Chapter 12 *Rapid* Review

Main Heading	Review Material	MyOMLab
THE IMPORTANCE OF INVENTORY (pp. 490–491)	Inventory is one of the most expensive assets of many companies. *The objective of inventory management is to strike a balance between inventory investment and customer service.* The two basic inventory issues are how much to order and when to order. ■ **Raw material inventory**—Materials that are usually purchased but have yet to enter the manufacturing process. ■ **Work-in-process (WIP) inventory**—Products or components that are no longer raw materials but have yet to become finished products. ■ **MRO inventory**—Maintenance, repair, and operating materials. ■ **Finished-goods inventory**—An end item ready to be sold but still an asset on the company's books.	Concept Questions: 1.1–1.4 **VIDEO 12.1** Managing Inventory at Frito-Lay
MANAGING INVENTORY (pp. 491–495)	■ **ABC analysis**—A method for dividing on-hand inventory into three classifications based on annual dollar volume. ■ **Cycle counting**—A continuing reconciliation of inventory with inventory records. ■ **Shrinkage**—Retail inventory that is unaccounted for between receipt and sale. ■ **Pilferage**—A small amount of theft.	Concept Questions: 2.1–2.4 Problems: 12.1–12.6 Virtual Office Hours for Solved Problem: 12.1
INVENTORY MODELS (pp. 495–496)	■ **Holding cost**—The cost to keep or carry inventory in stock. ■ **Ordering cost**—The cost of the ordering process. ■ **Setup cost**—The cost to prepare a machine or process for production. ■ **Setup time**—The time required to prepare a machine or process for production.	Concept Questions: 3.1–3.4 **VIDEO 12.2** Inventory Control at Wheeled Coach Ambulance
INVENTORY MODELS FOR INDEPENDENT DEMAND (pp. 496–507)	■ **Economic order quantity (EOQ) model**—An inventory-control technique that minimizes the total of ordering and holding costs: $$Q^* = \sqrt{\frac{2DS}{H}} \quad (12\text{-}1)$$ $$\text{Expected number of orders} = N = \frac{\text{Demand}}{\text{Order quantity}} = \frac{D}{Q^*} \quad (12\text{-}2)$$ $$\text{Expected time between orders} = T = \frac{\text{Number of working days per year}}{N} \quad (12\text{-}3)$$ $$\text{Total annual cost} = \text{Setup (order) cost} + \text{Holding cost} \quad (12\text{-}4)$$ $$TC = \frac{D}{Q}S + \frac{Q}{2}H \quad (12\text{-}5)$$ ■ **Robust**—Giving satisfactory answers even with substantial variation in the parameters. ■ **Lead time**—In purchasing systems, the time between placing an order and receiving it; in production systems, the wait, move, queue, setup, and run times for each component produced. ■ **Reorder point (ROP)**—The inventory level (point) at which action is taken to replenish the stocked item. *ROP for known demand:* $$\text{ROP} = \text{Demand per day} \times \text{Lead time for a new order in days} = d \times L \quad (12\text{-}6)$$ ■ **Safety stock (*ss*)**—Extra stock to allow for uneven demand; a buffer. ■ **Production order quantity model**—An economic order quantity technique applied to production orders: $$Q_p^* = \sqrt{\frac{2DS}{H[1 - (d/p)]}} \quad (12\text{-}7)$$ $$Q_p^* = \sqrt{\frac{2DS}{H\left(1 - \frac{\text{Annual demand rate}}{\text{Annual production rate}}\right)}} \quad (12\text{-}8)$$ ■ **Quantity discount**—A reduced price for items purchased in large quantities: $$TC = \frac{D}{Q}S + \frac{Q}{2}H + PD \quad (12\text{-}9)$$ $$Q^* = \sqrt{\frac{2DS}{IP}} \quad (12\text{-}10)$$	Concept Questions: 4.1–4.4 Problems: 12.7–12.40 Virtual Office Hours for Solved Problems: 12.2–12.5 **ACTIVE MODELS 12.1, 12.2**

Chapter 12 *Rapid* Review *continued*

Main Heading	Review Material	MyOMLab
PROBABILISTIC MODELS AND SAFETY STOCK (pp. 508–513)	■ **Probabilistic model**—A statistical model applicable when product demand or any other variable is not known but can be specified by means of a probability distribution. ■ **Service level**—The complement of the probability of a stockout. *ROP for unknown demand:* $\text{ROP} = d \times L + ss$ (12-11) Annual stockout costs = The sum of the units short for each demand level × The probability of that demand level × The stockout cost/unit × The number of orders per year (12-12) *ROP for unknown demand and given service level:* $\text{ROP} = \text{Expected demand during lead time} + Z\sigma_{dLT}$ (12-13) $\text{Safety stock} = Z\sigma_{dLT}$ (12-14) *ROP for variable demand and constant lead time:* $\text{ROP} = (\text{Average daily demand} \times \text{Lead time in days}) + Z\sigma_{dLT}$ (12-15) *ROP for constant demand and variable lead time:* $\text{ROP} = (\text{Daily demand} \times \text{Average lead time in days}) + Z \times \text{Daily demand} \times \sigma_{LT}$ (12-16) *ROP for variable demand and variable lead time:* $\text{ROP} = (\text{Average daily demand} \times \text{Average lead time in days}) + Z\sigma_{dLT}$ (12-17) In each case, $\sigma_{dLT} = \sqrt{(\text{Average lead time} \times \sigma_d^2) + \overline{d}^2\sigma_{LT}^2}$ but under constant demand: $\sigma_d^2 = 0$, and under constant lead time: $\sigma_{LT}^2 = 0$.	Concept Questions: 5.1–5.4 Problems: 12.41–12.50 Virtual Office Hours for Solved Problems: 12.6–12.9
SINGLE-PERIOD MODEL (pp. 513–514)	■ **Single-period inventory model**—A system for ordering items that have little or no value at the end of the sales period: $\text{Service level} = \dfrac{C_s}{C_s + C_o}$ (12-18)	Concept Questions: 6.1–6.4 Problems: 12.51–12.53
FIXED-PERIOD (*P*) SYSTEMS (pp. 514–515)	■ **Fixed-quantity (*Q*) system**—An ordering system with the same order amount each time. ■ **Perpetual inventory system**—A system that keeps track of each withdrawal or addition to inventory continuously, so records are always current. ■ **Fixed-period (*P*) system**—A system in which inventory orders are made at regular time intervals.	Concept Questions: 7.1–7.4

Self Test

■ **Before taking the self-test,** refer to the learning objectives listed at the beginning of the chapter and the key terms listed at the end of the chapter.

LO 12.1 ABC analysis divides on-hand inventory into three classes, based on:
a) unit price. **b)** the number of units on hand.
c) annual demand. **d)** annual dollar values.

LO 12.2 Cycle counting:
a) provides a measure of inventory turnover.
b) assumes that all inventory records must be verified with the same frequency.
c) is a process by which inventory records are periodically verified.
d) all of the above.

LO 12.3 The two most important inventory-based questions answered by the typical inventory model are:
a) when to place an order and the cost of the order.
b) when to place an order and how much of an item to order.
c) how much of an item to order and the cost of the order.
d) how much of an item to order and with whom the order should be placed.

LO 12.4 Extra units in inventory to help reduce stockouts are called:
a) reorder point. **b)** safety stock.
c) just-in-time inventory. **d)** all of the above.

LO 12.5 The difference(s) between the basic EOQ model and the production order quantity model is(are) that:
a) the production order quantity model does not require the assumption of known, constant demand.
b) the EOQ model does not require the assumption of negligible lead time.
c) the production order quantity model does not require the assumption of instantaneous delivery.
d) all of the above.

LO 12.6 The EOQ model with quantity discounts attempts to determine:
a) the lowest amount of inventory necessary to satisfy a certain service level.
b) the lowest purchase price.
c) whether to use a fixed-quantity or fixed-period order policy.
d) how many units should be ordered.
e) the shortest lead time.

LO 12.7 The appropriate level of safety stock is typically determined by:
a) minimizing an expected stockout cost.
b) choosing the level of safety stock that assures a given service level.
c) carrying sufficient safety stock so as to eliminate all stockouts.
d) annual demand.

Answers: LO 12.1. d; LO 12.2. c; LO 12.3. b; LO 12.4. b; LO 12.5. c; LO 12.6. d; LO 12.7. b.