16. The Hickory Cabinet and Furniture Company produces sofas, tables, and chairs at its plant in Greensboro, North Carolina. The plant uses three main resources to make furniture—wood, upholstery, and labor. The resource requirements for each piece of furniture and the total resources available weekly are as follows:

	Resource Requirements		
	Wood (lb.)	Upholstery (yd.)	Labor (hr.)
Sofa	7	12	6
Table	5	—	9
Chair	4	7	5
Total available resources	2,250	1,000	240

The furniture is produced on a weekly basis and stored in a warehouse until the end of the week, when it is shipped out. The warehouse has a total capacity of 650 pieces of furniture. Each sofa earns $400 in profit, each table, $275, and each chair, $190. The company wants to know how many pieces of each type of furniture to make per week to maximize profit.

a. Formulate a linear programming model for this problem.
b. Solve the model by using the computer.

17. Lawns Unlimited is a lawn care and maintenance company. One of its services is to seed new lawns as well as bare or damaged areas in established lawns. The company uses three basic grass seed mixes it calls Home 1, Home 2, and Commercial 3. It uses three kinds of grass seed—tall fescue, mustang fescue, and bluegrass. The requirements for each grass mix are as follows:

Mix	Mix Requirements
Home 1	No more than 50% tall fescue
	At least 20% mustang fescue
Home 2	At least 30% bluegrass
	At least 30% mustang fescue
	No more than 20% tall fescue
Commercial 3	At least 50% but no more than 70% tall fescue
	At least 10% bluegrass

The company believes it needs to have at least 1,200 pounds of Home 1 mix, 900 pounds of Home 2 mix, and 2,400 pounds of Commercial 3 seed mix on hand. A pound of tall fescue costs the company $1.70, a pound of mustang fescue costs $2.80, and a pound of bluegrass costs $3.25. The company wants to know how many pounds of each type of grass seed to purchase to minimize cost.

a. Formulate a linear programming model for this problem.
b. Solve this model by using the computer.

18. Alexandra Bergson has subdivided her 2,000-acre farm into three plots and has contracted with three local farm families to operate the plots. She has instructed each sharecropper to plant three crops: corn, peas, and soybeans. The size of each plot has been determined by the capabilities of each local farmer. Plot sizes, crop restrictions, and profit per acre are given in the following tables:

Plot	Acreage
1	500
2	800
3	700

CASE PROBLEM

THE UNIVERSITY BOOKSTORE STUDENT COMPUTER PURCHASE PROGRAM

The University Bookstore is owned and operated by State University through an independent corporation with its own board of directors. The bookstore has three locations on or near the State University campus. It stocks a range of items, including textbooks, trade books, logo apparel, drawing and educational supplies, and computers and related products, including printers, modems, and software. The bookstore has a program to sell personal computers to incoming freshmen and other students at a substantial educational discount, partly passed on from computer manufacturers. This means that the bookstore just covers computer costs, with a very small profit margin remaining.

Each summer all incoming freshmen and their parents come to the State campus for a 3-day orientation program. The students come in groups of 100 throughout the summer. During their visit the students and their parents are given details about the bookstore's computer purchase program. Some students place their computer orders for the fall semester at this time, whereas others wait until later in the summer. The bookstore also receives orders from returning students throughout the summer. This program presents a challenging management problem for the bookstore.

Orders come in throughout the summer, many only a few weeks before school starts in the fall, and the computer suppliers require at least 6 weeks for delivery. Thus, the bookstore must forecast computer demand to build up inventory to meet student demand in the fall. The student computer program and the forecast of computer demand have repercussions all along the bookstore supply chain. The bookstore has a warehouse near campus where it must store all computers because it has no storage space at its retail locations. Ordering too many computers not only ties up the bookstore's cash reserves, it also takes up limited storage space and limits inventories for other bookstore products during the bookstore's busiest sales period. Because the bookstore has such a low profit margin on computers, its bottom line depends on these other products. Because competition for good students has increased, the university has become very quality conscious and insists that all university facilities provide exemplary student service, which for the bookstore means meeting all student demands for computers when fall semester starts. The number of computers ordered also affects the number of temporary warehouse and bookstore workers who must be hired for handling and assisting with PC installations. The number of truck trips from the warehouse to the bookstore each day of fall registration is also affected by computer sales.

The bookstore student computer purchase program has been in place for 14 years. Although the student population has remained stable during this period, computer sales have been somewhat volatile. Following are the historical sales data for computers during the first month of fall registration:

Year	*Computers Sold*	*Year*	*Computers Sold*
1	518	8	792
2	651	9	877
3	708	10	693
4	921	11	841
5	775	12	1,009
6	810	13	902
7	856	14	1,103

Develop an appropriate forecast model for bookstore management to use to forecast computer demand for next fall semester and indicate how accurate it appears to be. What other forecasts might be useful to the bookstore?

CASE PROBLEM

VALLEY SWIM CLUB

The Valley Swim Club has 300 stockholders, each holding one share of stock in the club. A share of club stock allows the shareholder's family to use the club's heated outdoor pool during the summer, upon payment of annual membership dues of $175. The club has not issued any stock in years, and only a few of the existing shares come up for sale each year. The board of directors administers the sale of all stock. When a shareholder wants to sell, he or she turns the stock in to the board, which sells it to the person at the top of the waiting list. For the past few years, the length of the waiting list has remained relatively steady, at approximately 20 names.

However, during the past winter two events occurred that have suddenly increased the demand for shares in the club. The winter was especially severe, and subzero weather and heavy ice storms caused both the town and the county pools to buckle and crack.