Project 1

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**Scenario 1:**

For scenario 1 I set up two order stations and one pickup window. When a car came to the shop I checked to make sure the total amount of people waiting in line was less than 10. If it was greater than 10 then the customer left. If it was less than 10 then the customer went into the shortest of the two order lines. Once the customer ordered I checked to see if the pickup line was less than 6. If it was greater than 6 then the customer waits at the order station until there is less than 6 in the pickup line. If there is less than 6 in the pickup line then the customer leaves the order station and moves into the pickup line. Then the next in the order line moves to the order station. If the time on their food is not done then they wait that amount of time plus the amount of time to pay. Once the customer picks up their food at the pickup window then the customer leaves and the next in the pickup line moves to the pickup window. I had this run for 2 hours of simulation time.

I tested the mean interarrival time(AP) at 6 different times: 0.5, 1, 1.5, 2, 2.5, and 3 minutes. I ran the simulation with each of these AP times 30 times. For 0.5 a minute, I got an average of 54 people served food and 157 people who left without getting in line. For 1 minute, I got an average of 48 people served food and 58 people who left without getting in line. For 1.5 minutes, I got an average of 45 people served food and 24 people who left without getting in line. For 2 minutes, I got an average of 44 people served food and 3 people who left without getting in line. For 2.5 minutes, I got an average of 43 people served food and 2 people who left without getting in line. For 3 minutes, I got an average of 38 people served food and 0 people who left without getting in line. So, with these numbers I believe the best option for the upper limit would be for the mean interarrival time to be set to 2 minutes.

**Scenario 2:**

For scenario 2 I set up two order lines, two post order lines and one pickup window. When a car came to the shop I checked to make sure the total amount of people waiting in line was less than 10 (this includes the post order lines and the order lines). If it was greater than 10 then the customer left. If it was less than 10 then the customer went into the shortest of the two order lines (this was figured out by checking the number of cars in both the order line and post order line). Once the customer ordered they were moved from the order station (simulating the human walking to the next car) into the post order line. Then I checked to see if the pickup line was less than 6. If it was greater than 6 then the customer waits in the post order line until there is less than 6 in the pickup line. If there is less than 6 in the pickup line then the customer leaves the post order line and moves into the pickup line. If the time on their food is not done then they wait that amount of time plus the amount of time to pick up the food. Once the customer picks up their food at the pickup window then the customer leaves and the next in the pickup line moves to the pickup window. I had this run for 2 hours of simulation time.

I tested the mean interarrival time(AP) at 4 different times: 0.5, 1, 1.5, and 2 minutes. I ran the simulation with each of these AP times 30 times. For 0.5 a minute, I got an average of 44 people served food and 168 people who left without getting in line. For 1 minute, I got an average of 66 people served food and 26 people who left without getting in line. For 1.5 minutes, I got an average of 51 people served food and 25 people who left without getting in line. For 2 minutes, I got an average of 52 people served food and 0 people who left without getting in line. So, with these numbers I believe the best option for the upper limit would be for the mean interarrival time to be set to 1.5 minutes.

**Scenario 1 VS Scenario 2:**

Scenario 2 increases the throughput of customers once you hit a minute for the AP time. I believe the restaurant should switch from scenario 1 to scenario 2 if they have an average AP time over 1 minute because scenario 2 has a higher throughput than scenario 1. But if the average AP is under 1 minute then they should stay with scenario 1 because under 1 minute scenario 1 has a higher throughput then scenario 2.