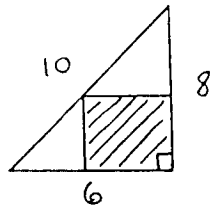I. You are to build an open cylindrical container which holds 64π in.^{3} Find the radius r and height h of the container which requires the least amount of material.

II. Build an open rectangular box with a square base and volume 80 ft.^{3} If material for the base costs \$5/ft.^{2} and material for the sides costs \$2/ft.^{2}, what are the dimensions of the least expensive box ?
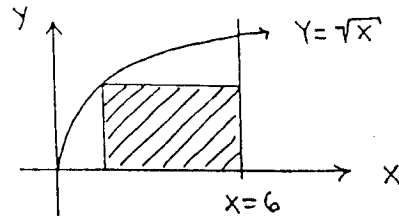
III. A hiker is 2 miles directly north of an east-west road, and her car is 4 miles east of the point on the road nearest the hiker. If she walks 3 mph through the woods and 5 mph on the road, find the shortest possible time required for her to reach her car.

IV. Find the dimensions of the rectangle of largest area which can be inscribed in the given diagram.

A.

B.

V. The manager of a hotel rents 100 rooms per night if the charge is \$50 per room. However, she has discovered that for every \$5 increase in price, four (4) fewer rooms are rented. What charge per room will result in maximum revenue for one night ? How many rooms are rented and what is the amount of this maximum revenue ?

VI. You have a small business which sells boxes of greeting cards. Assume that the demand x (the number of boxes sold) is inversely proportional to the square of the price p of a box of cards. If you charge \$20 per box, 125 boxes are sold. Your initial investment is \$750 and the cost to you for each box is \$5. Find the price p and the number of boxes x which will result in the maximum profit to you.