CHAPTER 12: INVENTORY MANAGEMENT

TRUE/FALSE

1. According to the global company profile, Amazon.com's advantage in inventory management comes from its almost fanatical use of economic order quantity and safety stock calculations.
2. A major challenge in inventory management is to maintain a balance between inventory investment and customer service.
3. Which item to order and with which supplier the order should be placed are the two fundamental issues in inventory management.
4. One function of inventory is to take advantage of quantity discounts.
5. Work-in-process inventory is devoted to maintenance, repair, and operations.
6. ABC analysis classifies inventoried items into three groups, usually based on annual units or quantities used.
7. In ABC analysis, "A" Items are the most tightly controlled.
8. ABC analysis is based on the presumption that carefully controlling all items is necessary to produce important inventory savings.
9. Cycle counting is an inventory control technique exclusively used for cyclical items.
10. One advantage of cycle counting is that it maintains accurate inventory records.
11. In cycle counting, the frequency of item counting and stock verification usually varies from item to item depending upon the item's classification.
12. Retail inventory that is unaccounted for between receipt and time of sale is known as shrinkage.
13. The demand for automobiles would be considered an independent demand.
14. Insurance and taxes on inventory are part of the costs known as setup or ordering costs.
15. If setup costs are reduced by substantial reductions in setup time, the production order quantity is also reduced.
16. The EOQ model is best suited for items whose demand is dependent on other products.
17. In the simple EOQ model, if annual demand were to increase, the EOQ would increase proportionately.
18. At the economic order quantity, holding costs are equal to purchasing costs.
19. In the simple EOQ model, if the carrying cost were to double, the EOQ would also double.
20. In the production order quantity (POQ) model, inventory does not arrive in a single moment but flows in at a steady rate, resulting in a larger lot size than in an otherwise identical EOQ problem.
21. The reorder point is the inventory level at which action is taken to replenish the stocked item.
22. In the quantity discount model, it is possible to have a cost-minimizing solution where annual ordering costs do not equal annual carrying costs.
23. In the quantity discount model, the cost of acquiring goods (product cost) is not a factor in determining lot size.
24. Service level is the complement of the probability of a stockout.
25. Units of safety stock are additions to the reorder point that allow for variability in the rate of demand, the length of lead time, or both.
26. Safety stock in inventory systems depends only on the average demand during the lead time.
27. The fixed-period inventory model can have a stockout during the review period as well as during the reorder period, which is why fixed-period models require more safety stock than fixed-quantity models.
MULTIPLE CHOICE

28. Which of the following statements regarding Amazon.com is false?
   a. The company was opened by Jeff Bezos in 1995.
   b. The company was founded as, and still is, a "virtual retailer" with no inventory.
   c. The company is now a world-class leader in warehouse management and automation.
   d. The company uses both United Parcel Service and the U.S. Postal Service as shippers.
   e. Amazon obtains its competitive advantage through inventory management.

29. Which of the following is a function of inventory?
   a. to decouple or separate parts of the production process
   b. to decouple the firm from fluctuations in demand and provide a stock of goods that will provide a selection for customers
   c. to take advantage of quantity discounts
   d. to hedge against inflation
   e. All of the above are functions of inventory.

30. Which of the following would not generally be a motive for a firm to hold inventories?
   a. to decouple or separate parts of the production process
   b. to provide a stock of goods that will provide a selection for customers
   c. to take advantage of quantity discounts
   d. to minimize holding costs
   e. All of the above are functions of inventory.

31. Which of the following is not one of the four main types of inventory?
   a. raw material inventory
   b. work-in-process inventory
   c. maintenance/repair/operating supply inventory
   d. safety stock inventory
   e. All of these are main types of inventory.

32. Which of the following statements about ABC analysis is false?
   a. ABC analysis is based on the presumption that controlling the few most important items produces the vast majority of inventory savings.
   b. In ABC analysis, "A" Items are tightly controlled, have accurate records, and receive regular review by major decision makers.
   c. In ABC analysis, "C" Items have minimal records, periodic review, and simple controls.
   d. ABC analysis is based on the presumption that all items must be tightly controlled to produce important cost savings.
   e. All of the above statements are true.
33. All of the following statements about ABC analysis are true except
   a. inventory may be categorized by measures other than dollar volume
   b. it categorizes on-hand inventory into three groups based on annual dollar volume
   c. it is an application of the Pareto principle
   d. it states that all items require the same degree of control
   e. it states that there are the critical few and the trivial many inventory items

34. ABC analysis is based upon the principle that
   a. all items in inventory must be monitored very closely
   b. there are usually a few critical items, and many items which are less critical
   c. an item is critical if its usage is high
   d. the safety stock (in terms of volume) should be higher for A items than for C items
   e. an item is critical if its unit price is high

35. ABC analysis divides on-hand inventory into three classes, generally based upon
   a. item quality
   b. unit price
   c. the number of units on hand
   d. annual demand
   e. annual dollar volume

36. Cycle counting
   a. is a process by which inventory records are verified once a year
   b. provides a measure of inventory accuracy
   c. provides a measure of inventory turnover
   d. assumes that all inventory records must be verified with the same frequency
   e. assumes that the most frequently used items must be counted more frequently

37. Which of the following statements regarding control of service inventories is true?
   a. Service inventory is a fictional concept, because services are intangible.
   b. Service inventory needs no safety stock, because there's no such thing as a service stockout.
   c. Effective control of all goods leaving the facility is one applicable technique.
   d. Service inventory has carrying costs but not setup costs.
   e. All of the above are true.

38. The two most basic inventory questions answered by the typical inventory model are
   a. timing and cost of orders
   b. quantity and cost of orders
   c. timing and quantity of orders
   d. order quantity and service level
   e. ordering cost and carrying cost
39. Among the advantages of cycle counting is that it
   a. makes the annual physical inventory more acceptable to management
   b. does not require the detailed records necessary when annual physical inventory is used
   c. does not require highly trained people
   d. allows more rapid identification of errors and consequent remedial action than is possible with
      annual physical inventory
   e. does not need to be performed for less expensive items

40. Which of the following are elements of inventory holding costs?
   a. housing costs
   b. material handling costs
   c. investment costs
   d. pilferage, scrap, and obsolescence
   e. All of the above are elements of inventory holding cost.

41. Which of the following is not an assumption of the economic order quantity model shown below?

\[ Q^* = \sqrt{\frac{2 \cdot D \cdot S}{H}} \]

   a. Demand is known, constant, and independent.
   b. Lead time is known and constant.
   c. Quantity discounts are not possible.
   d. Production and use can occur simultaneously.
   e. The only variable costs are setup cost and holding (or carrying) cost.

42. The primary purpose of the basic economic order quantity model shown below is

\[ Q^* = \sqrt{\frac{2 \cdot D \cdot S}{H}} \]

   a. to calculate the reorder point, so that replenishments take place at the proper time
   b. to minimize the sum of carrying cost and holding cost
   c. to maximize the customer service level
   d. to minimize the sum of setup cost and holding cost
   e. to calculate the optimum safety stock

43. If the actual order quantity is the economic order quantity in a problem that meets the assumptions
   of the economic order quantity model shown below, the average amount of inventory on hand

\[ Q^* = \sqrt{\frac{2 \cdot D \cdot S}{H}} \]

   a. is smaller the smaller is the holding cost per unit
   b. is zero
   c. is one-half of the economic order quantity
   d. is affected by the amount of product cost
   e. All of the above are true.
44. A certain type of computer costs $1,000, and the annual holding cost is 25%. Annual demand is 10,000 units, and the order cost is $150 per order. What is the approximate economic order quantity?
   a. 16
   b. 70
   c. 110
   d. 183
   e. 600

45. Most inventory models attempt to minimize
   a. the likelihood of a stockout
   b. the number of items ordered
   c. total inventory based costs
   d. the number of orders placed
   e. the safety stock

46. In the basic EOQ model, if the cost of placing an order doubles, and all other values remain constant, the EOQ will
   a. increase by about 41%
   b. increase by 100%
   c. increase by 200%
   d. increase, but more data is needed to say by how much
   e. either increase or decrease

47. In the basic EOQ model, if D=6000 per year, S=$100, H=$5 per unit per month, the economic order quantity is approximately
   a. 24
   b. 100
   c. 141
   d. 490
   e. 600

48. Which of the following statements about the basic EOQ model is true?
   a. If the ordering cost were to double, the EOQ would rise.
   b. If annual demand were to double, the EOQ would increase.
   c. If the carrying cost were to increase, the EOQ would fall.
   d. If annual demand were to double, the number of orders per year would increase.
   e. All of the above statements are true.

49. Which of the following statements about the basic EOQ model is false?
   a. If the setup cost were to decrease, the EOQ would fall.
   b. If annual demand were to increase, the EOQ would increase.
   c. If the ordering cost were to increase, the EOQ would rise.
   d. If annual demand were to double, the EOQ would also double.
   e. All of the above statements are true.
50. A product whose EOQ is 40 experiences a decrease in ordering cost from $90 per order to $10. The revised EOQ is
a. three times as large
b. one-third as large
c. nine times as large
d. one-ninth as large
e. cannot be determined

51. A product whose EOQ is 400 experiences a 50% increase in demand. The new EOQ is
a. unchanged
b. increased by less than 50%
c. increased by 50%
d. increased by more than 50%
e. cannot be determined

52. For a certain item, the cost-minimizing order quantity obtained with the basic EOQ model was 200 units and the total annual inventory cost was $600. The inventory carrying cost per unit per year for this item is
a. $1.50
b. $2.00
c. $3.00
d. $150.00
e. not enough data to determine

53. A product has demand of 4000 units per year. Ordering cost is $20 and holding cost is $4 per unit per year. The EOQ model is appropriate. The cost-minimizing solution for this product will cost _____ per year in total annual inventory costs.
   a. $400
   b. $800
c. $1200
d. zero; this is a class C item
e. cannot be determined because unit price is not known

54. A product has demand of 4000 units per year. Ordering cost is $20 and holding cost is $4 per unit per year. The cost-minimizing solution for this product is to order
   a. all 4000 units at one time
   b. 200 units per order
c. every 20 days
d. 10 times per year
e. none of the above

55. Which of the following statements regarding the reorder point is true?
   a. The reorder point is that quantity that triggers an action to restock an item.
   b. There is a reorder point even if lead time and demand during lead time are constant.
   c. The reorder point is larger than d x L if safety stock is present.
   d. The fixed-period model has no reorder point.
e. All of the above are true.
56. The EOQ model with quantity discounts attempts to determine 
   a. what is the lowest amount of inventory necessary to satisfy a certain service level 
   b. what is the lowest purchasing price 
   c. whether to use fixed-quantity or fixed-period order policy 
   d. how many units should be ordered 
   e. what is the shortest lead time 

57. An inventory decision rule states "when the inventory level goes down to 14 gearboxes, 100 
   gearboxes will be ordered." Which of the following statements is true? 
   a. One hundred is the reorder point, and 14 is the order quantity. 
   b. Fourteen is the reorder point, and 100 is the order quantity. 
   c. The number 100 is a function of demand during lead time. 
   d. Fourteen is the safety stock, and 100 is the reorder point. 
   e. None of the above is true. 

58. Which of the following statements regarding the production order quantity model is true? 
   a. It applies only to items produced in the firm's own production departments. 
   b. It relaxes the assumption that all the order quantity is received at one time. 
   c. It relaxes the assumption that the demand rate is constant. 
   d. It minimizes the total production costs. 
   e. It minimizes inventory. 

59. Which of these statements about the production order quantity model is false? 
   a. The production order quantity model is appropriate when the assumptions of the basic EOQ 
      model are met, except that receipt is noninstantaneous. 
   b. Because receipt is noninstantaneous, some units are used immediately, not stored in inventory. 
   c. Average inventory is less than one-half of the production order quantity. 
   d. All else equal, the smaller the ratio of demand rate to production rate, the larger is the 
      production order quantity. 
   e. None of the above is false. 

60. The assumptions of the production order quantity model are met in a situation where annual 
    demand is 3650 units, setup cost is $50, holding cost is $12 per unit per year, the daily demand rate 
    is 10 and the daily production rate is 100. The production order quantity for this problem is 
    approximately 
    a. 139 
    b. 174 
    c. 184 
    d. 365 
    e. 548 

61. A production order quantity problem has daily demand rate = 10 and daily production rate = 50. 
    The production order quantity for this problem is approximately 612 units. The average inventory 
    for this problem is approximately 
    a. 61 
    b. 245 
    c. 300 
    d. 306 
    e. 490
62. A production order quantity problem has annual demand = 3000, daily demand rate = 10, and daily production rate = 50. The production order quantity for this problem is approximately 612 units. The annual setup costs for this problem are approximately
a. $4.90
b. $50
c. $300
d. $490
e. $980

63. When quantity discounts are allowed, the cost-minimizing order quantity
a. is an EOQ quantity
b. minimizes the sum of holding and ordering costs
c. minimizes the unit purchase price
d. may be a quantity below that at which one qualifies for that price
e. minimizes the sum of holding, ordering, and product costs

64. Which of the following statements about quantity discounts is false?
   a. The cost-minimizing solution may or may not be where annual holding costs equal annual ordering costs.
   b. In inventory management, item cost becomes relevant to inventory decisions only when a quantity discount is available.
   c. If carrying costs are expressed as a percentage of value, EOQ is larger at each lower price in the discount schedule.
   d. The larger annual demand, the less attractive a discount schedule will be.
   e. The smaller the ordering cost, the less attractive a discount schedule will be.

65. If the standard duration of demand is six per week, demand is 50 per week, and the desired service level is 95%, approximately what is the statistical safety stock?
   a. 8 units
   b. 10 units
c. 16 units
d. 64 units
e. cannot be determined without lead time data

66. A specific product has demand during lead time of 100 units, with a standard deviation of 25 units. What safety stock (approximately) provides a 95% service level?
   a. 41
   b. 55
c. 133
d. 140
e. 165
67. Demand for dishwasher water pumps is 8 per day. The standard deviation of demand is 3 per day, and the order lead time is four days. The service level is 95%. What should the reorder point be?
   a. about 18
   b. about 24
   c. about 32
   d. about 38
   e. more than 40

68. The purpose of safety stock is to
   a. replace failed units with good ones
   b. eliminate the possibility of a stockout
   c. eliminate the likelihood of a stockout due to erroneous inventory tally
   d. control the likelihood of a stockout due to the variability of demand during lead time
   e. protect the firm from a sudden decrease in demand

69. The proper quantity of safety stock is typically determined by
   a. minimizing an expected stockout cost
   b. carrying sufficient safety stock so as to eliminate all stockouts
   c. meeting 95% of all demands
   d. setting the level of safety stock so that a given stockout risk is not exceeded
   e. minimizing total costs

70. If demand is not uniform and constant, then stockout risks can be controlled by
   a. increasing the EOQ
   b. placing an extra order
   c. raising the selling price to reduce demand
   d. adding safety stock
   e. reducing the reorder point

71. If daily demand is normally distributed with a mean of 15 and standard deviation of 5, and lead time is constant at 4 days, 90 percent service level will require safety stock of approximately
   a. 7 units
   b. 10 units
   c. 13 units
   d. 16 units
   e. 26 units

72. If daily demand is constant at 10 units per day, and lead time averages 12 days with a standard deviation of 3 days, 95 percent service requires a safety stock of approximately
   a. 28 units
   b. 30 units
   c. 40 units
   d. 59 units
   e. 114 units
73. In a safety stock problem where both demand and lead time are variable, demand averages 150 units with a standard deviation of 16, and lead time averages 5 days with a standard deviation of 1. The standard deviation of demand during lead time is approximately 
   a. 15 units 
   b. 100 units 
   c. 115 units 
   d. 500 units 
   e. 13,125 units 

74. The fixed-period inventory model requires more safety stock than the fixed-quantity models because 
   a. a stockout can occur during the review period as well as during the lead time 
   b. this model is used for products that have large standard deviations of demand 
   c. this model is used for products that require very high service levels 
   d. replenishment is not instantaneous 
   e. setup costs and holding costs are large 

75. A disadvantage of the fixed-period inventory system is that 
   a. it involves higher ordering costs than the fixed quantity inventory system 
   b. additional inventory records are required 
   c. the average inventory level is decreased 
   d. since there is no count of inventory during the review period, a stockout is possible 
   e. orders usually are for larger quantities 

76. An advantage of the fixed-period inventory system is that 
   a. the supplier will be more cooperative 
   b. there is no physical count of inventory items when an item is withdrawn 
   c. no inventory records are required 
   d. orders usually are for smaller order quantities 
   e. the average inventory level is reduced