

Pledge:

3/1/2007
Dr. Lunsford

MATH 171
Test 1

Name: _____
100 Points Possible

I. Short Answer and Multiple Choice. (36 points total)

1. If we want to compute a 75% confidence interval for a population mean, then the value of z^* (rounded to three decimal places) will be: (circle one) (3 points)

- (a) 1.100 (b) 1.405 (c) 1.150 (d) None of the above

2. Indicate whether each of the following statements is true or false by writing “true” or “false” in the blank provided next to each statement. (3 points each, 12 total)

- _____ A) If the correlation between two variables is positive, then the explanatory variable *causes* the response variable.
_____ B) The margin of error for a confidence interval for the mean μ , based on a specified sample size n , decreases as the confidence level decreases.
_____ C) In general, individual measurements are less variable than averages.
_____ D) The margin of error for a 95% confidence interval for the mean μ increases as the sample size increases.

3. Central Middle School has calculated a 95% confidence interval for the mean height (μ) of 11-year old boys at their school and found it to be 57 ± 2 inches. (Note: this means the confidence interval is $55 < \mu < 59$.) Indicate whether each of the following statements is true or false by writing “true” or “false” in the blank provided next to each statement. (3 points each, 6 total)

- _____ B) There is a 95% probability that μ is between 55 and 59.
_____ C) If we took many additional random samples of the same size and from each computed a 95% confidence interval for μ , approximately 95% of these intervals would contain μ .

4. Which of the following could be the 90% confidence interval based on the same data (i.e. from the Central Middle School) in question 3 above? (circle one) (3 points)

- A. 57 ± 1 B. 57 ± 2 . C. 57 ± 3 .

D. Without knowing the sample size, any of the above answers could be the 90% confidence interval.

5. Weight is a measure that tends to be normally distributed. Suppose the mean weight of all women at a large university is 135 pounds, with a standard deviation of 12 pounds. If you were to randomly sample 9 women at the university, there would be a 68% chance that the ***average weight of the 9 women (i.e. the sample mean weight)*** would be between: (circle one) (3 points)

- (a) 111 and 159 pounds. (b) 127 and 143 pounds. (c) 123 and 147 pounds.
(d) 131 and 139 pounds. (e) 133 and 137 pounds.

I. Short Answer and Multiple Choice, continued.

6. A study is conducted on students taking a statistics class. Several variables are recorded in the survey. Please identify each variable as categorical (qualitative) or quantitative in the blank provided next to the variable name. (3 points each, 9 total)

_____ Number of persons in family.

_____ Color of their car (if they own one)

_____ The amount of time the student spent doing homework last week.

Problem II. The scores of high school seniors on the ACT college entrance examination in 2003 had mean $\mu = 20.8$ and standard deviation $\sigma = 4.8$. Suppose the distribution of the scores is roughly normal. Please answer the following: (19 points total)

(a) How likely is it that a randomly chosen student chosen from all those who took the test scored 25 or higher? Draw a graph to show the distribution and shade the region that corresponds to the likelihood you found. On your graph please be sure to label your horizontal axis and to show values ± 1 , ± 2 , and ± 3 standard deviations from the mean. (9 points)

(b) What are the mean and standard deviation of the sample mean scores of all possible random samples of size 25 from the population of students who took the test? (4 points)

(c) Suppose you take a random sample of size 25 from the population of students who took the test. How likely is it that the sample mean from your sample is larger than 25? (3 points)

(d) At Lake Wobegon high school, their graduating class in 2003 of 25 seniors took the ACT and had an average score of 25. A famous radio show host named Garrison Keillor claims that all children in Lake Wobegon are “above average.” Based on your answers above, were the graduating seniors “above average” compared to the entire population? Why or why not? (3 points)

Problem IV. Use the data collected by the consumer group in Problem III to answer the following questions: (9 points total)

(a) Find a 90% confidence interval for the mean lifespan for this brand of light bulb. Assume that the standard deviation of the lifespan for all possible light bulbs of this brand is 600 hours. Write a complete English sentence stating the meaning of the confidence interval. (6 points)

(b) The manufacture of the light bulbs studied in Problem II claims that their light bulbs have an average lifespan of 1000 hours with a standard deviation of 600 hours. Based on the data collected in Problem II and your confidence interval computed above, do you think the manufacturer's claim is valid? Why or why not? (3 points)

Problem IV. Runners are concerned about their form when racing. One measure of form is the stride rate, the number of steps taken per second. Below you are given data from 9 runners. For each runner, the average stride rate and speed (in feet per second) were observed during a race. Below the data is a scatterplot of the data. Please answer the following questions. (18 points total)

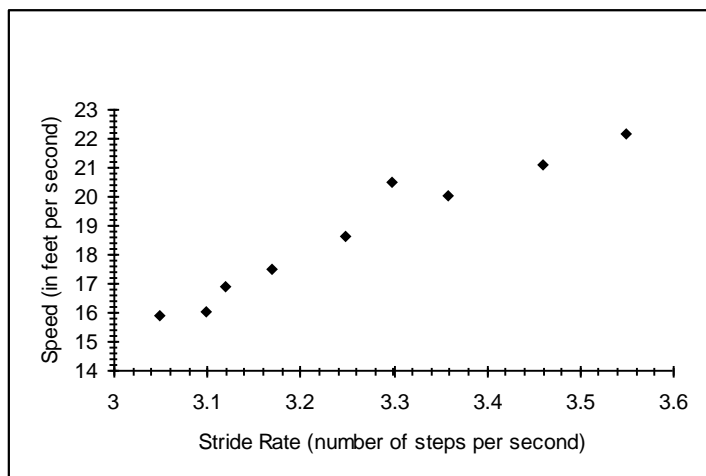
Runner	1	2	3	4	5	6	7	8	9
Stride Rate	3.05	3.12	3.17	3.25	3.36	3.46	3.55	3.1	3.3
Speed	15.86	16.88	17.5	18.62	19.97	21.06	22.11	16	20.5

(a) Plot the centroid of the data on the scatterplot. Clearly indicate the point and its coordinates on the plot. (4 points)

(b) The regression line for this data set is:

$$\text{Speed} = 13.088(\text{Stride Rate}) - 23.973$$

Accurately plot the regression line on the scatterplot to your right. Note that the vertical axis is at $x = 3$. (4 points)



Problem IV, continued.

(c) Use the regression line model given above to predict the expected speed for a runner whose stride rate is 3.4 steps per second. Show this prediction graphically (by using up and over lines) on the scatterplot. (4 points)

(d) Using the regression model, what percent of the variation in speed is explained by stride rate? (2 points)

(e) Via this regression model, an increase in stride rate of 0.1 steps per second should result in what change, on average, in speed? You should give the direction and amount of change. (4 points)