The results are summarized in the table below.

	treatment	control
special	151	188
not special	17	6

Using a significance level of 0.01, determine whether the treatment causes an effect on the proportion of cases that are special.

(a) State the null hypothesis.

(b) State the alternative hypothesis.

(c) Evaluate the critical value. (The critical value is either $z^\star$ or $t^\star$. 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?