PROBLEMS

Problems, solutions, and any comments on the problems or solutions should be sent to Curtis Cooper, Department of Mathematics and Computer Science, Central Missouri State University, Warrensburg, MO 64093 (email: ccooper@cmsuvmb.cmsu.edu).

Problems which are new or interesting old problems which are not well–known may be submitted. They may range from challenging high school math problems to problems from advanced undergraduate or graduate mathematics courses. It is hoped that a wide variety of topics and difficulty levels will encourage a number of readers to actively participate in problems and solutions. An asterisk (∗) after a number indicates a problem submitted without a solution.

Problems and solutions should be typed or neatly printed on separate sheets of paper. They should include the name of the contributor and the affiliation. Solutions to problems in this issue should be mailed no later than May 31, 1993, although solutions received after that date will also be considered until the time when a solution is published.

49. *Proposed by Mohammad K. Azarian, University of Evansville, Evansville, Indiana.*

Let

$$A = \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{k=1}^{m} \sin\left(\frac{i\pi}{3}\right) \cos\left(\frac{j\pi}{3}\right) \csc\left(\frac{2^k \pi}{3}\right) .$$

Show that

$$A \leq \frac{4\sqrt{3}}{3} \quad \text{if } m \text{ is odd and} \quad A = 0 \quad \text{if } m \text{ is even} .$$

50. *Proposed by Curtis Cooper and Robert E. Kennedy, Central Missouri State University, Warrensburg, Missouri.*

How many ways can a 3×1992 floor be tiled with 1×2 indistinguishable tiles?

51. *Proposed by Alvin Beltramo (student), Central Missouri State University, Warrensburg, Missouri.*

A standard deck of 52 cards is shuffled and two different denominations, e.g. king and five, are chosen. What is the probability that two cards, one from each denomination, are consecutive in the deck?

52. *Proposed by Dale Woods and Jin Chen, University of Central Oklahoma, Edmond, Oklahoma.*

(a) Find a closed form for the expression

$$\sum_{k=1}^{m} k \binom{2m}{m-k} .$$

(b)* Let $n \geq 2$ be an integer. Find a closed form for the expression

$$\sum_{k=1}^{m} k^n \binom{2m}{m-k} .$$