Inventory Management and Production Planning Questions

Production Planning

> If a production system produces 4 products and has a set-up (changeover) time of 4 minutes and run-time (time actually manufacturing) of 20 minutes, what will the maximum possible utilization be?

Max Util = RT/(RT+S/U) = 20 mins/24 mins = 83.3%

Inventory Management

Ian MacMillan operates a store specializing in the import of Scottish Woolens. His fastest-moving items are tartan (plaid) sweaters. Ian has hired you to design a more efficient inventory ordering policy for him. This is a critical business issue, because his holding costs are quite high (25% of material variable cost annually) due to his location in the Arboretum mall. His sweaters typically cost him $40 each, and he sells them for $80 apiece. Fortunately, he does not have to account for end-of-year clearances, because good tartan sweaters never go out of style, and he has no direct competitors. After looking over his past sales records, you determine that he seems to have a normally distributed sales demand averaging 50 sweaters per week with a standard deviation of 20 sweaters. His lead time from the Isle of Harris in Scotland is four weeks. Due to the difficulty in specifying which Tartan patterns he wants, it usually takes him 2 hours of labor at $100 per hour to place an order. The store is open 50 weeks each year. Assume Ian chooses a continuous replenishment policy.

i. What should Ian's optimal order quantity be (rounded to the nearest whole number)?
D = 50 wks/yr * 50 sweaters/wk=2500 sweaters/yr
S = 2 hrs * $100 per hour = $200
h = 25%/year
C = $40

Q=EOQ = Square root of [2DS/(hC)] = sqrt[2*2500*$200/(0.25*$40)] = 316 sweaters

ii. Assume Ian wants a 95% service level (which corresponds to n=1.65 standard deviations). At what point should he reorder (rounded to nearest whole number)?
LT = 4 wks
U = D * LT = 50 sweaters per week * 4 weeks = 200 sweaters
σ_{LT} = sqrt(LT)*20 sweaters = 40 sweaters

R = U + 1.65 σ_{LT} = 200 sweaters + 1.65 * 40 sweaters = 266 sweaters

iii. Assuming no stockouts, what is Ian's average inventory?
Avg I = Q/2 + SS = 316/2 + 66 = 224 sweaters

iv. What is Ian's holding cost per year in dollars going to be, assuming no stockouts?
Avg Cost = h * C * Avg I = 0.25/sweater/yr * $40 * 224 sweaters = $2240/yr