MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 3 - DECEMBER 2006
ROUND 7 TEAM QUESTIONS

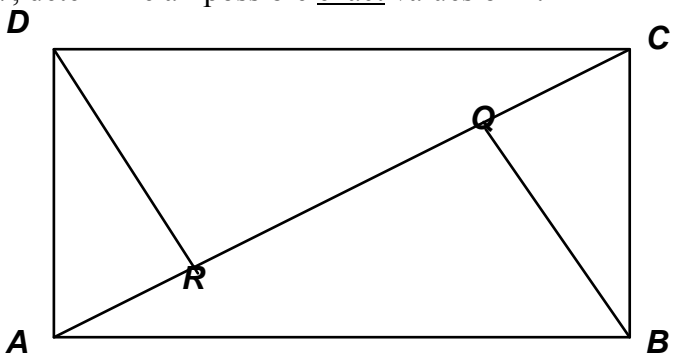
ANSWERS

A) _____ D) _____

B) _____ E) _____

C) (_____ , _____) F) _____ : _____

A) Rectangle $ABCD$ has an area of 300 units^2, a perimeter of P units, $\overline{DR} \perp \overline{AC}$, $\overline{BQ} \perp \overline{AC}$ and A, C, R and Q are collinear. If $RQ = 7$, determine all possible exact values of P.



B) What is the largest power of 12 which is a factor of 732! ?

C) Find the point of intersection of the system of intersecting lines represented by the equation

$$2x^2 + xy - 6y^2 + 7y - 2 = 0$$

D) Find all values of a for which $\log_{10} \dfrac{2a-1}{2-a} \leq 0$

E) In a 20 km race, four runners, A, B, C and D each run at different, but uniform rates of speed. A beats B by 2 km, A beats C by 5 km and A beats D by k km, where $k > 5$. Determine the value of k, if C beats D by 1 km.

F) The bases of trapezoid $ABCD$ are 6 and 15 and the nonparallel sides are 4 and 8. $\overline{PQ}$, a segment parallel to the bases, divides the trapezoid into two trapezoids that have equal perimeters. Determine the ratio $PB : PA$.