1. A rectangle is inscribed in a semicircle of radius 2. Find an expression for the area of the rectangle as a function of the length of one of the sides of the rectangle. Then use calculus to find the largest area that the rectangle could have.

2. A box with a square base and without a top is made using 400 in^2 of cardboard. What is the largest volume that such a box could have?

3. An athletic field is built by adding two semicircles to opposite sides of a rectangle, with a track running around the whole field. If the track is to be 400m in length, what is the largest area that the rectangle could have?
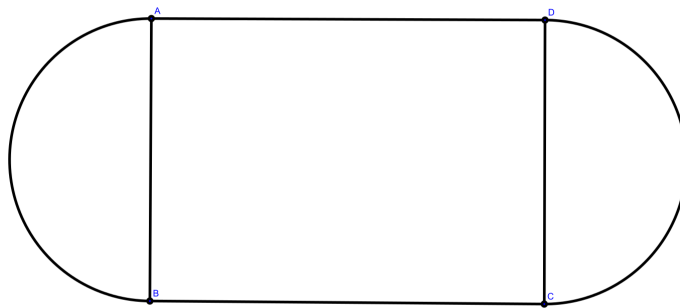
4. A corral is to be built next to a river. The corral will be triangular in shape, composed of two straight sections of fence, each 200 feet long (the third side is formed by the river). What is the largest area that such a corral could have?

5. A cylinder is to be inscribed in a cone that has radius 4 and height 6. What is the largest volume for such a cylinder?