MCV4U

Optimization

Calculus and the instantaneous rate of change is a valuable tool for solving optimization problems. For these types of problems, we want to find the optimal value for a given parameter based on a given set of constraints such as minimizing the cost of producing a container, or maximizing the area that will be fenced in.

We found that the first and second differences can provide clues to the location of turning points. We know that the instantaneous rate of change needs to be zero at a turning point.

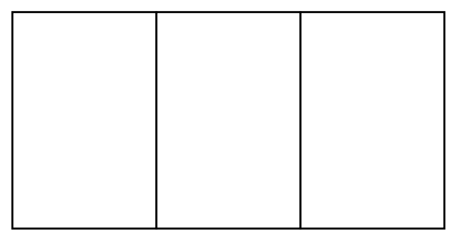
What we had been doing was guessing possible values and then calculating the IROC over and over again, hoping to get close to zero.

What if we calculate IROC only one time, at a general location and use the result to solve for the specific location.

For each problem below, find an expression that needs to be optimized. Calculate the IROC only once, at the general location $x = a$.

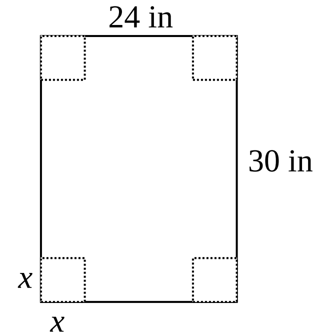
Problem #1

A farmer has 500 m of fencing that will be used to create a rectangular enclosure divided into three identical sections. Find the dimensions of the enclosure that will produce the greatest area.



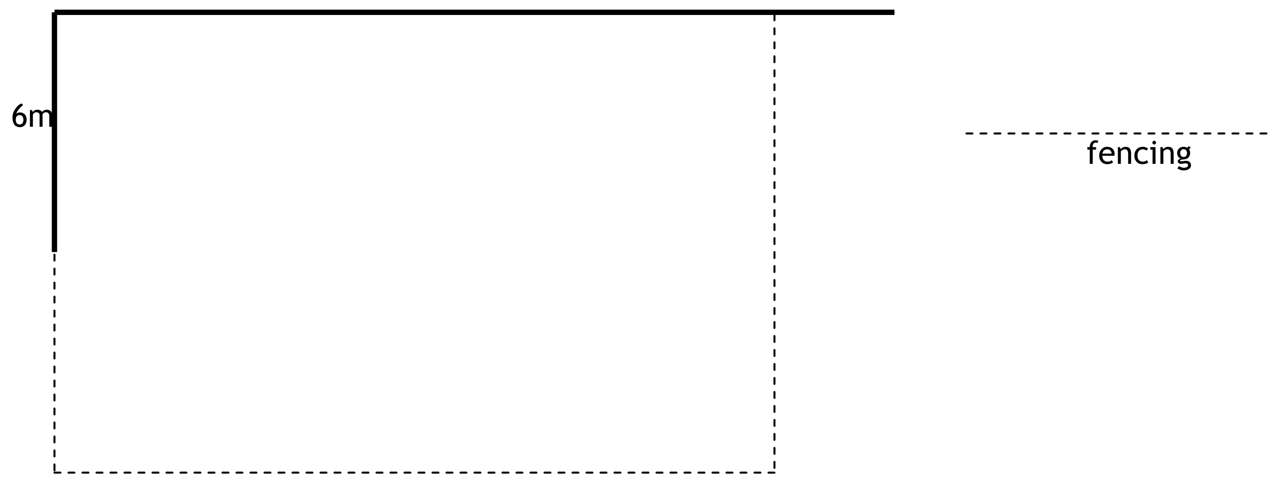
Problem #2

What are the dimensions for the open topped box of largest volume that could be made from the given sheet of cardboard



Problem #3

The town planners have hired you to design a rectangular enclosure for a children's day care. They will provide you with 122 metres of fencing. They would like your design to enclose the greatest possible area for the children to play in. What dimensions will give the largest play area? What is the largest play area? Model your solution in as many ways as possible.



Problem #4

The town planners have hired you to design a rectangular enclosure for a children's day care. They will provide you with 122 metres of fencing. They would like your design to enclose the greatest possible area for the children to play in. What dimensions will give the largest play area? What is the largest play area? Model your solution in as many ways as possible.