Quiz 1

Suppose you are supervising a car assembly line, where different parts of a car are installed into a fabricated car body. The assembly line has four processing stations in order:

A: Engine Setup → B: Wheel Assembling → C: Door Assembling → D: Window Assembling.

Assume the following amount of work is required at each station: A: 60 minutes, B: 45 minutes, C: 30 minutes, and D: 30 minutes. There is one worker at each station.

1. What is the flow time (mins)? What is the bottleneck station, the capacity rate of your process (cars per hour), the cycle time of your process (mins), the average utilization of your resources (in %)?
2. If an additional worker is available, what is the best way allocating this resource (assuming that the additional worker can only be added to one certain station)?
3. Assume the additional worker has been added to the station you choose in question 2. What is the new bottleneck stage?
4. Following question 3, what is the new flow time (mins), the new capacity rate of your process (cars per hour), the new cycle time of your process (mins)? the average utilization of all of your resources now (in %)?

Quiz 2

Customers enter the camera department of a store at the average rate of 6 per hour. The department is staffed by one employee, who takes an average of 6 minutes to serve each arrival. Assume this is a simple Poisson arrival exponentially distributed service time situation.

1. As a casual observer, how many customers would you expect to see in the camera department? what is the probability would you expect to see three customers in the camera department?
2. How long would a customer expect to spend in the camera department (total time) (in minutes)? What is the utilization of the clerk (in %)?

C-Spec, Inc., is attempting to determine whether an existing machine is capable of milling an engine part that has a key specification of 4 ± 0.003 inches. After a trial run on this machine, C-Spec has determined that the machine has a sample mean of 4.001 inches with a standard deviation of 0.002 inch. we assume the desired quality level is 3-Sigma.

1. Calculate the C_{pk} for this machine.
2. Should C-Spec use this machine to produce this part? Why?

Quiz 3

Demand for T-shirts follows a discrete distribution. The demand has values of 100, 200, 300, 400, 500, 600 with equal probability. Cost of one T-shirt is $10, the selling price of one T-shirt is $15, each unsold T-shirt is worth $5.

1. What is the under-stocking cost Cu and the over-stocking cost Co?
2. What is the optimal initial order quantity?

A mail-order firm has a warehouse. Weekly demand at the warehouse is 10,000 units. The company purchases each unit of product at $10. Annual holding cost of one unit of product is 25% of its value. Each order incurs an ordering cost of $1,000 (primarily from fixed transportation costs), and lead time is 1 week. Assume 50 (NOT 52) working weeks in a year.

1. What is the optimal order quantity (EOQ) for one single warehouse? What is the reorder point for this single warehouse?
2. How much average inventory can the company now expect to hold? What is the total cost?

Quiz 4

Here are the actual tabulated demands for an item for a nine-month period(Jan. through Sept.).

Month	Actual	Month	Actual
January	110	June	180
February	130	July	140
March	150	August	130
April	170	September	140
May	160		

1. Forecast April through September using a three-month moving average.
2. Use simple exponential smoothing with an alpha of 0.3 to estimate April through September, using the average of January through March as the initial forecast for March.
3. Use MAD to decide which method produced the better forecast over the six-month period.

Quiz 5

A builder has located a piece of property that she would like to buy and eventually build on. The land is currently zoned, but she is planning to request new zoning. What she builds depends on approval of zoning requests and your analysis of this problem to advise her. The decision process has been reduced to the following costs, alternatives, and probabilities: cost of land: $2 million; probability of rezoning: 0.6. If the land is rezoned, there will be additional costs for new roads, lighting, and so on, of $1 million.

If the land is rezoned, the contractor must decide whether to build a shopping center or 1500 apartments that the tentative plan shows would be possible. If she builds a shopping center, there is a 70 percent chance that she can sell the shopping center to a large department chain for $8 million and construction cost is $4 million; and there is a 30 percent chance that she can sell it to an insurance company for $9 million and the construction cost is $4 million. If, instead of the shopping center, she decides to build the 1500 apartments, she places probabilities on the profits as follows: There is a 60 percent chance that she can sell the apartments to a real estate investment corporation for $5000 each. There is 40 percent chance that she can get only $2000 for each. The construction cost for each apartment is $2000.

If the land is not rezoned, she will comply with the existing zoning restrictions and simply build 600 homes, on which she expects to make $6000 for each and the cost for each of them is $2000.

Draw a decision tree of the problem and determine the best solution and the expected net profit.