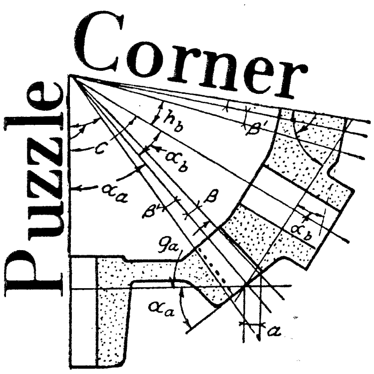
Puzzle Corner



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I must begin this column by retracting a statement which appeared in the last installment. A small explanation is also in order. My column was already written and handed in to the editor when the February issue appeared. I was immediately swarmed by a barrage of people who were anxious to tell me that the word infinite instead of the word finite appeared in the first Friedman problem. Hence a rush call was made to the editor. In the resulting confusion a "funny" line was mistakenly included. Thus for the second consecutive issue I must apologize to Harvey. I hope that this will be the last time.

problems

On March 20, the MIT Math Club held a meeting in which the above mentioned little guy gave a truly excellent lecture on sets in the plane and on the line. The first problem comes from this lecture.

22 — Let (a_α) be a non-empty set of reals. Define the distance set of (a_α) to be (b s.t. be am-a_β). What can be said about distance sets (measure. open. closed. connected. etc.)? In particular, what are some necessary and/or sufficient conditions for a set A to be the distance set of any set. For example, A must contain 0 and A cannot be (0,1,3). The best solution to the above problem will win a free subscription to TEN (*wow — ed.*).

23 — Here's one practically everybody at MIT is working on already. Is it true that the boundary of any open subset of the plane must contain a subset which is homeomorphic to the open interval (0,1)?

24 — I received an answer to one of my speed problems (number 20). I take this to be a mandate to print a similar problem as one of the regular puzzles for this issue. Here it is:

WASMARCH + THEBEST CANDIDATE	The product H•E•R•B•I•D equals 0.

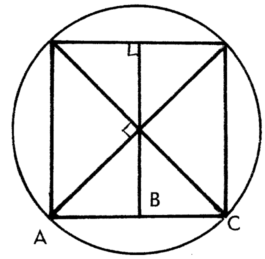
By the way, Tom, your solution was perfect.

25 — Daniel Drucker, '67, wants to know the last three digits of 7^{9999}

26 — Prove that 6 is the only square-free perfect number. *(Thank you, MAA).*

SPEED department

27 — Teddy Chang, '67, asks you to show that AB equals BC.



28 — An empty "D" train pulls into 23rd Street (*that's in New York for all you hillbillys who don't know — ed.*). At 23rd St. 20 people enter; at 34th 8 enter and then half get off. At 42nd 10 get on and then 1/4 of those on die of suffociation and are dragged off. Between stations 1/3 of the riders kill another third while the third third watches approvingly. Now at 50th, after the bodies are removed, two winos enter and put on a show for the crowd. Hence no one leaves at 72nd but 6 enter. At 81st half the people leave and 3 enter. How many stops did the train make?

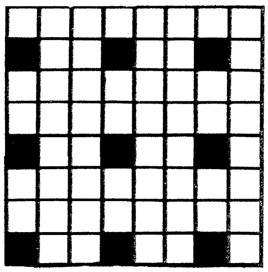
solutions

Here is Fiala's defense for his controversial desert island problem (number 3):

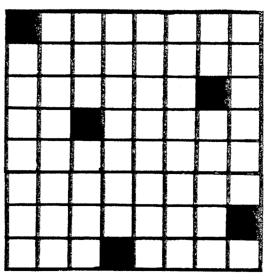
With regard to the problem I submitted several months ago, several questions as to the accuracy of my solution have arisen. These questions are over the value to be assigned to a given play

in the game. I intended the value to be the MIT men's winnings minus the Harvies' winnings. This was not clear in the original problem statement (I apologize); however, any reasonable person should have determined that you lose points if your guys get killed or if the enemy captures one of the girls — those who disagreed with my solution did not allow for this (they should have figured it out). Furthermore, several of those who submitted solutions used computers to get answers. They ought to know that you don't use computers when you're after broads (especially on a desert island).

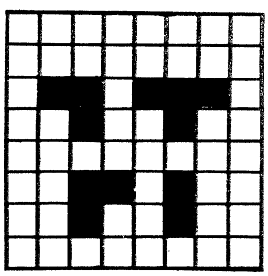
8 —



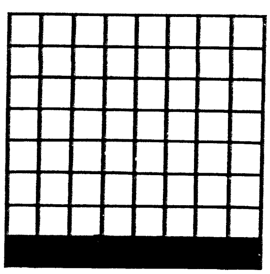
Kings 9



Queens 5



Knights 12



Rooks 8

9 — Richard Haberman, '67, solved this one. His solution is as follows:

For $(12{,}371)^n$

n	Remainder	n	Remainder
1	50	26	28
2	58	27	68
3	14	28	70
⋮	⋮	29	59
		30	64
		31	92
18	73	32	49
19	98	22	8
20	16	34	67
21	23	35	20
22	40	36	1
23	2	37	50
24	100	Then repeats!	
25	5		

Computation simplified by:

$$\frac{12371}{111} = \frac{1}{3}\,\frac{12371}{37}$$

$$= \frac{1}{3}\left(333\,\frac{50}{37}\right) = 111 + 50/111$$

To go from n-1 to n, multiply remainder by 50; divide by 111.
1. Remainder $(12{,}371)^{56} = 16$
2. + 34 ⟶ Remainder of 50
3. Then n = 28.
Therefore, remainder = 70.

10 — The source from which I took this problem says that $(2^{1093} - 2)$ is divisible by $(1093)^2$. That it is divisible by 1093 follows from Fermat's theorem, but the source does not supply an accurate proof of why another factor of 1093 exists. I apologize and will henceforth check my sources more carefully before printing any problems from them.

11 — The solution to this paradox is that if a tire is turned inside-out through a hole, the result is not a tire. Bob Wolf has "proved" to me that what results has a handle where the second circle is located (his hands were waving at incredible speeds during this demonstration, but his pictures were somewhat convincing and very pretty). Unfortunately he has not, as yet, written up this proof.

12 — The little guy tells me that the answer is yes. In fact, every real number can be written as the sum of 4 elements of C. At press time he is still working on whether 3 will suffice. *(Congratulations on grad school Harvey — ed.)*

Many people have asked me about number 14, one of the Speed problems. The equality desired is:

VT = I.

Also, |V| = I

(where "V" is the Boolean or).