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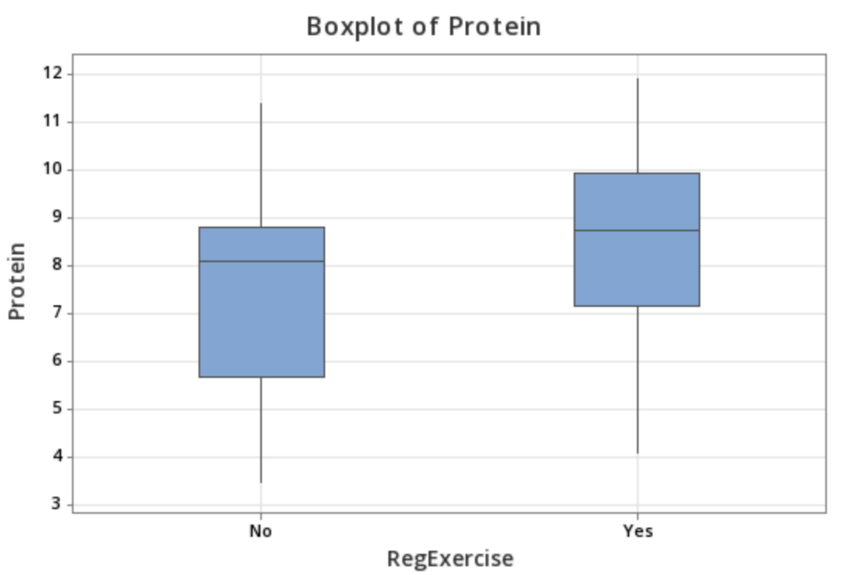
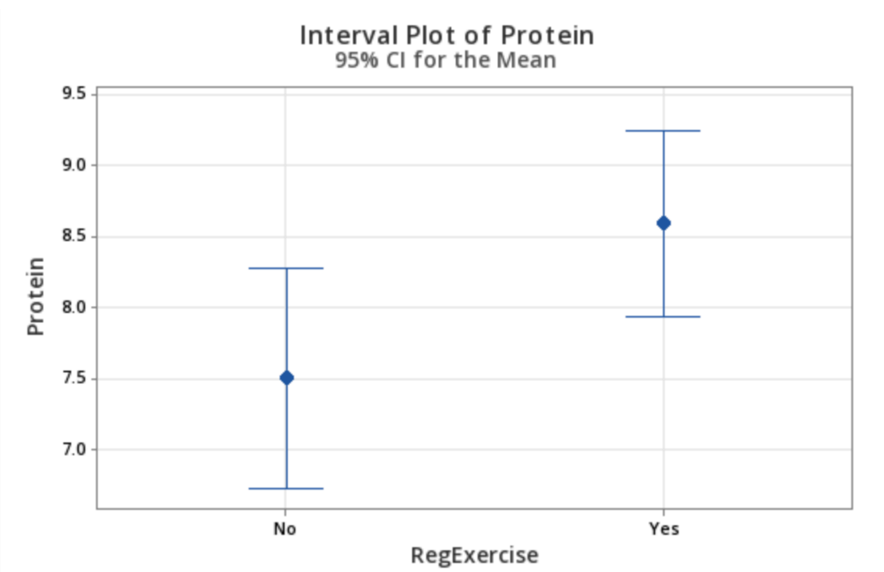
Project Report 3

1) A:

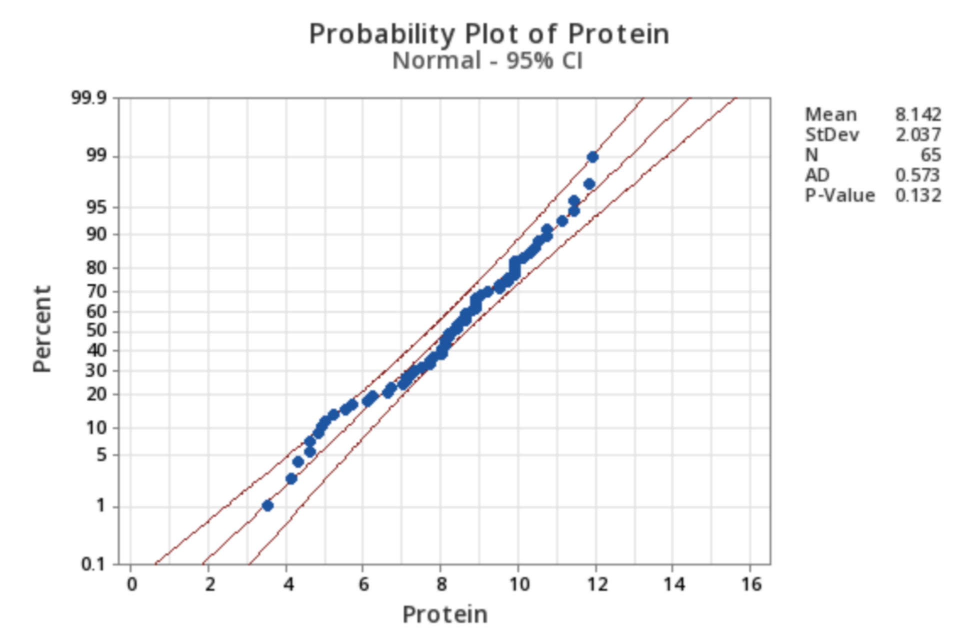
Statistics

Variable	RegExercise	N	Mean	SE Mean	StDev	Median
Protein	No	27	7.50741	0.377574	1.96193	8.1
	Yes	38	8.59211	0.323155	1.99206	8.75





Individual standard deviations are used to calculate the intervals.



1) B:

The Q-Q plot and Anderson-Darling test ($p = 0.132$) suggest that protein levels are approximately normally distributed meaning that the data is symmetric and suitable for parametric testing.

To test if mean protein levels differ between those who exercise regularly and those who do not, we used a two-sample t-test. The null hypothesis (H_0) states that there is no difference in mean protein levels between the groups. The test yielded a t-statistic of -2.18 and a p-value of 0.033 with 56 degrees of freedom.

Since the p-value (0.033) is less than the significance level of 0.05, we reject the null hypothesis. This suggests that there is a statistically significant difference in mean protein levels between individuals who exercise regularly and those who do not.

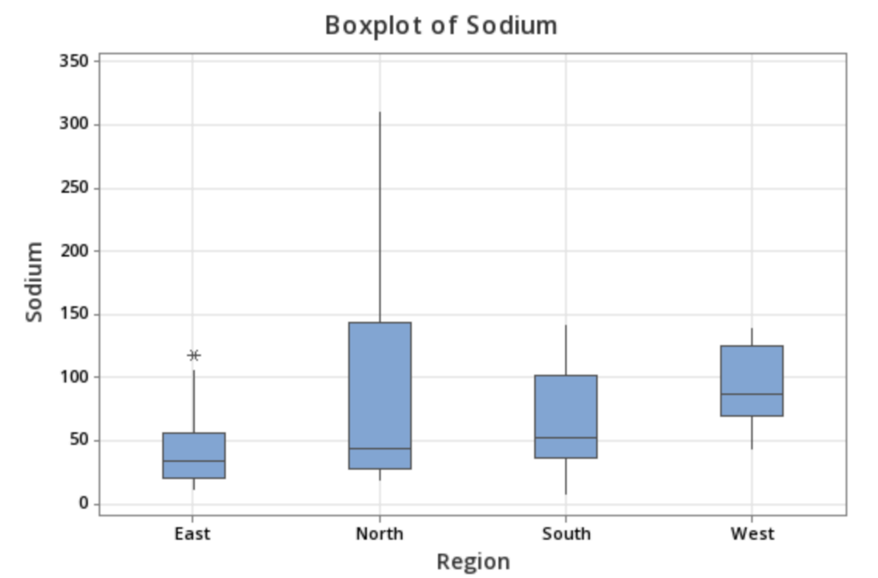
A 95% confidence interval for the mean difference in protein levels is (-2.080, -0.089). Since this interval does not include zero, it further supports our conclusion that there is a significant difference in protein levels.

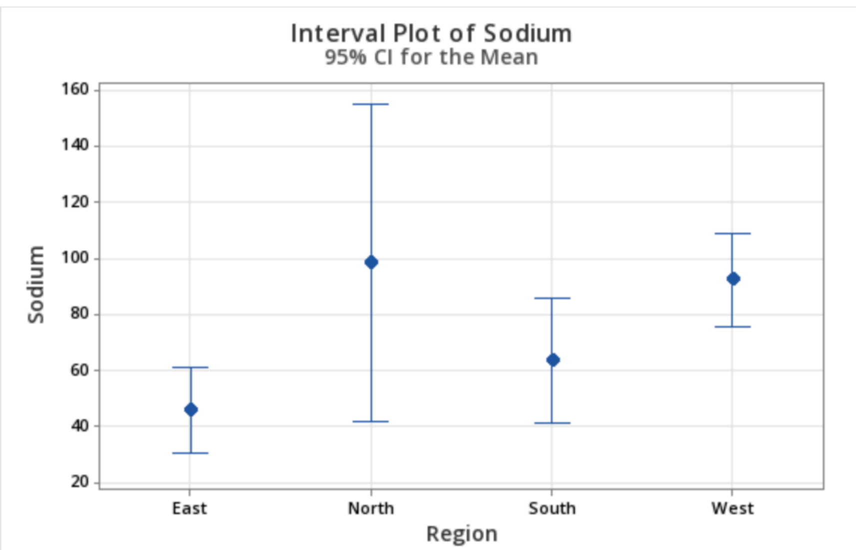
The mean difference of -1.085, with a Cohen’s d of -0.55, indicates a moderate practical significance in the difference in protein levels between those who exercise regularly and those who do not.

2) A:

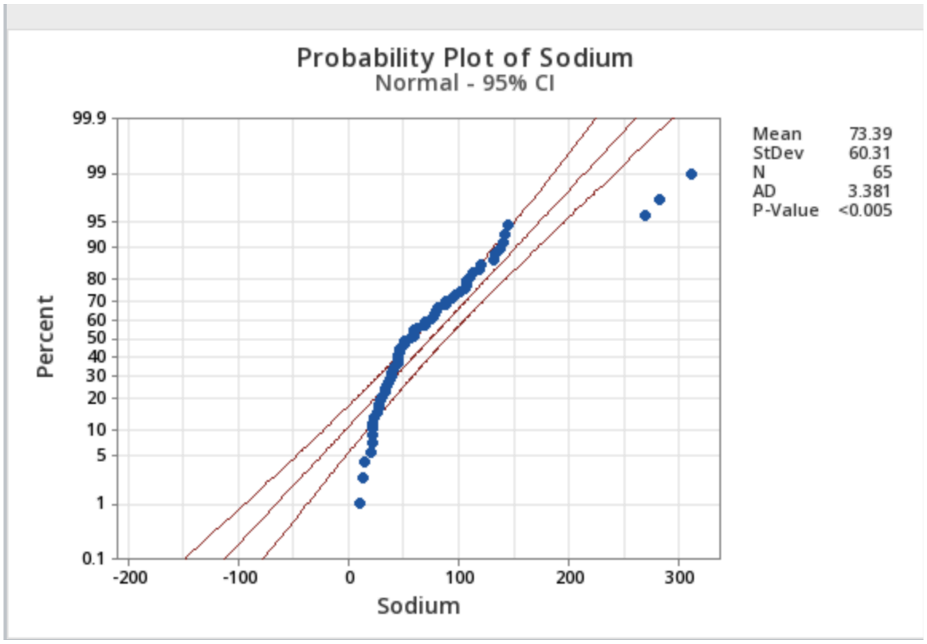
Statistics

Variable	Region	N	Mean	SE Mean	StDev	Median
Sodium	East	20	46.005	7.35329	32.8849	35
	North	15	98.3933	26.4101	102.286	44.7
	South	14	63.75	10.3623	38.7721	52.85
	West	16	92.6125	7.80710	31.2284	87.5





Individual standard deviations are used to calculate the intervals.



2) B:

The Q-Q plot and the Anderson-Darling test indicate that sodium levels are not normally distributed across all regions due to significant deviations and outliers.

Since the data is not normally distributed, a Kruskal-Wallis test (a non-parametric test) is best for comparing the median sodium levels across the four regions.

- Null Hypothesis (H_0): The median sodium levels are the same across all regions.
- Alternative Hypothesis (H_1): At least one region has a different median sodium level.

The Kruskal-Wallis test yielded an H-value of 14.20 with a p-value of 0.003.

Since the p-value (0.003) is less than the 0.05 significance level, we reject the null hypothesis. This tells us that there is a statistically significant difference in median sodium levels among the regions.

For non-parametric tests like the Kruskal-Wallis, effect size measures are not as straightforward. However, the difference in mean ranks across regions, (with West having the highest mean rank of 46.2 and East the lowest at 22.3) and means that sodium levels may vary between regions, particularly between East and West.

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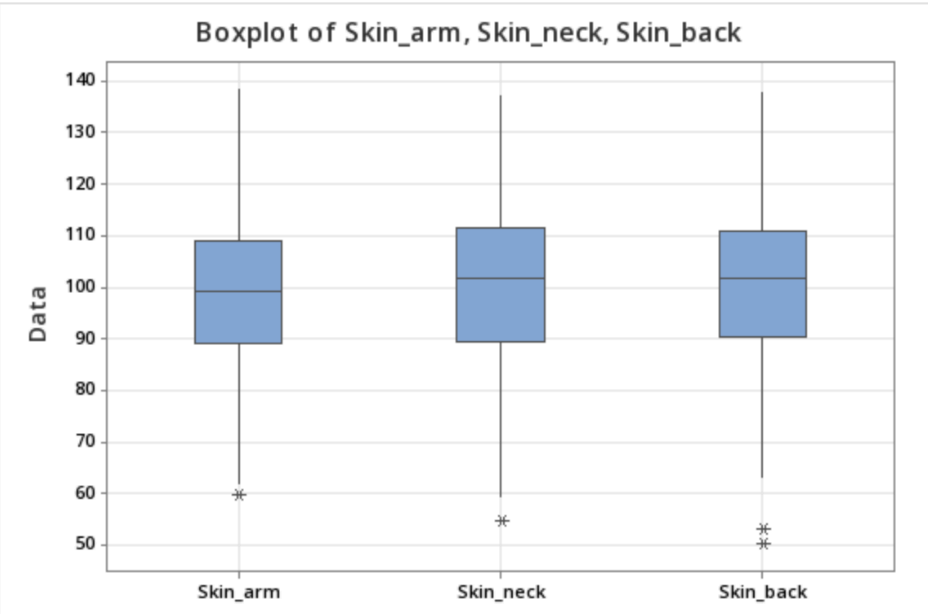
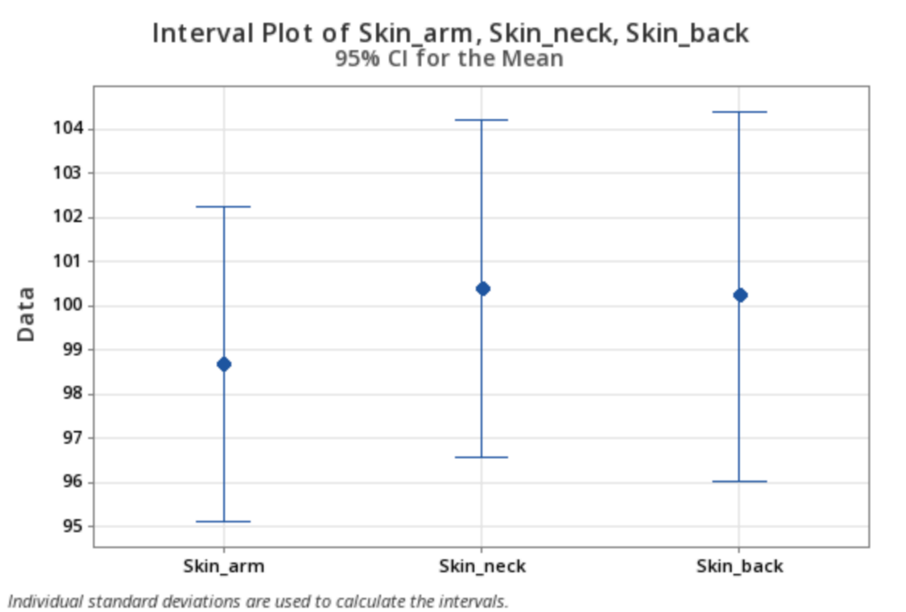
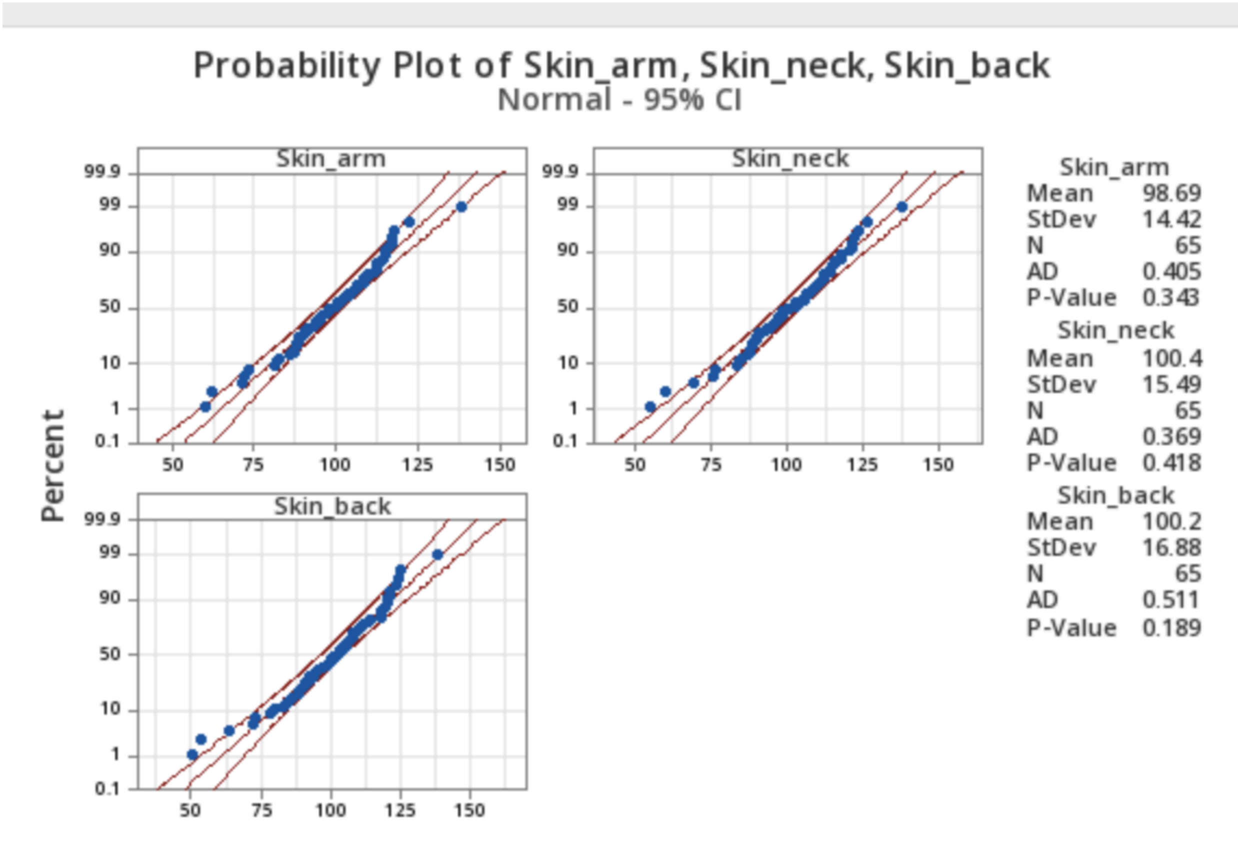
3) A:

Statistics

Variable	N	Mean	SE Mean	StDev	Median
Skin_arm	65	98.6877	1.78850	14.4194	99.4
Skin_neck	65	100.402	1.92115	15.4888	101.9
Skin_back	65	100.231	2.09411	16.8833	101.8







3) B:

The Q-Q plots and Anderson-Darling test results indicate that skin elasticity measurements for each site (arm, neck, and back) are about normally distributed. The p-values for the Anderson-Darling tests (greater than 0.05) confirm that we do not reject the null hypothesis of normality for each site.

To test whether mean skin elasticity differs among the three measurement sites we use a one-way ANOVA.

- Null Hypothesis (H_0): The mean skin elasticity is the same across all three sites (arm, neck, and back).
- Alternative Hypothesis (H_1): At least one site has a different mean skin elasticity.
- ANOVA Results: The F-value is 0.24, with a p-value of 0.789.

Since the p-value is greater than 0.05, we fail to reject the null hypothesis. This suggests there is no statistically significant difference in mean skin elasticity among the three sites.

The 95% confidence intervals for the mean skin elasticity at each site are:

- Arm: (94.86, 102.51)
- Neck: (96.58, 104.23)

- Back: (96.41, 104.05)

These overlapping intervals further indicate that there is no significant difference in mean skin elasticity between the measurement sites.

Given the non-significant result, a traditional effect size calculation like Cohen’s d is not relevant here, as effect size interpretations typically accompany meaningful differences. However, the very small F-value (0.24) and the similar mean ranks suggest minimal practical differences in skin elasticity across the sites.