The 1999 IUPUI/TMMI High School Mathematics Contest Questions

1. (Geometry) A billiards table is shaped like an acute triangle. Show that there is a closed orbit of three segments (a triangle). (Once the ball is started on this path, it will continue to travel on it.)


3. (Combinatorics) A sociologist and his wife attend a party with four other married couples. As they enter, each person shakes hands with some of the other people, but not, of course, with his or her spouse. Later in the party the sociologist asks each person how many people he or she shook hands with and obtains as answers all of the numbers 0, 1, ... , 8. How many people did the sociologist's wife shake hands with?

4. Every painting done in perspective has a unique, correct viewpoint from which the painting should be viewed with one eye. For the landscape painting reproduced above at a smaller scale, the viewpoint is 24 inches from the painting, on a line through the yellow dot, the line being perpendicular to the plane of the painting. When viewed from this point, light rays from objects in the painting enter the eye from the same directions they would if you were in a boat on the lake, viewing the real objects with your eye 3 feet above water level. Using the measurements indicated on the reproduction above, how high (in feet) was the actual treetop above water level?

5. Write an essay of 400 to 600 words (complete with bibliography) one one of the following topics:

   (a) An application of mathematics to art; or
   (b) An unusual application of mathematics

Back to the IUPUI/TMMI High School Mathematics Contest Home Page