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<center>Recommendation</center>

Based on the data that was provided, I have determined the optimal number of regular

and express lanes for your grocery store but will raise a few concerns regarding the unfortunate

but inherent abstraction of that data. First and foremost, I have omitted "arrival simple.txt" from

my calculations primarily because it seems somewhat unreasonable to seriously consider the

number of lanes a grocery store should utilize if only three customers are actually expected and

because it would have significantly altered my recommendation, making it unreasonable in

several scenarios. The optimal solution for that case alone, however, is 1 regular lane and no

express lanes, generating an average wait time of 2.17 minutes for all the customers. Instead, I

have only included "arrival medium.txt" and "arrival.txt" in my recommendation. Because there

is still a substantial disparity in the number of customers corresponding to these two files (452

and 3000 respectively) and it would thus have been impossible to formulate a generalized

recommendation using the explicit data in each file, I have decided to calculate the optimal

solution for both situations separately and then average the results, effectively treating both

scenarios as edge cases. As such, my solution is more tailored for a situation with approximately

1726 customers, assuming the other data remains about the same. The optimal solution for

"arrival.txt" is 9 regular lanes and 3 express lanes, generating an average wait time of 12.73

minutes for all the customers and an average maximum of 10 customers for all the lanes at any

point in time. Any change in the number of lanes will result in an approximate minimum average

wait time of 36 minutes and an average maximum lane length of 26 customers, both of which seem unreasonably excessive. The optimal solution for "arrival medium.txt" is 2 regular lanes and 1 express lane, generating an average wait time of 1.56 minutes for all the customers and an average maximum of 4 customers for all the lanes at any point in time. Any change in the number of lanes will result in an approximate minimum higher average wait time of 26 minutes and an average maximum lane length of 20 customers, both of which again seem unreasonably excessive. A change could also have been made in the opposite direction, achieving an average wait time of 0.39 minutes and an average maximum lane length of 3 customers with just the addition of one regular lane; however, this solution does not seem cost effective when taking into account the minimal improvement that accompanies it. Therefore, the optimal solution for a generalized scenario taking both of these cases into account and weighing their significance equally is 6 regular lanes and 2 express lanes, generating an approximate average wait time of 7.15 minutes for all the customers and an average maximum of 7 customers for all the lanes at any point in time. Note, however, that since the average of the regular lanes is actually 5.5 and has been rounded to 6, there may be some inaccuracy in these calculated values for the generalized recommendation. This should not pose a significant issue, however, as it will only slightly lower the average wait time. Furthermore, 7.15 minutes or even slightly lower is a fairly reasonable wait time and thus will not effect any significant negative changes in cost efficiency.