

Mayhem Problems

To be eligible for the March 2002 MAYHEM TAUNT, solutions must be post-marked *before July 1, 2002*, and attached to each solution of each problem must be a completed student information sheet.

M34. *Proposed by the Mayhem staff.*

The numbers 1 to 2002 are written on a blackboard so you decide to play a fun game. You flip a coin, then erase two numbers, x and y , from the board. If the coin was heads you write the number $x + y$ on the board, if the coin was tails you write the number $|x - y|$. You continue this process until only one number remains. Prove that the last number is odd.

M35. *Proposed by the Mayhem staff.*

Two sequences are defined by: $x_1 = 4732$, $y_1 = 847$, $x_{n+1} = \frac{x_n + y_n}{2}$ and $y_{n+1} = \frac{2x_n y_n}{x_n + y_n}$. Find

$$\lim_{n \rightarrow \infty} x_n \quad \text{and} \quad \lim_{n \rightarrow \infty} y_n.$$

M36. *Proposed by the Mayhem staff.*

In $\triangle ABC$, AM is the median from A . Prove $AM \leq \frac{AB+AC}{2}$.

M37. *Proposed by J. Walter Lynch, Athens, GA, USA.*

Find two (different) positive integers less than 100 such that the sum of the digits in both integers is the larger integer and the product of the digits in both integers is the smaller integer.

M38. *Proposed by the Mayhem staff.*

Find all values of n such that $1! + 2! + 3! + \cdots + n!$ is a perfect square.