**MASSACHUSETTS MATHEMATICS LEAGUE**
**CONTEST 6 – MARCH 2015**
**ROUND 1 ALG 2: SIMULTANEOUS EQUATIONS AND DETERMINANTS**

**ANSWERS**

A) _____

B) _____

C) _____

A) Compute the largest integer value of $k$ for which the determinant $\begin{vmatrix} 3 & -5k \\ 4 & k+100 \end{vmatrix}$ is negative.

B) For what value(s) of $c$ will the following system of equations have an infinite number of solutions?

$$14x+3y-7z=8$$
$$-8x+5y+4z=c$$
$$-2x+3y+z=2$$

C) Given: $A(10,-7)$, $B(-6,11)$, and $C(3,k)$

The area of $\Delta ABC$ is given by the formula $\frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}\right|$, that is, half the absolute value of the determinant of the 3 x 3 matrix formed by the coordinates of the vertices, taken clockwise (or counterclockwise) with 1s filling the third column.

Determine all single-digit positive integral values of $k$ for which the area of $\Delta ABC$ is an integer perfect square.