PuzzleCorner

Since this is the first issue of a new academic year, I once more review the ground rules under which this department is conducted.

In each issue I present three regular problems (the first of which is chess, bridge, go, or computer-related) and one "speed" problem. Readers are invited to submit solutions to the regular problems, and three issues later, one submitted solution is printed for each problem; I also list other readers who responded. For example, solutions to the problems you see below will appear in the February/March issue and this issue contains solutions to the problems posed in May/June. Since I must submit the February/March column in November, you should send your solutions to me during the next few weeks. Late solutions, as well as 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 January issue of each year; and sometimes I go back into history to republish problems that remained unsolved after their first appearance.

Problems

OCT 1. We begin with a Bridge problem from Jorgen Harmse:

SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO: ALLAN GOTTLIEB
NEW YORK UNIVERSITY
715 BROADWAY, 10TH FLOOR
NEW YORK, N.Y. 10012,
OR TO: GOTTLIEB@NYU.EDU

♠ A K 3 2
♥ 9 8 3
♦ A Q 10 T 6
♣ 4 3

♠ 9 8 7
♥ 10 7 x 2
♦ 4 3 2
♣ 7 6 2

You lead the deuce of hearts against 3NT, and your partner's ace brings down Declarer's king. Your partner leads the queen and Declarer discards. Explain the importance of your third heart (marked x).

OCT 2. Nob Yoshigahara has a color-based crypt-arithmetic problem. As usual, you are to substitute digits for letters to validate the following equations.

YELLOW + YELLOW + RED = ORANGE
RED x BLUE = YELLOW
RED x RED = WHITE

OCT 3. Winslow Hartford writes that his misspent youth at conventions infested with salesmen convinced him to write the following in a column about cancer clusters for the *Charlotte Observer*: "Dollar-bill poker": This is a friendly scam practiced at conventions. As there are eight numbers on the bill and 10 digits in all, you'd think multiple digits would be rare. But of 10 bills drawn from my wallet, nine showed "clusters" (two full-houses, four two-pair, three one-pair). (The "operator" of this scam, having changed a $50 bill in advance, is almost sure to have five of a kind). This report suggests a question for Puzzle Corner: How many random $1 bills does the operator need to:

a) have a 50% chance of 5 of a kind?
b) have a 90% chance of 5 of a kind?

Speed Department

George Blondin wishes to tell "Speedy Jim" [Landau] that there is an English word [kinda sorta] with SIX consecutive double letters. What is it?

Solutions

M/J 1. Jorgen Harmse, inspired by a previous Bridge column asking how well you could do with a lousy hand, has a reverse question basically asking how bad can things get when you have a great hand. Specifically Harmse writes: You hold the AKQ of spades, hearts, and diamonds and the AKQJ of clubs (I told you it was a great hand!). What is the highest contract the opponents can make against best defense?

Joseph Keilin shows us that things can really go bad even when "you've got the goods."

In no trump the opponents make zero tricks regardless of who is on lead and how the hand is played. In a trump contract the defense must take at least three trump tricks, so the best the opponents can make is 10 tricks, which is possible with the following layout in spades. (Four hearts or diamonds can be made with analogous layouts.)

North (Vul)
♠ X X X
♥ X X X X X
♦
♣ X X X X X

West
♠
♥ X X X X X
♦ X X X X
♣ X X X X

Contract: 4 spades by South

East
♠ A K Q
♥ A K Q
♦ A K Q
♣ A K Q J

South (Vul)
♠ X X X X X X X
♥
♦ X X X X X X
♣

West's best lead is a club. South ruffs. South crossruffs diamonds and clubs three times ending in the South hand. At this point South and East each have three trumps. South keeps leading diamonds until East ruffs in. At this point South has three trumps and East only two. If East draws trump South can trump whatever East returns and make his remaining diamonds. If East returns a heart, South ruffs and continues diamonds, putting East in the same position as before. South ends up making three ruffs in the North hand and four ruffs and three diamonds in the South hand. If West had lead either a diamond or heart, the play is similar. South ends up in his own hand after ruffing three diamonds in the North hand and three hearts or clubs in the South hand. At this point he has four spades to East's three, although that hardly matters. He continues leading diamonds as before with the same result.

Although you asked for a maximum contract and not maximum score, the maximum score can be achieved with a contract of one spade (or heart) doubled and redoubled for a score of 770 plus game bonus in contract bridge and 1270 in duplicate.

M/J 2. Mark Oshin notes that, given a regular tetrahedron, there is a plane that is equidistant from the four vertices; in fact there are several such planes. How many?

The following solution is from Charles Wampler:

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Puzzle

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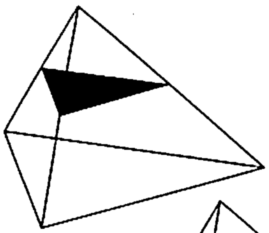
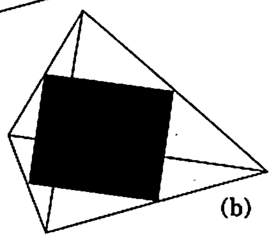
Since all four vertices cannot lie on the same side of the plane, the plane must either pass between a vertex and the opposing face or between two opposing edges. For each of the four vertices, the plane passing through the midpoints of the three adjacent edges is equidistant from all vertices (a). For each of the three pairs of opposing edges, the plane passing through the midpoints of the four edges joining them is equidistant (b). Hence the total number of equidistant planes is seven.



(a)



(b)

M/J 3. The late Bob High was "behind the eight ball": A billiard ball with a small black dot on the exact top is rolled around a circle of radius equal that of the ball. Assume no slippage or twisting. Where is the black dot when the ball returns to its original position?

I will admit to some trepidation on this one. It is a problem from Bob High so an easy solution is not expected. Moreover, some of our regular contributors submitted moderately difficult solutions, but it seems to me that the following simple solution from Eugene Sard is correct.

The intuitive answer is that the black dot is back on the top of the billiard ball when the ball returns to its original position. Surprisingly, however, the ball makes two complete revolutions in achieving this result. This can be seen by comparing the described situation with the cycloid generated by the black dot, if the the ball were rolling on a flat surface. When the ball is halfway through its travels, the dot touches the fixed surface, which is at the top of the ball for the actual circular surface. Hence, one complete revolution has occurred when the bottom of the circle is reached, and the second revolution occurs in the remaining travel back to the top of the circle.

Kasner and Newman in *Mathematics and the Imagination* (chapter on paradoxes) describe a similar situation with one coin rolling halfway around a second identical coin.

I discussed this problem with my assistant, Maria Katsouras, and we agree that the "arc of contact" traversed on the ball must at all times be of the same length as the "arc of contact" traversed on the circle. Thus when the ball comes back on top of the circle, the ball's "arc of contact" is a complete (great) circle.

Other Responders

Responses have also been received from M. Fountain, D. Garcia, T. Godfrey, T. Harriman, W. Hartford, R. Hess, M. Lindenberg, N. Markovitz, A. Ornstein, G. Perry, K. Rosato, L. Steffens, and N. Wickstrand.

Proposer's Solution to Speed Problem

Raccoonnookkeeper.

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I hope I haven't shocked anyone by having two entries in a row. For starters, I'd like to thank all the people who contacted me. Also, I'd like to try something new. Each issue I will ask several people from our class to write and tell me what they and their friends have been doing lately. The first lucky few are Natalya Eliashberg, John Gonzales, Karl Yen, Julia Stowell, Rebecca Witry, and Parag Shah. So, here's your excuse to call these people and make sure they have a lot to tell everyone. Now, on to the news!

Reshma Patel is in New York living with Mia Sakata. Mia is working at JP Morgan in Mergers and Acquisitions. Karen Kaplan was living with them while studying journalism at Columbia. She spent the summer working for the *LA Times* in the business section and should be working for the *Miami Herald* when this comes out. . . . Helen Chang is in Phoenix, working as a process engineer. She just got two puppies—Biscuit and Muffin. . . . Sophia Yen and Steve Ko are in San Francisco. Sophia is at University of California San Francisco medical school. Steve is working at Apple Computers on systems software for the power PC chip. They were married June 8. In the wedding party were Mia Sakata, Mark Lee, Helen Chang, Mike Yu, Lisa Chow, and Liz Leung. Pictures have been promised.

Tim Wilson and Julie Lyren were also married recently, in Acron, Ohio. I should be getting some pictures from Scott Shiamberg, who is getting a graduate degree in architecture. In the past few months, he has traveled to Florida, Bangkok, Thailand, and Taiwan for his job. . . . Mark Lee was working at Intel in Phoenix, then returned to MIT to finish an SB degree. In his spare time he managed to enter the 10K competition with some other MITers to produce a diet/nutrition/exercise program. . . . Shen-yi Sieh is working for Procter and Gamble in Japan and spends half of her time flying around Asia helping out the local P&G with its products.

In other news, Pascal R. Lewis is pursuing a master's in manufacturing systems at Georgia Tech. . . . Hooman Davoudiasl is starting his second year as a grad student in physics at Caltech. . . . Diane Hern is at the University of Texas at Austin, working on a graduate degree in biochemical engineering. . . . Kristine W. Ma is attending the University of California at Berkeley graduate school. . . . Greg Best is in San Francisco working for Trimble. . . . And Chay Kuo got into the MD/PhD program at the University of Chicago. . . . Krista Holland writes, "I'm moving again!" The Department of Energy transferred her to the Rocky Flats in Colo., for the summer; now she's in Las Vegas working at Yucca Mountain, and in December she'll be off to study geotechnical engineering at the University of Minnesota.

Jeremy Yung just finished his first year in grad school at MIT. He hopes to finish a master's degree in aero/astro in about a year. After that, he'll probably stay on for another degree. . . . Masahiro Arakawa is currently a graduate student at the University of Southern California. He's busy working on a master's in computer engineering and his jump-serve on the volleyball court. Earlier in the year, he ran into Dan Kim taking a break from medical school to play volleyball on the beach.

Ken Ricci is finishing his first year in the physics PhD program at Stanford University. He is supported by an Office of Naval Research Fellowship and was doing research with Stanford's Free Electron Laser facility this summer. . . . Stacy Reeves is working for Intel in Portland, Oreg. This spring she was in Boston visiting Carrie Allen, who is going to Oxford grad school, and Marlo Torres, who is working for 3M in North Dakota. In July she'll be going to Israel on business and is hoping to stop in Oxford to see Carrie.

Terry Tsai is now working at Sapient, a small consulting firm in Cambridge. . . . Jim Hansen is still working at the Microsoft Graphics Product Unit testing Power Point, while his wife, Cathy Lachapelle, '92, is attending grad school at Stanford. Their son, Colin, is now 4 and "getting more clever every month." A second child was born around July 11. After Jim's loans are paid off, he plans to return to school for a PhD so he can do work in his real field of interest, water resources.

That's all for now. Make sure to get in touch with the people named at the start of the letter. If you want to get on the MIT Class of 1993 mailing list, you can subscribe by sending mail to <listserv@mitvma.mit.edu>. In the e-mail write: SUBSCRIBE MIT1993. Make sure there is a space between "subscribe" and "MIT1993." Of course I can always be reached by writing Mari Madsen, secretary, 12-16 Ellery St. #405, Cambridge, MA 02138