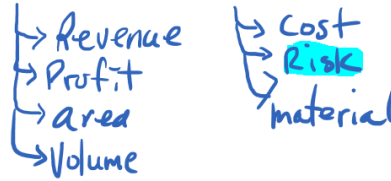


4.4 - Applied Maximum and Minimum Problems
(Optimization)



Actuarial science is the discipline that applies mathematical and statistical methods to assess risk in insurance, finance, and other industries and professions. More generally, actuaries apply rigorous mathematics to model matters of uncertainty. Actuaries are professionals trained in this discipline.

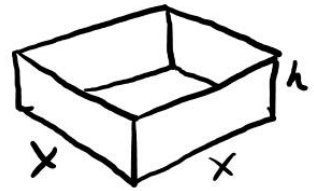


From <[**Example 1** Find two positive numbers whose product is 10 000 and whose sum is a minimum.](https://www.google.com/search?q=actuarial+science&rlz=1C1CHBD_enCA896CA896&oeq=actuarial+&aqs=chrome.69j69j57j0l131j433j0l131j95i433j0j39j5l4.6392j1j7&sourceid=chrome&ie=UTF-8&safeactive&ssuison>></small></p>
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Calculus 30 Steps to Solving Optimization problems

1. Set up a relation involving the quantity you wish to optimize and the other related quantities presented in the question.
2. Write the relation as a function of one variable (use the extra information)
3. Find the derivative of the new function
4. Identify critical numbers, understanding that a local max or min will occur at a critical number.
5. Find all quantities in the question.
6. Check, if necessary, that the critical number that seems to yield your max or min is actually a max or min (logic, sign analysis, test points, etc)
7. State the Max or Min required in the question. Be sure to state the function value as the max/min, not the independent variable value (y is the value desired, not x)

Example 2 If 2700 cm^2 of material is available to make a box with a square base and open top, find the largest possible volume of the box.



1. Find two numbers whose difference is 150 and whose product is a minimum.

$$x = \text{larger} \quad y = \text{smaller}$$

2. Find two positive numbers with product 200 such that the sum of one number and twice the second number is as small as possible.

3. A rectangle has a perimeter of 100 cm. What length and width should it have so that its area is a maximum?

4.4 Asn't: _____