EXAMPLE 3.5.1 Minimizing Amount of Fence

The highway department is planning to build a picnic park for motorists along a major highway. The park is to be rectangular with an area of 5,000 square yards and is to be fenced off on the three sides not adjacent to the highway. What is the least amount of fencing required for this job? How long and wide should the park be for the fencing to be minimized?

EXAMPLE 3.5.2 Maximizing Profit

Mateo owns a small company that makes souvenir T-shirts. He can produce the shirts at a cost of $2 apiece. The shirts have been selling for $5 apiece, and at this price, tourists have been buying 4,000 shirts a month. Mateo plans to raise the price of shirts and expects that for each $1 increase in price, 400 fewer shirts will be sold each month. What price should Mateo charge per shirt to maximize profit?

12. **RETAIL SALES** A bookstore can obtain a certain novel from the publisher at a cost of $3 per book. The bookstore has been offering the novel at a price of $15 per copy and, at this price, has been selling 200 copies a month. The bookstore is planning to lower its price to stimulate sales and estimates that for each $1 reduction in the price, 20 more books will be sold each month. At what price should the bookstore sell the novel to generate the greatest possible profit?

45. **CONSTRUCTION COST** A carpenter has been asked to build an open box with a square base. The sides of the box will cost $3 per square meter, and the base will cost $4 per square meter. What are the dimensions of the box of greatest volume that can be constructed for $48?

22. **INVENTORY** A manufacturer of medical monitoring devices uses 36,000 cases of components per year. The ordering cost is $54 per shipment, and the annual cost of storage is $1.20 per case. The components are used at a constant rate throughout the year, and each shipment arrives just as the preceding shipment is being used up. How many cases should be ordered in each shipment to minimize total cost?