

4.5 Group Activity Problems



Guidelines for Optimization Problems

1. Read the problem carefully, identify the variables, and organize the given information with a picture.
 2. Identify the objective function (the function to be optimized). Write it in terms of the variables of the problem.
 3. Identify the constraint(s). Write them in terms of the variables of the problem.
 4. Use the constraint(s) to eliminate all but one independent variable of the objective function.
 5. With the objective function expressed in terms of a single variable, find the interval of interest for that variable.
 6. Use methods of calculus to find the absolute maximum or minimum value of the objective function on the interval of interest. If necessary, check the endpoints.
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8. What two nonnegative real numbers a and b whose sum is 23 maximize $a^2 + b^2$? Minimize $a^2 + b^2$?

- 17. Rectangles beneath a semicircle** A rectangle is constructed with its base on the diameter of a semicircle with radius 5 and its two other vertices on the semicircle. What are the dimensions of the rectangle with maximum area?

- 39. Designing a box** Two squares of length x are cut out of adjacent corners of a $18'' \times 18''$ piece of cardboard and two rectangles of length 9 and width x are cut out the other two corners of the cardboard (see figure). The resulting piece of cardboard is then folded along the dashed lines to form an enclosed box (see figure). Find the dimensions and volume of the largest box that can be formed in this way.

