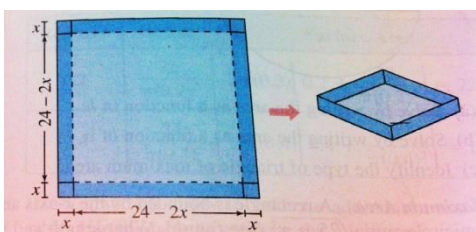
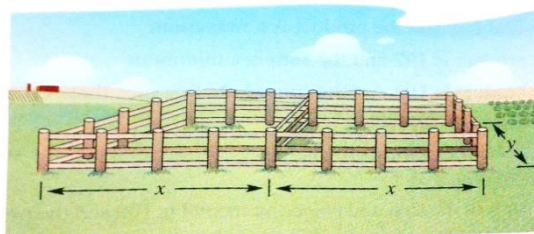


**Directions: Do each problem on one sheet of paper – single-sided. Show all work! Draw a picture/graph where appropriate.
Arrange and staple pages in order.**

1. Find two nonnegative numbers whose sum is 9 and so that the product of one number and the square of the other number is a maximum.
2. An open box is to be made from a square piece of material, 24 inches on a side, by cutting equal squares from the corners and turning up the sides (see figure). What sized squares should be cut from the material to maximize the volume of the box?
3. Skip this one for now



4. A rancher has 200 feet of fencing with which to enclose two adjacent rectangular corrals (see figure). What dimensions should be used so that the enclosed area will be a maximum?



5. You want to run an underground power cable from a power station on one side of a river to a house on the other side. The house is 5 miles downstream from the station, and the river has a constant width of 1 mile. It costs \$1000 per mile to lay cable underground, and \$3000 per mile to lay cable under water. How should you lay the cable to minimize the total cost, and what will the minimum cost be?
6. You are standing at the edge of a slow-moving river which is one mile wide and wish to return to your campground on the opposite side of the river. You can swim at 2 mph and walk at 3 mph. You must first swim across the river to any point on the opposite bank. From there walk to the campground, which is one mile from the point directly across the river from where you start your swim. What route will take the least amount of time ?
7. Find the point (x, y) on the graph of $y = \sqrt{x}$ nearest the point $(4, 0)$.
8. There are 50 apple trees in an orchard. Each tree produces 800 apples. For each additional tree planted in the orchard, the output per tree drops by 10 apples. How many trees should be added to the existing orchard in order to maximize the total output of trees?