It has been a year since I specified the size of the backlogs for the various kinds of problems that are printed. Currently, I have a large queue of regular problems and a comfortable supply of bridge, chess, and speed problems.

Last issue I mentioned that our younger son, Michael, who lives in Syracuse, New York, was not impressed with the snow amounts in the metro New York area. I should learn to be more careful about what I write, as who knows the reach of *Technology Review*? We have received so much more snow that we have not seen our backyard since late December, nearly two months ago, and are not likely to see it for a few weeks to come. Last weekend we visited Michael, only to find that right now Syracuse has less snow on the ground than we do. If the snow gods are reading this issue as well—Enough, already!

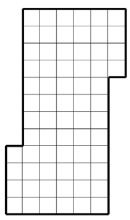
PROBLEMS

M/J 1. This problem from Jorgen Harmse brings back memories of the time when, as a high-school student in my first (and last) bridge tournament, I asked my opponent for permission to watch him play the hand I was defending ... and he agreed!

In the bridge game diagrammed below, you are South and have seen East's hand (don't ask how; its a secret). What contract should you declare? Since your partner has not seen East's hand, you must be the declarer.

	North	
	♠ ?	
	♥ ?	
	♦ ?	
West	♣ ?	East
♠ ?		♠ 10 8 7 6 5
♥ ?		♥ —
♦ ?		♦ J 9 8 7
♣ ?	South	♣ J 9 8 7
	♠ A K Q J 9	
	♥ —	
	♦ A K Q 10	
	♣ A K Q 10	

M/J 2. In Solomon Golomb's October 1987 installment of "Golomb's Gambits," we are asked to dissect the figure at right into four congruent pieces. These four pieces do *not* have to be similar to the original.



M/J 3. Larry Kells sends us a nautical problem.

A ship sails out from a port on the equator, heading due northeast. It always maintains the true northeast heading. At what latitude (to the nearest second of arc) will the ship be when it completes a circuit of Earth and returns (for the first time) to its starting longitude? Assume that Earth is a perfect sphere, and disregard the interference of land.

SPEED DEPARTMENT

Avi Ornstein asks one that I can see using as a parlor trick.

Pick a number n. Cube the number and subtract from that the square of the number. Divide the difference by the sum of the numbers from 1 to $n - 1$. What is the result?

SOLUTIONS

J/F 1. In tournament team play, deals are played at two tables and the two scores are compared. If the scores are different, the difference of the two North-South scores (treated as a positive number) is called the swing. For the purpose of calculating the difference, a positive East-West score is treated as a negative North-South score. Current tournament scoring of part scores, games, over- and undertricks, etc., is used. Honors are not counted. Larry Kells wants to know: what is the smallest positive multiple of 10 points that cannot be the exact swing on a single deal? How about 50 or 100 points? You are not being asked to give hands and reasonable bidding sequences and reasonable play.

There is agreement that the lowest multiple of 10 not possible is 7,820 and Gerry Grossman asserts that for multiples of 50 and 100, the corresponding answers are 9,050 and 9,100. Grossman computed this using Maple but warns that he considered only the scores and did not take into account the requirement that vulnerabilities at the two tables need to correspond.

The following solution for multiples of 10 is from my former Baker House colleague Isaiah Shalom, then known as Bill Friedmann.

"I will assume that we are using the scoring that has been in effect since 1987, in which the bonus for making a redoubled contract is 100 points, and that nonvulnerable doubled undertricks from the fourth one on are worth 300 points each. In that event, the smallest possible number divisible by 10 that cannot yield a swing is 7,820.

"This is established as follows. While no score of 10, 20, 30, 40, or 60 points is possible, 50 points can be yielded by down one undoubled, not vulnerable; 70 by one of a minor making; 80 by one of a major making; 90 by one no-trump making; 100 by down one, vulnerable; 110 by two of a major making; 120 by two no-trump making; 130 by a minor part score making four; 140 by a major part score making three; 150 by down three, not vulnerable; 160 by one of a major doubled making one; 170 by a major part score making four; 180 by a no-trump partial making four; 190 by a minor part score making seven; 200 by down two, vulnerable; 210 by a no-trump partial making five; 230 by a major partial making six; 240 by a no-trump partial making six; 250 by down five, not vulnerable; 260 by a major partial making seven; 270 by a no-trump partial making seven; and 280 by one no-trump doubled, not vulnerable, making two.

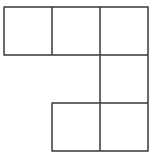
"We can also establish that the score of 540 can be produced by one of a minor doubled, vulnerable, making three; 560 by one of a major doubled, vulnerable, making three; 570 by two of a major doubled, not vulnerable, making three; 580 by one no-trump doubled, vulnerable, making three; 590 by four of a major doubled, not vulnerable, making four; 610 by four of a minor doubled, not vulnerable, making five; 620 by four of a major, vulnerable, making four; 630 by three no-trump, vulnerable, making four; 640 by five of a minor, vulnerable, making seven; 650 by four of a major, vulnerable, making five; 660 by three no-trump making five; 670 by two of a major doubled, vulnerable, making; 680 by four of a major, vulnerable, making six; 690 by three no-trump, vulnerable, making six; etc.

"Of course it is clear that the differences of 10, 20, 30, 40, and 60 can be established by taking proper scores that are suitably different, and that the above differences can be established with a zero score at one table. We can obtain the differences of 220, 290, 310, 380, and 390 easily enough as well (400 – 180, 400 – 110, 400 – 90, 500 – 120, and 500 – 110, respectively).

"Consider that the score of 7,600 can be obtained by down 13 redoubled, vulnerable, and that each score under 7,600 that is a multiple of 600 can be obtained by an appropriate number of fewer undertricks. By combining any of the above possible scores we can get any number except those that differ by 290 or 310 (380 is obtained by one no-trump doubled, vulnerable, making two). But we can achieve this by utilizing 890 (four of a major doubled, not vulnerable, making seven). This will enable us to achieve any swing other than 7,310, but we can achieve that with a score of 5,800 combined with 1,510 (seven of a major, not vulnerable, making).

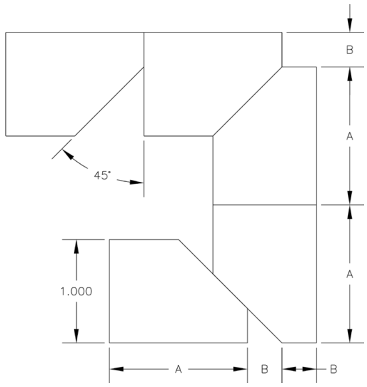
"We cannot obtain 7,820, since this requires a score of either 220, 820, 1,420, 2,020, or 2,620, none of which are possible. This is by the scoring that has been in place since 1987. Prior to 1987, a score of 2,020 was possible (six of a major redoubled, vulnerable, making, but that is worth 2,070 now), and the smallest such impossible swing was 8,480."

J/F 2. This problem is another in the series sent by Richard Hess and Robert Wainwright. You are to find a way to connect tiles so that five of them cover at least 92 percent of the hexomino at right. The tiles must be identical in size and shape and may be turned over so that some are mirror images of the others. They must not overlap each other or the border of the hexomino.



Jonathan Singer was able to achieve 92.5 percent coverage by first finding a shape (see the following diagram) with area greater than 1.0 such that five of these shapes could fit into the six cells. Then, to determine the largest area this shape could have, he solved the two equations A + 2B = 2 and 2A + B = 3, obtaining A = 1. 33 and B = . 33, which gives a total area of 1.11.

Therefore, five of these shapes cover $(5 \times 1.11)/6 = 92.5$ percent of the total area.



BETTER LATE THAN NEVER

1996 M/J 1. Benard Lemaire is quite interested in finding the maximum number of unattacked squares when N chess queens are placed on an $n \times n$ chess board, which he denotes by $U(N)$. He writes:

"For $N = 4$, $U(4) = 1$ as published; there are 24 other solutions.

"For $N = 5$, the solution shown is not optimal (its placement of five queens yields $U = 2$ unattacked squares). The optimum is $U(5) = 3$; its placement of five queens is unique.

"For $N = 6$, the solution shown is not optimal (its placement of six queens yields $U = 4$). The optimum is $U(6) = 3$, with three possible placements of the six queens.

"For $N = 7$ the solution shown is not optimal (its placement of seven queens yields $U = 4$). The optimum is $U(7) = 7$, with 38 possible placements of seven queens.

"For $N = 8$ the solution shown is optimal; there are six others.

"For $N = 9$ the solution shown is not optimal (its placement of nine queens yields $U = 15$). The optimum is $U(9) = 18$; its placement of nine queens is unique.

"For $N = 10$ the solution shown is optimal, but has a typo. $U(10) = 22$.

"For $N = 30$ the solution shown is (believed to be) optimal, with $U(30) = 40$; the placement shown is one of the two that we have.

"For $N = 40$ the solution shown is (believed to be) optimal, with $U(40) = 841$" the placement shown is one of the two that we have."

OTHER RESPONDERS

Responses have also been received from T. Harriman.

PROPOSER'S SOLUTION TO SPEED PROBLEM

$2n$: the difference is $n \times n \times (n - 1)$ and the sum is $n \times (n - 1)/2$. ■

Send problems, solutions, and comments to Allan Gottlieb, New York University, 715 Broadway, Room 712, New York, NY 10003, or to gottlieb@nyu.edu. For other solutions and back issues, visit the Puzzle Corner website at cs.nyu.edu/~gottlieb/tr.