It has been a year since I reviewed the criteria used to select solutions for publication. Let me do so now.

As responses to problems arrive, they are saved in neat piles, with no regard to their postmark or date of arrival. When it is time for me to write the column in which the solutions are to appear, I first weed out erroneous and illegible responses. For difficult problems, this may be enough; the most publishable solution becomes obvious. Usually, however, many responses remain. I then try to select a solution that supplies an appropriate amount of detail and that includes a minimal number of characters that are hard to set in type. A particularly elegant solution is, of course, preferred, as are contributions from correspondents whose solutions have not previously appeared. I also favor solutions that are neatly written, typed, or sent by e-mail, since these simplify typesetting.

Longtime Puzzle Corner contributor Avi Ornstein has written *Increase Your Brain Power*, a book that many of you might enjoy. See www.aviornstein.com for details.

PROBLEMS

N/D 1. Our bridge maven, Larry Kells, must be in a discouraged mood, because he wants to know the greatest number of high-card points a partnership can have without being able to make any contract with best defense.

N/D 2. Fred Andree asks a question concerning a topic dear (indeed, too dear) to my heart: food. He does note that the question can be reformulated to apply to other subjects.

Suppose there is a population of restaurants whose enjoyability (utility) for you forms a linear distribution. If you sorted all the restaurants by enjoyability and graphed that property, the graph would form a straight line from the least enjoyable to the most enjoyable. You haven't tried all the restaurants, and you don't know how good each one is, but you have tried enough of them to confirm the distribution. Suppose you have a few favorite restaurants that you have discovered over the years, and you want to keep their number fixed even when the specific restaurants in the group change. Suppose that all restaurants die (go out of business, change management, etc.) at some fixed rate. You have to try new restaurants in order to replace your favorites when they die. But you want to enjoy your favorites as much as possible, because the average new restaurant you try will not be as good as any of your favorites. You go out to restaurants regularly. What fraction of the time should you try a new restaurant if you want to maximize your overall restaurant enjoyment and still maintain the number of restaurants in your favorite few?

N/D 3. Longtime contributor Richard Hess can apparently do the seemingly impossible. He tells us there are 13 identical-looking stacks of four coins each and an accurate pointer scale. One stack has counterfeit coins, all identical in weight but different from true coins by an amount known to be less than five grams. True coins weigh an unknown amount, expressed in an integer number of grams. In *just two* weighings, detect which stack has the phonies and determine the weights of true and counterfeit coins.

SPEED DEPARTMENT

Alan Faller knows that a deck of cards has 52! possible permutations and wonders how many zeroes are at the end of that number.

SOLUTIONS

J/A 1. Last year we considered a problem in which North-South makes seven spades and wondered what would be the highest number of tricks East-West could make in a spade contract (in all cases with best play). Tom Terwilliger asks about a generalization in which we drop the requirement of a grand slam. Again assuming best play, what is the greatest swing in the number of tricks that can occur by having different sides play the hand in the same trump suit? For example, if North-South can make five spades (11 tricks) and East-West can make four spades (three tricks for North-South), the swing would be 11 - 3 = 8.

I received no answers for this problem, so it remains open.

J/A 2. Geoffrey Landis was having dinner with five friends. They all raised a toast and clinked glasses. Since their glasses were the all same diameter, at any instant only three could mutually touch at the rims. For six people, having each touch everybody else's glass requires 15 pairwise touches. Can this be done with five three-glass touches? If not, what is the minimum number required? (This is a 2-D problem; the glasses must touch at the rim.)

Aaron Ucko solved this problem and offers insight into a natural generalization. He writes:

"Six touches are both necessary and sufficient. The latter is easy to demonstrate: if we label the diners with letters from A to F, then the following rotationally symmetric combination covers each pair at least once:

{ABD, BCE, CDF, ADE, BEF, ACF}

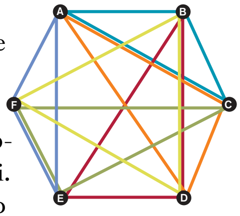
"(AD, BE, and CF each participate together in two touches.) To see why five won't do, note that each diner touches glasses with two of his or her five tablemates at a time and thus must participate in at least $\left\lceil \frac{5}{2} \right\rceil = 3$ touches, imposing a minimum of $\frac{6\times3}{3} = 6$ touches.

"More generally, if there are n diners, analogous reasoning indicates that the total number of touches must be at least $\left\lceil \frac{\lceil (n-1)/2 \rceil}{3} \right\rceil$, so 'nonredundant' arrangements are only theoretically possible for n congruent to 1 or 3 modulo 6. I have found such solutions for n in {3, 7, 9, 13, 15} along with minimally redundant solutions for n in {4, 5, 6}, and suspect but have not proved that the 'quantized' lower bound is always in fact attainable."

Jorgen Harmse offers the follow solution for $n = 5$:

{ABC, ADE, AFG, BDF, BEG, CDG, CEF}

Finally, Mark Perkins sent us the picture at right, illustrating a solution for $n = 6$.



J/A 3. Nob Yoshigahara sent us this cryptarithmetic problem from Kyoko Ohnishi. Replace each letter with a unique digit to give a true statement.

```
  COLOUR
  COLOUR
  COLOUR
  COLOUR
  COLOUR
  COLOUR
+ COLOUR
 RAINBOW
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Keith Szolusha enjoyed this problem enough to submit his first solution. I hope he is hooked now. He writes:

"A process of elimination gives us a much more limited set of possibilities for a solution and saves time generating an answer.

"To start, consider that R multiplied by 7 equals W or a number with W as the last digit. R cannot be 0, because then W would also be 0, and R and W are not the same number. Similarly, R cannot be 5, because then W would also be 5. You also know that C x 7 + some carryover from the previous column = RA. The most that can be carried over in any column is 6, since 9 x 7 = 63, and 9 x 7 + 6 = 69 (which is less than 70), so R cannot equal 7, 8, or 9. So R is 1, 2, 3, 4, or 6. There are a few more eliminations needed to solve the problem. C cannot equal 0, since 0 x 7 + 6 does not produce a number with a carryover to the next column. C also cannot equal 1; if it did, R would be either 0 or 1, because 1 multiplied by 7 plus any number from 0 through 6 carries 0 or 1. We already know that R can't be 0, and if C is 1, R cannot be 1 also.

"Given that R x 7 gives you the value of W, just step through the five possibilities of R and you will find a solution that fits. W is assigned immediately. Step through the possibilities of U and see the Os that are generated. From there you will find a few nonsolutions based upon numbers already taken. Once R is chosen, the choice of C is narrowed down to just a few possibilities—those that could produce R as a carryover.

"For example, if R is 3, W is 1. C is 4 or 5, since 4 times 7 plus carryover could equal 30 or greater, and 5 times 7 plus carryover could equal 35 or greater. Choose U from 0, 2, 4, 5, 6, 7, 8, or 9 and O from 2, 6, 0, 7, 4, 1, 8, or 5. Choosing 8 for either would make both equal 8, so neither U or O is 8. W is already 1, so O cannot be 1 and U cannot be 7. The possibilities of U and O reveal the choice of C as 4 or 5 and not a number already chosen by U or O. B can next be calculated based upon knowing O, U, R. This helps further iron out the possibilities for C, since in one case B equals 4 and C must equal 5 (for U = 0). In a few cases, B should be 3, but that is already taken by R, so U cannot be 2 or 4.

"Elimination starts. The choices left are for {U, O, C, B} to equal {0, 2, 5, 4}, {5, 7, 4, 2}, or {6, 4, 5, 2}. Given that C x 7 + carryover = 3A, when C is 5 and O is 2, A could be 6 or 7 because of carryover limits. When C is 4 and O is 7, 4 x 7 + carryover would equal 32 or 33. But A cannot be 3 because R is 3, and A cannot be 2 because B is 2 in this scenario. When C is 5 and O is 4, A could be 7 or 8 because of carryovers. So now, U, O, C, B, A is 0, 2, 5, 4, 6/7 or 6, 4, 5, 2, 7/8. The problem is finalized by finishing with the remaining possibilities for L to create N and I given the already known carryovers and the restrictions on A. There are so few choices left that U, W, O, R, B, C, A, N, L, I = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 reveals itself."

Arthur (Class of 2019) and Douglas Harris submitted a pictorial solution, which I've posted at cs.nyu.edu/~gottlieb/tr.

BETTER LATE THAN NEVER

M/A 2. Shim Berkovits found a slightly simpler solution.

Robert Ackerberg points out that the solution to the difference equation for x_n can be written as two sums, one for n even and one for n odd, that do not contain the $\sqrt{(a^2 - 4)}$. Ackerberg's entire comment can be found on the Puzzle Corner website.

M/A 3. Oh, my—what a mess! I received several letters explaining that the published solution was incorrect. One of these letters was from its author, who believes the crux of the error is that the solution jumps the gun on the "2^n times a prime" argument; it should be made later in the analysis.

Solutions from Joel Karnofsky and Thomas Turnbull are on the website.

OTHER RESPONDERS

Responses have also been received from D. Aucamp, J. Bush, C. Charoen-Rajapark, D. de Champeaux, A. Deckoff, J. Farris, D. Freeman, R. Giovanniello, J. Hammond, O. Helbok, E. Hierro, J. Hoburg, D. Katz, M. Kimball, N. Lapidot, A. Moulton, A. Mullin, Y. Neumeier, A. Ornstein, K. Rosato, N. Schneiderman, P. Schottler, E. Signorelli, S. Silberberg, M. Snyder, K. Switzer, T. Terwilliger, E. Tucson, R. Wake, P. Winterfeld, and W. Wong.

PROPOSER'S SOLUTION TO SPEED PROBLEM

Ten. Only when multiplying by numbers ending in 5 or 0 does a 0 get added. ■

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.