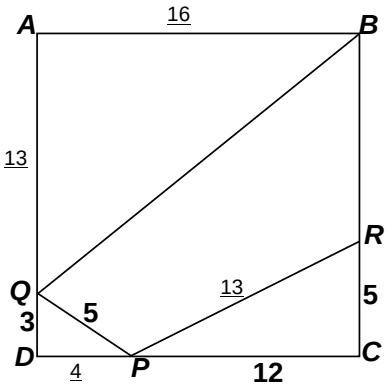
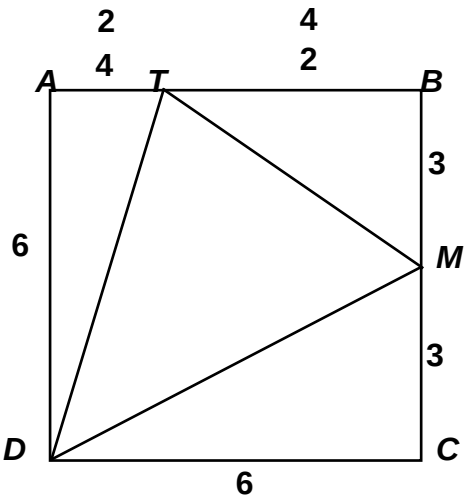
MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 2 - NOVEMBER 2015 SOLUTION KEY

Round 3



A) $DP = 4, PR = 13, AB = 16, QA = 13$

$\Rightarrow area(BRPQ) = 16^2 - (6 + 30 + 104) = \underline{\mathbf{116}}$.



B) $BM = CM = 3$

If $AT = 2,\ BT = 4$, then $area(TMD) = 36 - (6 + 6 + 9) = 15$.

If $AT = 4,\ BT = 2$, then $area(TMD) = 36 - (12 + 3 + 9) = 12$.

Thus, the largest area is **15**.

C) Since ΔABC is equilateral and $AB = 6$,

the area of ΔABC is $\frac{6^2\sqrt{3}}{4} = 9\sqrt{3}$, so each of the three regions has area $3\sqrt{3}$. The area of ΔADE is $\frac{AD^2\sqrt{3}}{4} = 3\sqrt{3} \Rightarrow AD = 2\sqrt{3} \Rightarrow DM = \sqrt{3},\ AM = 3$.

A, M and *N* are collinear and, as an altitude in equilateral ΔABC, $AN = 3\sqrt{3}$.

Thus, *MN* = $\underline{\mathbf{3\sqrt{3} - 3}}$ or $\underline{\mathbf{3\left(\sqrt{3} - 1\right)}}$.