

Math 203 – Test 2

Basic rules: You must show all your work to receive full credit. Provide explanations, using complete sentences, when necessary. There are 7 questions on 4 pages. Good luck!

Here are some formulas:

$$\sigma_{\hat{p}} = \sqrt{\frac{p(100 - p)}{n}} \quad \hat{\sigma}_{\hat{p}} = \sqrt{\frac{\hat{p}(100 - \hat{p})}{n}} \quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

1. Jane, Bob, and Sandy are Math 203 students who have been assigned to do a survey of UNL students to determine their satisfaction level with the UNL Libraries. Jane suggests that they place an ad in the Daily Nebraskan asking all readers to mail in their opinions. Bob suggests they stand outside Love Library and ask every 10th student who enters for his or her opinion. Sandy suggests they obtain a list of student names from the registrar and select 250 names to contact.

(a) (5 points) Which suggestion is best for avoiding bias in the survey?

- (b) (9 points) For each of the other two suggestions, explain why bias might be introduced if that suggestion is followed.

2. (10 points) Below are the number of errors made by a typist on various pages of typing.

14, 6, 12, 19, 2, 35, 5, 4, 3, 7, 5, 8

Give the 5-number summary for this set of data.

3. Suppose a game has 3 outcomes, A , B , and C .

(a) (6 points) If $P(A) = 0.2$ and $P(C) = 0.5$, what is $P(B)$?

(b) (8 points) Suppose a player of this game will **win \$3** if outcome A occurs and **win \$4** if outcome B occurs, but will **lose \$2** if outcome C occurs. If you were to play this game many, many times, how much would you expect to win or lose on average each time you play?

4. The distribution of heights of adult American men is approximately normal, with mean 69 inches and standard deviation 2.5 inches.

(a) (7 points) Sketch and then carefully label a normal curve which represents the distribution of heights of adult American men.

(b) (7 points) What percent of men are shorter than 64 inches? Show your work and also indicate on the graph you drew above the portion of the graph you're interested.

5. (10 points) A random sample of 1540 adults were asked if they jog. Of these 1540 adults, 15% answered “yes”. Find a 68% confidence interval for the percent of all adults who would answer “yes” when asked if they jog.
6. (Two unrelated questions....)
- (a) (7 points) The least squares regression equation $y = 50 + 0.1x$ gives the yield in bushels per acre of corn when x pounds of fertilizer are applied. How many bushels of corn per acre can a farmer expect to produce if 320 pounds of fertilizer are used?
- (b) (7 points) The length of students’ college careers at a certain university is known to be normally distributed, with mean 5.5 years and standard deviation 1.75 years. The quartiles of any normal distribution are located 0.67 standard deviations on either side of the mean. How long are the middle 50% of all students’ careers at this university? (Be sure to show your work!)

7. In the manufacturing process for paper clips, wire is first cut and then bent into a clip. The standard deviation of the lengths of wire cut is 0.04 inches. As a spot-check on quality, 4 cut wires are randomly selected and measured.

(a) (*2 points*) What is the population for this study?

(b) (*2 points*) What is the sample for this study?

(c) (*5 points*) Suppose that the selected wires have lengths

4.27 inches, 4.34 inches, 4.32 inches, 4.29 inches

What is the mean length of the wires in the sample? (Don't forget to show your work!)

(d) (*10 points*) Give a 99.7% confidence interval for the true mean length of the wires being cut. (Don't forget to show your work!)

(e) (*5 points*) Suppose that the machine which cuts the wires is supposed to be cutting them to a length of 4.24 inches. Based on your answers above, do you think the machine is out of adjustment? Explain.