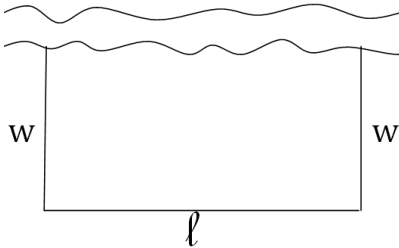


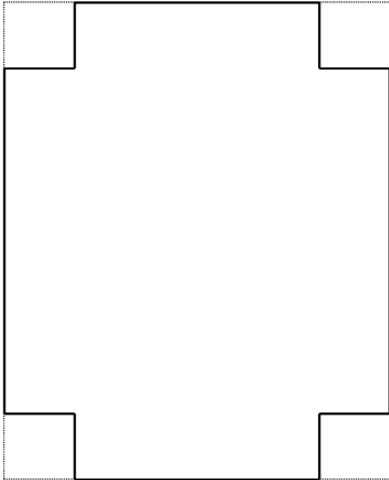
## Examples

1.) Farmer Brown has 1200 ft of fence to create a rectangular pen that will be adjacent to a river. If he does not need to put any fence on the side that borders the river, what dimensions will maximize the area of the pen, and what is the maximum area? (Do not forget units!)

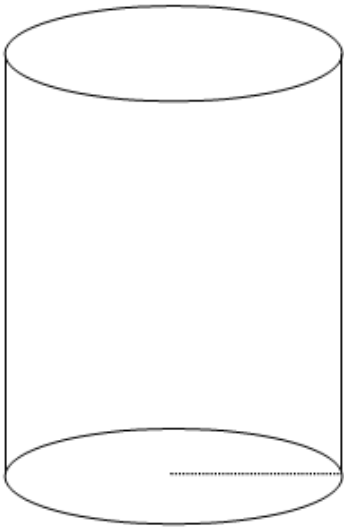


2.) Find two numbers  $A$  and  $B$  (with  $A \leq B$ ) whose difference is 42 and whose product is minimized.

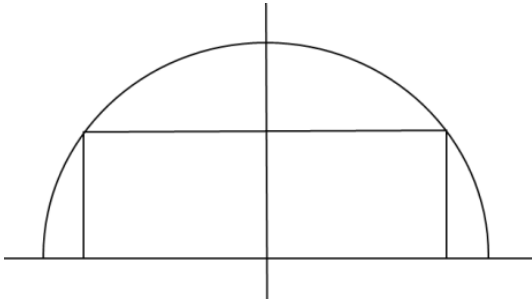
3.) A box is to be made out of a 10 by 18 piece of cardboard. Squares of equal size will be cut out of each corner, and then the ends and sides will be folded up to form a box with an open top. Find the length  $L$ , width  $W$ , and height  $H$  of the resulting box that maximizes the volume. (Assume that  $W \leq L$ ).



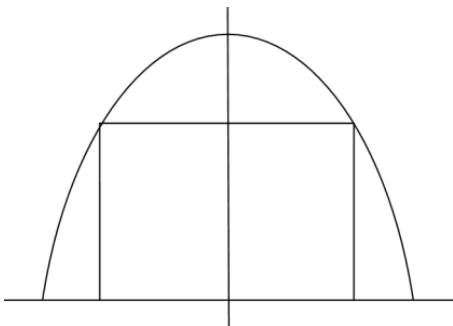
4.) A cylindrical oatmeal container has a capacity of 3 liters. Find the dimensions that will minimize the cost of production material to construct the container.



5.) Find the area of the largest rectangle that can be inscribed in a semicircle with a radius 4

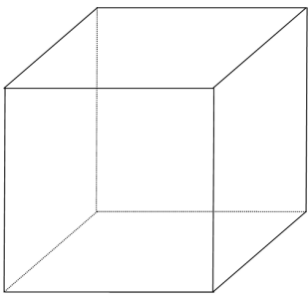


6.) Find the dimensions of the rectangle of largest area that has its base on the x-axis and its other two vertices above the x-axis and lying on the parabola  $y = 4 - x^2$ .



7.) Find the point on the line  $y = 4x + 7$  which is closest to the point  $(0,0)$ .

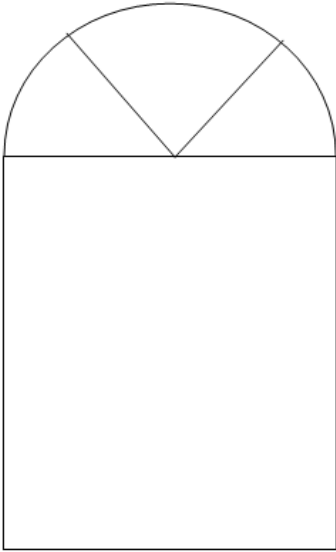
8.) If 2000 square centimeters of material is available to make a box with a square base and an open top, find the largest possible volume of the box.



9.) A piece of wire 12 m long is cut into two pieces. One piece is bent into the shape of a circle of radius  $r$  and the other is bent into a square of side  $s$ . How should the wire be cut so that the total area enclosed is:

- a.) Maximized
- b.) Minimized

10.) A Norman window has the shape of a semicircle atop a rectangle so that the diameter of the semicircle is equal to the width of the rectangle. What is the area of the largest possible Norman window with a perimeter of 45 feet?



- 11.) A running track has the shape of a rectangle with a semicircle on each end. If the length of the track is 400 meters, find the dimensions so that
- the rectangular (shaded) region is maximized.
  - The entire region is maximized.

