

Lesson 17 Inventory Management Solutions

Solved Problem #1: See textbook

Solved Problem #2: See textbook

Solved Problem #3: See textbook

#1: A large bakery buys flour in 25 pound bags. The bakery uses an average 4,860 bags a year. Preparing an order and receiving a shipment of flour involves a cost of \$10 per order. Annual carrying costs are \$75 per bag.

Answer the following questions.

- a. Determine the economic order quantity.

36 bags

- b. What is the average number of bags on hand?

18 bags

- c. How many orders per year will there be?

135

- d. Compute the cost of ordering flour, the cost of carrying the inventory, and the minimum total cost.

Total Ordering costs - \$1,350

Total Carrying costs - \$1,350

Total Costs - \$2,700

Note: Total Ordering costs and Total Carrying costs are the same at the optimal order quantity (slide 17-20).

- e. If ordering cost were increased by \$1 per order, how much would that affect the minimum total annual cost?

The total cost would increase by \$131.78 to @2831.78

#2: A large law firm uses an average of 40 boxes of copier paper a day. The firm operates 260 days per year. Storage and handling costs for the paper is \$30 a year per box, and it costs approximately \$60 to order and receive a shipment of paper.

Answer the following questions.

- a. What order quantity would minimize the annual ordering and carrying costs?

203.96 rounded to 204 boxes

- b. What is the average number of boxes on hand?

102 boxes

- c. How many orders per year will there be?

50.99 rounded to 51

- d. Compute the cost of ordering copier paper, the cost of carrying the inventory, and the minimum total cost.

Total Ordering costs - \$3,059.41

Total Carrying costs - \$3,059.41

Total Costs - \$6,118.82

- e. How many days are there between orders?

5.099 days

- f. The office manager is currently using an order size of 200 boxes. The partners of the firm expect the office to be managed in a cost-efficient manner. Would you recommend that the office manager use the optimal order size instead of the 200 boxes? Why?

The difference between the optimal order quantity and the current order size is 4 boxes. The total annual cost of ordering and carrying the 200 boxes is \$6,120. Therefore, the difference of \$1.18 per year is not big enough to suggest the office manager change his current order size.

#3: A produce distributor uses 800 packing crates a month, which it purchases at a cost of \$10 each. The manager has assigned an annual carrying cost of 35% of the purchase price per crate. Ordering costs are \$28. Currently the manager orders once per month.

Answer the following questions.

- a. What is the total cost of the current ordering method? This must be calculated manually.

Total costs = Total Carrying Costs + Total Ordering Costs
= $Q/2 * H + D/Q * S$ where Q is the ordering quantity, H is the holding cost, and D is the annual demand, and S is the ordering cost
= $800 / 2 * (.35 * \$10) + (800 * 12) / 800 * \28
= $400 * \$3.5 + 12 * \28
= $\$1,400 + \336
= $\$1,736$

- b. What is the optimal cost? You can use the appropriate EOQ template to answer the remainder of the questions.

\$1,371.71 (template answer which is the one you were supposed to calculate)

Manual answer rounded to 2 decimal places – Note the slight difference in the template answer (this is provided to show the slight effect of rounding to 2 decimal places)

$\sim = (391.92 / 2 * (.35 * \$10) + (9600 / 391.92) * \28
 $\sim = 195.95 * \$3.5 + 24.52 * \28
 $\sim = \$685.86 + 686.56$
 $\sim = \$1,372.42$

You should also note the differences between the template answer and the manual answer for the Total Carrying Costs and the Total Ordering Costs. In theory, the Economic Order

Quantity is the point where Total Carrying Costs = Total Ordering Costs. You should look at the PowerPoint presentation slide 17-20 to verify this fact.

- c. How much would be saved using the optimal EOQ cost?

\$364.39 (\$1736.00 - \$1,371.71)

- d. Should the manager change his ordering method?

Yes

- e. What is the optimal ordering quantity?

391.92 crates rounded to 392 cases (since we can not order partial cases)

- f. How many times will the manager order per year if he chooses to use the optimal ordering method?

24.49 times rounded to 24 times per year

#4: The Friendly Sausage Factory (FSF) can produce hot dogs at a rate of 5,000 per day. FSF supplies hot dogs to local restaurants at a steady rate of 250 per day. The cost to prepare the equipment for producing the hot dogs is \$66. Annual holding costs are \$.45 per hot dog. The factory operates 300 days per year.

Answer the following questions.

- a. What is the annual demand for hot dogs?

75,000 hot dogs (250 hot dogs per day * 300 days)

- b. What is the production run which will minimize total costs?

4,812.27 rounded to 4,812 hot dogs

- c. Based on the optimal production run in b., what is the maximum inventory?

4,471.65 rounded to 4,472 hot dogs

- d. What is the average inventory?

2,236 hot dogs (4,472/2)

- e. How many times will FSF have to make hot dogs every year?

15.59 rounded to 16 times per year

- f. When FSF starts a manufacturing run of hot dogs, how long will they run the machine (i.e. what is the run time)?

.96 days rounded to 1 day

- g. How long will it be from the end of a manufacturing run, until another run needs to be made (i.e. what is the pure consumption time – the difference between the order cycle time and the run time)?

Approximately 18 days (18.29 rounded to 18 days)

#5: A chemical company produces sodium bisulfate in 100 pound bags. Demand for the product is 20 tons per day. The capacity for production is 50 tons per day. Setup cost is \$100, and storage and handling costs are \$5 per ton per year. The firm operates 200 days per year. (Note: 1 ton = 2,000 pounds)

Answer the following questions.

- a. What is the annual demand in tons?

4,000 tons

- b. How many bags per manufacturing run are optimal?

10,328 bags

The optimal manufacturing run is 516.39 tons. Since there are 20 bags per ton, the number of bags is 10,327.8 bags rounded to 10,328 bags.

- c. What is the average inventory in bags for the optimal run size?

3,098 bags

The maximum inventory in tons is 309.84 tons or 6,196.8 bags. The average number of bags is the maximum divided by 2; therefore, the average inventory in bags is 3,098.4 rounded to 3,098 bags.

- d. What is the manufacturing run time?

10.32 days rounded to 10 days

- e. What is the pure consumption time?

15.49 days rounded to 15 days

#6: A mail-order house uses 18,000 boxes a year. Carrying costs are \$.60 per box per year, and ordering costs are \$96. The following price schedule applies.

<u>Number of Boxes</u>	<u>Price per Box</u>
1,000 to 1,999	\$1.25
2,000 to 4,999	\$1.20
5,000 to 9,999	\$1.15
10,000 or more	\$1.10

Answer the following questions.

- a. What is the optimal order quantity?
5,000 boxes
- b. What is the common EOQ?
2,400 boxes
- c. How many orders will the mail-order house have to make during the year?
3.6 orders per year
- d. What is the carrying cost, ordering cost, purchase cost and total cost for the optimal quantity?
- | | |
|----------------------|-------------------|
| Carrying cost | \$1,500.00 |
| Ordering cost | 345.60 |
| Purchase cost | 20,700.00 |
| Total cost | 22,545.60 |

#7: A jewelry company buys semiprecious stones to make bracelets and rings. The supplier quotes a price of \$5 per stone for quantities of 600 stones or more, \$9 for orders of 400 to 599, and \$10 per stone for lesser quantities. The jewelry firm operates 200 days per year. Usage is 25 stones per day, and ordering costs are \$48.

- a. If carrying costs are \$2 per year for each stone, answer the following questions.
- What is the optimal ordering quantity?
600 stones
 - What is the common EOQ?
490 stones
 - How many orders per year will the company make?
8.33 orders per year
 - What is the total ordering cost for the optimal solution?
\$400
- b. If carrying costs are 30 percent of the purchase price per year for each stone, answer the following questions.
- What is the carrying cost per unit when 400 to 599 stones are ordered?
\$2.70 per stone
 - What is the optimal ordering quantity?
600 stones
 - What is the common EOQ?
566 stones
 - How many orders per year will the company make?

8.33 orders per year

- v. What is the total purchase cost for the optimal solution?

\$25,000

- c. If the lead time is 6 working days, at what point should the company reorder?

150 stones

**ROP = demand rate * lead time
= 25 per day * 6 days
= 150 stones**

#8: A company will begin stocking remote control devices. Expected monthly demand is 800 units. The devices can be purchased from two suppliers: A and B. The price lists for the two suppliers are shown below. Ordering cost is \$40 and annual holding cost is 25% of unit price.

<u>Supplier A</u>	
<u>Quantity</u>	<u>Unit Price</u>
1 - 199	\$14.00
200 - 499	13.80
500 +	13.60

<u>Supplier B</u>	
<u>Quantity</u>	<u>Unit Price</u>
1 - 149	\$14.10
150 - 349	13.90
350 +	13.70

- a. What is the period you will use for this analysis?

Yearly

- b. For supplier A, answer the following questions.
i. What are the period carrying costs for each quantity break?

**1 - 199 \$3.50
200 - 499 3.45
500 + 3.40**

- ii. What is the optimal ordering quantity?

500 devices

- iii. What is the common EOQ?

475 devices

- iv. What is the total cost for the common EOQ?

\$134,107.8

v. How many orders per period will the company make?

19.2 orders per year

vi. What is the total cost for the optimal solution?

\$132,178

c. For supplier B, answer the following questions.

i. What are the period carrying costs for each quantity break?

1 - 149	\$3.525
150 - 349	3.475
350 +	3.425

ii. What is the optimal ordering quantity?

474 devices

iii. What is the common EOQ?

474 devices

iv. What is the total cost for the common EOQ? You do not have to calculate this manually. Hint, figure out how the template can automatically give it to you.

\$133,141.85

v. How many orders per period will the company make?

20.25 orders per year

vi. What is the total cost for the optimal solution?

\$133,141.85

d. Which supplier should the company choose? Why?

Choose supplier A because they have the lowest optimal cost.