

1. A farmer has 120 meters of fencing with which she plans to make a rectangular pigpen. The pen is to have one internal fence running parallel to the end fences that divide the pen into two sections. Determine the dimensions that produce the pen of maximum area if the length of the larger section is to be twice the length of the smaller section.
2. A rectangular play yard is to be constructed along the side of a house by erecting a fence on three sides, using a wall of the house as the fourth wall of the play yard. Determine the dimensions that produce the play yard of maximum area if 20 meters of fence is available for the project.
3. The marketing department of the TENRAQ Tennis Company noted that, on average, 600 tennis rackets will be sold monthly at the unit price of \$100. The department also observed that for each \$5 reduction in price an extra 50 rackets will be sold each month. What price will maximize the revenue?
4. An orchard presently has 25 trees per acre. The average yield has been calculated to be 495 apples per tree. It is predicted that for each additional tree planted per acre the yield will be reduced by 15 apples per tree. According to this information, how many additional trees per acre should be planted in order to maximize the average yield?
5. A homeowner has 40 feet of wire with which to enclose a rectangular garden. Determine the dimensions of the garden so that the enclosed area is as large as possible.
6. The sum of two numbers is 12. Determine the two numbers so that their product is as large as possible.
7. It is estimated that 14,000 people will attend an NCAA basketball game when the admission price is \$7 per person. For each 25-cent increase in the ticket price, the attendance will decrease by 280 people. What admission price will maximize ticket revenue?
8. If an object is thrown upward with an initial velocity of 32 feet per second, the height of the object above the ground after t seconds is $h(t) = 32t - 16t^2$. Determine the maximum height attained by the object. If the object is not intercepted in the air, when does the object hit the ground?
9. A shepherd has 150 feet of fencing with which to build two pens. The pens, which will share one side, will be rectangular in shape with the length running along the side of a barn so that no fencing is needed along that side. If one pen will be twice as long as the other, determine the dimensions of the pens that enclose the greatest area.
10. The difference of two numbers is 30. Determine the numbers so that their product is as small as possible.
11. A rancher has 180 feet of fencing with which to build three adjacent pens of equal size. The pens will be rectangular with the length running along the side of a barn so that no fencing is needed on that side. Determine the dimensions of the pens that enclose the largest area.
12. The difference between two numbers is sixteen. Determine the numbers so that their product is smallest.
13. A rectangular field is to be enclosed on all four sides with a fence. Fencing material costs \$3 per foot for one pair of parallel sides and \$6 per foot for the other two parallel sides. Determine the maximum area that can be enclosed for \$2,400.
14. A farmer has 1200 meters of fencing with which to enclose a rectangular field bordering a river. If no fencing is required along the river, determine the dimensions of the field of maximum area that can be enclosed.
15. Determine the dimensions of the largest rectangular field that can be enclosed using 200 meters of fencing.
16. A rectangular field is to be enclosed with a fence. One side of the field is against an existing fence so that no fencing is needed on that side. If the fencing material for the two ends costs \$2 per foot and the fencing material for the side parallel to the existing fence costs \$4 per foot, determine the dimensions of the field of largest area that can be enclosed for \$1,000.
17. The manager of an 80-unit apartment complex is trying to determine the rent per apartment that will maximize the monthly revenue. From experience, the manager knows that for a rent of \$200 he can lease all the apartments. However, for each \$20 increase in rent, one additional unit will remain vacant. How many apartments must remain vacant so that the monthly revenue will be as large as possible? What is the monthly rent?
18. A charter flight charges a fare of \$200 per person plus \$4 per person for each unsold seat on the plane. If the plane holds 100 passengers, determine the number of unsold seats and the fare per person that maximize revenue.
19. Suppose that after x inches of rain in June, the number of mosquitoes, in millions, in a certain area of Kentucky is given by $M(x) = 10x - x^2$. What amount of rain produces the largest number of mosquitoes?