MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 2 – NOVEMBER 2011 SOLUTION KEY

Round 2

A) Let x denote the side of each square cutout.

Since 37.5% = 3/8, we have $\frac{3}{8}(4\cdot 6) = 4x^2 \Rightarrow x^2 = \frac{9}{4} \Rightarrow x = \mathbf{1.5}$ (or $\frac{3}{2}$).

B) $\begin{cases} (1)\ \ 10t+u = 7(t+u) \\ (2)\ \ (10t+u)(t+u) = 567 \end{cases}$

(1) $\Rightarrow t = 2u$

Substituting for $10t + u$ in (2), $7(t+u)^2 = 567 \Rightarrow (t+u)^2 = 81 \Rightarrow t + u = 3u = 9$

$\Rightarrow u = 3, t = 6 \Rightarrow$ **63**

~~B)~~C) $ST = (S+20)(T-1) = ST - S + 20T - 20 \Rightarrow S = 20(T-1)$

$S > 0 \Rightarrow T \geq 2$, $S \leq 65 \Rightarrow T \leq 4$.

Thus, there are 3 possible ordered pairs (S, T), namely (20, 2), (40, 3) and (60, 4).

However, the last ordered pair fails, since to travel 240 miles (60 mph for 4 hours), I would have to travel 80 mph for 3 hours, breaking the speed limit.

Thus, there are only **2** ordered pairs satisfying the never-break-the-speed-limit condition.