MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 4 - JANUARY 2009
ROUND 7 TEAM QUESTIONS

ANSWERS

A) _____ D) _____

B) _____ E) _____

C) _____ F) _____

A) Find the length of the minor axis of the ellipse $2x^2 + 3xy + 2y^2 = 63$.
   <u>Note</u>: This ellipse has been rotated 45° and its axes lie along the lines $y = x$ and $y = -x$.

B) Factor completely over the integers: $G^4 + T^4 - 8(G^2 + T^2 - 2) - 2GT(2G^2 + 2T^2 - 3GT - 8)$

C) One of the solutions of the equation $\sqrt{1 + a\sin x} = -\cos x$ over $0° \le x < 360°$ is 150°.
   Determine the other solution(s).

D) The parabola $y = x^2$ intersects the line $y = 7x + 13$ at points A and B.
   Find the coordinates of the midpoint of $\overline{AB}$.

E) Given: *ABCDE* is a regular pentagon, $AD = 1$
   Compute the perimeter of isosceles trapezoid *CEFG*.
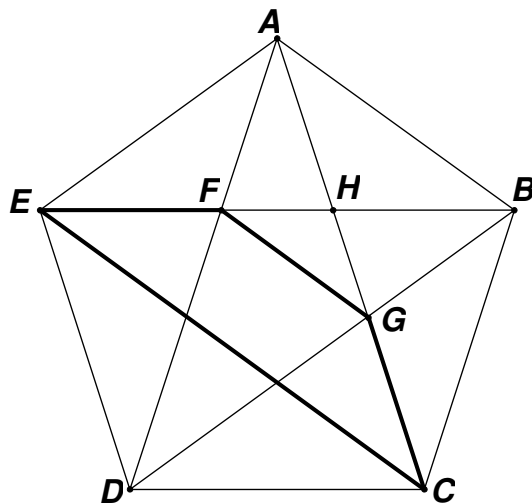
F) If A is a <u>positive</u> integer, determine the <u>largest</u> possible value of x, given: $3 - \cfrac{1}{\cfrac{1}{A} + \cfrac{1}{x}} = \cfrac{1}{3}$