in any systematic way. However, recently profits have been squeezed due to increasing competitive pressures, and the firm has retained a management consultant to study its inventory management. The consultant has determined that the various costs associated with making an order for the item stocked are approximately $70 per order. She has also determined that the costs of carrying the item in inventory amount to approximately $27 per unit per year (primarily direct storage costs and forgone profit on investment in inventory). Demand for the item is reasonably constant over time, and the forecast is for 16,500 units per year. When an order is placed for the item, the entire order is immediately delivered to the firm by the supplier. The firm operates 6 days a week plus a few Sundays, or approximately 320 days per year. Determine the following:

a. Optimal order quantity per order
b. Total annual inventory costs
c. Optimal number of orders to place per year
d. Number of operating days between orders, based on the optimal ordering

13.4. The Sofaworld Company purchases upholstery material from Barrett Textiles. The company uses 45,000 yards of material per year to make sofas. The cost of ordering material from the textile company is $1,500 per order. It costs Sofaworld $0.70 per yard annually to hold a yard of material in inventory. Determine the optimal number of yards of material Sofaworld should order, the minimum total inventory cost, the optimal number of orders per year, and the optimal time between orders.

13.5. The Taegu Stationery Company purchases paper from the Pusan Paper Company. Taegu produces stationery that requires 1,958,740 sq. meters of paper per year. The cost per order for the company is $2,300; the cost of holding 1 meter of paper in inventory is $0.09 per year. The company works 5 days per week. Determine the following:

a. Economic order quantity.
b. Minimum total annual cost.
c. Optimal number of orders per year.
d. Optimal time between orders.

e. Run length in working days

13.6. The Ambrosia Bakery makes cakes for freezing and subsequent sale. The bakery, which operates five days a week, 52 weeks a year, can produce cakes at the rate of 116 cakes per day. The bakery sets up the cake-production operation and produces until a predetermined number \( Q \) have been produced. When not producing cakes, the bakery uses its personnel and facilities for producing other bakery items. The setup cost for a production run of cakes is $700. The cost of holding frozen cakes in storage is $9 per cake per year. The annual demand for frozen cakes, which is constant over time, is 6000 cakes. Determine the following:

a. Optimal production run quantity \( Q \)
b. Total annual inventory costs
c. Optimal number of production runs per year
d. Optimal cycle time (time between run starts)
e. Run length in working days

13.7. The EastCoasters Bicycle Shop operates 364 days a year, closing only on Christmas Day. The shop pays $300 for a particular bicycle purchased from the manufacturer. The annual holding cost per bicycle is estimated to be 25% of the dollar value of inventory. The shop sells an average of 18 bikes per week. The ordering cost for each order is $250. Determine the optimal order quantity and the total minimum cost.

13.8. The Suwan Company uses a highly toxic chemical in one of its manufacturing processes. It must have the product delivered by special cargo trucks designed for safe shipment of chemicals. As such, order (and delivery) costs are relatively high, at $3,750 per order. The chemical product is packaged in 1-gallon plastic containers. The cost of holding the chemical in storage is $45 per gallon per year. The annual demand for the chemical, which is constant over time, is 8,500 gallons per year. The lead time from order placement until receipt is 9 days. The company operates 300 working days per year. Compute the optimal order quantity, total minimum inventory cost, and the reorder point.

13.9. The Food Place Supermarket stocks Munchkin Cookies. Demand for Munchkins is 5000 boxes per year (365 days). It costs the store $80 per order of Munchkins, and it costs $0.50 per box per year to keep the cookies in stock. Once an order for Munchkins is placed, it takes four days to receive the order from a food distributor. Determine the following:

a. Optimal order size
b. Minimum total annual inventory cost
c. Reorder point

d. Economic order quantity.

13.10. Kroft Foods makes cheese to supply to stores in its area. The dairy can make 350 pounds of cheese per day, and the demand at area stores is 205 pounds per day. Each time the dairy makes cheese, it costs $175 to set up the production process. The annual cost of carrying a pound of cheese in a refrigerated storage area is $12. Determine the optimal order size and the minimum total annual inventory cost.

13.11. The Tsinglo Brewery produces an ale which it stores in barrels in its warehouse, and supplies to its distributors on demand. The demand for ale is 2,000 barrels per day. The brewery can produce 2,655 barrels per day. It costs $7,500 to set up a production run for ale. Once it is brewed, the ale is stored in a refrigerated warehouse at an annual cost of $55 per barrel. The brewery operates 300 days a year. Determine the economic order quantity and the minimum total annual inventory cost.

13.12. The purchasing manager for the Lhasa Steel Company must determine a policy for ordering coal to operate 15 converters. Each converter requires exactly 7 metric tons of coal per day to operate, and the firm operates 365 days per year. The purchasing manager has determined that the ordering cost is $80 per order, and the cost of holding coal is 17% of the unit purchase price per year. The purchasing manager has negotiated a contract to obtain the coal for $16 per ton for the coming year.

a. Determine the optimal quantity of coal to receive in each order.
b. Determine the total inventory-related costs associated with the optimal ordering policy (do not include the cost of the coal).