

Worksheet 51 - Function Applications

1. A piece of cardboard is twice as long as it is wide. It's to be made into a box with an open top by cutting 2-inch squares from each corner and folding up the sides.

(a) Determine a function for the volume, V , of the box in terms of the original length of the cardboard, x .

(b) What are the restrictions on x ?

(c) For what dimensions of the bottom of the box will the volume be 320 cubic inches?

2. A farmer has 300 meters of fence, and wishes to enclose a rectangular field divided into two areas where one is twice as wide as the other. What are the dimensions that maximize the total area?

3. Write:

(a) The area of a circle, A , as a function of its circumference, C .

(b) The volume of a sphere, V , in terms of its surface area, S .

4. Camera 1 is 0.2 miles north of car 1 and camera 2 is 0.25 miles north of car 2. Car 1 and car 2 are 0.5 miles apart. Car 1 begins traveling east at 85 mph with camera 1 following it, making an angle θ_1 . Also at the same time car 2 starts traveling west at 80 mph towards car 1 with camera 2 following it, making an angle θ_2 .

(a) Find the angles for both camera 1 and camera 2 as function of time, t , in hours.

(b) After how many seconds will the two cars collide? What are the angles of the two cameras at this time?

(c) Will the distances from the cameras to their respective cars be equal before the cars collide? If so after, after how many seconds?

5. Carbon monoxide (CO) combines with the hemoglobin of the blood to form carboxyhemoglobin (COHb), which reduces the transport of oxygen to tissues. Smokers routinely have a 4% to 6% COHb level in their blood, which can cause symptoms such as blood flow alterations, visual impairment, and poorer vigilance. The quadratic function defined by

$$T(x) = 0.00787x^2 - 1.528x + 75.89$$

approximates the exposure time in hours necessary to reach this 4% to 6% level, where $50 \leq x \leq 100$ is the amount of carbon monoxide present in the air in parts per million (ppm).

(a) A kerosene heater or a room full of smokers is capable of producing 50 ppm of carbon monoxide. How long would it take for a nonsmoking person to start feeling the symptoms mentioned?

(b) Find the carbon monoxide concentration necessary for a person to reach the 4% to 6% COHb level in 3 hours.