Problems

We have inserted the symbol E* to the left of each problem (or its parts) where Excel should be used (unless your instructor gives you contrary instructions). An asterisk on the problem number indicates that at least a partial answer is given in the back of the book.

4.1. Reconsider the Super Grain Corp. case study as presented in Section 4.1. The advertising firm, Giacomi & Jackowitz, now has suggested a fourth promising advertising medium—radio commercials—to promote the company's new breakfast cereal, Crunchy Start. Young children are potentially major consumers of this cereal, but parents of young children (the major potential purchasers) often are too busy to do much reading (so may miss the company's advertisements in magazines and Sunday supplements) or even to watch the Saturday morning programs for children where the company's television commercials are aired. However, these parents do tend to listen to the radio during the commute to and from work. Therefore, to better reach these parents, Giacomi & Jackowitz suggests giving consideration to running commercials for Crunchy Start on nationally syndicated radio programs that appeal to young adults during typical commuting hours.

Giacomi & Jackowitz estimates that the cost of developing each new radio commercial would be $50,000, and that the expected number of exposures per commercial would be 900,000. The firm has determined that 10 spots are available for different radio commercials, and each one would cost $200,000 for a normal run.

E* *a.* Formulate and solve a spreadsheet model for the revised advertising-mix problem that includes this fourth advertising medium. Identify the data cells, the changing cells, and the target cell. Also show the Excel equation for each output cell expressed as a SUMPRODUCT function.

b. Indicate why this spreadsheet model is a linear programming model.

c. Express this model in algebraic form.

4.2* Consider a resource-allocation problem having the following data:

	Resource Usage per Unit of Each Activity		
Resource	1	2	Amount of Resource Available
1	2	1	10
2	3	3	20
3	2	4	20
Contribution per unit	$20	$30	

Contribution per unit = profit per unit of the activity.

E* *a.* Formulate a linear programming model for this problem on a spreadsheet.

E* *b.* Use the spreadsheet to check the following solutions: $(x_1, x_2) = (2, 2), (3, 3), (2, 4), (4, 2), (3, 4), (4, 3)$. Which of these solutions are feasible? Which of these feasible solutions has the best value of the objective function?

c. Use the Solver to find an optimal solution.

d. Express this model in algebraic form.

e. Use the graphical method to solve this model.

4.3. Consider a resource-allocation problem having the following data.

	Resource Usage per Unit of Each Activity			
Resource	1	2	3	Amount of Resource Available
A	30	20	0	500
B	0	10	40	600
C	20	20	30	1,000
Contribution per unit	$50	$40	$70	

Contribution per unit = profit per unit of the activity.