PROBLEMS

Problems, solutions, and any comments on the problems or solutions should be sent to the problem editor, whose address appears on the inside back cover. An asterisk (*) after a number indicates a problem submitted without a solution.

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.

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 December 15, 1988.

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

Let $n \geq 2$ and

$$\sum_{j=1}^{i+1} a_{ij} = 0 \quad for \quad i = 1, 2, ..., n-1 .$$

Find the determinant of the nxn matrix

$$\begin{pmatrix} a_{11} & a_{12} & & & & \\ a_{21} & a_{22} & a_{23} & & & \\ \vdots & \vdots & \vdots & & & \\ a_{n-1,1} & a_{n-1,2} & a_{n-1,3} & \cdots & a_{n-1,n-1} & a_{n-1,n} \\ 0 & 0 & 0 & \cdots & 0 & 1 \end{pmatrix} .$$

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

A pitcher faces a batter in an at-bat. Let b be the probability the pitch is a ball, w, the probability the batter swings and misses (wiffs), and f, the probability the batter hits a foul ball. What is the probability that the batter strikes out?

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

The Fibonacci numbers F_n satisfy $F_0 = 0$, $F_1 = 1$, and

$$F_{n+2} = F_{n+1} + F_n \quad for \; n = 0, 1, 2, \ldots .$$

Show that

$$\sum_{i=1}^{n} F_i^3 = \frac{1}{10} F_{3n+2} + \frac{3}{5}(-1)^{n-1} F_{n-1} + \frac{1}{2} .$$

4. *Proposed by Curtis Cooper, Central Missouri State University, Warrensburg, Missouri.*

Let n be a positive integer and let P be a permutation on $\{1, \ldots, n\}$. Consider a list of n statements where statement i in the list is

$$i. \; Statement \; P(i) \; is \; false.$$

Which permutations permit non-contradictory truth assignment to the n statements in the list?