HINTS FOR 2008 AIME 1:

3. Solve the system of equations for j and then again for b. Only one set of values gives positive integer values for both variables.

4. Compare the left side of the equation to $(x + 42)^2$ and $(x + 45)^2$.

6. Reduce each row by its largest common factor. Then the rows alternate between consecutive integers and consecutive odd integers. Find the pattern.

7. Note that a set S will contain a perfect square unless a pair of consecutive perfect squares have the property that the smaller square is below all elements of S and the larger square is above all elements of S.

8. Use the formula $\arctan x + \arctan y = \arctan \dfrac{x + y}{1 - xy}$.

9. Solve the system $x + y + z = 10$ and $3x + 4y + 6z = 41$.

10. Show that $\angle DCA$ must be $\pi/2$.

11. Let $a(n)$ and $b(n)$ be the number of permissible sequences of length n beginning with A and B, respectively, and let $x(n) = a(n) + b(n)$ be the total number of permissible sequences of length n. Show that $a(n + 2) = x(n)$ and $b(n + 2) = a(n + 1) + b(n)$. Then solve for $x(n)$.

12. If s is the speed in kilometers per hour of the cars, show that the number of gaps in an hour is $\dfrac{250s}{s/15 + 1}$.

13. Use the conditions to reduce the polynomial to a polynomial having only the coefficients a_1 and a_2. Then use the fact that $p(r, s) = 0$ for all such polynomials to show that the two polynomials multiplied by these coefficients must each equal zero.

14. Express PQ and BQ in terms of the sine and cosine of $\angle ABQ$ and the radius of the circle. Then use the fact that $BP^2 = PQ^2 + BQ^2$ to express BP^2 in terms of these variables. Complete the square to find its maximum.