

Inventory Management

1. The demand for chamoyadas at the El Oasis store in Urbana IL for the past five days was 210, 240, 190, 200, and 220. Please calculate the average daily demand.
2. The annual demand for Pandamonium Doughnuts in Champaign IL is 360,000. Please calculate the average weekly demand based on a 50-week year.
3. Artisan-made scarves sold at Ten Thousand Villages in Champaign have a daily demand that follows a Normal distribution with mean of 20 and standard deviation of 3. Given that the lead time to receive scarves from their central distributor is 5 days, what is the total demand for 5 days and what is the standard deviation for 5-day demand?
4. Café Kopi in Champaign IL sells reconstituted pies that it purchases frozen from the Pies by Inge bakery in Monticello IL. There are costs of storage and spoilage as well as a fixed cost of transportation per order, based on which, LaTonya Wilson, manager of Café Kopi has figured out the EOQ. LaTonya would like your help in calculating the inventory position that should trigger an order. LaTonya informs you that the lead time for the frozen pies is 2 days, the demand is 38 pies per day, and the standard deviation of daily demand is 6 pies. She does not like to have to turn away customers and has a tolerance for stock out probability of 1% corresponding to a z value of 2.33. Please help her by calculating the reorder point.
5. The local Honda dealer, Finneas Auto, must decide how many spare shock absorbers of a particular type to order for repairing Honda automobiles. This shock absorber has a demand of 4 units per month and costs \$25 each. The holding cost (also known as carrying charge) is 30 percent per year, and the ordering cost is \$15 per order.
 - a. What is the EOQ for this item?
 - b. If Finneas used the EOQ as order quantity, what is their annual cost of ordering this part?
 - c. If Finneas used the EOQ as order quantity, what is their annual cost of carrying this part (i.e., holding this part) in inventory?
 - d. What is their total cost of managing the inventory for this part?
 - e. How often (every how many months) will Finneas order this part and how many times in a year?

Solutions

1. El Oasis' average daily demand = $(210+240+190+200+220) \div 5 = 1060 \div 5$
= 212 chamoyadas

2. Pandamonium's average weekly demand = $360,000 \div 50$
= 7,200 doughnuts

3. Ten Thousand Villages can cover 5 days of lead time with $20 * 5 = 100$ scarves
Standard deviation for 5-day demand = $3 * \text{square root}(5) = 6.71$ scarves

(To understand why we use square root (5):

$$\text{Variance of daily demand} = (\text{std. dev})^2 = 3^2 = 9$$

$$\text{Variance of 5-day demand} = 5 * \text{Variance of daily demand} = 5 * 9 = 45$$

$$\text{Std. Dev of 5-day demand} = \sqrt{45} = 6.71$$

4. Café Kopi's Reorder Point ROP for frozen pies from Pies by Inge
= Demand during lead time + Safety stock

$$\text{Demand during lead time (ddlt)} = d * LT$$

$$\text{ddlt} = 38 * 2 \text{ days} = 76 \text{ pies}$$

$$\text{Safety stock} = (z * \sigma_{\text{per period}} * \sqrt{LT})$$

$$\text{Safety stock} = 2.33 * 6 * \text{sqrt}(2)$$

$$= 19.77$$

$$\text{ROP} = 76 + 19.77 = 95.77 \text{ rounded up to } 96 \text{ pies.}$$

LaTonya should place an order of EOQ when the inventory position reaches 96 pies.

5. Finneas Auto

a. EOQ:

$$Q^* = \sqrt{\frac{2DS}{H}} = \text{sqrt}((2 * 4 * 12 * 15) \div (0.3 * 25))$$
$$= 13.86 \text{ rounded up to } 14 \text{ shock absorbers}$$

b. Annual ordering cost = Number of orders * Cost of transacting one order

$$= (D \div Q) * S = ((4 * 12) \div 14) * 15 = \$ 51.43$$

c. Annual cost of carrying or holding = Average inventory * Holding cost per unit per year

$$= (Q \div 2) * H = (14 \div 2) * (0.3 * 25) = \$ 52.50$$

d. Total Cost of managing inventory for Q^* (i.e., EOQ) can be calculated as

$$TC(Q^*) = \sqrt{2 D S H} = \text{sqrt}(2 * (4 * 12) * 15 * 0.3 * 25) = \$103.92$$

This gives the same solution as adding the two annual costs of holding and ordering calculated earlier (in b and c) separately for the EOQ:

$$\$ 51.43 + \$ 52.50 = \$ 103.93$$

e. Time between orders = $(Q \div D)$ year = $(14 \div 48) = 0.2917$ years

$$= 0.2917 * 12 = 3.5 \text{ months}$$

Number of orders in a year = $(D \div Q)$ orders = $(48 \div 14)$

$$= 3.43 \text{ orders}$$