

CHAPTER 20

20-16 Economic order quantity for retailer.

1. $D = 10,000$ jerseys per year, $P = \$200$, $C = \$7$ per jersey per year

$$EOQ = \sqrt{\frac{2DP}{C}} = \sqrt{\frac{2 \times 10,000 \times \$200}{7}} = 755.93 \cong 756 \text{ jerseys}$$

2. Number of orders per year = $\frac{D}{EOQ} = \frac{10,000}{756} = 13.22 \cong 14$ orders

3. Demand each working day = $\frac{D}{\text{Number of working days}} = \frac{10,000}{365} = 27.40$ jerseys per day

$$\text{Purchase lead time} = 7 \text{ days}$$

$$\begin{aligned} \text{Reorder point} &= 27.40 \times 7 \\ &= 191.80 \cong 192 \text{ jerseys} \end{aligned}$$

20-17 Economic order quantity, effect of parameter changes (continuation of 20-16).

1. $D = 10,000$ jerseys per year, $P = \$30$, $C = \$7$ per jersey per year

$$EOQ = \sqrt{\frac{2DP}{C}} = \sqrt{\frac{2 \times 10,000 \times \$30}{7}} = 292.77 \text{ jerseys} \cong 293 \text{ jerseys}$$

The sizable reduction in ordering cost (from \$200 to \$30 per purchase order) has reduced the EOQ from 756 to 293.

2. The AT proposal has both upsides and downsides. The upside is potentially higher sales. FB customers may purchase more online than if they have to physically visit a store. As a result of the proposal, FB would have lower administrative costs and would need to hold lower inventories (as more sales occur directly through AT's Web site) resulting in lower inventory carrying costs.

The downside is that AT could capture FB's customers. Repeat customers to the AT Web site need not be classified as FB customers. FB would have to establish enforceable rules to make sure it captures ongoing revenues from customers it directs to the AP Web site.

There is insufficient information to determine whether FB should accept AT's proposal. Much depends on whether FB views AT as a credible, "honest" partner.

20-18 EOQ for a retailer.

1. $D = 26,400$ yards per year, $P = \$165$, $C = 20\% \times \$9 = \1.80 per yard per year

$$EOQ = \sqrt{\frac{2 DP}{C}} = \sqrt{\frac{2 \times 26,400 \times \$165}{\$1.80}} = 2,200 \text{ yards}$$

2. Number of orders per year: $\frac{D}{EOQ} = \frac{26,400}{2,200} = 12$ orders per year

3. Demand each working day $= \frac{D}{\text{Number of working days}}$
 $= \frac{26,400}{250}$
 $= 105.60$ yards per day
 $= 528$ yards per week (105.60×5 days per week)

Purchasing lead time = 2 weeks

Reorder point = 528 yards per week \times 2 weeks = 1,056 yards

20-19 EOQ for manufacturer.

1. Relevant carrying costs per part per year:
Required annual return on investment $15\% \times \$30 =$ \$4.50
Relevant insurance, materials handling, breakage, etc.
costs per year 3.00
Relevant carrying costs per part per year \$7.50

With $D = 4,500$ parts per year; $P = \$75$; $C = \$7.50$ per part per year, EOQ for manufacturer is:

$$\text{EOQ} = \sqrt{\frac{2 DP}{C}} = \sqrt{\frac{2 \times 4,500 \times \$75}{7.50}} = 300 \text{ units}$$

2. Relevant annual ordering costs $= \left(\frac{D}{Q} \times P \right)$
 $= \left(\frac{4,500}{300} \times \$75 \right)$
 $= \$1,125$

where $Q = 300$ units, the EOQ.

3. At the EOQ, total relevant ordering costs and total relevant carrying costs will be exactly equal. Therefore, total relevant carrying costs at the EOQ = \$1,125 (from requirement 2). We can also confirm this with a direct calculation:

$$\begin{aligned} \text{Relevant annual carrying costs} &= \left(\frac{Q}{2} \times C \right) \\ &= \left(\frac{300}{2} \times \$7.50 \right) \\ &= \$1,125 \end{aligned}$$

where $Q = 300$ units, the EOQ.

4. Purchase order lead time is half a month.
Monthly demand is $4,500 \text{ units} \div 12 \text{ months} = 375 \text{ units per month}$.
Demand in half a month is $\frac{1}{2} \times 375 \text{ units}$ or 188 units.

Turfpro should reorder when the inventory of rotor blades falls to 188 units.