Problems appropriate for this column are assumed not to be widely known nor accessible in popular textbooks. Those problems that are interesting or useful to teachers of mathematics by virtue of illustrating key mathematical concepts are especially welcome. Solutions to the problems proposed in this issue should be submitted on separate signed sheets no later than February 15, 2012. All correspondence should be sent to Prof. Harris Kwong, Department of Mathematical Sciences, SUNY Fredonia, Fredonia, NY, 14063 (Harris.Kwong@fredonia.edu).

PROBLEMS

466. Proposed by Robert Serkey, Westinghouse High School (retired), Brooklyn, NY.

In triangle PQR, we have $\sin P + \sin Q = 5 \sin R$. Find the value of $\cot \frac{P}{2} \cdot \cot \frac{Q}{2}$.

467. Proposed by Ayoub B. Ayoub, Pennsylvania State University, Abington College, Abington, PA.

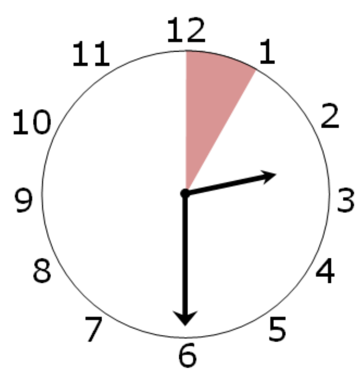
Let ABC be a right triangle at A. A square is constructed on BC outside the triangle. Show that the internal angle bisector of $\angle A$ goes through the center O of the square.

468. Proposed by Robert Serkey, Westinghouse High School (retired), Brooklyn, NY.

If one number is removed from the set of integers from 1 to p, the average of the remaining integers is $23\frac{1}{5}$. Which number was removed? (Note: this problem is a variant of Problem 1, Round 1 of the 2010/2011 British Mathematical Olympiad).

469. Proposed by Colin Foster, King Henry VIII School, Coventry, United Kingdom.

The clock shown below is stopped at a random time.



What is the probability that *both* hands are in the shaded region? What is the probability that *at least* one of the two hands is in the shaded region?

(NOT SO) ELEMENTARY

Problems proposed for this category should require ingenuity but not make use of advanced theorems. Proposals are solicited from any source, but **solutions will be accepted only from primary school teachers or precollege students**.