Inventory Management Exercises

IM_1:

The shop "Freshflavour" sells ice creams. The annual demand for this product is 20 000 litres and the price per litre is 12 euros. The owner of the shop estimates that order cost is 90 euros per order. The holding cost per year per litre is 20% of the price. Assume that the shop is open 250 days per year.

a) What is the economic order quantity?

b) Determine the total cost associated to this inventory management policy;

c) What is the time between orders?

d) Determine the number of orders per year.

e) Determine the inventory level 25 days after the reception of the first order;

f) Suppose that the supplier of the store "Freshflavour" only delivers quantities that are multiple of 100 litres. How much will this restriction cost the "Freshflavour"?

IM_2:

The store "PhoneParts" sells mobile phone accessories. Currently the store adopts a reorder point system for the inventory management of the hands-free car kit. The weekly demand for this product is 1440 units. The store has a fixed cost of €10 every time that places an order. The manager estimates that holding cost is €0,02 per unit per week. Assume that the store is open 50 weeks per year.

   a) What is the economic order quantity?

   b) What is the total annual cost?

   c) Knowing that the lead time of the supplier is 4 days, determine the reorder point.

   d) If the supplier only sells lots of 500 units, what lot size do you suggest to buy? Determine the impact of this restriction on the total annual cost.

IM_3:

The FRESHWINE company produces several kinds of wine, among them the wine "Quinta da Flor" which has an annual demand of 43000 litres. This wine is only sold in half-litre bottles. Currently the company has only one supplier for this kind of bottle. The price per bottle is €10, but the supplier offers a discount on the price for orders greater than 500 bottles. The cost schedules of the supplier are presented on the following table:

P	10	9,5	9	7
Q	≤500	501-700	701-900	>900

The order cost is €10 per order and the holding cost is 30% of the price. According to the quantity discounts offered, what order quantity would you recommend to FRESHWINE?

IM_4:

The LedTV company produces high-end TVs. One of the components used on the production of this kind of TVs is the component Ledx1, which has an annual demand equal to 12000 units. The holding cost of component Ledx1 during a year is 20% of the price and the ordering cost is 30€. The current supplier of component Ledx1 offers quantity discounts according to the following table:

p	€10	€9,5	€9,4
Q	<2000	2000≤Q<6000	Q≥6000

a) What is the economic order quantity for current supplier?

b) What price would justify ordering lots of 6000 units?

IM_5:

ARCHIVE produces various models of portable consoles, one of which is the ARC1, which has an annual demand of 750 units. To produce this model, the company purchases component CZ from an external supplier. 3 units of these components are used to produce each ARC1 console model. The ordering cost for ARCHIVE for each order placed is 200 euros, and the annual holding cost is estimated to be 10% of the purchase price per unit. The purchase price of each component is 25 Euros, although the supplier is willing to reduce the price to 20 Euros, if ARCHIVE purchases a minimum of 1000 units for each order.

Based on the conditions offered by the supplier, what order quantity would you recommend for ARCHIVE?

IM_6:

The company VITALENTE produces several kinds of optical lenses, among them the LEN01 model which has an annual demand of 60000 units. Currently the company has a capacity to produce 320 lenses of this model per day. The setup cost is equal to €200 and the holding cost of a lens of this model is €3,84 per year. Assume that the company works 250 days per year.

a) What is the optimal lot size?
b) Determine the total annual cost.
c) Determine the duration of each production run.
d) Compute the production time in each production run.
e) Determine the time between production phases.
f) What is the number of lenses in inventory when the production stops?
g) Determine the average inventory level.
h) Determine the inventory level 10 days after the beginning of the first production run.
i) Determine the inventory level 3 days before the end of a production run.

IM_7:

RODI is a Portuguese company which is dedicated to the production of dishwashers. The LAV01 model inox dishwasher is considered the top-of-the-range of the company, with an annual demand of 60000 units. The equipment used to produce this model restricts the production of lots multiples of 200 units. The unit cost of production is €1500 for lots with less than 800 units and decreases for €1400 if the lot size is equal or higher than 800. The setup cost is €300. Currently the company has the capacity to produce 100000 dish washers a year of the LAV 01 model. The holding cost of maintaining this model of dish washer in stock during a year is 10% of its unit cost of production. Assume that the company works 250 days per year (5 days a week).

What lot size of LAV01 model dish washers would you recommend for RODI? Determine the total annual cost for this quantity.

IM_8:

METEO internally produces climate control monitoring systems. The annual demand for these systems is 7500 units, and the company has the capacity to produce 200 units a week, with a unit production cost of 100 euros. The size of each of METEO's production batches is 600 units, with a setup cost of 250 euros. The annual holding cost of each unit stored in the warehouse is 25% of the unit production cost. The company works 250 days a year, 5 days a week.

a) Assuming that the company continues to work with production batches of 600 units, determine:

a1. How many systems are in stock when each production batch is completed?

a2. What is the annual holding cost?

a3. How many days does it take to produce a production batch?

a4. What is the stock level 18 days after the beginning of a production run?

b) Do you agree with the quantity of the production batch used by the company? If not, what quantity would you suggest? Justify your answer.

IM_9:

The company SOTINTA uses several chemical compounds in the production of its paints, among them the chemical compound TINT01, which has an annual demand of 1250 litres. Currently, the chemical compound TINT01 is ordered from a Spanish supplier at a cost of 4 euros per liter. The ordering cost is €150 and the holding cost is 25% of the price. The lead time of this supplier is normally distributed with a mean of 4 weeks and a standard deviation of 2 weeks. SOTINTA wants to adopt a reorder point policy with a probability of stockout lower than or equal to 2,5% for the chemical compound TINT01. The company works 250 days a year.

a) What is the economic order quantity for the chemical compound TINT01?

b) Determine the safety stock established by SOTINTA for the chemical compound TINT01.

c) Calculate the annual holding cost associated with this policy.

d) What is the service level for a reorder point of 183 litres?

IM_10:

BERDETINTO is a wine shop that sells an average of 140 bottles of wine per day, with a standard deviation of 10 bottles. These sales follow a Normal distribution. Lead-time of the supplier has, on average, of 6 days with a standard deviation of 1 day. BERDETINTO currently holds a safety stock of 329 bottles of wine in its cellars and orders batches of 4375 bottles of wine. The annual holding cost per litre is 1,50 euros and the cost of one order to the supplier is 50 euros.

a) What is the current re-order point?

b) What is current the level of service of BERDEDINTO? (Approximate to the closest percentile)

c) Compute the annual holding cost.

IM_11:

VENTILAR produces and commercializes cooling fans. Each fan is made up of a set of blades, which are produced internally by the company. The number of blades required is 1200 units a week, and the production capacity is 100000 units a year. The cost of production per unit is 18 euros, with a fixed cost of 300 euros each time the production of a new lot starts. Currently, a lot takes 20 days to be produced.

VENTILAR is presently considering whether to buy the blades from TOPÁS, which offers the following conditions for their supply:
- Unit price: 15 euros;
- Order costs: 180 euros;
- Lead time: random and normally distributed, with an average of 10 days, and a standard deviation of 2 days.

The company intends to adopt a reorder point policy with a stock-out probability equal to, or less than 2,5%.

The cost to hold a set of blades in stock during a year is 25% of its purchase price. The company works 50 weeks a year, 5 days a week.

   a) What is the lot size currently produced by VENTILAR?
   b) How many times is the production of a new lot started during a year? (If you have not answered question a), then assume a lot size of 4900 blades)
   c) Based on the present lot size, how many blades would be in stock 30 days after the start of production?
   d) What lot size would you recommend VENTILAR if opted to order the blades from the supplier TOPÁS?
   e) If the company was to opt to buy in the blades, what would be the stock level in the warehouse each time a new order is made, in order to guarantee the desired service level?
   f) Considering that the company aims to minimize annual holding costs, which option would you recommend – maintain the current policy of producing internally, or opt to order lots from the supplier of the size that you recommended above?

IM_12:

KASIO makes scientific equipment, including the scientific calculator model DS, which has an annual demand of 90000 units. Each scientific calculator DS has a production cost of 40€. At present, KASIO is able to make 2500 scientific calculator DS per week. The production setup cost is 1000€ and the storage cost of each scientific calculator DS is 20€ per year. Additionally, each scientific calculator DS also has a 5€ annual theft insurance cost. The firm operates 5 days a week, 50 weeks a year.

a) What is the optimal lot size?

b) Starting from the beginning of the first production run, when is an inventory level of 700 units first reached?

c) Determine the cost of a production run. (if you haven't answered a), assume KASIO makes 5000 units each time during each production run).

d) Each scientific calculator DS uses 2 SH4 processors bought from a single external supplier. The ordering cost is 500€ and the unit price of the SH4 processors is 6€. However, the supplier agreed to lower the price to 5€ for orders of 50000 or more units. The holding cost of one SH4 processor during a year is 25% of its price.

d1) What is the optimal order quantity? Justify.

For strategic reasons, a new supplier for the SH4 processors was chosen. The new ordering cost is 100€ and the new unit price 7€. The lead time of the new supplier is normally distributed with a mean of 3 days and a standard deviation of 2 days. Assuming that KASIO orders 6000 SH4 processors each time it places an order and adopts a 98% service level, calculate:

d2) The re-order point.

d3) The annual holding cost.

IM_13:

BRIDESHEAD makes teddy bears, including the model ALOYSIUS, which has an annual demand of 40000 units. Due to the quality of its materials, each teddy bear costs 15€ to produce. The setup cost of the production line is 300€, and the opportunity cost is 10€ per unit per year. Currently, BRIDESHEAD is able to produce 60000 units every year. The interval between production runs of the ALOYSIUS model is 15 days. BRIDESHEAD works 5 days per week, 50 weeks every year.

a) What is the current lot size of the ALOYSIUS line?
b) During the production phase, how many units are stored per day?
c) Do you agree with the lot size chosen by BRIDESEHAD? If you don't, what lot size do you suggest the firm adopts?

d) Each ALOYSIUS bear uses 2 buttons for eyes. A single button costs BRIDESHEAD 4€ and its unit annual holding cost is 50% of that value. The buttons are ordered from an external supplier every time the inventory level reaches 1617 units. The supplier takes an average of 3 days, with a standard-deviation of 1 day to make the delivery. Delivery times are normally distributed. Each order to the supplier has a fixed cost of 50€.

d1) What is the probability that the firm will face a stockout due to lack of buttons for its teddy bears?
d2) How many orders of buttons should BRIDESHEAD make per year?
d3) What is the total annual cost BRIDESHEAD faces with buttons?

IM_14:

TRATARLIXO manufactures different types of garbage cans, including the model "Recycle01" with yearly demand of 12500 units. At their facilities in Leiria the company produces 100 garbage cans per day. The holding cost per garbage can per year is equal to 30% of the unit production cost. Start-up cost is of 60 euros and unit production cost is 30 euros. Currently, TRATARLIXO produces a batch of 600 units per production start-up. Please assume the TRATARLIXO operates 250 days, or 50 weeks a year (that is 5 days per week).

   a) How many production start-ups occur in a year?
   b) Compute the annual holding cost.
   c) What is the inventory level for Recycle01 eight days after the beginning of production?

   d) One of the components used in the manufacturing of the Recycle01 is a metallic pedal. Each garbage can use one metallic pedal. The holding cost per pedal per year is 20% of its price. The firm may choose to buy the pedal from one of two suppliers, each offering different conditions:

Supplier METALIC	Supplier SOMETAL
Lead time: normally distributed with mean of 3 weeks and standard deviation of 2 weeks	Lead time: 5 weeks
Price = 10 euros/pedal	Price = 15 euros/pedal
Order cost = 50 euros/order	Order cost = 70 euros/order

   TRATALIXO wishes to maintain a stock out probability less than or equal to 2,5%.

   d1) If TRATARLIXO chooses METALIC as the supplier, what level of safety stock would you recommend?
   d2) Which of the two suppliers would you recommend? Please justify your answer.

MULTIPLE CHOICE QUESTIONS

1. Daily demand for the product PERFUMAIS from D. Maria's shop is equal to 60. The cost of each order is 62,5 euros and D. Maria estimates the yearly holding cost to be of 3 euros per unit. Which of the following is the economic order quantity?

1		1560 units
2		791 units
3		50 units
4		300 units

2. According to the EOQ model, if the ordered quantity is 1400 units and the time between orders is 7 weeks, the stored quantity 4 weeks after the reception of the previous order is:

1		600 units
2		200 units
3		400 units
4		800 units

3. The company MO.CA produces cardboard furniture and appliances, such as the cardboard tree NATAL.CA, with annual demand of 1500 units. Currently the production capacity is of 10 units per day. Start-up cost of production is 120 euros and the yearly holding cost is of 30 euros. At present, MO.CA is producing batches of 150 units of NATAL.CA.

What is the annual holding cost associated with the batch size defined by the company?		
1		1038 euros/year
2		2250 euros/year
3		2595 euros/year
4		900 euros/year

What is the production time in each production run?		
1		3 weeks
2		15 weeks
3		5 weeks
4		22 weeks

4. The reputed Pharaoh's cigar factory consumes 1300 tobacco crates per year. The yearly holding cost per crate is of 3 euros. The lead time for the supplier of this type of tobacco is normally distributed with mean equal to 10 weeks and standard deviation of 5 weeks. Currently Mr Partágas, the factory director, is ordering batches of 500 crates. The factory operates 52 weeks per year.

Assuming the factory director wishes to maintain a stock out probability less than or equal to 2,5%, what level of safety stock do you recommend?		
1		1175 crates
2		125 crates
3		245 crates
4		12740 crates

Assuming the firm works with a safety stock of 750 boxes, what should the reorder point be?		
1		800 crates
2		1425 crates
3		13750 crates
4		1000 crates

If the company works with a safety stock of 750 crates, what should the annual holding cost associated with this policy be?		
1		3000 euros
2		1875 euros
3		1125 euros
4		2250 euros

5. Weekly demand for wholegrain flour at GOODBUY supermarket follows a Normal distribution with mean of 60 packages and standard deviation of 10 packages. The yearly holding cost of each package is 2 euros. The lead time is 8 weeks. Currently the supermarket owner orders batches of 500 packages.

Assuming the GOODBUY supermarket owner follows a safety stock of 70 packages, what is the service level provided to the customers?		
1		99,32%
2		95,0%
3		81,06%
4		85%

Assuming the GOODBUY supermarket owner follows a safety stock of 70 packages, what is the yearly holding cost associated with this inventory policy?		
1		640 euros/year
2		500 euros/year
3		1140 euros/year
4		140 euros/year

6. Annual demand for TVPLUS television sets at ELECTRICA store is of 10 000 units. The order cost is of 30 euros and the weekly holding cost per unit is 0,50 euros. How many orders should ELECTRICA make in a year?		
1		65 orders
2		9 orders
3		10 orders
4		24 orders

7. Weekly demand for tea bags at Mrs Amélia's tea store equals 125 bags. Ordering costs are 10 euros and Mrs Amélia estimates the yearly holding cost per tea bag to be of 0,50 euros.

Calculate the periodicity between tea bag orders.		
1		20 days
2		12,5 days
3		10 days
4		25 days

If the lead-time is 4 days, which of the following is the re-order point?		
1		100 units
2		20 days
3		500 units
4		2500units