Graded Assignment on Statistical Analysis for Healthcare Management

<table>
<tr><th>Task</th><th>Measured Output</th><th>Analysis Output</th></tr>
<tr><td>1: Mean, Median and Mode</td><td>
<table>
<tr><th></th><th>Measure</th><th>Original Value</th><th>After 10% Increase</th></tr>
<tr><td>0</td><td>Mean</td><td>30.9</td><td>33.6</td></tr>
<tr><td>1</td><td>Median</td><td>30.5</td><td>33.5</td></tr>
<tr><td>2</td><td>Mode</td><td>[30]</td><td>[33]</td></tr>
</table>
</td><td>Effect of a 10% Increase: A proportional increase in admissions caused all central tendency measures (mean, median, and mode) to rise by roughly 10%. This suggests that increasing capacity leads to a predictable increase in these statistical measures.

Best Measure Representation: Since the data set does not have extreme outliers, the mean is a good representative measure of patient admissions.</td></tr>
<tr><td>2: Range, Variance and Standard Deviation</td><td>({'Range': 4, 'Variance': 1.61, 'Std Deviation': 1.268857754044952},
{'New Range': 6,
'New Variance': 2.8541666666666665,
'New Std Deviation': 1.689427911059441})</td><td>Range: The difference between the longest and shortest recovery times was 4 days.

Variance: The variance of recovery time was 1.61, indicating the degree to which recovery times spread out from the mean.
Standard Deviation: Initially, the standard deviation was 1.27 days, meaning most recovery times were within approximately 1.27 days of the mean.
Impact of Adding Two New Patients (4 and 10 days):
The standard deviation increased to 1.69 days, indicating greater variability.
The increase happened because the new values (4 and 10 days) expanded the spread of recovery times, making the data more dispersed.</td></tr>
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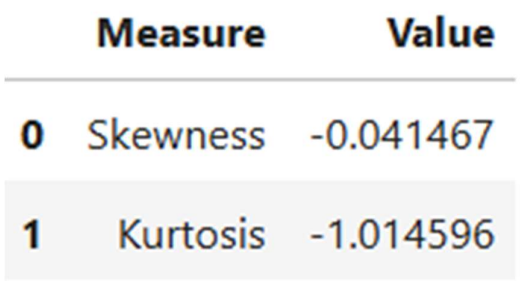
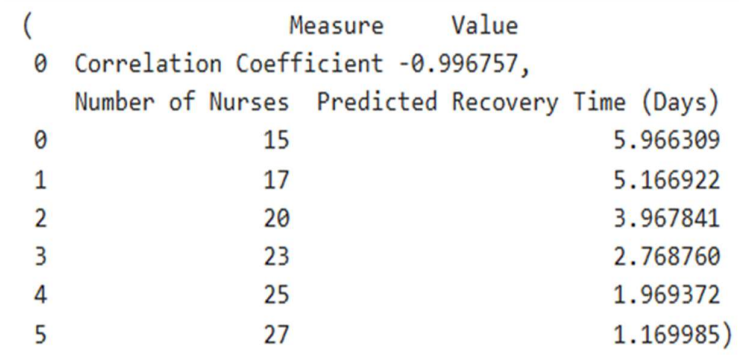
3: Skewness and Kurtosis	 **Measure** **Value** **0** Skewness -0.041467 **1** Kurtosis -1.014596	Patient Satisfaction Scores: Skewness (-0.04): The skewness is very close to zero, indicating that the distribution is nearly symmetrical. Kurtosis (-1.01): A negative kurtosis value suggests a platykurtic distribution, meaning the data has flatter tails than a normal distribution. Since the skewness is close to zero and the kurtosis is negative, the data is approximately normal but slightly flatter than a perfect normal distribution. **Expected Change in Skewness if Satisfaction Scores Increase**: If a new customer service initiative improves patient satisfaction, scores would shift higher, likely causing a left (negative) skew as more patients rate at the higher end (closer to 10). In this case, skewness would decrease further into the negative range, meaning the tail on the left would be slightly longer.
Task 4: Correlation coefficient	 (Measure Value 0 Correlation Coefficient -0.996757, Number of Nurses Predicted Recovery Time (Days) 0 15 5.966309 1 17 5.166922 2 20 3.967841 3 23 2.768760 4 25 1.969372 5 27 1.169985)	**Nurse Staffing Vs Patient Recovery Time** Correlation Coefficient: The correlation coefficient is negative, indicating as the number of nurses increases, patient recovery time decreases. **Predicted Impact of Increasing Nurses by 5 per Department:** If each department increases staffing by 5 nurses, recovery time is expected to further decrease based on the trend. For example: With 15 nurses, recovery time is ~6 days. With 20 nurses, recovery time is ~4 days. With 25 nurses, recovery time is ~2 days. This suggests that increasing nurse staffing could significantly improve patient recovery rates.

Task 5: Null and alternative Hypothesis		**Hypothesis Test for Patient Wait Times:** **Null Hypothesis (H 0 H 0):** The average wait time in the emergency department is 30 minutes. Alternative Hypothesis ($H\ a$ H a): The average wait time significantly differs from 30 minutes. Test Results: T-Statistic: 0.52 (indicates how far the sample mean is from 30 minutes in standard errors) P-Value: 0.61 (greater than 0.05 significance level) Since the p-value (0.61) is greater than 0.05, we fail to reject the null hypothesis. This means there is no significant evidence that the average wait time is different from 30 minutes. If wait times were found to be significantly longer than 30 minutes, the hospital could consider: • Increasing Staff Availability • Optimizing Triage System • Streamlining Registration and Admission •

	Statistic	Value
0	T-Statistic	0.522233
1	P-Value	0.614117

Task 6: Hospital Cleanliness		Hospital Cleanliness Vs Patient Satisfaction: Chi-Square Statistic: 75.0 (measures the association between cleanliness and satisfaction) P-Value: 5.18×10^{-17} (extremely small, well below 0.05) Since the p-value is much smaller than 0.05, we reject the null hypothesis, meaning cleanliness and patient satisfaction are dependent.
Task 7: null and alternative hypotheses		Treatment Effectiveness: Null Hypothesis (H 0 H 0): There is no significant difference in recovery times among Treatment A, B, and C. Alternative Hypothesis ($H\ a$ H a): There is a significant difference in recovery times among the treatments. ANOVA Test Results: F-Statistic: 19.19 (higher F indicates greater variation among groups) P-Value: 0.00018 (much smaller than 0.05) Since the p-value is significantly below 0.05, we reject the null hypothesis. This means at least one treatment method leads to a significantly different recovery time compared to the others.

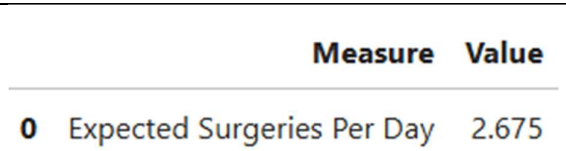
	Statistic	Value
0	Chi-Square Statistic	7.500000e+01
1	P-Value	5.175555e-17
2	Degrees of Freedom	2.000000e+00

	Statistic	Value
0	F-Statistic	19.185185
1	P-Value	0.000183

Task 8: hospital administration time		Normality Analysis of Hospital Administration Times: Shapiro-Wilk Test Statistic: 0.97 P-Value: 0.92 (greater than 0.05) Interpretation: Since the p-value is greater than 0.05, we fail to reject the null hypothesis, meaning the data follows a normal distribution. The histogram and KDE plot further confirm this, showing a balanced, bell-shaped curve.
Task 9: probability distribution.		Poisson Distribution Model for Emergency Arrivals: Model Used: Poisson Distribution (5 arrivals per hour) Probability of Exactly 3 Arrivals in the Next Hour: 0.140 (14%)

	Statistic	Value
0	Shapiro-Wilk Test Statistic	0.970912
1	P-Value	0.920121

	Scenario	Value
0	Probability of Exactly 3 Arrivals	0.140374

Task 10: type of probability distribution	 	Probability Distribution: The data follows a discrete probability distribution. The Poisson distribution models the number of events occurring in a fixed period, making it suitable for surgeries performed per day. Expected Number of Surgeries Per Day: 2.675 Impact of Hiring a New Surgical Team: Increase in Mean – More surgeries can be performed daily. Rightward Shift in Distribution – Higher numbers (e.g., 4, 5, and more surgeries per day) will become more frequent. Higher Variability – The probability of performing a high number of surgeries per day will increase. This would require adjustments in resource allocation, scheduling, and patient management.