

# Take Home Quiz 1

Your Name

Due Tuesday Feb. 18 at 11:00am

This quiz should take you approximately 35 minutes. Place your answers into this markdown document, knit it, and hand in the result as a PDF or Word document. You may use R, any reference material, and information already available on the internet. Do not work together and do not get help from other people or from AI. If you have questions, ask Dr. Clair.

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The first three problems use the data `stl-event-permits.csv` which contains monthly counts of event or party permits issued by the St. Louis Streets Department from 2013-2019. It is available on our website at <https://turtlegraphics.org/timeseries/data/stl-event-permits.csv>

## Problem 1 (10 points)

- Load the `stl-event-permits.csv` data, convert to a tibble, and produce a time plot of the number of events.
- Produce a seasonal plot of the number of events. What is the peak month for street parties in St. Louis?

## Problem 2 (10 points)

- Perform a classical seasonal decomposition of the number of events.
- Plot the trend component. Does there appear to be a trend over time?

## Problem 3 (10 points)

- Create an autocorrelogram of the random components of the seasonal decomposition from problem 2.
- Does the random component appear to be white noise? Check with a Ljung-Box test using 18 lags.

## Problem 4 (10 points)

Consider the time series 1, 2, 3, 1, 2, 3, 1, 2, 3, 1, 2, 3, ...

- Calculate the 2-moving average.
- Calculate the 3-moving average.

## Problem 5 (10 points)

The series `souvenirs` from `fpp3` is heteroscedastic. Explain what this means, and how you might stabilize the variance of the series.