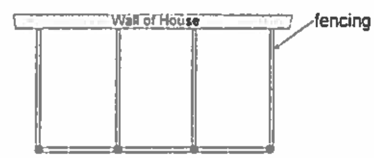
Section 3.2: Max/Min Word Problems

1. A cannonball is fired and its height, h, in meters, above the ground, t seconds after being fired, is given by $h(t) = -5t^2 + 40t + 3$. Algebraically determine the maximum height of the cannonball and the time taken to reach this height.

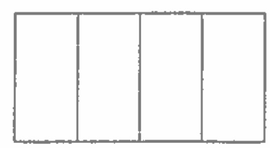
2. Suppose a ball is thrown upwards at a speed of 20 m/s. The approximate height, h, in meters that it will reach in t seconds is given by $h(t) = -5t^2 + 30t$. Determine the maximum height the ball will reach and the time needed to reach this height.

3. A lifeguard marks off a rectangular swimming area using 100 m of rope. If he uses the beach as one side of the swimming area, what are the dimensions that give the maximum swimming area?

4. A rectangular region, placed against the wall of a house, is divided into three regions of equal area using a total of 120 m of fencing as shown. Algebraically determine the function which gives the area of the entire region as a function of its width, and use this function to calculate the maximum possible area.



5. A farmer uses 400 m of fencing to create a rectangular pig pen and to divide it into four regions of equal area as shown. Algebraically determine the function which gives the area of the pig pen as a function of its width, and state the dimensions that produce maximum area.



6. The sum of two numbers is 60. Find the numbers if their product is a maximum.

7. The sum of a number and three times another number is 18. Find the numbers if their product is a maximum.

8. A theatre seats 400 people per show and is currently sold out with a ticket price of \$10. A survey shows that for every \$1 per ticket price increase, 25 fewer tickets will be sold. Write a function to model this situation and use this function to determine the ticket price that will result in the greatest revenue per show.

9. An orange grower has 400 crates of oranges ready for market and will have 20 more crates each day that shipment is delayed. The present price is \$60 per crate; however, for each day shipment is delayed, the price per crate decreases by \$2.
Write a quadratic function to model the grower's revenue and use it to determine how many days the grower should delay shipment in order to maximize revenue.
What is the maximum revenue?

Answers

1. 83 m at 4 sec; 2. 45 m at 3 sec; 3. 25 m by 50 m; 4. 15 m by 60 m; 5. 40 m by 100 m; 6. 30 and 30; 7. 3 and 9; 8. $y = (10 + x)(400 - 25x)$ Ticket price \$13; 9. After 5 days Maximum revenue is \$25 000