

Steps to Follow in Solving  
Applied Max-Min Problems  
(Section 5.5)

1. Read the problem several times, looking carefully for the quantity to be maximized or minimized.
2. Draw a picture (where possible).
3. Give names to the relevant variables, eg.
  - A = area
  - P = perimeter
  - C = circumference
  - V = volume
  - r = radius
  - x,y = edge-length of a rectangle or square
  - c = cost of a book
  - u,v = two positive real numbers.

If there is a picture, label the picture with the names of the variables.

4. **Write down a function whose dependent variable is the quantity to be maximized or minimized.**
5. Make sure that this function is a function of only one variable. If not, use relationships between the variables to express one single variable (which will become the independent variable of the function) in terms of all the other variables. Then write the function as a function of this single independent variable. [See the back of your textbook (two pages from the back) for common geometric formulas that may help you in writing down the function and/or for determining relationships among variables].
6. Determine the domain of this function. Take into account the physical or geometric nature of the problem. Append end-points if possible, in order to assure that the function is defined on a closed interval. [Recall, a continuous function defined on a closed interval is guaranteed to have an absolute maximum and absolute minimum on the closed interval.]
- 7a. If the domain of the function is a closed interval, then use the techniques of section 5.4 to find the absolute max and the absolute min, both of which are guaranteed to exist.
- 7b. If the domain of the function can't be made to be a closed interval, then try to find any relative max's or relative min's that might solve the problem. Use the 2<sup>nd</sup> derivative test for relative extremes to tell whether any relative extreme that you've found is a relative max or relative min.
8. Re-read the problem, again, and answer the question that was asked.