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 September 15, 1989, although solutions received after that date will also be considered until the time when a solution is published.

9. *Proposed by Robert E. Shafer, Berkeley, California.*

Let p be a prime. Prove that

$$(p-1)! \equiv (p+1)\left(1^{p-1}+2^{p-1}+3^{p-1}+\cdots+(p-1)^{p-1}\right) \pmod{p^2} .$$

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

Show

$$\sum_{\substack{k=1 \\ (k,45)=1}}^{45} \sin^8 \frac{k\pi}{45} = \frac{51}{8} .$$

11. *Proposed by Stanley Rabinowitz, Westford, Massachusetts.*

A strip is the closed region bounded between two parallel lines in the plane. Prove that a finite number of strips cannot cover the entire plane.

12. *Proposed by Robert E. Shafer, Berkeley, California.*

Evaluate

$$\int_0^1 e^{\frac{1}{\log x}} dx \ ,$$

where log denotes the natural log.