Assignment #2, Due 7/24(25)/2024

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:

   (a) What are the null hypothesis and the alternative hypothesis?

   (b) Explain your reasons for the choice of the null hypothesis.

   (c) Do you think the testimony of eyewitnesses can be used to charge the couples?

2. **Median Annual Income in Chicago.** The median annual income for families living in the United States is $56,200. Annual incomes in thousands of dollars for a sample of 50 families living in Chicago, Illinois, are shown. Use the sample data to see if it can be concluded that the families living in Chicago have a median annual income greater than $56,200. Use $\alpha = .05$. What is your conclusion?

66.3	60.2	49.9	75.4	73.7
65.7	61.1	123.8	57.3	48.5
74	146.3	92.2	43.7	86.9
59.7	64.2	56.2	48.9	109.6
39.8	60.9	79.7	42.3	52.6
60.9	43.5	61.7	54.7	95.2
70.4	43.8	57.8	83.5	56.5
51.3	42.9	87.5	43.6	67.2
48.7	79.1	61.9	53.4	56.2
57	49.6	109.5	42.1	74.6

3. A clothing manufacturer purchased some newly designed sewing machines in the hopes that production would be increased. The production records of a random sample of workers are shown below.

Worker	Old Machine	New Machine
1	28	36
2	36	40
3	27	25
4	25	32
5	38	30
6	36	32
7	40	40
8	29	28
9	32	35
10	28	33
11	20	26
12	32	31
13	32	23
14	32	34
15	36	36

Use the Wilcoxon signed-rank test to determine whether the new machines have significantly increased production. Use a .05 level of significance.

4. **Quality of Teaching Assessments.** A student organization surveyed both current students and recent graduates to obtain information on the quality of teaching at a particular university. An analysis of the responses provided the following teaching-ability rankings. Do the rankings given by the current students agree with the rankings given by the recent graduates? Use $\alpha = .10$ and test for a significant rank correlation

Professor	Current Students	Recent Graduates
1	4	6
2	6	8
3	8	5
4	3	1
5	1	2
6	2	3
7	5	7
8	10	9
9	7	4
10	9	10

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. **Airline Call Center.** An airline operates a call center to handle customer questions and complaints. The airline monitors a sample of calls to help ensure that the service being provided is of high quality. Ten random samples of 100 calls each were monitored under normal conditions. The center can be thought of as being in control when these 10 samples were taken. The number of calls in each sample not resulting in a satisfactory resolution for the customer is as follows:

    4   5   3   2   3   3   4   6   4   7

    (a) What is an estimate of the proportion of calls not resulting in a satisfactory outcome for the customer when the center is in control?

    (b) Construct the upper and lower limits for a p chart for the manufacturing process, assuming each sample has 100 calls.

(c) With the results of part (b), what conclusion should be made if a sample of 100 has 12 calls not resulting in a satisfactory resolution for the customer?

(d) Compute the upper and lower limits for the *np* chart.