Question 1: Capacity Analysis

A garment factory produces sweaters for men, women and children. It runs two shifts per day (250 days per year), with 8 hours of working time each. The data for its only critical operation (i.e. bottleneck) are shown in the table below.

a) Assuming machine utilization is not to exceed 90%, determine how many machines are needed for this operation.

	Men	Women	Children
Yearly Demand	70,000	60,000	110,000
Setup Time [h]	0.7	2	2.5
Processing Time [h]	0.05	0.1	.03
Lot Size	240	180	400

b) How does your answer to a) change, if you decrease lot sizes to one half of their current values? How about decreases to a quarter or a tenth?

c) What do you think about decreasing lot sizes?

Question 2: Inventory Build-Up Diagrams

Solve Problem 4 in the course reader. (On the page preceding the *Note on the Management of Queues.)*

Question 3: Queueing Theory

An ATM machine experiences random arrivals of 15 customers per hour and can handle 18 customers per hour. Assume that arrivals are Poisson and that the service rate is exponentially distributed.

a. What is the probability that there is no customer in service?

b. What is the average number of customers in line?

c. What is the average waiting time at the ATM?

d. How much time does the average customer wait before she gets her money?

e. What is the probability that a customer has to wait?

Question 4: Queueing Theory

A decorator receives requests for initial consultations at a rate of 2.5 per hour. He averages 10 minutes with each customer.

a. Compute the operating characteristics of the customer waiting line, assuming Poisson arrivals and exponentially distributed service rates.

b. Service goals mandate that customers should (on average) wait no longer than 5 minutes. Is this goal being met? What do you recommend?

c. If the decorator reduces his average service time to 8 minutes per customer, what is the service rate going to be? Will this help meeting the service requirement?