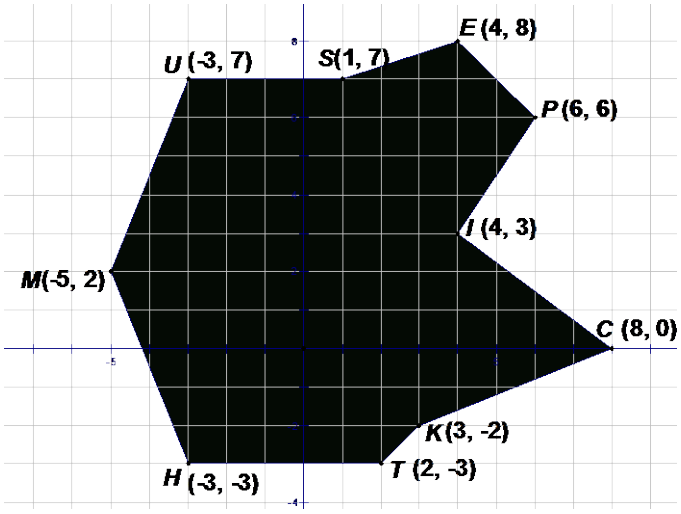
MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 6 - MARCH 2012 SOLUTION KEY

Team Round

E) Using Pick's Theorem $\left(A = I + \frac{B}{2} - 1 \right)$, where

I = # of interior points
B = # points on the boundary



There are 12 vertical lines through the interior of the region.
Counting interior points from left to right:
5 + 5(9) + 10 + 9 + 8 + 6 + 2 + 1 = 86
Starting at *U* and moving clockwise, besides the 10 vertex points, there are 7 points along the horizontal sides and 1 on $\overline{PE}$ for a total of 18.
Thus, the area is 86 + 18/2 – 1 = **94** square units.

Alternative Solution: Draw vertical lines through *M* and *C* and horizontal lines through *E* and *H*. This creates an 11 x 13 rectangle (Area 143).
Now we must subtract off any unshaded regions inside the rectangle and outside the shaded region. This region may be subdivided into exclusively rectangles and "half-rectangles".
Starting with region 1, we have
Excess = 6 + 1.5 + 2 + 10 + 3 + 6 + 5 + 5 + .5 + 5 + 5 = 49. Thus, A = 143 – 49 = **94**.