MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 1 - OCTOBER 2011 SOLUTION KEY

Round 3

A) Since the two lines are perpendicular, $m = -\frac{1}{4}$.

Since the second line passes through $(x, y) = \left(2, \frac{3}{4}\right)$, the coordinates must satisfy the equation. Substituting, $\frac{3}{4} = -\frac{1}{4} \cdot 2 + b \Rightarrow b = \frac{5}{4} \Rightarrow \underline{\left(-\mathbf{\frac{1}{4}}, \mathbf{\frac{5}{4}}\right)}$.

B) $\begin{cases} x+1 = 2(y+1) \\ x-2 = 3(y-2) \end{cases} \Rightarrow x = 2y + 1$

Substituting, $(2y - 1) - 2 = 3(y - 2) \Rightarrow y = 5$, $x = 11 \Rightarrow$ sum = **16**.

C) A 100% increase doubles the original amount; 110% adds an additional 10% or 1/10. Therefore, a 110% increase is equivalent to 2.1 times as large.

$2.1(2 \cdot 5 + 2W) = 2(5+10) + 2(1.1W)$

$\Rightarrow 21 + 4.2W = 30 + 2.2W \Rightarrow 2W = 9 \Rightarrow W = 4.5$

The original rectangle is 5 x 4.5 with a perimeter of 19.

The new rectangle is 15 x 4.95 with a perimeter of 39.9 .

Thus, $(A, B) =$ **(19, 39.9)** .

Did you know that 5 out of every 4 people profess to have difficulty with %?