Henry Clements is a friend of yours who has a car rental agency in major metropolitan area. Although he is an independent company he works closely with three other independent companies in metro area. They share information and each they forecast the number of cars each will need the following week. Then if needed, the will transfer cars between location on Sunday when none of the agencies is open. If they have to go and get a car during the week, it will cost $75 each considering the lost time and good will of making the customer wait. Moving on Sunday gives the customer the option to return the car to any of the four locations and it has allowed Henry and the other agencies access to extra cars to meet their needs. Everyone is happy with this arrangement.

Henry reviewed his company's performance and he believes there is room for improvement. He has obtain records for the last three months. The data he collected are shown below. It is Friday and he has to input his forecast for the number of cars needed tomorrow. He knows you are have been taking a class in Quantitative Analysis and has asked you to review his data and help with his forecast and determine what else he might to do increase his performance. As you discuss the situation with him, you learn that he wants to be able to meet the customers' requirement for a vehicle 95% of the time. He says he rarely ever gets complaints if the exact model is not available, as long as he has a vehicle available, so he does not try to anticipate particular size or model requests and lets randomness take care of that. Weekly demand is as follows.

Week 1	126	Week 7	243
Week 2	200	Week 8	167
Week 3	243	Week 9	131
Week 4	167	Week 10	208
Week 5	132	Week 11	251
Week 6	211	Week 12	171

In the past Henry has used the average number of cars as his basic number and adjusted to meet his goal of 95% service. He asks you about some other methods he has heard about.

1. What should his forecast be using his method? What are the mean and standard deviation of the demand?
2. What would the forecast be if he used regression analysis? What is the regression formula? What is the r value?
3. What about time-series forecasting? There are at least six time-series methods. Which is best? What is the MAD of each option?
4. What will you tell him about which is the best option?

Henry has two people who can check cars out for a rental. One works at the service counter and the other works in the office and can come out to help if needed. Henry has determined that people arrive following a Poisson distribution. Rentals average about 24 per day and the service person take about 15 minutes to process a customer for a rental. [Note. Henry's business is in a community, not in an airport, so he is only open 8 hours a day.] Henry sees that the agent at the service counter in not busy all the time so he is contemplating not keeping the office person trained and leaving only the service counter person.

5. Is this a wise move? What is the average time the customer takes from when he/she arrives until he/she has a car?
6. Currently, when the office person in serving customers, a second line forms in front of the counter. Is that how Henry should set up the waiting area or is there a better way?
7. What are the time in the queue and time in the system for your proposed method (if different from Question 2.

When a car is returned to his location, Henry has three employees who prepare the car for the next rental. As a car arrives, one of the employees takes the car and washes it, cleans and vacuums it, and inspects it and prepares the paperwork for the next rental and returns the car to the lot. The employees each take a car in sequence. Henry has observed the process and has observed the time each takes to complete each step. He asks you if there is a better way to organize this part of the operations. The information about the times (in minutes) is as follow:

	Wash	Vacuum	Inspect & return
Beverly	22	13	11
Cameron	15	17	20
Tina	19	19	14

Each rental requires two agreement forms, one for when the car is checked out and one when it is checked in. Henry orders these form from a local printer. The printer charges Henry $40 to set up the printer. The forms cost 50 cents each. Because of the damage to the forms and the forms becoming obsolete, it cost Henry 25% to store the forms. The printer will only accept orders in multiples of 100.

8. If the three months of data collected and presented above is indicative of all demand, how many forms should Henry order?
9. The printer offers Henry a 10% discount if Henry orders 5000 or more form at a time. Would this be advantageous to Henry?
10. How much would it save if any?

Henry is now ready compute what do with the cars on Sunday. The other locations report the following on-hand and needed cars. Henry will have 150 cars on-hand Saturday night.

	Location North	Location East	Location South
On-hand	165	180	210
Needed	195	160	190

Based on past experience, the cost to move cars is:

Between	And	Cost
Henry	Location North	$12
Henry	Location East	$22
Henry	Location South	$17
Location North	Location East	$7
Location North	Location South	$28
Location East	Location South	$14

11. How many cars will need to be moved and what will the total cost of the move be?

12. Based on all the above computations, what would you recommend to Henry about his operation and what changes would you propose (if any)?