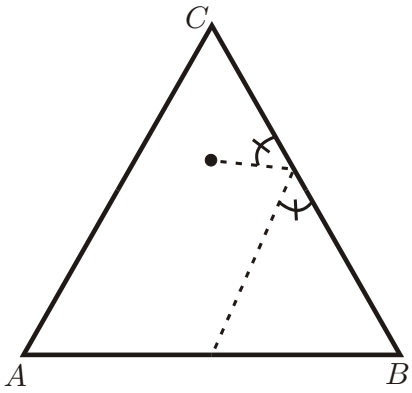
Problem of the Week

Proposed by Bernardo Ábrego and Silvia Fernández. **October 18-25**

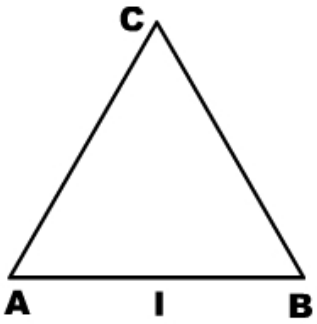


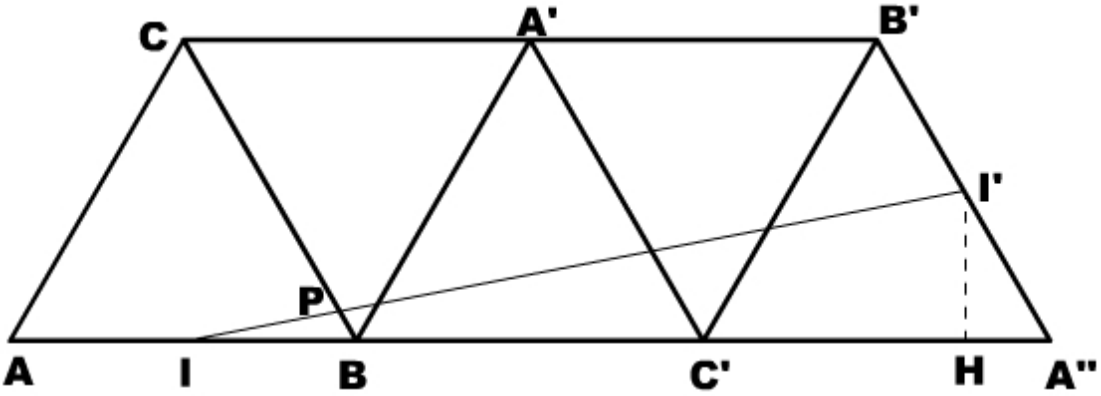
Consider a billiard table in the shape of an equilateral triangle. Each of the sides of the table is 40 inches long and the corners are labeled A, B, and C. A billiard ball, represented by a single point, is placed in the midpoint of side AB. The ball is hit so that it first bounces on side BC. Determine which point on side BC the ball must first hit in order to come back to its initial position at the time of the fifth bounce. Explain your answer.

Solution by: Jeffrey Liu

We know this ball in the triangle billiard table obeys this law. In order to make the ball comes back to its initial position at the time of the fifth bounce, we can draw a graph as below according to the law of reflection.

(Original Picture)





Because this ball obeys the law on reflection, that means we can imagine we have put

some mirrors on the side BC, A'B', A'C' and B'C'. A' is the reflected point of point A, B' is the reflected point of point B, C' is the reflected point of point C, and A" is the reflected point of point A'. From point I to point I' is the track of the ball. As you can see above, from point I to point I', there are total 5 intersections (Including point I' but not point I) with the triangles in the picture. That is exactly what we want, point P is the answer.