

# Applied Max/Min Exercises

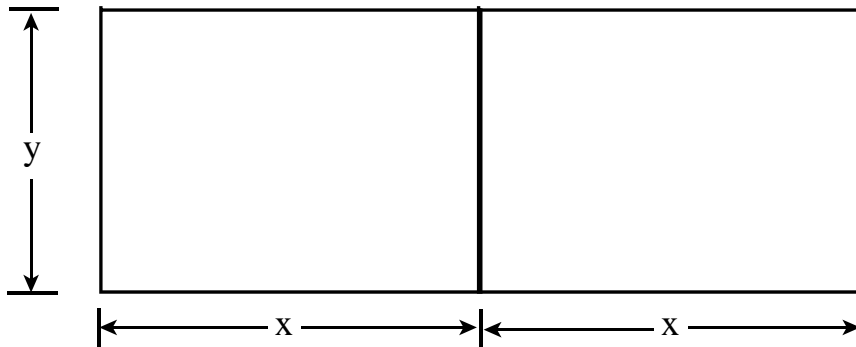
FALL 2019

Pat Rossi

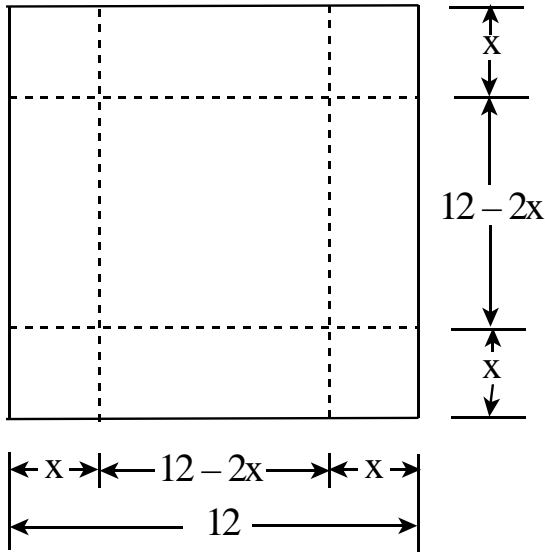
Name \_\_\_\_\_

**Instructions.** Use the “5-Step Method” that we’ve used in class

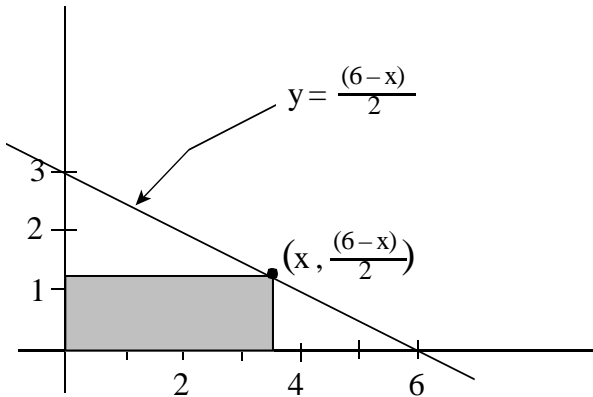
1. Find the maximum area a rectangle can have if the perimeter is 20 ft.
2. A rectangle has a perimeter of 100 feet. What length and width should it have so that its area is maximum?
3. What positive number  $x$  minimizes the sum of  $x$  and its reciprocal?
4. The sum of one number and two times a second number is 24. What numbers should be selected so that their product is as large as possible?
5. Find two positive numbers whose sum is 110 and whose product is a maximum.
6. Find two positive numbers whose product is 192 and whose sum is a minimum.
7. Find two positive numbers  $x$  and  $y$  such that  $x + y = 6$  and  $xy^2$  is as large as possible.
8. Find two positive numbers such that their product is 36 and the sum of their cubes is a minimum.
9. A farmer has 1000 feet of fencing with which to enclose three sides of a rectangular pasture; a straight river will form the fourth side of the pasture. Find the dimensions of the pasture of largest area that the farmer can enclose with the fence.
10. A rancher has 200 feet of fencing to enclose two adjacent rectangular corrals, as shown in the figure below. (Some of the fencing will be used to form the partition between the two pens.) What dimensions should be used so that the enclosed area will be maximum?



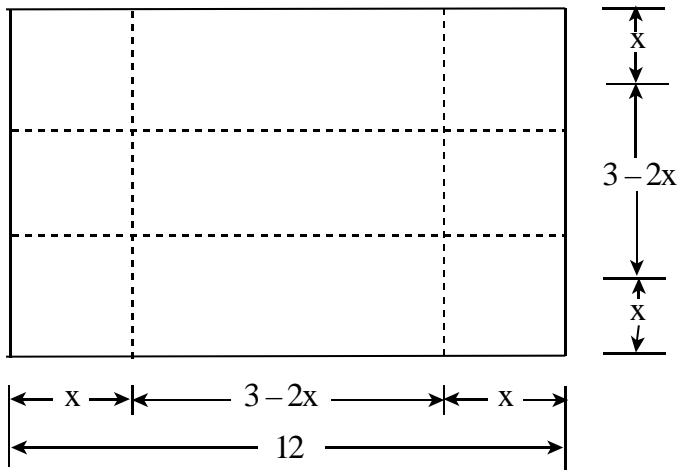
11. A cardboard box of  $108 \text{ cm}^3$  volume with a square base and open top is to be constructed. Find the minimum area of cardboard needed. (Neglect material wasted in construction.)
12. An open box is to be made from a square piece of material, 12 inches on a side, by cutting equal squares from each corner and turning up the sides, as shown in the picture below. Find the volume of the largest box that can be made in this manner.



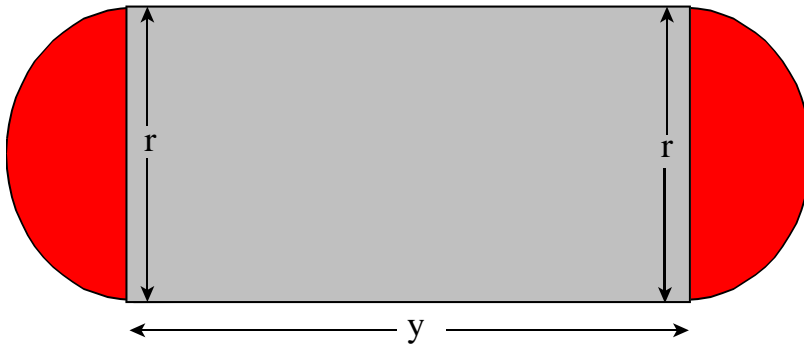
13. A rectangle is bounded by the  $x$  and  $y$  axes and the graph of  $y = \frac{(6-x)}{2}$  as shown in the picture below. What length and width should the rectangle have so that its area is a maximum?



14. An open box is to be made from a rectangular piece of material by cutting equal squares from each corner and turning up the sides. Find the dimensions of the box of maximum volume if the material has dimensions of 2 feet by 3 feet.



15. Find the dimensions of the rectangle of maximum area that can be inscribed in a semicircle of radius  $a$ . [Hint : you may find it easier to maximize the *square of the area*. Of course, if the *square of the area* of the rectangle is a maximum, then the *area* of the rectangle is also a maximum.]
16. An indoor physical fitness room consists of a rectangular region with a semicircle on each end. If the perimeter of the room is to be a running track 200 meters in length, find the dimensions that will make the area of this rectangular region as large as possible.



17. A net enclosure for golf practice is open at one end, as shown in the figure below. Find the dimensions that require the least amount of netting if the volume of the enclosure is to be  $\frac{250}{3}$  cubic meters, and the enclosure has a square cross section.