

Confidence Intervals

Task 3

Please open the 'Engagement project.xlsx' file and navigate to the 'Task 3 sheet using Microsoft Excel.

You will find information about two pairs of students:

Students who haven't had a paid-plan subscription

- Engaged in Q4 2021
- Engaged in Q4 2022

Students who have been paid-plan subscribers

- Engaged in Q4 2021
- Engaged in Q4 2022

For each of the four groups, determine the minute interval within which you can be 95% confident that a randomly selected individual will be situated.

What conclusions can you draw about the students' engagement in Q4 2021 and Q4 2022?

Tip: Use the z-statistic when performing calculations.

Follow the general steps below to compute confidence intervals in Excel:

1. Determine your sample size (n)—the count of the number of observations in your data.

2. Calculate the sample's mean value:

$$\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$$

3. Determine the sample's standard deviation:

$$s = \sqrt{\sum_{i=1}^n \frac{(X_i - \bar{X})^2}{n - 1}}$$

4. Estimate the significance level:

$$\alpha = 1 - \text{Confidence Level}$$

In this case, the confidence level is 95%.

5. Obtain the z-score from the standard normal distribution table for probability (p) = 1 - $\alpha/2$.

Note that you can assume normality since the sample size is larger than 30. The z-score for a 95% confidence interval is **1.96**.

6. Calculate the standard error:

$$s_{\bar{X}} = \frac{s}{\sqrt{n}}$$

7. Calculate the margin of error:

$$z_{\alpha/2} \frac{s}{\sqrt{n}}$$

This is the critical value—typically a z-score for a normal distribution, 1.96 for a 95% confidence interval—multiplied by the standard error. You can directly multiply by 1.96, assuming a normal distribution.

8. Calculate the confidence interval by adding and subtracting the margin of error from the mean value:

$$\bar{X} \pm z_{\alpha/2} \frac{s}{\sqrt{n}}$$