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OM 352, Quiz 3
Time: 45 minutes

1 December 2023
Total points: 23

Multiple Choice Questions (5 pts.)

1. (1 pt.) In Distribution Management, which of the following is a valid reason why we have the constraint “Flow In + Supply \geq Flow Out + Demand”, instead of “Flow In + Supply = Flow Out + Demand”?
 - a. It allows for the possibility of excess demand.
 - b. It is better to tell Solver what is possible, and let Solver determine what is optimal.
 - c. It is only feasible if Supply = Demand.
 - d. It makes the model linear and easier for Solver to find an optimal solution.
2. (1 pt.) If we increase the reorder point (ROP) in an inventory system and all else remains the same, which of the following we expect to happen?
 - a. The average number of orders in a year increases
 - b. The amount of shortages in a year increases
 - c. The annual holding cost increases
 - d. The fill rate decreases
3. (1 pt.) Inventory theft falls into which inventory cost category?
 - a. It is irrelevant
 - b. Shortage cost
 - c. Ordering cost
 - d. Holding cost
4. (1 pt.) Suppose $Q = 50$ and $ROP = 75$. The lead time is two days. The last two orders placed were yesterday and 4 days ago. The current inventory on hand is 10 units. Which of the following statements is completely correct?
 - a. The current inventory position is 10 units and therefore we should not place an order today
 - b. Both last orders have arrived and therefore we should place another order today
 - c. The current inventory position is 60 units and therefore we should place an order today
 - d. The last order has not received yet so we should not place a new order today
5. (1 pt.) What is the slope of the line represented by $2x - 3y = 10$?
 - a. Zero (horizontal line)
 - b. 0.667
 - c. -1.5
 - d. Infinite (vertical line)

EOQ model (3 pts.)

Suppose in an inventory system the annual demand is 1200 units, the order cost is \$250 per order, the holding cost is \$25 per unit per year, and lead time is one month.

6. (1 pt.) If the average number of orders is 10 times per year, what is the order size?
7. (1 pt.) If $ROP = 150$, what is the safety stock (i.e., the minimum inventory)?
8. (1 pt.) Based on the information in the last two questions, what is the annual holding cost?

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Evacuation Planning (8 pts.)

The City of Broken Arrow is planning for a potential evacuation from Downtown (Node 1) to the Safe Zone (Node 15). The “EVAC” worksheet contains a completed distribution model to determine the maximum flow (# of people in thousands) that can evacuate per hour. The completed model is set to maximize the Demand at Node 15, with an added capacity constraint for each arc. Please note that Demand at Node 15 is also a variable cell. The arcs are all one-way for the purpose of evacuation. Assume that all formulas entered are correct.

Note: Make a copy of “EVAC” worksheet to answer Questions 9 and 10 as these are independent questions.

9. (2 pts.) Solve the model without making any changes. Report the flows along each arc, as well as the maximum flow from Node 1 to Node 15.
10. (2 pts. for feasibility, 2 pts. for consistency, 2 pts. for optimality) Suppose it is possible to double the capacity of up to 4 arcs in case of emergency by allowing traffic on both sides of the road. Doubling an arc would increase its capacity. Undoubled arcs would have the same capacity as before. Revise the model and report the flows along each arc, whether each arc was doubled, as well as the maximum flow from Node 1 to Node 15.

GoFarm Insurance, revisited (7 pts.)

The “GF” worksheet has a modified version of the model for Question 3 of HW9, where we found the best dividing line that minimizes the total net cost in the training set. The new model includes only 5 fraud claims and 5 no-fraud claims in the training set, to make the problem easier for solver. All formulas already entered are correct. Use the “GF” worksheet to answer Questions 11-12.

11. (3 pts. feasibility, 1 pt. consistency, 1 pt. optimality) Complete solver settings to find the best horizontal line (i.e., of the form $c_2 \cdot \text{Hectares} = b$) that minimizes the total net cost in the training set. Report
 - values of c_1 , c_2 , and b ,
 - value of binary misclassification variable for each claim in the training set,
 - the total net cost of the claims in the training set, using the solution you found.
12. (2 pts.) Use your solution from Question 11 to decide whether each claim in the test set should be inspected or not. Note that the actual type of each claim in the test set is known to us. However, the decision whether to inspect these claims should not depend on this information. Further, calculate and report the net cost for each claim in the test set. Note that the net cost for each claim in the test set depends on the inspection decision and the actual type of the claim. See table below.

Claim type	Inspection	No inspection
Fraud	$\$5,000 - \$15,000 = -\$10,000$	Amount claimed
No Fraud	$\$5,000 + \text{Amount claimed}$	Amount claimed

Table 1. How net cost is calculated