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Project 4

Exercise 9.68

We have:

1. Calculate Standard Error:
2. Find the Z-Score for 95% Confidence:

Z = 1.96

1. Compute the Confidence Interval:
2. Interpretation: Since the confidence interval includes 0, we do not have enough evidence to conclude a significant difference in germination rates at the two temperatures.

Answer for 9.68: The 95% confidence interval is (−0.5408,0.0408), indicating no significant difference in germination rates.

Exercise 10.41

To determine if there's a significant difference in densities between the two stations, we will perform a two-sample t-test with unequal variances.

1. Calculate Sample Means and Variances: Using the data provided, we calculate the sample mean and variance for each station.

Let’s approximate with:

Station 1 Mean = 10702.73, Variance = 3,509,495.98

Station 2 Mean = 5887.27, Variance = 4,460,740.52

1. Conduct a Two-Sample t-Test (Assuming Unequal Variances):

The t-statistic formula is:

1. Determine Critical Value: With a significance level of 0.05 and degrees of freedom calculated approximately as 19, the critical t-value is about 2.093.
2. Conclusion: Since ∣t∣=5.66 is greater than 2.093, we reject the null hypothesis, concluding a significant difference in organism densities.

Answer for 10.41: There is a significant difference in densities between the two stations.

Exercise 9.77

In Exercise 9.42, “12 Volkswagen trucks averaged 16 kilometers per liter with a standard deviation of 1.0 kilometer per liter, while 10 Toyota trucks averaged 11 kilometers per liter with a standard deviation of 0.8 kilometer per liter”. For Exercise 9.77, ”We are to construct a 98% confidence interval for the ratio of the standard deviations σ1​/σ2 of the distances traveled per liter of fuel by the Volkswagen and Toyota mini trucks”.

Solution

1. Identify the Sample Standard Deviations and Sample Sizes:
2. Calculate the F-Statistic: The F-statistic is calculated by dividing the square of the standard deviations:
3. Determine the Critical Values for a 98% Confidence Interval:
4. Compute the Confidence Interval for σ1​/σ2: Using the F-statistic and the critical values, we can calculate the confidence interval for the ratio of standard deviations:
5. Interpret the Confidence Interval: The 98% confidence interval for the ratio of the standard deviations σ1/σ2 is approximately (0.373,1.782). Since this interval includes 1, we conclude that there is no statistically significant difference in the variability of fuel economy between the two types of mini trucks.