Part 2

1. ***What would you choose as the key measure of success of this experiment in encouraging driver partners to serve both cities, and why would you choose this metric?***

The **change in percentage of drivers who cross the bridge during periods of significant unequal demand** is an appropriate metric.

This metric takes the periods where app usage data suggests there is a significant disparity in demand between the two cities and evaluates how many drivers are cross-migrating to balance out the difference.

Significance here will be determined internally and will be in the units of rides requested per unit time. It will also be directional; that is, drivers going against the grain (from higher demand to lower demand) will be excluded from the calculations.

An adjacent statistic would be the simpler: **percent change in number of times a driver crosses the toll booth within a period of time** or **percentage change in number of fares taken in the opposing city**. This stat may however be subject to a bias in the sense that, if very few (or zero) drivers are making the trip at all at the moment, then going from zero rides to any non-zero number would be statistically significant while not necessarily being very informative.

Historical data will need to be collated to properly gauge the increases (if any) that follow the implementation of this toll-paying policy.

2. ***Describe a practical experiment you would design to compare the effectiveness of the proposed change in relation to the key measure of success. Please provide details on:***
    a. ***how you will implement the experiment***

Prior to the implementation of the toll-paying policy, we would collect sample data of the ratio of drivers that already pay the toll out-of-pocket when crossing to the opposing city during periods of low demand in their local city.

Over a set period of time, new data will then be collected to see the fluctuations (if any) in the number of drivers cross-migrating between cities.

This should be convenient to obtain following normal operation of the app/service.

    b. ***what statistical test(s) you will conduct to verify the significance of the observation***

A hypothesis test is appropriate here. The test will compare the population proportions (percentage of drivers who cross from the city with less demand to the city with greater demand in a given frame of time) from before and after the toll-paying policy is implemented.

The Ho (null hypothesis) would be that the two proportions are the same regardless of the change in the toll policy. The Ha (alternate hypothesis) would be that they are different.

The test will be evaluated using confidence levels of 90%, 95% and/or 99%.

    c. ***how you would interpret the results and provide recommendations to the city operations team along with any caveats.***

A large (and positive) change in the rates of movement amongst drivers, leading to a balancing in demand between cities will naturally be a positive outcome. Otherwise, the change will be regarded as ineffective and more incentives will need to be provided to drivers on the platform.

One natural caveat to consider is to check if the increase in cross-migration is offset by the toll-waiving cost. If drivers are moving between cities more but the increase in revenue (if any) does not offset the cost of paying the toll each time,

Ultimate might be losing revenue while meeting increasing demand. This would be a consideration for the internal pricing strategy.

Additionally, we have to consider the equilibrium of demand and supply with the increased scope. If the migration of drivers from the more populous to less populous city causes a sharp enough drop in driver supply in the former city, the amount of wait time before getting a ride might increase significantly, causing customer dissatisfaction.