SINCE THIS IS the first issue of a new academic year, let me once again review the "Puzzle Corner" ground rules. In each issue I present three regular problems (the first of which is normally bridge related) and one "speed" problem. Readers are invited to submit solutions to the regular problems, and two columns later (i.e., four issues later), one submitted solution is printed for each regular problem; I also list other readers who responded. For example, the current issue contains solutions to the regular problems posed in May.

I am writing this column in June and expect that the column containing the solutions will be due in late October. Please try to send your solutions early to ensure that they arrive before my deadline. Late solutions and comments on published solutions are acknowledged in subsequent issues in the "Other Respondents" section. Major corrections or additions to published solutions are sometimes printed in the "Better Late than Never" section, as are solutions to previously unsolved problems.

For speed problems, the procedure is quite different. Often whimsical, these problems should not be taken too seriously. If the proposer submits a solution with the problem, that solution appears at the end of the same column in which the problem is published. For example, the solution to this issue's speed problem is given below. Only rarely are comments on speed problems published. There is also an annual problem, published in the first issue of each year.

Problems

SEP 1. We start off with a bridge duet from Larry Kells, who wants to know the minimum number of points that a single defender needs to be certain of defeating any grand slam and the maximum number of points a single defender can have and still not be certain of defeating any grand slam. To clarify, we are counting only high-card points, with no deductions for unprotected honors. If, for example, a 20-point hand could be found that would definitely defeat all suited grand slams but, depending on the remaining distribution, might not defeat seven no trump, this 20-point hand would not count for either problem.

SEP 2. The following problem is from Ermanno Signorelli, who believes that, although MIT students might be empty handed, they should never be "all wet."

An empty-handed Tech student is outdoors, heading for class, when it suddenly starts to pour. She has no umbrella or raincoat, so she has to decide how fast to travel in order to stay as dry as possible. Rain is pouring down vertically in all three of the following cases at 17.3 miles per hour (putting aside the cases when the rain is coming from the left or right). What is the student's best strategy if (1) the rain is coming down at 30 degrees to vertical toward her back, (2) the rain is coming straight down, or (3) the rain is coming down at 30 degrees to vertical toward her face? Assume her wettable horizontal surface is one square foot and her wettable vertical surface is six square feet.

SEP 3. Peter Kramer enjoyed one of our 2002 speed problems so much that he proposed a variation suitable for a regular problem.

A patient is told to take a quarter of a standard aspirin tablet each day. He purchases a large (say, 1,000 or more tablets) bottle of whole aspirins. He starts out the first day by shaking out one whole tablet and breaking it into halves and one of the halves into quarters, putting the unused half and quarter back into the bottle. On succeeding days he continues in this manner until a half- or a quarter-tablet appears. If a half-tablet appears, he breaks it into two quarter-tablets and returns the remaining quarter-tablet to the bottle; if a quarter-tablet appears, he takes it. As the days go by, more and more half-tablets and quarter-tablets come out when he shakes out a tablet. The sizes of the tablets and tablet pieces do not affect the likelihood of their appearance. (Logically, there will be a time where it is equally likely that a whole tablet will appear as it is that a piece of a tablet will appear.) What is the approximate likelihood that the next-to-last tablet piece he takes out will be a half-tablet?

Speed Department

Ermanno Signorelli knows that Mary's father has five daughters, four of whom are named Nana, Nene, Nini, and Nono. What is the name of the fifth daughter?

Solutions

MAY 1. An unusual chess problem from Jorgen Hamse. Stalemate occurs when the side to move has no legal move but is not in check. In (some versions of) speed chess, moving the king into check is legal, the appropriate reply being to capture the king and claim the game. Can you find a position where neither side is in check and neither side has a legal move, even if moving into check is considered legal? The position must be reachable; that is, there must be two sequences of legal (perhaps bizarre) moves leading to this position, one with White to play and the other with Black to play.

The following solution is from Ed Sheldon.

One such position is as shown in the following diagram.

					B	N	K
				p		B	p
				p	p		p
					p		p
p		p					
p		p	p				
p	B		p				
K	N	B					

The key to the above solution is that both bishops are of the same color. The bishop was created by pawn promotion. The position was obtained with essentially parallel moves by both sides (so it is easy to generate a position with Black to move). The moves leading to the above position are

1	h4	a5	**13**	Ka1	Kh8	**25**	Rf2	Rc7
2	Rh3	Ra6	**14**	Nb1	Ng8	**26**	Bxc7	Bxf2
3	Rg3	Rb6	**15**	g4	b5	**27**	Be5	Be3
4	Rg6	Rb3	**16**	Qc4	Qf5	**28**	Bc3	Bd4
5	Rh6	Ra3	**17**	Bd3	Be6	**29**	Bc1	Bf8
6	bxa3	gxh6	**18**	Ne2	Nd7	**30**	Bb2	Bg7
7	e4	d5	**19**	gxf5	bxc4	**31**	c3	f6
8	Qe2	Qd7	**20**	fxe6	cxd3	**32**	h5	a4
9	Bb2	Bg7	**21**	exd7	dxe2	**33**	f5	c4
10	Nc3	Nf6	**22**	f4	c5	**34**	e5	d4
11	O-O-O	O-O	**23**	Rf1	Rc8	**35**	e6	d3
12	Kb1	Re8	**24**	d8(B)	e1(B)			

MAY 2. In 1996, we asked how to place lampposts to illuminate the equator of a planet. Now Andrew Russell wants you to place the minimum number of lampposts needed to illuminate the entire (spherical) planet. Oh yes, you are also to arrange that the total length of all the posts is minimal (among solutions with the minimal number of posts).

Several readers realized that the minimum number of lampposts is four, that they should be placed at the vertices of an inscribed regular tetrahedron, and that each post should have a height of 2R. John Draim gave the values for all five regular polyhedrons (Platonic solids). For example, with an icosahedron, the height of each post is approximately .26R.

William Tucker gave an argument suggesting strongly that, for the tetrahedron at least, no improvement is possible. Due to the two-page limit on the length of this column, Tucker's argument appears on the website I have set up at cs.nyu.edu/~gottlieb/tr. A very brief summary of the argument would begin by noting that any solution must correspond to a (not necessarily regular) inscribed tetrahedron. Analytic geometry is then applied to relate the vertices of the tetrahedron to the sum of the post lengths. Finally, 1,000,000 random sets of vertices are generated, the post lengths are calculated, and, Tucker writes, "we get a minimum [total post] height of 8.0497001, and the number of values [found in] each of 10 equal intervals between 8 and 9 [are] 3, 9, 21, 32, 47, 62, 77, 88, 90, 117. This is a clear indication that the minimum is 8 (well, clear enough for me)."

MAY 3. Chuck Haspel has, among other problems, one involving the hands of a clock. He writes,

"My wife and I had an argument a few months ago about which hand on the clock was the 'big hand' (we have been married a long time). I said the hour hand was the big hand and was supported by a tiny minority of the sources we checked: one Internet document, one of our children, and one friend. All the rest supported her, and so did the fact that on many clocks the hands are the same width, and the minute hand is longer.

"This mini-contretemps will never be settled, but it does suggest the following problem. Suppose you have a clock that can be read to infinite accuracy but on which the hands are identical.

"Call a position of the hands 'unambiguous' if there is no doubt about the time. 12:00 is unambiguous because the hands coincide, and 6:00 is unambiguous because if the hand on 6 were interpreted as the minute hand, the other hand would have to be halfway between two numbers. Are there any ambiguous positions, i.e., are there any legal positions of the hands that can be interpreted as two different times?"

Richard Merrifield had little trouble with this problem. He notes that there are 66 ambiguous hand positions for a clock whose hour and minute hands are indistinguishable.

Let angular position be designated by x, the fraction of a complete revolution. If the hour hand is at x, the minute hand will be at $12x$. (All arithmetic on x is modulo 1.) In turn, if the hour hand is at $12x$, the minute hand is at $144x$, which, if the position is to be ambiguous, must equal the original hour-hand position. Thus the ambiguous values of x satisfy $144x = x$. The solutions to this equation are $x = n/143$, where n is an integer in the range of 1 to 143, but not all of these are both ambiguous and distinct. For the 11 values of x that also satisfy $12x = x$ (n an integer multiple of 13), the two hands coincide, and the solutions are unambiguous. The remaining solutions occur in pairs (x,$12x$) that both denote the same hand positions. There are thus $(143 - 11)/2 = 66$ distinct ambiguous solutions.

The sequence of ambiguous time pairs is (12:05.350, 1:00.4196), (12:10.0699, 2:00.8392), (12:15.1049, 3:01.2587),..., (11:49.9301, 9:59.1608), (11:54.9650, 10:59.5804).

Better Late than Never

2004 DEC 1. Yaacov Weiss notes that the defenders can "countercheat": South pitches anything on the first trick and then beats East's Q with his K.

2005 MAY SD. Donald Hooker caught us. There are no "Friday the 13th"s in a leap year beginning on a Saturday.

Other Responders

Responses have also been received from F. Albisu, J. Arens, S. Avgoustiniatos, R. Bishop, B. Blondin, C. Brooks, F. Crespo, C. Danielian, P. Drouilhet, D. Freeman, I. Gershkoff, R. Giovanniello, J. Hamse, D. Lee, D. Moskowitz, B. Norris, C. Reimers, K. Rosato, J. Schwartz, M. Seidel, E. Sheldon, L. Stabile, J. Teare, and T. Terwilliger.

Proposer's Solution to Speed Problem

Mary, of course.

Send problems, solutions, and comments to Allan Gottlieb, New York University, 715 Broadway, 7th Floor, New York NY 10003, or to gottlieb@nyu.edu.