

ROP and safety stock

COMPUTING REORDER POINTS (ROP) FOR IPHONES WITH AND WITHOUT SAFETY STOCK

An Apple store has a demand (D) for 8,000 iPhones per year. The firm operates a 250-day working year. On average, delivery of an order takes 3 working days, but has been known to take as long as 4 days. The store wants to calculate the reorder point without a safety stock and then with a one-day safety stock.

a-First compute the daily demand and then apply Equation (12-6) for the ROP. Then compute the ROP with safety stock.

b- If there are only 200 working days per year, what is the correct ROP, without safety stock and with safety stock?

A PRODUCTION ORDER QUANTITY MODEL

Nathan Manufacturing, Inc., makes and sells specialty hubcaps for the retail automobile aftermarket. Nathan's forecast for its wire-wheel hubcap is 1,000 units next year, with an average daily demand of 4 units. However, the production process is most efficient at 8 units per day. So the company produces 8 per day but uses only 4 per day. The company wants to solve for the optimum number of units per order. (Note: This plant schedules production of this hubcap only as needed, during the 250 days per year the shop operates.)

- a- Gather the cost data and apply Equation: Annual demand = $D = 1,000$ units Setup costs = $S = +10$ Holding cost = $H = +0.50$ per unit per year Daily production rate = $p = 8$ units daily Daily demand rate = $d = 4$ units daily
- b- If Nathan can increase its daily production rate from 8 to 10, how does Q_p^* change?

QUANTITY DISCOUNT MODEL

Chris Beehner Electronics stocks toy remote control flying drones. Recently, the store has been offered a quantity discount schedule for these drones. This quantity schedule was shown in Table :

TABLE 12.2 A Quantity Discount Schedule

PRICE RANGE	QUANTITY ORDERED	PRICE PER UNIT P
Initial price	1–119	\$100
Discount price 1	120–1,499	\$ 98
Discount price 2	1,500 and over	\$ 96

Furthermore, setup cost is \$200 per order, annual demand is 5,200 units, and annual inventory carrying charge as a percent of cost, I , is 28%.

- a- What order quantity will minimize the total inventory cost? We will follow the two steps just outlined for the quantity discount mode
- b- Resolve the problem with $D = 2,000$, $S = \$5$, $I = 50\%$, discount price 1 = \$99, and discount price 2 = \$98

DETERMINING SAFETY STOCK WITH PROBABILISTIC DEMAND AND CONSTANT LEAD TIME

David Rivera Optical has determined that its reorder point for eyeglass frames is 50 ($d * L$) units. Its carrying cost per frame per year is \$5, and stockout (or lost sale) cost is \$40 per frame. The store has experienced the following probability distribution for inventory demand during the lead time (reorder period). The optimum number of orders per year is six.

NUMBER OF UNITS	PROBABILITY
30	.2
40	.2
ROP → 50	.3
60	.2
70	.1
	<u>1.0</u>

- a- How much safety stock should David Rivera keep on hand?
- b- David Rivera's holding cost per frame is now estimated to be \$20, while the stockout cost is \$30 per frame. Does the reorder point change?

ROP FOR VARIABLE DEMAND AND CONSTANT LEAD TIME

The average daily demand for Lenovo laptop computers at a Circuit Town store is 15, with a standard deviation of 5 units. The lead time is constant at 2 days. Find the reorder point if management wants a 90% service level (i.e., risk stockouts only 10% of the time).

- a- How much of this is safety stock?

Apply Equation to the following data:

Average daily demand (normally distributed) = 15

Lead time in days (constant) = 2

Standard deviation of daily demand = 5 Service level = 90%

- b- If the Circuit Town manager wants a 95% service level, what is the new ROP?

ROP FOR CONSTANT DEMAND AND VARIABLE LEAD TIME

The Circuit Town store in Example 12 sells about 10 digital cameras a day (almost a constant quantity). Lead time for camera delivery is normally distributed with a mean time of 6 days and a standard deviation of 1 day. A 98% service level is set.

- a- Find the ROP.

Apply Equation (to the following data:

Daily demand = 10

Average lead time = 6 days

Standard deviation of lead time = 1 day

Service level 5 98%, so Z (from Appendix I or the Excel formula = NORMSINV(.98))
= 2.055

- b- If a 90% service level is applied, what does the ROP drop to?

ROP FOR VARIABLE DEMAND AND VARIABLE LEAD TIME

The Circuit Town store's most popular item is six-packs of 9-volt batteries. About 150 packs are sold per day, following a normal distribution with a standard deviation of 16 packs. Batteries are ordered from an out-of-state distributor; lead time is normally distributed with an average of 5 days and a standard deviation of 1 day.

- a- To maintain a 95% service level, what ROP is appropriate?

Determine a quantity at which to reorder by applying Equation to the following data:

Average daily demand = 150 packs

Standard deviation of demand = 16 packs

Average lead time = 5 days

Standard deviation of lead time = 1 day

Service level 5 95%, so Z 51.645 (from Appendix I or the Excel formula = NORMSINV(.95))

- b- For an 80% service level, what is the ROP?