MATH 2510
Spring 2018
MIDTERM EXAM 2

NAME_____

SECTION_____

Please read and follow directions carefully. Show work when required. If you use a function in a calculator to compute an answer, please clearly indicate the function used AND the output of the function that you are using for your answer.

Round all answers to four decimal places unless directed otherwise.

During this exam you are allowed to use your calculator. No other notes or assistance from any person (other than the instructor) is permitted.

On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance on this exam.

*SIGNATURE:*_____

MC TOTAL (10 points) _____

#6 (5 points) _____

#7 (5 points) _____

#8 (10 points) _____

#9 (10 points) _____

#10 (10 points) _____

TOTAL SCORE _____/50

MULTIPLE–CHOICE : 2 point each
For the following multiple–choice questions, no work is required and no partial credit is possible.
Choose the one alternative that best completes the statement or answers the question and circle that answer choice.

1) A marketing research company is estimating the average total compensation of CEOs in the service industry. Data were randomly collected from 18 CEOs and the 94% confidence interval for the mean was calculated to be ($2181260, $5836180). If the same random sample were to be used, what would happen to the confidence interval if the confidence level were changed to 96%?

A) The interval would get wider.

B) The interval would get narrower.

C) There would be no change in the width of the interval.

D) It is impossible to tell until the 96% interval is constructed.

2) A 95% confidence interval was constructed to estimate the average number of naps per week that CU students take and the result was (3.15, 3.62). What is the margin of error of the confidence interval?

A) 0.470 B) 0.447 C) 0.235 D) 0.223

3) The mean age of bus drivers in Chicago is 51.5 years. If a hypothesis test is performed, how should you interpret a decision that rejects the null hypothesis?

A) There is not sufficient evidence to support the claim μ=51.5.

B) There is sufficient evidence to reject the claim μ=51.5.

C) There is not sufficient evidence to reject the claim μ=51.5.

D) There is sufficient evidence to support the claim μ=51.5

4) Suppose you had constructed a confidence interval from a normally distributed population with a **known** population standard deviation. If you were to take another random sample, this time with a **larger** sample size, what can you say about the length of the second interval? Assume the level of confidence is the same for both intervals.

A) The second interval will be shorter than the first.

B) The second interval will be the same length as the first.

C) It is impossible to compare the lengths of the confidence intervals until the samples are taken.

D) The second interval will be longer than the first.

5) If 10200 confidence intervals are created to estimate μ, a population mean, and each interval has a confidence level of 89%, how many intervals are expected to contain μ?

A) 9078 B) 9639 C) 561 D) 1122

SHORT ANSWER: 5 points each:
For the following short–answer questions, both a correct answer and relevant correct work must be shown (or described) to receive full credit. Partial credit may be earned even if the correct answer is not found. However, an answer alone, even if correct, may result in no credit.

In the case where you use a calculator function to compute the answer, write the function with input as entered into your calculator and the specific output used from that function as the corresponding work.

6) A random sample of 100 pumpkins is obtained and the mean circumference is found to be 40.16 cm. The standard deviation of all pumpkin circumferences is known to be 1.6 cm. Use a 0.05 significance level to test the claim that the mean circumference of all pumpkins is greater than 39.9 cm.

   a.) (2 points) What is the appropriate statistical test to test this claim? Explain your choice.

   b.) (3 points) What is the P–value of the test and should you reject or fail to reject the null hypothesis?

7) An educator wants to estimate the proportion of school children in Boston who are living with only one parent. The report is to be published, thus they want a reasonably accurate estimate. However, their funding is limited so they do not want to collect a larger sample than necessary. They hope to use a sample size such that, with a confidence level of 0.99, the error will not exceed 0.038. What sample size will ensure this, regardless of what sample proportion value occurs when they gather the sample?

SHORT ANSWER : 10 points each

For the following short–answer questions, both a correct answer and relevant correct work must be shown (or described) to receive full credit. Partial credit may be earned even if the correct answer is not found. However, an answer alone, even if correct, may result in no credit.

In the case where you use a calculator function to compute the answer, write the function with input as entered into your calculator and the specific output used from that function as the corresponding work.

8) The goals scored by two soccer teams are approximately normally distributed and independent random samples of 8 games played by each team this season are given in the following table.

Peabody Dragons	2	2	2	2	2	2	2	2
Worchester Tree Frogs	2	1	1	2	1	2	2	1

At the 5% significance level, does the evidence support the claim that the mean number of goals scored by the Dragons this season is different from the mean number of goals scored by the Tree Frogs?

a.) (2 points) Are these samples paired or unpaired?

b.) (2 points) State the null and the alternate hypothesis of the test.

c.) (2 points) State the appropriate statistical test to test this claim and state the P–value of the test.

d.) (4 points) What is the conclusion of the hypothesis test? Interpret your result in terms of the mean number of goals scored by the two teams.

9) The coach of the Dracut Marmosets, another soccer team, wants to determine if a stretching routine leads to a difference in the kicking performance of her team. Below are the distances (in meters) that a random sample of six players were able to kick a soccer ball before and after stretching. Assume that kicking distances are normally distributed.

	Player A	Player B	Player C	Player D	Player E	Player F
Before Stretching	52	44	61	71	71	43
After Stretching	82	55	74	69	89	72

a.) (2 points) Are the samples paired or independent?

b.) (2 points) State the null and alternate hypothesis of the test.

c.) (2 points) State the appropriate statistical test to test this claim and state the P–value of the test.

d.) (4 points) What is the conclusion of the hypothesis test at the 5% significance level? Interpret your result in terms of the mean kicking distance of a player on the team.

10) A data scientist in charge of a charity organization that distributes free kits that help smokers quit. There are two towns that still need a shipment, Onett and Twoson. She knows that both towns have approximately 30,000 people in them and wants to determine how many kits to send to each town.

a.) (2 points) She first decides to determine if one town has a different proportion of smokers than the other. Independent polling in each town yields the following results:

Town Name	Sample Size	Number of Smokers in Sample
Onett	1780	215
Twoson	1751	150

To test her claim, what null and alternate hypothesis should be used?

b.) (3 points) Compute the P–value of the appropriate test . Using a 1% level of significance, what is the interpretation of the hypothesis test?

c.) (2 points) Before the researcher can report her results, her supervisor informs her that it is believed that there is a significant difference and asks her to estimate the difference of population proportions. Create a 95% confidence interval for the difference of population proportions based on the previously mentioned polling results.

d.) (3 points) Based on your interval, should one town receive more kits than the other? If so, which one?

1) A
2) C
3) B
4) A
5) A
6) a.) Use a ZTest because the popluation standard deivation is given.

b.) Give 1 point for a P–value: 0.0521. Give two points for "Fail to reject H_0."

7) 1 point for recognizing that the C–level is 0.99, 1 point for E is 0.038, 1 point for z_c=2.58, 1 point for using the correct formula (one with 1/4) and 1 point for rounding the answer up to get 1153.

8)
a.) Independent. Give them zero if this is wrong

b.) 1 point each for $H_0 : \mu_1 = \mu_2$ and $H_1 : \mu_1 \neq \mu_2$

c.) 1 point for 2–SampTTest and 1 point for a P–value of 0.0331

d.) Give 2 points for " reject H_0 " and 2 points for phrasing it correctly.

9)
a.) Paired. Give them zero if this is wrong

b.) 1 point each for $H_0 : \mu_a = \mu_b$ and $H_1 : \mu_a \neq \mu_b$

c.) 1 point for TTest and 1 point for a P–value of 0.0202

d.) Give 2 points for "reject H_0 " and 2 points for phrasing it correctly.

10)
a.) Give one point each for $H_0 : p_1 = p_2$ and $H_1 : p_1 \neq p_2$

b.) Give one point for using 2–PropZTest, one point for a P–value of 0.0006093 and one point for stating that the two proportions of smokers are different.

c.) Give 1 point for using 2–PropZInt and one point for the correct interva of (0.0151 , 0.0551) or if the called Onett "Population 2", they would get (– 0.0551, –0.0151)

d.) Give 1 point for saying yes and 2 points for saying that Onett should get more kits.