1. Your calculator will tell you that $\sqrt[3]{6\sqrt{3}} + 10 - \sqrt[3]{6\sqrt{3}} - 10$ is approximately equal to 2. Is this quantity exactly equal to 2? Prove that your answer is correct.

2. Let $ABCD$ be a quadrilateral and let $X, M, Y$ and $N$ be respectively the midpoints of $AB, BC, CD$ and $DA$. Show that the point $P$ where $XY$ and $MN$ meet is the midpoint of each of $XY$ and $MN$.

3. (NEW YEAR’S PROBLEM) Let $m$ and $e$ be positive integers and suppose that $N = 1997m/(m + 1997e)$ is an integer. Find all possible values for $N$.

4. I have a magic money machine into which I can put any number of one dollar coins. If I insert $n$ dollars, the machine returns $2n$ dollars. Each time I use the machine, however, I must insert more money than I did on the previous use. If I start with exactly $1$ and use the machine once, I will have $2$. One my next use of the machine, I am forced to insert $2$ yielding $4$, and on my third use of the machine, I can insert either $3$ or $4$ yielding a total of $7$ or $8$. Consequently, there is no way that I can ever obtain exactly $3$ or $5$ or $6$ by using the machine repeatedly, starting with $1$. Find the largest integer $L$ such that it is impossible to obtain exactly $L$ dollars with the magic money machine, starting with $1$.

5. Let $S$ be a subset of the set $\{1, 2, 3, \ldots, 1000\}$ with the property that no sum of two distinct members of $S$ is contained in $S$. Find the maximum possible number of members in the set $S$. 

You are invited to submit a solution even if you get just one problem

RETURN TO: MATHEMATICS TALENT SEARCH DEADLINE
Dept. of Mathematics, 480 Lincoln Drive February 14
University of Wisconsin, Madison, WI 53706 1997

..........................................................
(Please detach)

<table>
<thead>
<tr>
<th>LAST NAME</th>
<th>FIRST</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHOOL</td>
<td>TOWN</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HOME ADDRESS</th>
<th>TOWN</th>
<th>ZIP CODE</th>
</tr>
</thead>
</table>

PROBLEM SET IV