Please put away all electronic devices. This sheet will be collected but not assessed. The professor will look at the second page but will ignore the first page.

**Dream big** (totally made up by your professor). Mathematics, applied mathematics, statistics, and computation provide powerful tools for understanding and influencing reality. Let’s think about if they have a role to play in your future life. Think about one to three medium-to-long-term goals you have. After you have them in mind, reflect on if there’s a way that use of the aforementioned tools could help meet those goals. I urge you to just write what comes to mind. Trying to make your response be a well-structured plan is counter to the purpose of the exercise. The purpose of the exercise is simply to start (or continue) to wonder about the ways in which quantitative approaches might impact your future.

Consider a very simple bike share program with only 3 stations: A, B, C. Suppose that all bicycles must be returned to the station at the end of the day, so that each day there is a time, let’s say midnight, that all bikes are at some station, and we can examine all the stations at this time of day, every day. We want to model the movement of bikes from midnight of a given day to midnight of the next day. We find that over a one day period,

* of the bikes borrowed from station A, 30% are returned to station A, 50% end up at station B, and 20% end up at station C.
* of the bikes borrowed from station B, 10% end up at station A, 60% have been returned to station B, and 30% end up at station C
* of the bikes borrowed from station C, 10% end up at station A, 10% end up at station B, and 80% are returned to station C.

Draw and label a diagram to represent this situation as a Markov chain:

Write down the transition matrix:

Suppose that on a given day, 30% of the bikes are at A, 30% are at B, and 40% are at C. What should we expect the distribution of bikes to be one day later?