ElevatorUp

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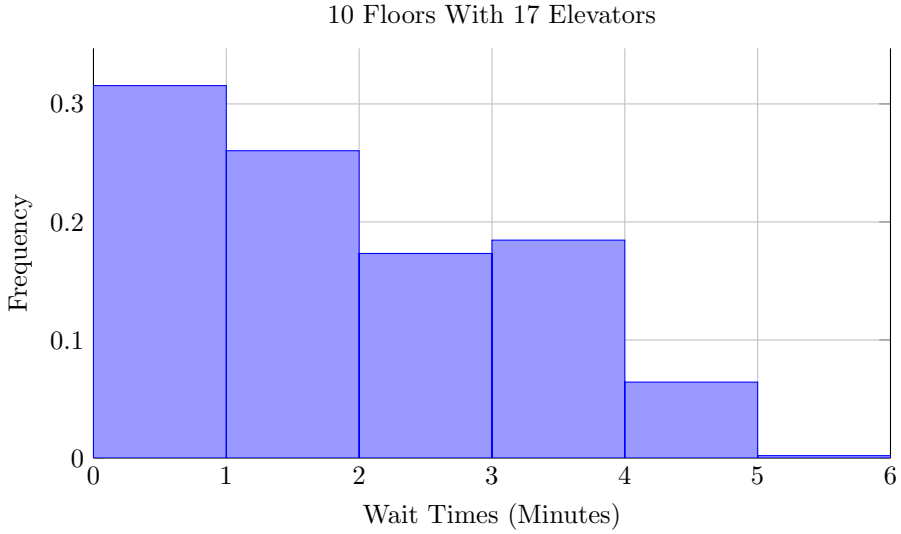
1 Introduction

We chose to use ten floors and 400 days for the experiment. Through trial and error, we found that with 17 elevators no one had a wait time of six minutes or greater. From here, we were able to compare adding an elevator to the building versus having a gap between floor arrivals. Realistically, a building would want to avoid adding another expensive elevator, so if the same improvement in wait times can be realized with a reasonable time gap, that is certainly preferable. We will then, using the same time gap and number of elevators, see if a building with eleven floors is still able to maintain less than 6-minute waits.

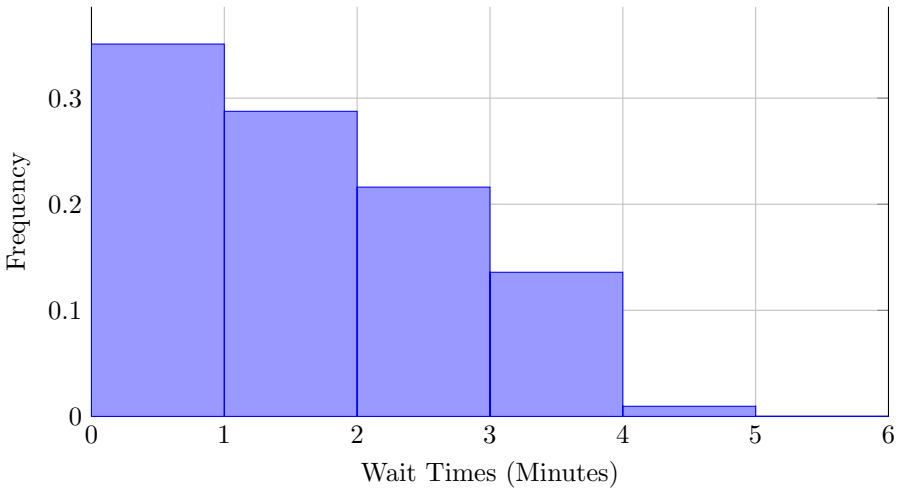
2 Results

At ten floors and no gap, we found that 17 elevators were needed to keep people from waiting more than six minutes.



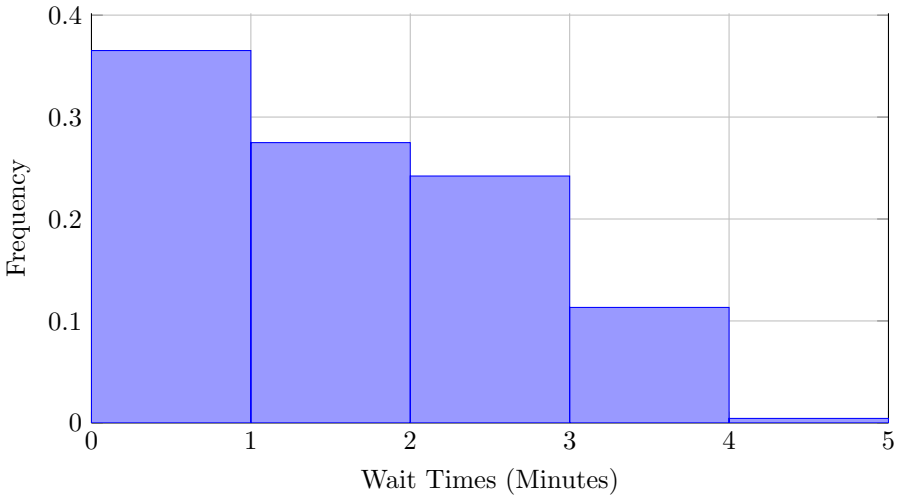
At ten floors, no gap, and 18 elevators, we found the following histogram.

10 Floors With No Gap and 18 Elevators

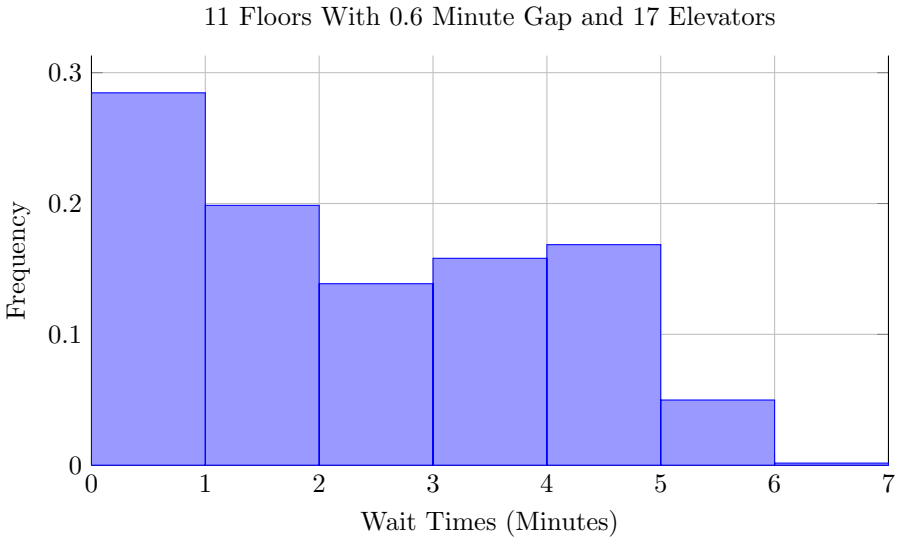


We then, using trial and error and a manual binary search, looked for the necessary gap to match these results with one fewer elevator. As it turns out, with 17 elevators, the gap time between floor arrivals would have to be 0.6 minutes in order to be have wait times at least as good as having an additional elevator. This corresponds to selecting 0.03 as our g in the simulation.

10 Floors With a 0.6 Minute Gap and 17 Elevators



At 11 floors, a 0.6 minute gap, and 17 elevators we found the following histogram. Notice that this histogram is that only one with wait times over six minutes.



3 Conclusion

We found that with ten floors, in order to reach better results in wait time than having 18 elevators, there would have to be a gap of at least 0.6 minutes between floor start times. This would mean that there would be about 5.4 minutes when the building would not be full. If somehow this loss of work costs more to the company than putting in another elevator (very unlikely), then a new elevator should be installed.

The addition of another floor changes the wait times with the max wait time being at least seven minutes. This means that adding a new floor would have to be a serious consideration for a building where they staggered the arrival times of floors.