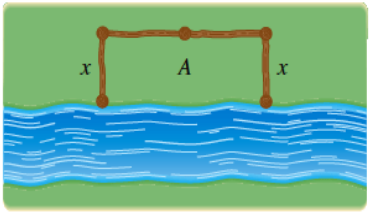
Group #: _____ Name: _____

You will notice that the first two problems are broken down into smaller pieces, which are done on purpose to guide you to see what information you need to garner first before you can solve the desired problem. A good problem solver is one who can do this well on a regular basis, since problems in real life won't be presented to you this way (it's more like Problem 3). Problems 4 and 5 only ask you to find a function to model the desired quantity instead of asking you to optimize. This is because the mathematics involved in optimizing for those problems is not yet familiar to you (easily done with Calculus!). But setting up is more than half of the battle already in many situations.

Everyone who completes the quiz gets 10 points extra credit for being a fighter! Round your answer to two decimal places if needed.

1. (25 points) A farmer has **2400 ft of fencing material** (known information) and wants to fence off a rectangular field that borders a straight river. He does not need a fence along the river (see the figure below). What are the **dimensions** (this is what you are looking for) of the field of **largest area** (this is what you are maximizing) that he can fence? Solve the problem by breaking it down into the following pieces.

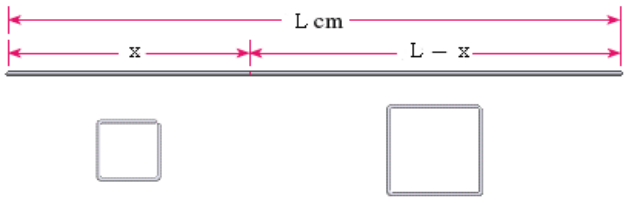


   (a) Write an equation for the known information.

   (b) Find a function that models the area of the field using the known information in terms of one of its sides.

   (c) Use your model to solve the problem. Be sure to verify that your answer actually makes sense.

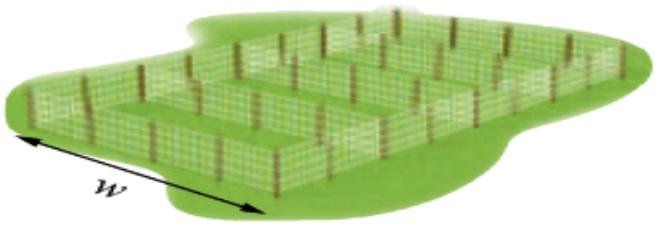
2. (25 points) A wire $L = 26$ cm long is cut into two pieces, one of length x and the other of length $26 - x$, as shown in the figure. Each piece is bent into the shape of a square.



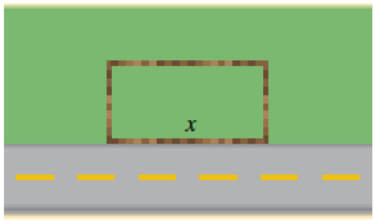
   (a) Find a function that models the total area enclosed by the two squares.

   (b) Find the value of x that minimizes the total area of the two squares.

3. (15 points) A rancher with 750 ft of fencing wants to enclose a rectangular area and then divide it into four pens with fencing parallel to one side of the rectangle (see the figure below). Find the largest possible total area of the four pens.



4. (15 points) A property owner wants to fence a garden plot adjacent to a road, as shown in the figure below. The fencing next to the road must be sturdier and costs \$5 per foot, but the other fencing costs just \$3 per foot. The garden is to have an area of $1200\,\text{ft}^2$. Find a function that models the cost of fencing the garden.



5. (20 points) A box with an open top is to be constructed from a rectangular piece of cardboard with dimensions 12 inches by 20 inches by cutting out equal squares of side x at each corner and then folding up the sides (see figure below). Find a function that models the volume of the box.