4.8 continued

Problems Page 3

4.8 → a, b, c, d

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

E* *b.* Use the spreadsheet to check the following solutions: $(x_1, x_2) = (7, 7), (7, 8), (8, 7), (8, 8), (8, 9), (9, 8)$. Which of these solutions are feasible? Which of these feasible solutions has the best value of the objective function?

E* *c.* Use the Solver to find an optimal solution.

d. Express the model in algebraic form.

~~*e.* Use the graphical method to solve this model.~~

E*4.9. Consider a cost–benefit–trade-off problem having the following data:

	Benefit Contribution per Unit of Each Activity				
Benefit	**1**	**2**	**3**	**4**	**Minimum Acceptable Level**
P	2	−1	4	3	80
Q	1	4	−1	2	60
R	3	5	4	−1	110
Unit cost	$400	$600	$500	$300	

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

b. Make five guesses of your own choosing for the optimal solution. Use the spreadsheet to check each one for feasibility and, if feasible, for the value of the objective function. Which feasible guess has the best objective function value?

c. Use the Solver to find an optimal solution.

4.10.* Fred Jonasson manages a family-owned farm. To supplement several food products grown on the farm, Fred also raises pigs for market. He now wishes to determine the quantities of the available types of feed (corn, tankage, and alfalfa) that should be given to each pig. Since pigs will eat any mix of these feed types, the objective is to determine which mix will meet certain nutritional requirements at a *minimum cost*. The number of units of each type of basic nutritional ingredient contained within a kilogram of each feed type is given in the following table, along with the daily nutritional requirements and feed costs:

Nutritional Ingredient	**Kilogram of Corn**	**Kilogram of Tankage**	**Kilogram of Alfalfa**	**Minimum Daily Requirement**
Carbohydrates	90	20	40	200
Protein	30	80	60	180
Vitamins	10	20	60	150
Cost (¢)	84	72	60	

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

E* *b.* Use the spreadsheet to check if $(x_1, x_2, x_3) = (1, 2, 2)$ is a feasible solution and, if so, what the daily cost would be for this diet. How many units of each nutritional ingredient would this diet provide daily?

E* *c.* Take a few minutes to use a trial-and-error approach with the spreadsheet to develop your best guess for the optimal solution. What is the daily cost for your solution?

E* *d.* Use the Solver to find an optimal solution.

e. Express the model in algebraic form.

4.11. Maureen Laird is the chief financial officer for the Alva Electric Co., a major public utility in the Midwest. The company has scheduled the construction of new hydroelectric plants 5, 10, and 20 years from now to meet the needs of the growing population in the region served by the company. To cover the