4.10

A specialty coffeehouse sells Colombian coffee at a fairly steady rate of 280 pounds annually. The beans are purchased from a local supplier for $2.40 per pound. The coffeehouse estimates that it costs $45 in paperwork and labor to place an order for the coffee, and holding costs are based on a 20 percent annual interest rate.

a. Determine the optimal order quantity for Colombian coffee.

b. What is the time between placement of orders?

c. What is the average annual cost of holding and setup due to this item?

d. If replenishment lead time is three weeks, determine the reorder level based on the on-hand inventory.

4.17

The Wod Chemical Company produces a chemical compound that is used as a lawn fertilizer. The compound can be produced at a rate of 10,000 pounds per day. Annual demand for the compound is 0.6 million pounds per year. The fixed cost of setting up for a production run of the chemical is $1,500, and the variable cost of production is $3.50 per pound. The company uses an interest rate of 22 percent to account for the cost of capital, and the costs of storage and handling of the chemical amount to 12 percent of the value. Assume that there are 250 working days in a year.

a. What is the optimal size of the production run for this particular compound?

b. What proportion of each production cycle consists of uptime and what proportion consists of downtime?

c. What is the average annual cost of holding and setup attributed to this item? If the compound sells for $3.90 per pound, what is the annual profit the company is realizing from this item?

4.26

A local outdoor vegetable stand has exactly 1,000 square feet of space to display three vegetables: tomatoes, lettuce, and zucchini. The appropriate data for these items are given in the following table.

	Item		
	Tomatoes	Lettuce	Zucchini
Annual demand (in pounds)	850	1,280	630
Cost per pound	$0.29	$0.45	$0.25

The setup cost for replenishment of the vegetables is $100 in each case, and the space consumed by each vegetable is proportional to its costs, with tomatoes requiring 0.5 square foot per pound. The annual interest rate used for computing holding costs is 25 percent. What are the optimal quantities that should be purchased of these three vegetables?

Tomlinson Furniture has a single lathe for turning the wood for various furniture pieces, including bedposts, rounded table legs, and other items. Four forms are turned on the lathe and produced in lots for inventory. To simplify scheduling, one lot of each type will be produced in a cycle, which may include idle time. The four products and the relevant information concerning them appears in the following table.

Piece	Monthly Requirements	Setup Time (hours)	Unit Cost	Production Rate (units/day)
J–55R	125	1.2	$20	140
H–223	140	0.8	35	220
K–18R	45	2.2	12	100
Z–344	240	3.1	45	165

Worker time for setups is valued at $85 per hour, and holding costs are based on a 20 percent annual interest charge. Assume 20 working days per month and 12 months per year for your calculations.

a. Determine the optimal length of the rotation cycle.

b. What are the optimal lot sizes for each product?

c. What are the percentages of uptime and downtime for the lathe, assuming that it is not used for any other purpose?

d. Draw a graph showing the change in the inventory level over a typical cycle for each product.

e. Discuss why the solution you obtained might not be feasible for the firm, or why it might not be desirable even when it is feasible.