Activity: what a larger hub batch does

Chapter 10, Multi-Echelon Systems with Batch Ordering

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Work in pairs, with Chapter10Models.xlsx. 20 minutes.

Names: _____

The system. The chapter's running example, as `Chapter10Models.xlsx` ships: the fuse cutout at a hub and four storerooms, each storeroom seeing one failure a week and running base stock $S_j = 3$, one week from the hub. The hub runs $(r_0, Q_0) = (9, 8)$ with a three-week supplier. Holding costs \$28.75 per cutout per year at either level, and a crew waiting at a storeroom \$287.50 per cutout per year. There is no ordering cost.

The chapter tried a batch of twelve. The supplier now offers a better price for **sixteen** at a time, double the present batch.

Part A. Predict

With the batch doubled and the reorder point left at 9, will each of these go up, go down, or stay the same?

	Up, down or same?
The hub's ready rate	
The mean wait of a storeroom's request	
Expected backorders at each storeroom	
The storeroom base stock S_j that costs least	
The system's cost per week	

Part B. Change one cell

Record the five figures as the workbook ships, then type **16** into `Hub!B19` and record them again. On the `Exact` sheet, find the storeroom base stock with the lowest cost at each batch.

Cell	What it is	$Q_0 = 8$	$Q_0 = 16$
`Hub!B22`	$\bar{B}_0$, the hub's expected backorders		
`Hub!B23`	$\overline{RR}_0$, the hub's ready rate		
`Hub!B27`	$\bar{W}$, the mean wait, weeks		
`Storeroom!E19`	backorders per storeroom		
`Exact!B28`	system cost per week		
`Exact`	the cheapest S_j		

Part C. Check two cells by hand

1. Obtain $\bar{W}$ from $\bar{B}_0$ by Little's Law, in weeks and in days, and compare with `Hub!B27`.
2. Obtain the hub's expected on-hand at $Q_0 = 16$ from $\bar{I}_0 = \bar{B}_0 + r_0 + (Q_0 + 1)/2 - E[D_0(L_0)]$, and say what the larger batch has done to the stock the hub holds.

Part D. Move the reorder point, then price the offer

1. Keep $Q_0 = 16$ and lower `Hub!B18` one step at a time from 9, watching `Exact!B28`. At which reorder point is the cost lowest, and what is it?
2. How much more a week does the batch of sixteen cost, at its best, than the present policy? Convert it to dollars a year, and then to a discount per cutout on the 208 cutouts a year the hub buys.
3. What would the offer have looked like to a planner who changed only the batch?

Part E, if you have time. What stays put

At the cheapest policy for each batch, 8 (reorder point 9), 12 (reorder point 7) and 16 (your answer to Part D), compute the hub's average position, $r_0 + (Q_0 + 1)/2$. What does the hub's best policy keep nearly fixed as the batch grows, and why does the reorder point have to fall?

Exit ticket (tear off and hand in)

Name: _____

1. The batch of sixteen raised the hub's ready rate and cut every storeroom's backorders, yet the system costs more. Why?

2. True or false, and why: the reorder point can be left alone when the batch changes, because the reorder point protects against the lead time, and the lead time did not change.