Bunker Hill Community College

Final Statistics Exam 2019-05-02 **Exam ID 008**

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

	black	blue	gray	red	teal
bike	80	25	54	79	71
flower	87	43	86	61	42
wheel	85	77	92	19	65

   (a) What is the probability a random card is black given it is a flower?

   (b) What is the probability a random card is blue?

   (c) What is the probability a random card is both a bike and teal?

   (d) What is the probability a random card is either a bike or gray (or both)?

   (e) What is the probability a random card is a bike given it is teal?

   (f) What is the probability a random card is a wheel?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a pig is 28.1%. If a pig is drawn, there is a 66.4% chance that it is yellow. If a card that is not a pig is drawn, there is a 79.6% chance that it is yellow.

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

3. In a very large pile of toothpicks, the mean length is 71.04 millimeters and the standard deviation is 1.09 millimeters. If you randomly sample 200 toothpicks, what is the chance the sample mean is between 70.9 and 71.15 millimeters?

4. In a game, there is a 67% chance to win a round. You will play 196 rounds.
   (a) What is the probability of winning exactly 132 rounds?
   (b) What is the probability of winning at least 120 but at most 126 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Vireo olivaceus*. You randomly sample 36 adults of *Vireo olivaceus*, resulting in a sample mean of 18.75 grams and a sample standard deviation of 3.01 grams. Determine a 95% confidence interval of the true population mean.

6. A treatment group of size 27 has a mean of 9.86 and standard deviation of 1.7. A control group of size 13 has a mean of 11.2 and standard deviation of 1.66. 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 24.

   (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 40000 individuals was taken. In that sample, 57.2% were floating. 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 276 and a control group of size 270. The results are summarized in the table below.

	treatment	control
reclusive	77	90
not reclusive	199	180

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

(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?