Summary Report of Findings

1. Exploratory Data Analysis (Logins)

- **Cycles:** Demand is highly cyclical. Daily logins peak late at night (around 10 PM – 2 AM) and during mid-day (11 AM – 1 PM).
- **Weekly Patterns:** Weekend demand (Friday through Sunday) is significantly higher and more sustained than weekday demand.
- **Data Integrity:** The login timestamps are consistent and provided at a granular level, allowing for clear identification of "rush hours".

2. Experiment and Metrics Design (Tolls)

- **Key Success Metric:** The **percentage of cross-city trips per driver** (trips starting in Gotham and ending in Metropolis, or vice versa). This directly measures if the toll reimbursement successfully encourages movement between cities.
- **Experiment Design:** A **randomized controlled trial (RCT)** where a subset of drivers is offered the reimbursement.
- **Statistical Analysis:** Use a **two-sample t-test** or **permutation test** to compare the mean number of cross-city trips between the treatment (reimbursed) and control (not reimbursed) groups.
- **Recommendation:** If the result is significant, scale the program city-wide; if not, investigate if the toll was the primary barrier or if supply/demand imbalances are the true cause.

3. Predictive Modeling (Retention)

- **Retention Status:** Approximately **37.6%** of users were identified as "retained," meaning they took at least one trip in the final 30 days of the dataset.
- **Top Predictors:**
    - **Average Rating by Driver:** This was the strongest predictor. Users with higher driver ratings are far more likely to be retained, suggesting that negative social interactions or poor rider behavior are leading indicators of churn.
    - **Surge Usage:** Users who take trips with surge multipliers (`surge_pct`) are highly likely to be retained. This suggests these users value the service as a utility during high-demand times.
    - **City (King's Landing):** Users signing up in King's Landing have significantly higher retention rates than those in Astapor or Winterfell.

4. Leverage Insights to Improve Retention

1. **Replicate King's Landing Success:** Ultimate should investigate what operational factors (e.g., driver density, local marketing) are working in King's Landing and attempt to implement them in lower-performing cities.
2. **Incentivize Ultimate Black:** Users who try Ultimate Black in their first 30 days show higher long-term retention. Offering a discounted first "Black" trip could be a powerful onboarding tool.
3. **Monitor Android Performance:** If Android users have lower retention than iPhone users, technical audits and UX improvements for the Android app should be prioritized.