SUMMARY OF PROBLEM SOLVERS AT RIT

Journal	Problem	Proposed In Issue	Solution In Issue	Student Solver(s)	Type of Solution
MH	203	September 2006	February 2007	Aaron Kaufer (SMAC)	(1)
PME	1131	Fall 2005	Fall 2006	Andres E. Espinoza-Masias (VCSG)	(2)
PME	1128	Fall 2005	Fall 2006	Andres E. Espinoza-Masias (VCSG)	(2)
JRM	2629	October 2004 (32-1)	February 2006 (33-1)	Nathan Reff (SMAM)	(2)
MH	S99	September 2005	February 2006	Andrew Merrill (SPSP)	(2)
MH	S92	February 2005	September 2005	Abdullah Muhammad (EECB)	(2)
MH	189	November 2004	April 2005	Jason Moore (SMAM)	(2)
MH	185	September 2004	February 2005	Hans-Christian Rotmann (EEEB)	(2)
CMJ	769	January 2004	January 2005	Julia Bethel (SMAM) Julie Blackwood (SMAM) Ted Dziuba (SMAM) Hans-Christian Rotmann (EEEB) [Submitted jointly as *The RIT Problem Solving Group*]	(2)
AMM	10959	August 2002	January 2004	Prashant Bhoola (SCHB)	(2)

Math Horizons Problem 203

Prove that for any odd prime number p, there exists a unique positive integer n such that $n(p + n)$ is the square of an integer.

The Pi Mu Epsilon Journal Problem 1131

ABCD is a convex quadrilateral in which ΔBCD is equilateral and $m\angle DAB = 30°$. Show that

$$(AC)^2 = (AD)^2 + (AB)^2.$$

The Pi Mu Epsilon Journal Problem 1128

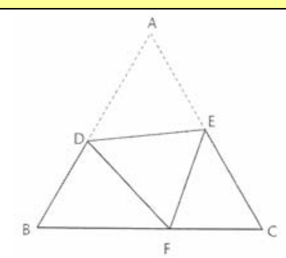
Evaluate

$$\int_0^{\pi/2} \frac{1}{1+\tan^n x}\,dx$$

for $n = 0, 1, 2, \ldots$.

Journal of Recreational Mathematics Problem 2629

An equilateral triangle ABC is folded along the line DE so that its apex A touches the base BC at point F, as shown in the figure to the right.



1. If the distances from A to points D and E are 91 and 65 respectively, what is the side length of the original triangle ABC?
2. In general, let AD = x and AE = y and find a formula for the length BC in terms of x and y.

Math Horizons Problem S99

Let n be a positive integer. Solve the equation

$$\sum_{k=1}^{n} \cos^k kx = \frac{n(n+1)}{2}.$$

Math Horizons Problem S92

Moshe Rockshell was hired by the Cybercafe to investigate how much money was taken in during a slow day. The cashier, having absconded with the cash, left behind only the following information.

1. The only customers were a group of 6 vidiots and a group of 13 internuts.
2. The vidiots were in the Cybercafe for twice as many minutes as the internuts.
3. The total bill for the 6 vidiots was the same as the total bill for the 13 internuts.

Based on this and the fact that the Cybercafe charged each customer 20 cents per minute for the first 30 minutes but 30 cents per minute thereafter, Moshe computed correctly what could have been the total take. Later, when the cashier was apprehended, he admitted that the actual amount was λ times as large as Moshe's figure, where λ was a real number greater than 1. What was the value of λ?

Math Horizons Problem 189

Let A be an $n\times n$ matrix, B be an $n\times r$ matrix, C be an $r\times n$ matrix and D be an $r\times r$ matrix, all over a commutative ring R with identity. Suppose there is a matrix E over R such that $DE = C$. Prove that

$$\det\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \det\left(A - BE\right)\det\left(D\right).$$

What conclusion can be drawn if there is a matrix F over R such that $FD = B$?

Math Horizons Problem 185

Prove by combinatorial reasoning that

$$\sum_{k=1}^{n} k\binom{n+1}{k+1} = (n-1)2^n + 1.$$

The College Mathematics Journal Problem 769

For a natural number n, show that

$$\Omega_n := \prod_{k=0}^{n} \frac{(2k)!(2k)!}{k!(n+k)!} = 2^n.$$

The American Mathematical Monthly Problem 10959

For $\nu \in \mathbb{R}$ with $\nu > -1$, evaluate

$$\int_0^\infty \int_0^\infty \left(x^2 + xy + y^2\right)^\nu e^{-(x+y)} dydx.$$