**MASSACHUSETTS MATHEMATICS LEAGUE**
**CONTEST 5 - FEBRUARY 2014 SOLUTION KEY**

**Round 4**

A) Since Bonnie works three times as fast as Clyde, Clyde does $\frac{1}{4}$ of the job and Bonnie does $\frac{3}{4}$. Since Bonnie take 6 minutes to do $\frac{3}{4}$ of the job, it will take her $\frac{4}{3}(6) = \underline{\mathbf{8}}$ minutes to do the entire job alone.

B) Let $x$ denote my teenage son's age and shoe size back in the day.
Let $y$ denote his current age. Then:

$$\begin{cases} y = x + 26 \\ x + 1 = \frac{3}{8}y \end{cases} \Rightarrow 8(x+1) = 3(x+26) \Rightarrow 5x = 78 - 8 \Rightarrow x = 14$$

Thus, his current shoe size is **15**.

C) Let $A$, $B$, $C$ and $D$ denote the unknown round scores.
Since there are 7 rounds, the median score is the 4th score when the scores are listed in increasing order: $A$, 18, 18, 22, $B$, $C$, $D$
The team score is 58 points plus the scores in the remaining 4 rounds.
$A$ must be the team round score and must be less than 18, since the mode is 18 and it only occurred twice.
$B$, $C$ and $D$ must all be different (otherwise the mode would not be unique).
Also each must be larger than 22.
In the worst case scenario, ($A$, $B$, $C$, $D$) = (0, 24, 26, 28) $\Rightarrow$
total score = 58 + 3(26) = 136
In the best case scenario, ($A$, $B$, $C$, $D$) = (15, 26, 28, 30)
$\Rightarrow$ total score = 15 + 58 + 3(28) = 157
Thus, ($M$, $m$) = **(157, 136)**.