**Winter**

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ENGR 371 PROJECT

Analysis of the Henry Hall Building Elevator Usage

08

**Fall**

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1. Background and hypothesis

The Concordia elevators in the Hall building are very practical for students and staff who need to get to the highest floors of the building, for those with disabilities or injuries, or for those who simply do not want to take the escalators. The trouble with the elevators is that they can sometimes take longer than desired to arrive. We wish to analyze usage of the two elevators in the Hall building at different times of day (morning, afternoon, and evening) to determine which time of day the elevators are most frequented. We will use the number of entries and exits in the elevator carts of the lobby as a proxy. We also wish to determine whether male or female students are more likely to use the elevators.

We decided to analyze three one-hour periods: 8:00am to 9:00am, 12:00pm to 1:00pm and 5:00pm to 6:00pm. We selected these time slots to represent mornings, afternoons and evenings. We predict that the afternoon will be the busiest period in terms of total number of displacements and people per elevator. This is based on the assumption that the students generally prefer to avoid early or late classes, and the noon to 1:00pm period corresponds to the time when students and staff are likely to leave or enter the building for lunch.

Formally, we hypothesize that the average number of people per elevator ride will be highest during the afternoon period. We also hypothesize that the mornings will be more popular than the evenings and that males will be more numerous in the elevators than females.

1. Designing experiments

The experiment for this analysis will be straightforward. During each one hour-period analyzed, one team member will carefully record how many males and females enter and exit the two elevators in the Hall Building lobby, and the time at which the elevators arrive. The first recording should not occur before the period’s start time and the last recording should not occur after the period’s end time. The sample points for each period will be collected over the course of two days in order to get a more accurate result.

1. Conducting experiments and collect of data

The experiments were conducted on two days: Monday, March 23rd 2015 and Wednesday, March 25th 2015. On each day, recordings of the entries and exits of males and females from the two elevators of the Hall Building lobby were conducted for three one-hour periods, as detailed above. Each team member collected data during two one-hour periods. Jordan was responsible for the data collection for the Monday afternoon and evening periods, Maria was responsible for the data collection for the Wednesday afternoon and evening periods and Richard was responsible for both morning periods.

**Day 1 of Data Collection, March 23rd:**

**Morning (8:00 am - 9:00 am):**

In the morning, 28 samples were collected over the period of one hour. The mean, variance, and standard deviation for males *entering* the elevator was 5.07, 7.11, and 2.67 respectively. For males *exiting* the elevator, the mean, variance and standard deviation was 0.32, 0.45, and 0.67 respectively.

For the females counted, their mean, variance and standard deviation *entering* the elevator was 3.82, 5.49, and 2.34 respectively. And for females *exiting* the elevator, they were 0.25, 0.27, and 0.52 respectively.

For the *total* mean, variance and standard deviation of individuals entering, it was 8.89, 17.06, and 4.13 respectively. For the total mean, variance and standard deviation of individuals exiting, it was 0.57, 0.92, and 0.96 respectively.

**Afternoon (12:00 pm - 1:00 pm):**

In the afternoon, 32 samples were collected over the period of one hour. The mean, variance, and standard deviation for males *entering* the elevator was 6.31, 6.93, and 2.63 respectively. For males *exiting* the elevator, the mean, variance and standard deviation was 2.09, 4.22, and 2.05 respectively.

For the females counted, their mean, variance and standard deviation *entering* the elevator was 5.63, 4.56, and 2.14 respectively. And for females *exiting* the elevator, they were 1.91, 3.57, and 1.89 respectively.

For the *total* mean, variance and standard deviation of individuals entering, it was 11.94, 17.22, and 4.15 respectively. For the total mean, variance and standard deviation of individuals exiting, it was 4.00, 6.71, and 2.59 respectively.

**Evening (5:00 pm - 6:00 pm):**

In the evening, 28 samples were collected over the period of one hour. The mean, variance, and standard deviation for males *entering* the elevator was 3.96, 4.11, and 2.03 respectively. For males *exiting* the elevator, the mean, variance and standard deviation was 3.36, 2.98, and 1.73 respectively.

For the females counted, their mean, variance and standard deviation *entering* the elevator was 2.89, 2.77, and 1.66 respectively. And for females *exiting* the elevator, they were 2.89, 3.88, and 1.97 respectively.

For the *total* mean, variance and standard deviation of individuals entering, it was 6.86, 6.50, and 2.55 respectively. For the total mean, variance and standard deviation of individuals exiting, it was 6.25, 8.19, and 2.86 respectively.

**Day 2 of Data Collection, March 25th:**

**Morning (8:00 am - 9:00 am):**

Wednesday morning, 27 samples were collected over the period of one hour. The mean, variance, and standard deviation for males *entering* the elevator was 3.93, 6.84, and 2.62 respectively. For males *exiting* the elevator, the mean, variance and standard deviation was 0.19, 0.23, and 0.48 respectively.

For the females counted, their mean, variance and standard deviation *entering* the elevator was 3.07, 4.61, and 2.15 respectively. And for females *exiting* the elevator, they were 0.26, 0.28, and 0.53 respectively.

For the *total* mean, variance and standard deviation of individuals entering, it was 7.00, 18.31, and 4.28 respectively. For the total mean, variance and standard deviation of individuals exiting, it was 0.44, 0.49, and 0.70 respectively.

**Afternoon (12:00 pm - 1:00 pm):**

In the afternoon, 33 samples were collected over the period of one hour. The mean, variance, and standard deviation for males *entering* the elevator was 5.85, 5.57, and 2.36 respectively. For males *exiting* the elevator, the mean, variance and standard deviation was 2.09, 2.09, and 1.44 respectively.

For the females counted, their mean, variance and standard deviation *entering* the elevator was 4.91, 3.46, and 1.86 respectively. And for females *exiting* the elevator, they were 1.76, 4.63, and 2.15 respectively.

For the *total* mean, variance and standard deviation of individuals entering, it was 10.76, 9.38, and 3.06 respectively. For the total mean, variance and standard deviation of individuals exiting, it was 3.85, 10.01, and 3.16 respectively.

**Evening (5:00 pm - 6:00 pm):**

In the evening, 29 samples were collected over the period of one hour. The mean, variance, and standard deviation for males *entering* the elevator was 3.97, 2.96, and 1.72 respectively. For males *exiting* the elevator, the mean, variance and standard deviation was 2.90, 3.45, and 1.86 respectively.

For the females counted, their mean, variance and standard deviation *entering* the elevator was 3.17, 3.50, and 1.87 respectively. And for females *exiting* the elevator, they were 2.69, 2.79, and 1.67 respectively.

For the *total* mean, variance and standard deviation of individuals entering, it was 7.14, 8.50, and 2.92 respectively. For the total mean, variance and standard deviation of individuals exiting, it was 6.25, 8.19, and 2.86 respectively.

The collected data is presented in Appendix A.

1. Analysis and interpretation of data

For each data set presented in Appendix A, we computed the following statistics:

1. Total number of events in the recorded period, where an event is defined as the arrival and subsequent departure of an elevator.
2. Sample mean of the number of males, females and both genders to enter the elevator per event.
3. Sample mean of the number of males, females and both genders to exit the elevator per event.
4. Median of the number of males, females and both genders to enter the elevator per event.
5. Median of the number of males, females and both genders to exit the elevator per event.
6. Sample variance of the number of males, females and both genders to enter the elevator per event.
7. Sample variance of the number of males, females and both genders to enter the elevator per event.
8. Sample standard deviation of the number of males, females and both genders to enter the elevator per event.
9. Sample standard deviation of the number of males, females and both genders to exit the elevator per event.

The sample mean is defined as the arithmetic average of the values contained in a sample. It is mathematically expressed as sum of the values of elements contained in the sample divided by the number of elements contained in the sample. It can be interpreted as the expected value of the values contained in the sample. The following formula was used to calculate the mean of the data sets.

 \mathbf{\bar{x}}=\frac{1}{N}\sum_{i=1}^{N}\mathbf{x}_i. 

The median value of a sample is defined as middle value of the sample. That is, half of the elements in the sample will have lower or equal values, and the other half will have higher or equal values.

The sample variance is a measure of the spread or distribution of the values contained in a sample. Denoted as , the sample variance is mathematically expressed as the sum of the square of the difference between sample values and the sample mean, divided by the number of elements in the sample minus 1. The following formula was used to calculate the variance of the data sets.



The sample standard deviation is another measure of the spread of the distribution of the values contained in a sample. It is denoted as . As the symbol suggests, the standard deviation is obtained by taking the square root of the sample variance. The sample standard deviation has the advantage of being expressed in the same units as the mean, whereas the variance is of course expressed in the squared units that can make it harder to interpret.

**Summary (Day 1 & Day 2 comparison):**

Since there was the same expected trends for the gender separated data, and since there was no other significant data available about the individuals (asking whether they’re in ENCS or not for example, etc.), it was concluded that the gender-separated data be ignored for the sake of analyzing greater disparities within the total for each time slice. It was initially hypothesized that the afternoon would be the busiest time since students typically tend to avoid both early and late classes and many people (both students and staff) are leaving for lunch.

The hypothesis does not hold true when comparing the mean and variance of the afternoon collection to those of the morning and the evening. The total mean and variance in the Monday morning collection of people entering were 5.07 and 7.11. Compared to the Monday afternoon collections of people entering of 6.31 and 6.93, this displays that there was a higher average of people using the elevators as well as a higher consistency in their numbers (the lower the variance, the more consistent the number of people exiting and entering the elevators) meaning more people were entering for lunch time. When comparing the Monday afternoon collection to the Monday evening collection. The evening collection’s total mean and variance of people entering were 6.86 and 6.50, which are higher than the afternoon’s collection, which is reasonable since Monday is the beginning of the week and perhaps the busiest school day for many. Thus, between 5:00 pm to 6:00 pm, many people very well may be coming in for their final classes.

For the Monday collection of people exiting, the total mean and variance in the morning was 0.57 and 0.92, versus 4.00 and 6.71 in the afternoon, a staggering difference. Again the evening collection had not only the most amounts of people entering, but also exiting with a mean and variance of 6.25 and 8.19. Between 5:00 pm to 6:00 pm is rush hour and perhaps many people are rushing home for dinner or simply don’t include evening courses in their schedule (it goes both ways). Once again, the evening collection proved to have the most people using the elevators on the first floor.

For the Wednesday collection, the results seem to yield similar conclusions as that of the Monday collection. On Wednesday morning, for people entering, the total mean and variance were 7.00 and 18.31. For that afternoon, it was 10.76 and 9.38. For the same evening, it was 7.14 and 8.50. So again similar results where more and more people use the elevators as the day wears on, however the mean influx is highest in the afternoon, yet is most consistent in the evening.

For Wednesday’s collection out flux, the morning time slice yielded a total mean and variance of 0.44 and 0.49. The afternoon yielded 3.85 and 10.01. Finally, the evening yielded 5.59 and 5.75.

Overall, it is clear that there is a high and consistent out flux (exiting) of individuals using the elevators in the evenings, whereas a high and very inconsistent influx of individuals using the elevators in the mornings. In the afternoons, the data yields are more consistent, yet still yield below optimal variance for expected results, yet still have fairly evened influx and out flux in elevator usage.

The sample data chosen was not necessarily entirely random since the times chosen were key peaking hours during the day. It was expected for the mean number of people using the elevators to increase as the day wore on. However, it was also hypothesized that the absolute busiest time slice would be the afternoon, when in fact, it ended up being the evening time slice. Despite seemingly logical selection of data flow, the results still turned out to be different than expected.

APPENDIX A

**Sample Data Collection**

**Table 1:** Males and Females Entering and Exiting the Hall Building Elevators Monday Morning

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Data Results from 1st Floor (Morning)** | | | | | | |
| **Monday March 23rd** | | | | | | |
| **Time** | **Entering** | | | **Exiting** | | |
| 8:00 am - 9:00 am | **M** | **F** | **T** | **M** | **F** | **T** |
| 8:00:00 AM | 1 | 0 | 1 | 0 | 0 | 0 |
| 8:03:00 AM | 3 | 1 | 4 | 0 | 0 | 0 |
| 8:04:00 AM | 4 | 3 | 7 | 0 | 0 | 0 |
| 8:07:00 AM | 3 | 3 | 6 | 0 | 0 | 0 |
| 8:11:00 AM | 8 | 4 | 12 | 0 | 0 | 0 |
| 8:13:00 AM | 7 | 4 | 11 | 0 | 0 | 0 |
| 8:17:00 AM | 2 | 4 | 6 | 0 | 0 | 0 |
| 8:20:00 AM | 6 | 5 | 11 | 0 | 0 | 0 |
| 8:23:00 AM | 4 | 7 | 11 | 0 | 0 | 0 |
| 8:24:00 AM | 2 | 3 | 5 | 0 | 0 | 0 |
| 8:27:00 AM | 8 | 9 | 17 | 1 | 0 | 1 |
| 8:29:00 AM | 4 | 5 | 9 | 0 | 0 | 0 |
| 8:31:00 AM | 3 | 1 | 4 | 0 | 0 | 0 |
| 8:32:00 AM | 5 | 0 | 5 | 1 | 1 | 2 |
| 8:34:00 AM | 4 | 2 | 6 | 0 | 0 | 0 |
| 8:36:00 AM | 2 | 6 | 8 | 0 | 0 | 0 |
| 8:39:00 AM | 9 | 3 | 12 | 1 | 1 | 2 |
| 8:41:00 AM | 5 | 2 | 7 | 0 | 0 | 0 |
| 8:44:00 AM | 6 | 7 | 13 | 0 | 1 | 1 |
| 8:46:00 AM | 12 | 7 | 19 | 1 | 0 | 1 |
| 8:47:00 AM | 7 | 3 | 10 | 0 | 0 | 0 |
| 8:49:00 AM | 4 | 1 | 5 | 1 | 0 | 1 |
| 8:52:00 AM | 6 | 7 | 13 | 0 | 2 | 2 |
| 8:53:00 AM | 5 | 4 | 9 | 0 | 0 | 0 |
| 8:55:00 AM | 9 | 2 | 11 | 3 | 1 | 4 |
| 8:56:00 AM | 2 | 3 | 5 | 1 | 0 | 1 |
| 8:58:00 AM | 8 | 5 | 13 | 0 | 1 | 1 |
| 8:59:00 AM | 3 | 6 | 9 | 0 | 0 | 0 |
| **Total:** | **142** | **107** | **249** | **9** | **7** | **16** |
| Sample Points: | **28** |  |  |  |  |  |

**Table 2:** Males and Females Entering and Exiting the Hall Building Elevators Monday Afternoon

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Data Results from 1st Floor (Afternoon)** | | | | | | |
| **Monday March 23rd** | | | | | | |
| **Time** | **Entering** | | | **Exiting** | | |
| 12:00 pm - 1:00 pm | **M** | **F** | **T** | **M** | **F** | **T** |
| 12:00:00 PM | 8 | 5 | 13 | 2 | 3 | 5 |
| 12:01:00 PM | 6 | 5 | 11 | 2 | 2 | 4 |
| 12:04:00 PM | 10 | 7 | 17 | 0 | 0 | 0 |
| 12:06:00 PM | 4 | 3 | 7 | 2 | 0 | 2 |
| 12:07:00 PM | 9 | 6 | 15 | 4 | 1 | 5 |
| 12:09:00 PM | 4 | 7 | 11 | 2 | 2 | 4 |
| 12:12:00 PM | 8 | 4 | 12 | 6 | 3 | 9 |
| 12:12:00 PM | 4 | 5 | 9 | 6 | 1 | 7 |
| 12:14:00 PM | 10 | 9 | 19 | 1 | 1 | 2 |
| 12:16:00 PM | 5 | 5 | 10 | 2 | 0 | 2 |
| 12:19:00 PM | 6 | 6 | 12 | 2 | 6 | 8 |
| 12:22:00 PM | 9 | 5 | 14 | 0 | 0 | 0 |
| 12:27:00 PM | 12 | 8 | 20 | 7 | 3 | 10 |
| 12:28:00 PM | 9 | 10 | 19 | 0 | 3 | 3 |
| 12:31:00 PM | 11 | 12 | 23 | 0 | 3 | 3 |
| 12:32:00 PM | 9 | 6 | 15 | 3 | 0 | 3 |
| 12:34:00 PM | 6 | 4 | 10 | 0 | 2 | 2 |
| 12:35:00 PM | 6 | 3 | 9 | 0 | 7 | 7 |
| 12:37:00 PM | 4 | 5 | 9 | 0 | 4 | 4 |
| 12:38:00 PM | 3 | 6 | 9 | 1 | 5 | 6 |
| 12:41:00 PM | 7 | 7 | 14 | 3 | 0 | 3 |
| 12:43:00 PM | 5 | 6 | 11 | 1 | 0 | 1 |
| 12:44:00 PM | 5 | 2 | 7 | 2 | 1 | 3 |
| 12:46:00 PM | 1 | 5 | 6 | 2 | 4 | 6 |
| 12:48:00 PM | 6 | 4 | 10 | 3 | 0 | 3 |
| 12:49:00 PM | 6 | 4 | 10 | 7 | 1 | 8 |
| 12:52:00 PM | 4 | 3 | 7 | 0 | 3 | 3 |
| 12:53:00 PM | 7 | 7 | 14 | 3 | 0 | 3 |
| 12:55:00 PM | 4 | 5 | 9 | 0 | 1 | 1 |
| 12:56:00 PM | 2 | 6 | 8 | 2 | 2 | 4 |
| 12:58:00 PM | 5 | 7 | 12 | 3 | 3 | 6 |
| 12:59:00 PM | 7 | 3 | 10 | 1 | 0 | 1 |
| **Total:** | **202** | **180** | **382** | **67** | **61** | **128** |
| Sample Points: | **32** |  |  |  |  |  |

**Table 3:** Males and Females Entering and Exiting the Hall Building Elevators Monday Evening

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Data Results from 1st Floor (Evening)** | | | | | | |
| **Monday, March 23, 2015** | | | | | | |
| **Time** | **Entering** | | | **Exiting** | | |
| 5:00 pm - 6:00 pm | **M** | **F** | **T** | **M** | **F** | **T** |
| 5:01:00 PM | 3 | 4 | 7 | 4 | 2 | 6 |
| 5:03:00 PM | 5 | 2 | 7 | 3 | 1 | 4 |
| 5:05:00 PM | 4 | 1 | 5 | 5 | 4 | 9 |
| 5:06:00 PM | 2 | 3 | 5 | 3 | 1 | 4 |
| 5:11:00 PM | 1 | 2 | 3 | 3 | 1 | 4 |
| 5:16:00 PM | 5 | 4 | 9 | 4 | 7 | 11 |
| 5:17:00 PM | 4 | 3 | 7 | 5 | 7 | 12 |
| 5:20:00 PM | 2 | 4 | 6 | 3 | 1 | 4 |
| 5:22:00 PM | 7 | 6 | 13 | 0 | 3 | 3 |
| 5:25:00 PM | 6 | 4 | 10 | 2 | 5 | 7 |
| 5:27:00 PM | 0 | 7 | 7 | 3 | 0 | 3 |
| 5:28:00 PM | 3 | 2 | 5 | 4 | 4 | 8 |
| 5:29:00 PM | 2 | 3 | 5 | 5 | 2 | 7 |
| 5:31:00 PM | 5 | 1 | 6 | 2 | 1 | 3 |
| 5:32:00 PM | 5 | 0 | 5 | 3 | 4 | 7 |
| 5:34:00 PM | 4 | 2 | 6 | 7 | 3 | 10 |
| 5:36:00 PM | 2 | 4 | 6 | 5 | 1 | 6 |
| 5:39:00 PM | 8 | 3 | 11 | 2 | 4 | 6 |
| 5:41:00 PM | 5 | 2 | 7 | 6 | 1 | 7 |
| 5:42:00 PM | 7 | 4 | 11 | 5 | 6 | 11 |
| 5:44:00 PM | 1 | 2 | 3 | 4 | 5 | 9 |
| 5:46:00 PM | 4 | 6 | 10 | 2 | 4 | 6 |
| 5:47:00 PM | 3 | 2 | 5 | 3 | 2 | 5 |
| 5:51:00 PM | 6 | 3 | 9 | 4 | 3 | 7 |
| 5:53:00 PM | 7 | 2 | 9 | 0 | 0 | 0 |
| 5:54:00 PM | 3 | 0 | 3 | 1 | 2 | 3 |
| 5:58:00 PM | 4 | 2 | 6 | 5 | 3 | 8 |
| 5:59:00 PM | 3 | 3 | 6 | 1 | 4 | 5 |
| **Total:** | **111** | **81** | **192** | **94** | **81** | **175** |
| Sample Points: | **28** |  |  |  |  |  |

**Table 4:** Males and Females Entering and Exiting the Hall Building Elevators Wednesday Morning

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Data Results from 1st Floor (Morning)** | | | | | | |
| **Wednesday March 25th** | | | | | | |
| **Time** | **Entering** | | | **Exiting** | | |
| 8:00 am - 9:00 am | **M** | **F** | **T** | **M** | **F** | **T** |
| 8:04:00 AM | 1 | 0 | 1 | 0 | 0 | 0 |
| 8:08:00 AM | 0 | 2 | 2 | 0 | 0 | 0 |
| 8:08:00 AM | 2 | 2 | 4 | 0 | 0 | 0 |
| 8:10:00 AM | 3 | 0 | 3 | 0 | 0 | 0 |
| 8:12:00 AM | 0 | 0 | 0 | 1 | 0 | 1 |
| 8:15:00 AM | 2 | 2 | 4 | 0 | 0 | 0 |
| 8:16:00 AM | 3 | 1 | 4 | 0 | 0 | 0 |
| 8:19:00 AM | 1 | 2 | 3 | 0 | 0 | 0 |
| 8:21:00 AM | 1 | 1 | 2 | 0 | 1 | 1 |
| 8:23:00 AM | 2 | 0 | 2 | 0 | 0 | 0 |
| 8:25:00 AM | 7 | 3 | 10 | 0 | 1 | 1 |
| 8:27:00 AM | 5 | 2 | 7 | 0 | 0 | 0 |
| 8:32:00 AM | 4 | 3 | 7 | 0 | 0 | 0 |
| 8:35:00 AM | 5 | 7 | 12 | 0 | 0 | 0 |
| 8:36:00 AM | 4 | 5 | 9 | 0 | 0 | 0 |
| 8:39:00 AM | 3 | 6 | 9 | 0 | 0 | 0 |
| 8:41:00 AM | 9 | 4 | 13 | 1 | 1 | 2 |
| 8:43:00 AM | 10 | 6 | 16 | 0 | 0 | 0 |
| 8:46:00 AM | 8 | 5 | 13 | 0 | 1 | 1 |
| 8:47:00 AM | 7 | 6 | 13 | 0 | 0 | 0 |
| 8:50:00 AM | 4 | 3 | 7 | 0 | 0 | 0 |
| 8:52:00 AM | 5 | 4 | 9 | 0 | 0 | 0 |
| 8:54:00 AM | 3 | 3 | 6 | 0 | 2 | 2 |
| 8:55:00 AM | 6 | 4 | 10 | 0 | 0 | 0 |
| 8:56:00 AM | 4 | 1 | 5 | 2 | 0 | 2 |
| 8:58:00 AM | 3 | 6 | 9 | 0 | 1 | 1 |
| 9:01:00 AM | 4 | 5 | 9 | 1 | 0 | 1 |
| **Total:** | **106** | **83** | **189** | **5** | **7** | **12** |
| Sample Points: | **27** |  |  |  |  |  |

**Table 5:** Males and Females Entering and Exiting the Hall Building Elevators Wednesday Afternoon

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Data Results from 1st Floor (Afternoon)** | | | | | | |
| **Wednesday March 25th** | | | | | | |
| **Time** | **Entering** | | | **Exiting** | | |
| 12:00 pm - 1:00 pm | **M** | **F** | **T** | **M** | **F** | **T** |
| 12:00:00 AM | 10 | 4 | 14 | 4 | 2 | 6 |
| 12:01:00 PM | 7 | 6 | 13 | 2 | 0 | 2 |
| 12:03:00 PM | 5 | 9 | 14 | 5 | 7 | 12 |
| 12:06:00 PM | 11 | 4 | 15 | 2 | 0 | 2 |
| 12:07:00 PM | 7 | 4 | 11 | 0 | 0 | 0 |
| 12:10:00 PM | 6 | 4 | 10 | 3 | 0 | 3 |
| 12:12:00 PM | 3 | 4 | 7 | 3 | 0 | 3 |
| 12:13:00 PM | 5 | 2 | 7 | 0 | 0 | 0 |
| 12:15:00 PM | 4 | 8 | 12 | 0 | 0 | 0 |
| 12:16:00 PM | 2 | 5 | 7 | 1 | 2 | 3 |
| 12:18:00 PM | 6 | 6 | 12 | 5 | 8 | 13 |
| 12:21:00 PM | 9 | 5 | 14 | 3 | 2 | 5 |
| 12:21:00 PM | 10 | 4 | 14 | 3 | 6 | 9 |
| 12:24:00 PM | 8 | 5 | 13 | 1 | 2 | 3 |
| 12:25:00 PM | 5 | 4 | 9 | 1 | 0 | 1 |
| 12:27:00 PM | 9 | 6 | 15 | 1 | 3 | 4 |
| 12:28:00 PM | 6 | 2 | 8 | 2 | 1 | 3 |
| 12:29:00 PM | 4 | 3 | 7 | 1 | 2 | 3 |
| 12:32:00 PM | 3 | 6 | 9 | 2 | 3 | 5 |
| 12:34:00 PM | 4 | 4 | 8 | 0 | 1 | 1 |
| 12:36:00 PM | 5 | 2 | 7 | 1 | 0 | 1 |
| 12:37:00 PM | 2 | 4 | 6 | 2 | 2 | 4 |
| 12:40:00 PM | 4 | 7 | 11 | 1 | 4 | 5 |
| 12:41:00 PM | 3 | 3 | 6 | 2 | 0 | 2 |
| 12:42:00 PM | 6 | 5 | 11 | 3 | 1 | 4 |
| 12:44:00 PM | 8 | 4 | 12 | 3 | 5 | 8 |
| 12:45:00 PM | 7 | 5 | 12 | 2 | 0 | 2 |
| 12:47:00 PM | 4 | 5 | 9 | 1 | 1 | 2 |
| 12:48:00 PM | 8 | 9 | 17 | 3 | 0 | 3 |
| 12:51:00 PM | 7 | 8 | 15 | 1 | 0 | 1 |
| 12:53:00 PM | 4 | 5 | 9 | 5 | 3 | 8 |
| 12:56:00 PM | 6 | 3 | 9 | 2 | 2 | 4 |
| 12:59:00 PM | 5 | 7 | 12 | 4 | 1 | 5 |
| **Total:** | **193** | **162** | **355** | **69** | **58** | **127** |
| Sample Points: | **33** |  |  |  |  |  |

**Table 6:** Males and Females Entering and Exiting the Hall Building Elevators Wednesday Evening

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Data Results from 1st Floor (Evening)** | | | | | | |
| **Wednesday March 25th** | | | | | | |
| **Time** | **Entering** | | | **Exiting** | | |
| 5:00 pm - 6:00 pm | **M** | **F** | **T** | **M** | **F** | **T** |
| 5:00:00 PM | 2 | 0 | 2 | 3 | 2 | 5 |
| 5:02:00 PM | 5 | 3 | 8 | 2 | 1 | 3 |
| 5:05:00 PM | 4 | 3 | 7 | 5 | 1 | 6 |
| 5:07:00 PM | 4 | 3 | 7 | 1 | 3 | 4 |
| 5:10:00 PM | 2 | 2 | 4 | 0 | 2 | 2 |
| 5:11:00 PM | 3 | 6 | 9 | 4 | 5 | 9 |
| 5:14:00 PM | 5 | 4 | 9 | 6 | 3 | 9 |
| 5:16:00 PM | 4 | 3 | 7 | 4 | 4 | 8 |
| 5:17:00 PM | 7 | 5 | 12 | 0 | 4 | 4 |
| 5:20:00 PM | 4 | 4 | 8 | 3 | 1 | 4 |
| 5:23:00 PM | 8 | 6 | 14 | 2 | 4 | 6 |
| 5:25:00 PM | 5 | 4 | 9 | 4 | 0 | 4 |
| 5:28:00 PM | 4 | 3 | 7 | 2 | 3 | 5 |
| 5:29:00 PM | 2 | 6 | 8 | 3 | 4 | 7 |
| 5:32:00 PM | 5 | 2 | 7 | 0 | 5 | 5 |
| 5:35:00 PM | 6 | 3 | 9 | 4 | 0 | 4 |
| 5:37:00 PM | 3 | 4 | 7 | 1 | 2 | 3 |
| 5:39:00 PM | 4 | 2 | 6 | 3 | 2 | 5 |
| 5:41:00 PM | 3 | 0 | 3 | 1 | 5 | 6 |
| 5:44:00 PM | 6 | 4 | 10 | 6 | 4 | 10 |
| 5:45:00 PM | 3 | 8 | 11 | 5 | 3 | 8 |
| 5:47:00 PM | 0 | 3 | 3 | 2 | 1 | 3 |
| 5:53:00 PM | 4 | 4 | 8 | 3 | 7 | 10 |
| 5:55:00 PM | 6 | 2 | 8 | 5 | 2 | 7 |
| 5:58:00 PM | 2 | 2 | 4 | 0 | 1 | 1 |
| 5:59:00 PM | 3 | 1 | 4 | 4 | 1 | 5 |
| 6:02:00 PM | 2 | 0 | 2 | 3 | 3 | 6 |
| 6:04:00 PM | 5 | 2 | 7 | 2 | 2 | 4 |
| 6:05:00 PM | 4 | 3 | 7 | 6 | 3 | 9 |
| **Total:** | **115** | **92** | **207** | **84** | **78** | **162** |
| Sample Points: | **29** |  |  |  |  |  |

**Statistical Data Calculated from Sample Data**

**Table 7:** Mean, Median, Variance, and Standard Deviation of Monday Morning Entries and Exits

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Monday March 23rd - Afternoon** | | | | | |
| **Sex** | **Entry/Exit** | **Mean** | **Median** | **Variance** | **Std. Dev.** |
| Male | Entry | 6.31 | 6.00 | 6.93 | 2.63 |
| Female | Entry | 5.63 | 5.00 | 4.56 | 2.14 |
| Male and Female | Entry | 11.94 | 11.00 | 17.22 | 4.15 |
| Male | Exit | 2.09 | 2.00 | 4.22 | 2.05 |
| Female | Exit | 1.91 | 1.00 | 3.57 | 1.89 |
| Male and Female | Exit | 4.00 | 3.00 | 6.71 | 2.59 |

**Table 8:** Mean, Median, Variance, and Standard Deviation of Monday Afternoon Entries and Exits

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Monday March 23rd - Morning** | | | | | |
| **Sex** | **Entry/Exit** | **Mean** | **Median** | **Variance** | **Std. Dev.** |
| Male | Entry | 5.07 | 4.50 | 7.11 | 2.67 |
| Female | Entry | 3.82 | 3.50 | 5.49 | 2.34 |
| Male and Female | Entry | 8.89 | 9.00 | 17.06 | 4.13 |
| Male | Exit | 0.32 | 0.00 | 0.45 | 0.67 |
| Female | Exit | 0.25 | 0.00 | 0.27 | 0.52 |
| Male and Female | Exit | 0.57 | 0.00 | 0.92 | 0.96 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Monday March 23rd - Evening** | | | | | |
| **Sex** | **Entry/Exit** | **Mean** | **Median** | **Variance** | **Std. Dev.** |
| Male | Entry | 3.96 | 4.00 | 4.11 | 2.03 |
| Female | Entry | 2.89 | 3.00 | 2.77 | 1.66 |
| Male and Female | Entry | 6.86 | 6.00 | 6.50 | 2.55 |
| Male | Exit | 3.36 | 3.00 | 2.98 | 1.73 |
| Female | Exit | 2.89 | 3.00 | 3.88 | 1.97 |
| Male and Female | Exit | 6.25 | 7.00 | 8.19 | 2.86 |

**Table 9:** Mean, Median, Variance, and Standard Deviation of Monday Evening Entries and Exits

**Table 10:** Mean, Median, Variance, and Standard Deviation of Wednesday Morning Entries and Exits

**Table 11:** Mean, Median, Variance, and Standard Deviation of Wednesday Afternoon Entries and Exits

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Wednesday March 25th - Afternoon** | | | | | |
| **Sex** | **Entry/Exit** | **Mean** | **Median** | **Variance** | **Std. Dev.** |
| Male | Entry | 5.85 | 6.00 | 5.57 | 2.36 |
| Female | Entry | 4.91 | 5.00 | 3.46 | 1.86 |
| Male and Female | Entry | 10.76 | 11.00 | 9.38 | 3.06 |
| Male | Exit | 2.09 | 2.00 | 2.09 | 1.44 |
| Female | Exit | 1.76 | 1.00 | 4.63 | 2.15 |
| Male and Female | Exit | 3.85 | 3.00 | 10.01 | 3.16 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Wednesday March 25th - Evening** | | | | | |
| **Sex** | **Entry/Exit** | **Mean** | **Median** | **Variance** | **Std. Dev.** |
| Male | Entry | 3.97 | 4.00 | 2.96 | 1.72 |
| Female | Entry | 3.17 | 3.00 | 3.50 | 1.87 |
| Male and Female | Entry | 7.14 | 7.00 | 8.50 | 2.92 |
| Male | Exit | 2.90 | 3.00 | 3.45 | 1.86 |
| Female | Exit | 2.69 | 3.00 | 2.79 | 1.67 |
| Male and Female | Exit | 5.59 | 5.50 | 5.75 | 2.40 |

**Table 12:** Mean, Median, Variance, and Standard Deviation of Wednesday Evening Entries and Exits

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Wednesday March 25th - Morning** | | | | | |
| **Sex** | **Entry/Exit** | **Mean** | **Median** | **Variance** | **Std. Dev.** |
| Male | Entry | 3.93 | 4.00 | 6.84 | 2.62 |
| Female | Entry | 3.07 | 3.00 | 4.61 | 2.15 |
| Male and Female | Entry | 7.00 | 7.00 | 18.31 | 4.28 |
| Male | Exit | 0.19 | 0.00 | 0.23 | 0.48 |
| Female | Exit | 0.26 | 0.00 | 0.28 | 0.53 |
| Male and Female | Exit | 0.44 | 0.00 | 0.49 | 0.70 |