

Name (First Last: **Christian Ruiz**

Worked with: _____

- 1) **20 Points** Cookie needs to purchase organic Palm oil to make her soaps. She needs 1,000 kgs of Palm oil per day on average. The supplier charges a \$60 delivery fee per order (which is independent of the order size) and \$4.75 per kg. Cookie's annual holding cost is 25%. Assume 52 weeks per year and 7 days per week.

Avg Demand (D) = 1,000 kg/day of palm oil (365,000kg/yr)

Ordering Cost (S) = \$60 (flat rate)

Holding Cost (H) = 25% * 4.75 = \$1.1875/kg/yr

- (a) If Cookie wants to minimize inventory holding and ordering costs, how much Palm oil should she purchase with each order (in kgs)?

$$EOQ = \sqrt{(2 \times 365,000 \times 60) / 1.1875} = 6,073\text{kg}$$

- (b) Cookie's supplier is willing to sell her Palm oil at a 5% discount if she purchases 10,000 kgs at a time. If she were to purchase 10,000 kgs per order what would be her total average inventory ordering and holding costs per day (in \$s)? (Note, do NOT include her purchasing costs per day, which would be $1000 \times 4.75 \times 95\%$.)

Ordering costs:

Orders per year = annual demand / order quantity

Orders per year = 365,000kg/yr / 10,000kg/order = 36.5 orders/yr

Total ordering cost per year = 36.5 orders/yr x \$60/order = \$2,190

Total ordering cost per day = \$2,190/yr / 365 days/yr = \$6/day

Holding Costs:

Avg inventory = order quantity / 2 = 10,000kg/2 = 5,000kg

Reduced cost per kg due to the 5% discount

Discounted holding cost per kg = 0.95 x \$4.75 = \$4.51/kg

Annual holding cost per unit (H) = 0.25 x \$4.51/kg = \$1.128/kg/yr

Total holding cost per year = 5,000kg x \$1.128/kg/yr = \$5,640

Total Holding and Ordering Cost

Cost per year = ordering cost + holding cost = \$2,190 + \$5,640 = \$7,831

Ordering and holding cost per day = \$7,831/365 = \$21.45/day

- 2) **20 Points** Goop Inc needs to order raw material to make a special polymer. The demand for the polymer is forecasted to be normally distributed with a mean of 250 gallons and a standard deviation of 125 gallons. Goop sells polymer for \$25 per gallon. Goop purchases raw material for \$10 per gallon and Goop must spend \$5 per gallon to dispose of all unused raw material due to government regulations. (One gallon of raw material yields one gallon of polymer.) If demand is more than Goop can make, then Goop sells only what they made, and the rest of demand is lost.

Mean = 250 gal

Std = 125 gal

Confidence = 92%

z-score for 92% = 1.41

- (a) Suppose Goop wants to ensure that there is a 92% probability that they will be able to satisfy the customer's entire demand. How many gallons of raw material should they purchase?

Order quantity = mean + z-score x std

Order quantity = 250gal + 1.41 x 125gal = 426.25gal ~ 427gal

- (b) How many gallons should Goop purchase to maximize its expected profit?

To find the optimal number of gallons to purchase for maximizing profit, we will need to find the critical ratio and then find the order quantity that is associated with that ratio.

CR = (selling price – purchase cost) / (selling price – purchase cost + disposal cost)

CR = (25 – 10) / (25 – 10 + 5)

CR = 15 / 20 = 0.75

z-score for 0.75 = 0.674

order quantity = mean + z-score x std

order quantity = 250 + 0.674 x 125

order quantity = 334.25gal ~ 335gal