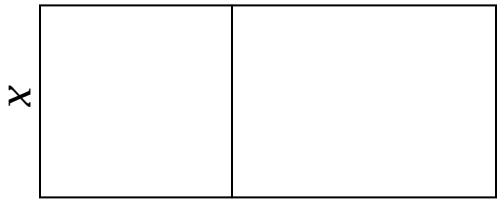
College Algebra Instructor: Mr. Katz

Name: _____ Date: _____

The Ultimate Solution to the Rectangular Pen Problem

Imagine you need to make a rectangular pen with a fixed amount of fencing *P*. Perhaps the rectangular pen will have two subsections created by three vertical segments and two horizontal segments like so:



Or perhaps the rectangular pen will have eight subsections created by five vertical segments and three horizontal segments like so:

In either case, the important question is what would be the maximum area possible for the entire pen?

For example, in the familiar case of the rectangular pen with three sides (one side against a river or barn) as in your textbook, the formula for the width and length of the pen is:

$$width = \frac{P}{4} \qquad length = \frac{P}{2}$$

So if P = 600 feet of fencing, a width of 150 feet and length of 300 feet would give the maximum area.

Use your algebra skills to derive a general formula that would give the width and length to maximize area for any rectangular pen constructed with *h* horizontal segments and *v* vertical segments from *P* amount of fencing. Show your algebra derivation and diagrams on the back of this worksheet.

(Hints: let the variables in your formula be *P,h,v*. Also, use the vertex formula $\frac{-b}{2a}$ in the derivation of your formula.)