

Assignment #2, Due 7/7/2025 or 7/8/2025

1. In class, we use the court example to explain the null and alternative hypotheses.

Based on the case of People vs. Collins (1969), discuss the following topics:

- What are the null hypothesis and the alternative hypothesis?
 - Explain your reasons for the choice of the null hypothesis.
 - Do you think the testimony of eyewitnesses can be used to charge the couples?
2. **Ideal Pace of Life.** A Pew Research Center survey asked adults if their ideal place to live would have a faster pace of life or a slower pace of life. A preliminary sample of 16 respondents showed 4 preferred a faster pace of life, 11 preferred a slower pace of life, and 1 said it did not matter.
- Are these data sufficient to conclude there is a difference between the preferences for a faster pace of life or a slower pace of life? Use $\alpha = .05$. What is your conclusion?
 - Considering the entire sample of 16 respondents, what is the percentage who would like a faster pace of life? What is the percentage who would like a slower pace of life? What recommendation do you have for the study?
3. **Speed of Overnight Delivery Services.** A test was conducted for two overnight mail delivery services. Two samples of identical deliveries were set up so that both delivery services were notified of the need for a delivery at the same time. The hours required to make each delivery follow. Do the data shown suggest a difference in the median delivery times for the two services? Use Wilcoxon Signed-rank test and $\alpha = .05$ for the test.

Deliver	Service	
	1	2
1	24.5	28.0
2	26.0	25.5
3	28.0	32.0
4	21.0	20.0
5	18.0	19.5
6	36.0	28.0
7	25.0	29.0
8	21.0	22.0
9	24.0	23.5
10	26.0	29.5
11	31.0	30.0

4. **State Expenditure per Student and Student–Teacher Ratio.** The following data show the rankings of 11 states based on expenditure per student (ranked 1 highest to 11 lowest).
- What is the rank correlation between expenditure per student and student–

teacher ratio? Discuss.

- (b) At the $\alpha = .05$ level, does there appear to be a relationship between expenditure per student and student-teacher ratio? and student-teacher ratio (ranked 1 lowest to 11 highest).

State	Expenditure per Student	Student- Teacher Ratio
Arizona	9	10
Colorado	5	8
Florida	4	6
Idaho	2	11
Iowa	6	4
Louisiana	11	3
Massachusetts	1	1
Nebraska	7	2
North Dakota	8	7
South Dakota	10	5
Washington	3	9

5. **Production Process Temperature.** Temperature is used to measure the output of a production process. When the process is in control, the mean of the process is $\mu = 128.5$ and the standard deviation is $\sigma = .4$.

- (a) Construct the $\bar{x}$ chart for this process if samples of size 6 are to be used.
 (b) Is the process in control for a sample providing the following data?

128.8 128.2 129.1 128.7 128.4 129.2

- (c) Is the process in control for a sample providing the following data?

129.3 128.7 128.6 129.2 129.5 129.0

6. **Tennis String Breaking Strength.** Over several weeks of normal, or in-control, operation, 20 samples of 150 packages each of synthetic-gut tennis strings were tested for breaking strength. A total of 141 packages of the 3000 tested failed to conform to the manufacturer's specifications.

- (a) What is an estimate of the process proportion defective when the system is in control?
 (b) Compute the upper and lower control limits for a p chart.
 (c) With the results of part (b), what conclusion should be made about the process if tests on a new sample of 150 packages find 12 defective? Do there appear to be assignable causes in this situation?
 (d) Compute the upper and lower control limits for an np chart.
 (e) Answer part (c) using the results of part (d).
 (f) Which control chart would be preferred in this situation? Explain.