## Activity 7.4‡ – The Extreme Value Theorem and Optimization

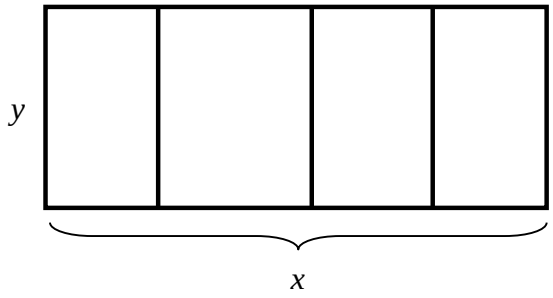
**FOR DISCUSSION**: *What is the difference between local and absolute extrema?*
*State the Extreme Value Theorem and its corollary.*
*What is an optimization problem?*

---

Practice solving the following problems by completing the steps outlined in Lesson 7.4.

- Draw a sketch labeled with variables.
- Create a list of equations that are relevant to the problem.
- Identify the quantity to be optimized and write a function that models it.
- Consider the domain and find the absolute maximum or minimum of the function.
- Write your answer with units.

1. A rancher wants to enclose a rectangular area and then divide it into four pens with fencing parallel to one side of the rectangle, as shown. What is the minimum length of fencing needed if the total area of the four pens is to be 3600 square feet?




‡ This activity has supplemental exercises.

2. A fenced-in garden is to be laid out in a rectangular area. One side of the garden will be against a barn and needs no fence. The fence parallel to the barn costs $10 per foot, while the remaining fence costs $15 per foot. Find the largest area that can be enclosed for a cost of $540.

3. If 1400 square centimeters of material is available to make a box with a square base and an open top, find the largest possible volume of the box.

4. An open rectangular storage container is to be constructed out of material that costs $5 per square foot. A separate lid costs $8 per square foot. The length of the box is to be twice the width. Minimize the cost of the box (with lid) if the total volume of the box is to be 5.2 cubic feet.

5. Suppose a cylindrical can with no top is to be made from 86 square inches of material. Find the height of the can that holds the most amount of liquid. How much liquid will it hold?