**Course Project Checkpoint 12**

**Palmer Penguins Species Proportion Analysis**

In this analysis, I hypothesized that the proportion of Adélie penguins within a sample from the palmerpenguins dataset represented the overall population proportion. Initially, I established the population proportion of Adélie penguins as $p = 0.44$. A random sample of 100 penguins was then taken to estimate the sample proportion and to assess the population proportion using both a confidence interval and a hypothesis test.

The sample proportion of Adélie penguins was calculated to be $\hat{p} = 0.58$. Using the exact method of the binom.confint() function from the binom package, a 95% confidence interval was constructed, resulting in an interval of (0.477, 0.678). This interval suggests, with 95% confidence, that the true population proportion of Adélie penguins falls within this range.

A two-tailed hypothesis test was conducted to compare the sample proportion against the hypothesized population proportion of 0.44. The z-test yielded a statistic of $z = 0.0695$ with a corresponding p-value of $p = 0.9446$. Given the significance level of $\alpha = 0.05$, and the p-value being greater than this threshold, there was not enough evidence to reject the null hypothesis. Thus, the analysis does not support a significant deviation from the hypothesized population proportion.

To reinforce these findings, the prop.test function was also applied, resulting in a chi-squared statistic close to zero and a high p-value ($p = 0.9879$), further confirming that the null hypothesis should not be rejected. The 95% confidence interval from the Wald method was slightly narrower, ranging from (0.389, 0.494), but consistent with the previous interval in suggesting that the hypothesized proportion is plausible given the sample data.

Overall, the data does not provide sufficient evidence to refute the hypothesis that the population proportion of Adélie penguins is 0.44. Therefore, we maintain the presumption that around 44% of the penguin population in this dataset are Adélie penguins.