Bunker Hill Community College

Final Statistics Exam 2019-05-02   **Exam ID 007**

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

	indigo	red	teal
bike	89	97	87
dog	58	31	16
gem	53	19	56
shovel	10	49	77
wheel	44	82	45

(a) What is the probability a random card is indigo given it is a gem?

(b) What is the probability a random card is either a bike or teal (or both)?

(c) What is the probability a random card is a shovel given it is red?

(d) What is the probability a random card is a shovel?

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

(f) What is the probability a random card is both a dog and indigo?

2. In a deck of strange cards, each card has an image and a color. The chance of drawing a flower is 21.6%. If a flower is drawn, there is a 34.4% chance that it is white. If a card that is not a flower is drawn, there is a 44.6% chance that it is white.

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

3. In a very large pile of toothpicks, the mean length is 72.68 millimeters and the standard deviation is 1.85 millimeters. If you randomly sample 196 toothpicks, what is the chance the sample mean is between 72.57 and 72.81 millimeters?

4. In a game, there is a 52% chance to win a round. You will play 149 rounds.

    (a) What is the probability of winning exactly 82 rounds?

    (b) What is the probability of winning at least 65 but at most 78 rounds?

5. As an ornithologist, you wish to determine the average body mass of *Vireo olivaceus*. You randomly sample 28 adults of *Vireo olivaceus*, resulting in a sample mean of 19.67 grams and a sample standard deviation of 2.38 grams. Determine a 98% confidence interval of the true population mean.

6. A treatment group of size 21 has a mean of 10 and standard deviation of 1.98. A control group of size 35 has a mean of 11.2 and standard deviation of 1.83. If you decided to use a signficance 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 39.

   (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 9500 individuals was taken. In that sample, 95.2% were floating. Determine a 98% 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 26 and a control group of size 10. The results are summarized in the table below.

	treatment	control
pink	22	4
not pink	4	6

Using a significance level of 0.005, 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 $z^\star$ 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?