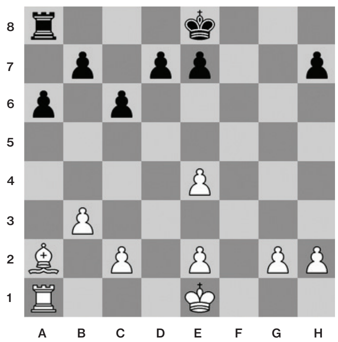
A road trip and a move closer. At the end of October, our older son David, his wife Mari, and our grandson (okay, their son) Hunter moved from San Diego to Chicago so that Mari could attend business school at Northwestern. Mari and Hunter took a plane—how boring and conventional. David and I, together with their large dog, two cats, and 1.5 cars' worth of personal belongings, drove their Toyota the 2,100 miles in 2.6 days. It was grueling, but on the plus side, for the first time ever, I had several multi-hour, one-on-one conversations with my son, which I very much enjoyed.

Just last week our younger son Michael accepted a position in New York City, so he and his wife Maureen will be moving sometime in January. Alice and I are delighted that for a while, our children will be 700 and 50 miles away, down from 2,500 and 250.

I was asked if a computer may be used to solve our problems. The answer is yes, but I tend to select clever solutions over brute-force searches when deciding which one to publish. However, sometimes all the solutions received involve (often substantial) searches.

Problems



M/A 1. Howard Cohen remembers almost all of a chess position he encountered. The only part missing is that there is another White pawn, but Howard is not sure if it was on F5 or F6 (KB5 or KB6 for old-timers). However, he does remember that White was able to castle from the position. Where was the missing pawn?

M/A 2. Dick Miekka has two pieces of gnarly rope and a box of matches. Each piece of rope will burn for exactly one hour, but unevenly. How can he measure exactly 45 minutes?

M/A 3. Arthur Wasserman has this thing for blue eyes (and gurus). He writes:

"A group of people with assorted eye colors live on an island. They are all perfect logicians—if a conclusion can be logically deduced, they will do it instantly. Initially, no one knows the color of his or her own eyes, but people can see everyone else at all times and keep a count of the number of others they see with each eye color (excluding themselves). They do not communicate with each other. Every night at midnight, a ferry stops at the island. Anyone who has figured out the color of his or her own eyes must leave the island that midnight. Everyone on the island knows all the rules in this paragraph.

"On this island there are 100 blue-eyed people, 100 brown-eyed people, and a Guru (she happens to have green eyes). So any given blue-eyed person can see 100 people with brown eyes and 99 people with blue eyes (and one with green), but that does not reveal his or her own eye color; as far as this person knows, the totals could be 101 brown and 99 blue. Or 100 brown, 99 blue, and he or she could have red eyes.

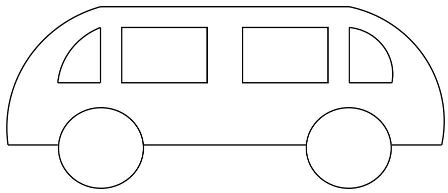
"The Guru is allowed to speak once. One day at noon she stands before all the islanders and says, 'I can see someone who has blue eyes.'

"Who leaves the island, and on what night?"

Wasserman adds that this is not a "trick question" and the answer is logical. There are no mirrors or reflecting surfaces, nothing dumb. It doesn't depend on tricky wording or anyone lying or guessing, and it doesn't involve people doing something like creating a sign language or doing genetics. The Guru is not making eye contact with anyone in particular; she's simply saying, "I count at least one blue-eyed person on this island who isn't me."

Speed Department

Dick Miekka wants to know which way the following bus is going.



Solutions

N/D 1. David Griffel proposes a new kind of puzzle he calls THIRDS, in which you are to use the letters from the third of the alphabet shown to replace the dashes and produce a standard English word. A letter can be used more than once. Here are three such puzzles.

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--RR---  (ABCDEFGH)
--D--E-T (IJKLMNOPQ)
-E--I-O-- (RSTUVWXYZ)
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By far the most common triple submitted was BARRAGE/INDOLENT/TERRITORY. For example, Caroline Wang wrote, "After sifting through a BARRAGE of junk mail, I happily found *Tech Review* amidst my mail. Not wanting to feel INDOLENT, I read more than just my Class Notes and delved into often unvisited TERRITORY, the Puzzle Corner."

Less frequently found words were JUDGMENT and SERVITORS.

N/D 2. Unfortunately, Tom McNelly's kitchen clock has a defect: The minute and hour hands are indistinguishable. He worries that now some configurations of the hands are ambiguous—that is, they could represent two different times. Can this occur, and if so, at what times?

First I must acknowledge the point made by Efstathios Avgoustiniatos that many (analog) clocks have their hands move only every second. In this case there is no ambiguity.

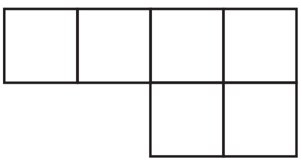
Turning to clocks with continuously moving hands, I received a number of fine solutions; the following is from Daniel Turek.

The position of the hour hand uniquely determines the position of the minute hand. Taking the position of the hour hand as $H \in [0; 12)$, the position of the minute hand is given by $M = f(H) = 12 * (H \bmod 1) \in [0; 12)$. Two times t_1 and t_2 (specified by hour- and minute-hand positions H_1, M_1 and H_2, M_2, respectively) are indistinguishable when $H_1 = M_2$ and $M_1 = H_2$; that is, the hour- and minute-hand positions of t_1 and t_2 are interchanged. This is more readily expressed as $H_1 = f(f(H_1))$, which follows from the equations above.

So the question reduces to finding all $H \in [0, 12)$ that are stationary under application of $f(f(\cdot))$. The solution follows by inspection when considered in base 12. Denote a base 12 number as x_{12}, base 2 digits $A_{12} = 10$ and $B_{12} = 11$, and repeating decimals as $0.\overline{x} = 0.xxx$ ... and $0{:}\overline{xy} = 0{:}xyxy$ ... Application of $f(\cdot)$ to a base 12 number serves to remove any digits left of the decimal, then shift the decimal one place to the right. The fixed values under a single application of $f(\cdot)$ therefore take the form $x.\overline{x}_{12}$, for $x \in \{0, 1, ..., A\}$, since $B.\overline{B}_{12} = 10_{12} = 12$. These values correspond to the 11 times when the hands of a clock coincide—for example, $0.0_{12} = 0$ representing 12 noon, and $1{:}\overline{1}_{12} = 1{:}\overline{09}$ representing 1:05:27. These are not solutions, however, since these times are not indistinguishable from any other time.

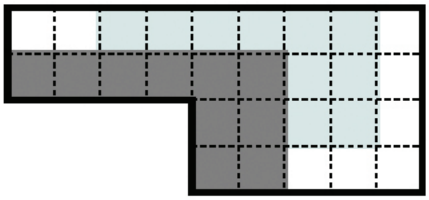
The solutions are the stationary points of $f(f(\cdot))$ that are *not* stationary under $f(\cdot)$, which take the form $x.\overline{yx}_{12}$, for $x, y \in \{0, 1, ..., B\}$ and $x \neq y$. There are $144 - 12 = 132$ such values, linearly spaced in increments of $0.\overline{01}_{12}$ except at the locations of the omitted values. The first few correspond to the times 12:05:02, 12:10:04, 12:15:06, 12:20:08, 12:25:10, and 12:30:13. Thank goodness Tom's clock doesn't have an indistinguishable second hand as well!

N/D 3. Another "Modest Hexominoes" puzzle from Richard Hess and Robert Wainwright, in which you are to design a connected tile so that n of them cover the maximum area of a given hexomino. 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. For the current problem, you were to cover at least 83 percent of the hexomino below with two tiles.



Guy Steele felt that making the requirement 83 percent "is a dead giveaway that the tiles will likely cover 5/6 of the six squares (hence each tile is 2.5 squares' worth)!" He believes that a requirement of 80 or 79 percent would have been more challenging.

Steele's solution follows.



Better Late Than Never

2013 M/A 2. Eugene Sard and Francisco Albisu note that the ellipse is not horizontal. Mark Lively has sent a simpler solution.

S/O 2. Readers who enjoyed Alan Faller's tacking problem might check out his blog at weatherstream.wordpress.com.

N/D SD. Other 10-letter solutions, specifically REPERTOIRE, PROPRIETOR, PEPPERROOT, and PROTOTYPER, were found by Sorab Vatcha, David Harmin, and Bob Weggel (the last has also 12-letter hyphenated words). Dawn Sapan offers RESTITORY, which does appear in several legal documents but not in the law dictionaries I searched.

Comments on this word problem also arrived from two linguistics professors! Wales Browne, stretching the rules to permit the proper name of an old friend, offers the 11-letter IBM QUIETWRITER. Benjamin Bruening and his daughter Lily suggest that constructs like "preprototypewriter" should be allowed since "they follow the regular word formation rules of English, and their meaning would be clear to any English speaker." I guess I should specifically limit solution to these problems to the subset of English found in dictionary.com or some Webster's dictionary. I am always fascinated when mundane-sounding speed problems lead to such interesting considerations.

Other Responders

F. Albisu, A. Andersson, M. Branicky, E. Browne, J. Chandler, C. Charoen-Rajapark, T. Chase, G. Cheadle, E. Collins, G. Coram, E. Courtens, S. Duncan, J. Eggers, L. Fattal, S. Feldman, E. Friedman, R. Giovanniello, P. Groot, D. Hankin, J. Hardis, J. Harmse, T. Harriman, R. Hess, A. Hirshberg, J. Kiger, M. Kohn, L. Kohnfelder, S. Korb, J. Kotelly, L. Kuchnir, W. Lemnios, M. Lively, T. Maloney, J. Matrisciano, M. Mawson, T. Mita, F. Model, B. Norris, A. Ornstein, E. Passow, M. Perkins, A. Prakash, K. Rosato, E. Sard, M. Seidel, I. Shalom, E. Signorelli, P. Silverberg, A. Stern, H. Stern, M. Tarsi, C. Tavares, D. Wanderman, and S. Woo.

Proposer's Solution to Speed Problem

Since there is no door shown, we must be looking at the street side of the bus rather than the curb side. Hence the bus is moving from right to left (except in England, etc.).

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.