MASSACHUSETTS MATHEMATICS LEAGUE
JANUARY 2005
ROUND 7: TEAM QUESTIONS

ANSWERS

A)_____ **D)**_____

B)_____ **E)**_____

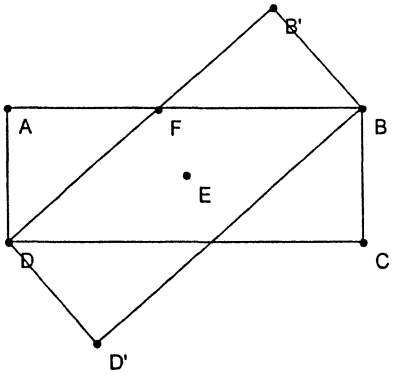
C)_____ **F)**_____

A) Given ΔABC with A(1, 2) B(4, 6) and C(–8, 11) If the angle bisector of $\angle$ ABC intersects $\overline{AC}$ at D find the coordinates of D.

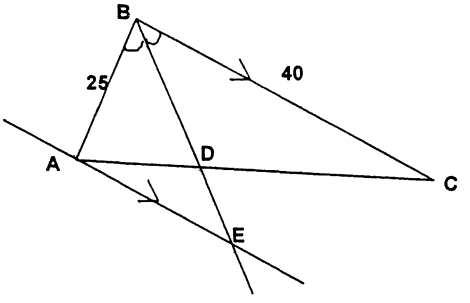
B) Factor : $x^{4n+3} + 4x^{2n+3} + 16x^{3}$

C) A student solved $cos(x) + sin(2x) - cos(3x) = 0$ by transforming it to the form $(n \cdot foo(x) + 1) \cdot foo(nx) = 0$ for some positive integer n and some basic trig function *foo*. Find the exact value of $n + foo(\frac{\pi}{3n})$.

D) Rectangle ABCD has AD=6 and AB>AD. Let E be the point of intersection of its diagonals. Rotate ABCD about E until A lands on D. If the area contained in the intersection of the rotated and original rectangular regions is 45 square units, what was the length of $\overline{AB}$?



E) In triangle ABC, AB = 25, BC = 40 and AC = 39. Ray BD bisects angle ABC and line AE is parallel to side BC. Find the exact perimeter of triangle ADE



F) Find all ordered pairs (a,b) which will make the solution to the following equation a set of three consecutive positive integers: $x^3 - 8 = (x - 2)(ax + b)$