

MASSACHUSETTS MATHEMATICS LEAGUE
DECEMBER 2004
ROUND 7: TEAM QUESTIONS

ANSWERS

A) _____ D) _____
B) _____ E) _____ p.m.
C) _____ F) _____

- A) Find the perimeter of a regular dodecagon (a 12-gon) whose area is $96 + 48\sqrt{3}$.
- B) If $907_{2k-1} = 709_{2k+1}$ find the value of 3724_k expressed in base 10.
- C) A rectangle has vertices $(0,0)$, $(5,0)$, $(5,3)$, and $(0,3)$. A line through $(1,b)$ in the interior of the rectangle divides the rectangle into two regions of equal area. Find the slope of the line in terms of b .
- D) Find all exact values of x for which $(\log_5 3)(\log_x 3) + 3\log_5 x = \log_{\sqrt{5}} 5 + \log_5 25$
- E) Two candles are the same length but burn at different rates. If the first were lighted at 7 a.m. and the second at 10 a.m. both would be burn out at 7 p.m. Instead both were lighted at noon. At what time will one candle be $2/3$ the length of the other?
- F) A turtle starts at point A facing west and runs at 1 ft/min repeating this plan: run 10 ft, turn right 24° . A rabbit starts at point A facing east and runs at 11 ft/min repeating this plan: turn right 30° , run 10 ft. After starting they first meet at a point B after k minutes; they then meet often but first meet back at point A again after m minutes. Find $k + m$.

