MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 6 - MARCH 2012 SOLUTION KEY

Team Round

F) To generate a memorable license plate we must pick 6 of the 9 nonzero digits and put them in increasing or decreasing order. This can be done in $2\binom{9}{6} = 2(84) = 168$ ways.

Let x denote the # of "memorable" plates to be cross checked.

Left most digit:	Possible Plates	Count
4	**56** 789	***1***
3	**45** 678 / 679 / 689 / 789	
	46 789	
	56 789	***6***

Thus, $2(1 + 6 + k) = 168 \Rightarrow k + 7 = 84 \Rightarrow k = 77$, the number of strictly increasing memorable plates beginning with 1 or 2, which have not been specifically enumerated.
$\Rightarrow x = 168 - 77 =$ **91**

FYI: [Here's the enumerated list for those who must see to believe.]

2	**34** 567 / 568 / 569 / 578 / 579 / 589 / 678 / 679 / 689 / 789	
	35 678 / 679 / 689 / 789	
	36 789	
	45 678 / 679 / 689 / 789	
	46 789	
	56 789	***21***
1	**23** $\Rightarrow$ 456 457 458 459 467 468 469 478 479 489	
	567 568 569 578 579 589	
	678 679 689	
	789 $\Rightarrow 20$	
	24 $\Rightarrow 10$ **45** $\Rightarrow 4$	
	25 $\Rightarrow 4$ **46** $\Rightarrow 1$	
	26 $\Rightarrow 1$ **56** $\Rightarrow 1$	
	34 $\Rightarrow 10$	
	35 $\Rightarrow 4$	
	36 $\Rightarrow 1$	***56***