Forty years! It is hard to believe, but this issue marks the 40th anniversary of "Puzzle Corner" in *Technology Review*. Nearly all my students this year were not yet born when that first issue appeared. Indeed, neither was the assistant professor in the next office. According to former NYU president L. Jay Oliva, my senior status entitles me to the appellation "experience advantaged," which I much prefer to the simpler "old."

In fact, "Puzzle Corner" is 41 years old; during academic 1965–1966, it appeared in the MIT student magazine *Tech Engineering News*. John Mattill saw it there and recruited me for *Technology Review* the next academic year. Sadly, *TEN* is long since defunct, and I foolishly didn't keep my original issues. If anyone has theirs, I would very much appreciate a copy of my column during that first year.

Please indulge my mentioning two small stories from "the past." Fairly early in "Puzzle Corner" history, one reader's solution method resulted in something like 17 simultaneous equations in an equal number of unknowns, which he then proceeded to solve *by hand*, *typing* the detailed solution out on paper with *no* errors or typos.

In 1990 I was told that space was tight and my column would be phased out. I wrote my farewell in the July issue, but *Technology Review* received a flood of mail, and the decision was reversed with nearly no loss in continuity. Then in September I received the Harold E. Lobdell Award from the Alumni Association for my stewardship of the column. I never knew if the award was a goodbye present, an apology, or an actual recognition of quality.

### Problems

**S/O 1.** Fred Tydeman seeks the minimum number of knights that can be placed on an otherwise empty chessboard so that each of the 64 squares is either occupied or under attack.

**S/O 2.** My old Baker House colleague John Rudy plays racquetball with his son. In this game, if the server wins the rally, he gets a point and serves again. If the server loses the rally, no points are awarded, and the opponent serves next. Assume that whoever is serving wins the rally with probability $p$; the score is server 13, opponent 14; and 15 points wins the game. For what values of $p$ is the server more likely to win than the opponent?

**S/O 3.** Victor Luchangco had nine coins of equal weight, but someone removed material from one coin and added it to another. Victor has a balance scale that can hold at most two coins on each side and wishes to determine both the lighter and heavier coin using only four weighings. Can he do it?

### Speed Department

Victor Barocas and nine friends were walking down the street wearing identical hats when a gust of wind blew all 10 hats off. Each of them picked up a hat and placed it on his head. Is it more likely that exactly one of them has his original hat or that exactly nine of them have their original hats?

### Solutions

**M/J 1.** Larry Kells found an "amazing deal" by Thomas Andrews where all four players can make 3NT as declarer, against best defense. Can you find one?

Kells offers us Andrews's solution, where South holds

♠ A8765432
♥ Q109
♦ –
♣ KJ

West holds the same pattern, but with distribution 0-2-3-8, North has 3-8-2-0, and East 2-0-8-3. Say West leads a low club, his long suit. South wins while pitching a spade from dummy. Now South concedes a spade. East wins, but the defenders get only two club tricks because the suit is blocked and West has no side entry. After taking at most the ace of diamonds in addition (their fourth trick), the defenders must give up the lead, and declarer is ready to run the spades (which aren't blocked, since a spade was pitched from dummy). He gets seven spades, one heart, and one club.

If West leads a diamond, his partner's suit, dummy covers. If East ducks, South pitches a heart, then sets up and uses the hearts, much as he uses the spades after a club lead; the diamonds are blocked.

If West leads a heart, he loses his stopper. South takes three hearts, then gives up a spade to force an entry to dummy. The defenders don't have anything ready to run, so South gets the lead back, at some point enters dummy in spades, and runs the hearts.

If West starts with the ace of clubs, declarer should pitch a heart from dummy, then follow whichever variation, depending on what West leads next. (He should not pitch a spade on the ace of clubs, because if West shifts to a heart, South would no longer be able to set up a spade entry to the long hearts.) If West continues clubs, then a spade can be pitched. In those variations where declarer ends up running the heart suit but with one fewer trick available due to the first-trick heart discard, he has the good king of clubs as compensation—which he doesn't have in the opening-diamond-lead scenario, where he uses the unshortened hearts.

Finally, if East wins the first diamond, South must discard a spade (to preserve a possible heart entry to the spades in case East shifts to spades), then follow the variation according to what East does next. Note that declarer gets an extra trick with the king (or jack) of diamonds if he ends up running the shortened spades. (If the defenders start with their two aces in either order, declarer discards a heart from dummy and a spade from hand. Then he follows whichever variation, according to what is led next, and he gets a trick in each minor to go with at least six tricks in whichever major suit he finally runs and the other major-suit ace.)

In every scenario, the defenders cannot do better than two tricks in one minor (which blocks), the other minor ace, and one trick in the majors—and in some cases they don't get even that.

Due to the symmetry of the deal, each of the other players as declarer succeeds the same way with a suitable permutation of suits.

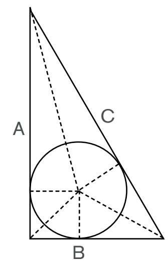
**M/J 2.** Warren Smith, a former colleague of mine at the NEC Research Institute, advocates "range voting" for elections. The following problem is from his Center for Range Voting website, rangevoting.org.

Three people enter a room, and a red or blue mark is made on each person's forehead. The color of each mark is determined by a coin toss, with the outcome of one coin toss having no effect on the others. Each person can see the others' marks but not his own. No communication of any sort is allowed, except for an initial strategy session before the game begins. Once they have had a chance to look at the other marks, they must (simultaneously) guess the color of their own marks or pass. The group shares a hypothetical million-dollar prize if at least one player guesses correctly and none guesses incorrectly. The problem is to find a strategy for the group maximizing its chances of winning the prize. For example, one obvious strategy for the players would be for one player always to guess "red" while the others pass. That would give the group a 50 percent chance of winning the prize. Can the group do better?

Indeed it can, as shown by this solution from Steven Gordon. Any solution will have an equal number of wrong and right guesses. The optimal strategy will have all three of the people guessing wrong when any of them guesses wrong and only one guessing right (the other two passing) at all other times. Here is an optimal strategy. If a player observes marks of the same color on the other two players, that player guesses his own to be the opposite color. If a player observes marks of different colors on the other two players, that player passes. Below are the eight possible outcomes; six of these (75 percent) are successful.

| *Marks* | *Guesses* | *Outcome* |
|---|---|---|
| RRR | BBB | Lose |
| RRB | PPB | Win |
| RBR | PBP | Win |
| RBB | RPP | Win |
| BRR | BPP | Win |
| BRB | PRP | Win |
| BBR | PPR | Win |
| BBB | RRR | Lose |

**M/J 3.** Our final problem is the originally intended version of 2005 Jul 2 as submitted by Avi Ornstein (I inadvertently changed it).




Given that a right triangle with legs of lengths $A$ and $B$ is circumscribed around a unit circle (radius = 1), express the length of $B$ in terms of $A$. In addition, what is the smallest possible area of the triangle?

Let $C$ be the hypotenuse. Drawing lines from the center of the circle to the three vertices and also dropping perpendiculars to the three sides from the center of the circle, three triangles are formed with altitudes 1 and bases $A$, $B$, $C$.

The area of the right triangle equals the sum of the areas of the three smaller triangles. So $\frac{1}{2}AB = \frac{1}{2}(A+B+C)$, and $C = AB - A - B$. Squaring both sides of this equation, noting that $C^2 = A^2 + B^2$, and dividing both sides by $B^2$ gives $B = 2(A-1)/(A-2)$. This answers the first part of the question and shows that the area of the right triangle is $A(A-1)/(A-2)$.

To obtain a closed triangle, $A$ (and $B$) must exceed 2. Our formula for the area tends to $\infty$ when $A \to \infty$ and when $A \to 2^+$. Thus, there must be at least one area minimum in the range $A > 2$. Differentiating with respect to A and setting the result equal to zero, we find $A = 2 \pm \sqrt{2}$. Applying the answer to part one, we find that $B = A$, and the area becomes $2\sqrt{2}+3$.

### Better Late than Never

**M/J SD.** Several readers noticed that an editorial error introduced a typo. The tennis score is 6-6 (1-2).

### Other Responders

Responses have also been received from F. Albisu, D. Aucamp, R. Baum, L. Bonderson, P. Drouilhet, J. Feil, D. Frankel, E. Friedman, R. Gilman, S. Gordon, T. Harriman, R. Hess, C. Hillman, H. Hodara, H. Ingraham, L. Iori, J. Kenton, J. Klincewicz, W. Ladd, P. Lincoln, L. Marden, N. Markovitz, R. Merrifield, T. Mita, Z. Moledina, L. Nissim, D. Robey, E. Sard, J. Simon, R. Smith, E. and W. Sun, A. Taylor, S. Zalkin, and M. Zissman.

### Proposer's Solution to Speed Problem

It is impossible for *exactly* nine to have their original hats. If nine did, the tenth would also.

Send problems, solutions, and comments to Allan Gottlieb, New York University, 715 Broadway, Room 712, New York NY 10003, or to gottlieb@nyu.edu.