Happy birthday, Puzzle Corner! With this "golden anniversary" issue, the column turns 50. When the first issue appeared, my *mother* was around 50. Now my "literary child" (or perhaps "illiterary child") has reached that milestone, and my biological children, David and Michael, have six decades between them.

Throughout the half-century, I have been fortunate to have served under superb editors, starting with John Mattill in the 1960s through Alice Dragoon today, and have enjoyed support and quality contributions from many thoughtful readers.

Finally, everything I accomplish bears the stamp of my talented and supportive wife, the beautiful Alice Bendix Gottlieb.

This being the first issue of a calendar year, we again offer a "yearly problem" in which you are to express small integers in terms of the digits of the new year (2, 0, 1, and 6) and the arithmetic operators. The problem is formally stated in the "Problems" section, and the solution to the 2015 yearly problem is in the "Solutions" section.

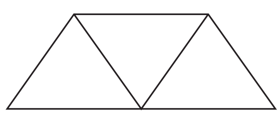
Problems

Y2016. How many integers from 1 to 100 can you form using the digits 2, 0, 1, and 6 exactly once each, along with the operators +, −, × (multiplication), / (division), and exponentiation? We desire solutions containing the minimum number of operators; among solutions having a given number of operators, those using the digits in the order 2, 0, 1, 6 are preferred. Parentheses may be used; they do not count as operators. A leading minus sign, however, does count as an operator.

J/F 1. A poker-inspired combinatorial problem from Richard Morgen, inspired by a recent game of Texas Hold 'em in which he received a pair of pocket aces and was later surprised to discover that another player did as well. He wonders what the odds are of this happening. Specifically, 10 players each receive two cards from an ordinary, well-shuffled deck of 52. What are the odds of two players each receiving two aces?

J/F 2. Next we have three more problems from Bob Wainwright's "10 tough tiling tasks" series sent to us by Richard Hess. You are to dissect the equilateral trapezoid composed of three abutting equilateral triangles as shown below into four similar pieces—that is, parts of the same shape. Each part must be connected and must have a finite number of sides.

For the first task, all four parts have the same size. For the second task, three are of one size and the fourth a different size. For the third task, two parts are of one size and two of another size.



Speed Department

A geometry quickie from R. Vacha. Consider two long, narrow, solid objects: a rectangular block with a square cross section and a cylinder. Neglecting the small surface areas of the two ends (i.e., assuming length >> width), at what lateral dimensions is the volume of each object numerically equal to the corresponding area?

Solutions

Y2015. The following solution is from Seth McGinnis.

$1 = 1^{205}$	$20 = 20 \times 1^5$	$49 = 51 - 2 + 0$
$2 = 2 + 0 \times 15$	$21 = 20 + 1^5$	$50 = 51 - 2^0$
$3 = 2 + 15^0$	$22 = 21 + 5^0$	$51 = 2 + 50 - 1$
$4 = 20 \times 1/5$	$24 = 120/5$	$52 = 2 + 50 \times 1$
$5 = 20 - 15$	$25 = 20 + 1 \times 5$	$53 = 2 + 51 + 0$
$6 = 5 + 1^{20}$	$26 = 20 + 1 + 5$	$60 = 5 \times (2 + 10)$
$7 = 2 + 10 - 5$	$29 = 50 - 21$	$62 = 52 + 10$
$8 = 2 + 0 + 1 + 5$	$30 = 2 \times (0 + 15)$	$64 = 2^{(0+1+5)}$
$9 = 2 \times (0 + 5) - 1$	$31 = 51 - 20$	$70 = 10 \times (5 + 2)$
$10 = 5 + 10/2$	$32 = 2^{(10-5)}$	$71 = 20 + 51$
$11 = 12 - 5^0$	$33 = 2^5 + 1 + 0$	$75 = 150/2$
$12 = 12 + 0 \times 5$	$35 = 20 + 15$	$80 = 20 \times (5 - 1)$
$13 = 15 - 2 + 0$	$36 = 5^2 + 1 + 0$	$95 = 5 \times (20 - 1)$
$14 = 20 - 1 - 5$	$38 = 50 - 12$	$97 = 102 - 5$
$15 = 25 - 10$	$40 = 5 \times (10 - 2)$	$98 = 2 \times (50 - 1)$
$16 = 20 + 1 - 5$	$42 = 52 - 10$	$99 = 20 \times 5 - 1$
$17 = 2 + 0 + 15$	$47 = 50 - 1 - 2$	$100 = 20 \times 1 \times 5$
$19 = 20 - 1^5$	$48 = 50 \times 1 - 2$	

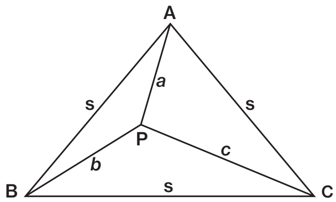
S/O 1. Sorab Vatcha takes us into new territory by offering a Scrabble problem. In the first turn of a new game of Scrabble, what word, when optimally placed on the empty board, would give the highest possible score? What is the score, and what is the optimal placement? All the rules of Scrabble apply.

Vatcha requires that the word be in the current *Official Scrabble Players Dictionary*. I am refining that requirement to refer specifically to the reference found at http://www.hasbro.com/scrabble-2/en_US/search.cfm#dictionary.

Frank Model offers MUZJIKS, a Russian peasant, with the Z on the double-letter square. This tallies 128 points, including the 50-point bonus for using all the tiles.

S/O 2. As an incoming MIT freshman, Burgess Rhodes was challenged by an upperclassman with a special case of the following geometry problem. (By comparison, I was challenged to Ping-Pong games.)

Point P inside an equilateral triangle is at a distance a, b, and c from vertices A, B, and C, respectively. If $\{a, b, c\}$ is a Pythagorean triple (i.e., $a^2 + b^2 = c^2$), what is the side length s of the triangle?



The following is an amalgam of solutions from John David Kramer and Eric Nelson-Melby.

This problem looks formidable enough to intimidate even an MIT freshman, but it is easily solved with high school algebra once the right approach is found.

Set up a rectangular coördinate system with B the origin and BC the x axis. Let $P = (x, y)$. Then $a^2 = (s/2 - x)^2 + (s\sqrt{3}/2 - y)2$, $b^2 = x^2 + y^2$, and $c^2 = (s - x)^2 + y^2$

Solving for x and y (using $a^2 + b^2 = c^2$) gives $x = (s^2 - a^2)/2s$ and $y = (s^2 - a^2 + 2b^2)/(2s\sqrt{3})$. Substituting these values into $b^2 = x^2 + y^2$ and combining terms yields a quadratic equation in s^2

$$s^4 - 2s^2(a^2 + b^2) + a^4 + b^4 - a^2b^2 = 0$$

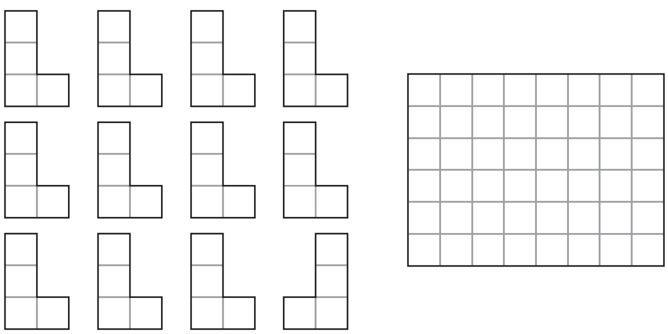
There are two solutions: $s^2 = c^2 \pm ab\sqrt{3}$. Only the first guarantees $x > 0$, so the final solution is $s = \sqrt{c^2 + ab\sqrt{3}}$.

The same approach works for general a, b, and c. The formal solution of the resulting quadratic equation is real provided that a, b, and c are the sides of a proper triangle. By considering this triangle, the general solution for s^2 may be written as

$$s^2 = (a^2 + b^2 + c^2)/2 + \sqrt{3}\, ab \sin\theta$$

where θ is the angle between the sides a and b of the triangle with sides a, b, and c. In the Pythagorean case, $\theta = 90°$. The result is closely related to the well-known formula for the area of a triangle in terms of its three sides. Recall that $ab \sin(\theta)$ is twice the area of the triangle $\{a, b, c\}$.

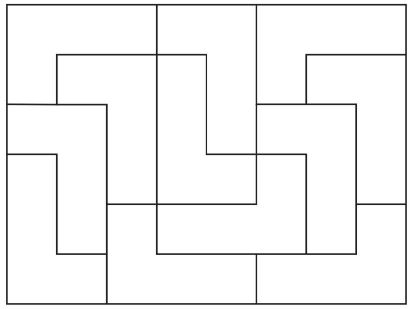
S/O 3. Nob Yoshigahara wants you to place all the L-shaped pieces into the rectangular region. You may rotate the Ls but may not turn them over. Note that one L is different from the others.



I think all solvers found the same solution given that all their solutions had the odd shape in the same location.

Although I received several artistic creations and photos of physical constructions (some from prospective alumni of the late 2020s), to get good fidelity I am creating my own primitive version using a drawing program.

Richard Bair was able to show that solutions exist for any number of "lefties" (his term for the odd shape).



Better Late Than Never

J/A 2. Paul Schottler noticed that the solution resembles a ladies' shoe from the 1880s.

S/O SD. Several readers noticed that the solution was not rigorous; indeed the "function" given is not single-valued. They included clarifications. My only defense is to quote from the description of speed problems given in that issue. "Often whimsical, these problems should not be taken too seriously."

Other Responders

Responses have also been received from S. Berger, R. Bird, J. Bretz, J. Bross, R. Bumby, A. Campbell, G. Coram, D. Ellis, G. Ford, E. Friedman, R. Giovanniello, J. Grossman, W. Haase, T. Harriman, W. Jasper, J. Kotelly, D. Loeb, J. Mackro, R. Mallett, P. Manglis, T. Mattick, Z. Mester, T. Mita, R. Morgen, A. Ornstein, J. Russell, R. Sheffield, E. Signorelli, R. Spellman, L. Stein, A. Taylor, H. Thiriez, A. Threadgold, T. Threadgold, P. Winterfeld, E. Zeger, and S. Zuckert.

Proposer's Solution to Speed Problem

Width = Diameter = 4 units.

Have a favorite puzzle from the last 50 years? Tell us which one and why at PuzzleCorner@technologyreview.com.

For a profile of Allan Gottlieb, see "Puzzle Corner's Keeper," p. 17. 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.