

- 21. INSTALLATION COST** A cable is to be run from a power plant on one side of a river 1,200 meters wide to a factory on the other side, 1,500 meters downstream. The cost of running the cable under the water is \$25 per meter, while the cost over land is \$20 per meter. What is the most economical route over which to run the cable?
- 22. INSTALLATION COST** Find the most economical route in Exercise 21 if the power plant is 2,000 meters downstream from the factory.
- 23. POSTER DESIGN** A printer receives an order to produce a rectangular poster containing 648 square centimeters of print surrounded by margins of 2 centimeters on each side and 4 centimeters on the top and bottom. What are the dimensions of the smallest piece of paper that can be used to make the poster? [*Hint*: An unwise choice of variables will make the calculations unnecessarily complicated.]
- 24. PACKAGING** A cylindrical can is to hold 4 cubic inches of frozen orange juice. The cost per square inch of constructing the metal top and bottom is twice the cost per square inch of constructing the cardboard side. What are the dimensions of the least expensive can?
- 25. PACKAGING** Use the fact that 12 fluid ounces is approximately 6.89 cubic inches to find the dimensions of the 12-ounce soda can that can be constructed using the least amount of metal. Compare these dimensions with those of one of the soda cans in your refrigerator. What do you think accounts for the difference?
- 26. PACKAGING** A cylindrical can (with top) is to be constructed using a fixed amount of metal. Use calculus to derive a simple relationship between the radius and height of the can having the greatest volume.
- 27. CONSTRUCTION COST** A cylindrical container with no top is to be constructed to hold a fixed volume of liquid. The cost of the material used for the bottom is 3 cents per square inch, and that for the curved side is 2 cents per square inch. Use calculus to derive a simple relationship between the radius and height of the least expensive container.
- 28. PRODUCTION COST** Each machine at a certain factory can produce 50 units per hour. The setup cost is \$80 per machine, and the operating cost is \$5 per hour. How many machines should be used to produce 8,000 units at the least possible cost? (Remember that the answer should be a whole number.)
- 29. COST ANALYSIS** It is estimated that the cost of constructing an office building that is n floors high is thousand dollars. How many floors should the building have in order to minimize the average cost per floor? (Remember that your answer should be a whole number.)
- 30. INVENTORY** An electronics firm uses 600 cases of components each year. Each case costs \$1,000. The cost of storing one case for a year is 90 cents, and the ordering fee is \$30 per shipment. How many cases should the firm order each time to keep total cost at a minimum? (Assume that the components are used at a constant rate throughout the year and that each shipment arrives just as the preceding shipment is being used up.)