

**MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 2 - NOVEMBER 2009
ROUND 7 TEAM QUESTIONS**

******* CALCULATORS ARE PERMITTED IN THIS ROUND *******

ANSWERS

A) _____ D) _____

B) _____ E) _____

C) _____ F) _____

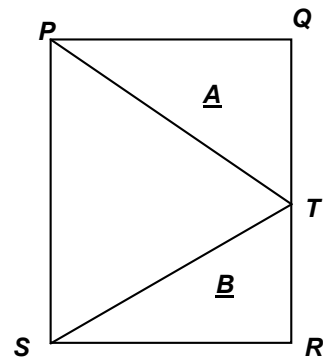
A) Given: $z = 1 - \sqrt{3}i$ Compute: $\left| \sqrt{z} \cdot \sqrt[3]{z^2} \cdot \sqrt[6]{z^5} \right|$

B) A brick mason can do a job in 6 less hours than his apprentice. He and his apprentice work together for 4 hours. After the fourth hour, the apprentice works alone and finishes the remainder of the job in three hours. If the brick mason had been able to hire k apprentices, each of whom worked at the same rate as his original apprentice, and they all worked together with him from the start, the job would have been finished in a time of one hour or less. What is the minimum possible value of k ?

C) Point P is located in the interior of rectangle $ABCD$. (No diagram given.)
 $AD = 52$, $PA = 56$, $PB = 25$ and $PC = 33$. Compute AB .

D) Factor completely over the integers. $a^{4x} - 4a^{3x} + a^{2x} + 6a^x$

E) $PQRS$ is a rectangle.
Let A and B denote the areas of $\triangle PQT$ and $\triangle SRT$ respectively.
If $m\angle PTS = 60^\circ$ and $PT = \tan(\angle TPS) = 1$, compute $\frac{A}{B}$.



F) $ABCDE$ is a pentagon, $AB = BC = CD$ and $DE = EA$.
For integers d and k , $m\angle A = m\angle B = m\angle C = m\angle D = d^\circ$ and $m\angle E$ is $5k^\circ$.
Compute the largest possible value of $\frac{m\angle EAD}{m\angle DAB}$ that is less than 1.

