IE 375 Comments on Homework #3

One general observation is about the way that you round numbers. You must make sure that you treat all the values in the required accuracy. You lost some points when you rounded too much. Of course, there is always a limit on the number of digits to carry, and that understanding should come with the problem statement.

Homework 3 statistics:

Average: 1.25 (out of 2, with bonus 3), Standard Deviation: 0.89

Grade	2	1	0
# of students	22	6	12

Question 1

This is an interesting problem as it forces you to search for some implementable inventory policies. There is nothing special in the solution as you need to be careful and a bit meticulous in not letting any possibility out. The optimization is crude, as you search all the alternatives and select the best.

<u>Comments regarding your performance:</u>

- In question 1 *part a and b,* we expect from you to consider two cases where $k \geq Q$ or $k < Q$. Unfortunately, none considered both of cases. Both students considering just one case took partial points.
- In question 1 *part c*, most of you attempted to explain your different reasons clearly. Thank you for your comments.

Grade	**2**	**1.5**	**1**	**0**
# of students	**0**	**23**	**5**	**12**

Question 2

This question was asked in an exam several years ago. Here are the comments:

This is a rather standard inventory problem.

Part a) askes for the optimal order quantity. The only thing you should do is to make sure that units used are consistent with each other. Other than a few who did not know the associated costs, most of you did this part.

Part b) asks for the associated cost. I am happy to see that some of you used the original formulation to compute the associated cost, rather than using one of the given formulas. It shows that you are not memorizing and would not risk making a mistake when you are not sure what to use – of course in homework assignments all formulas are available.

Part c) asks the time between two consecutive orders, i.e., T. The answer is quite simple, but a lot of answers are expected to be incorrect. Issue of precision of numbers came into consideration in this question. See the general remarks in the introduction of this document.

Part d) asked reorder level, which is defined in the textbook. You were expected to take the lead-time into account. Unfortunately, precision of the answer as well as the answer itself was unsatisfactory for a group of you. The answer is simple: Lead time is 20 days; daily demand is 20 engines. Hence the reorder level is 400 engines. When inventory drops to 400 engines we order.

Part e) is another way of asking the same question as part d): "If you have 1200 engines available, when are you going to order?". Answer is simple – we wait until it drops to 400. So, time needed to demand 800 engines is 40 days.

Part f) is a bit more complicated.

First, let us consider the general case where fixed ordering cost is increasing (the one you are given is called a "ladder" type, as it is a step function) but step size is arbitrary (in the problem it is equal). In other words, for the first container you pay K_1, for the second K_2, and so on. When you *have a different* type of fixed ordering cost the solution is not straightforward. You may think that the limitation will dictate and hence order quantity is equal to the limitation. Of course, what I wanted you to understand is the possibilities you have and select the best one. The answer to the question should be to lay down possibilities and select the best among those possibilities. Here are the possibilities:

- Order quantity = capacity of a single container – We know that this would be worse than our optimal solution.
- Order quantity is selected optimally when you decide to use two containers – this means that you solve the problem with a fixed cost which is twice of the fixed container cost.
    - If the EOQ obtained is less than the capacity of two containers (and more than the capacity of a single container, which would be case in this problem, by construction), this EOQ the best solution that can be obtained with two containers.

- If the EOQ obtained is larger than the capacity of two containers, evaluate the cost of
- Order quantity = capacity of two containers

* Continue with the case three containers, and so on.

Note that you may be able to show some characterictics that will reject some of the possibilities listed above. Those of you who read quantity discounts will appreciate the above answer.

In our problem, on the other hand, there is a structure that one can exploit. When step sizes of the "ladder" type function is constant, one can obtain a nice property: If the solution of the unconstrained problem yields a quantity less than the capacity, it is obviously optimal. On the other hand, when it exceeds the capacity limit, then the solution at the capacity limit is optimal. The reasoning is as follows: If a quantity that requires more than one container is selected, it will always be better off when to split the the order (send one container a bit later) with respect to holding cost and there is no change the total fixed ordering cost paid.

Main purpose of the problem was to make you observe the possibility of choices.

<u>Comments regarding your performance:</u>

- In this question, *parts a, b, and c* are basic computation questions. In these parts, the common mistake is about the change of units. All units must be consistent. If you work on annual basis, then your unit should be annual. Otherwise, your calculations will get wrong. Students who have inconsistent units in the calculations took partial points if they provided the correct formulae. However, if they did not provide the formulae, they could not take any points.
- In *part d,* some of you thought the reorder point in terms of time rather than quantity. Please, check the definition of reorder point.
- In *part e,* you can solve the question on the Q vs. Time graph easily. However, wrong approaches also took some partial points.
- In *part f,* the most critical points are the convexity of G(Q) function. However, some of you did not remember this property of G(Q). Please, review the characteristics of G(Q).

Grade	**2**	**1.5**	**1**	**0.5**	**0**
# of students	**14**	**10**	**1**	**1**	**14**