ALLAN J. GOTTLIEB, '67

Bill + Jill ≠ Dill

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 (1, 9, 9, and 3) and the arithmetic operators. The problem is formally stated in the "Problems" section, and the solution to the 1992 yearly problem is in the "Solutions" section.

Problems

Y1993. Form as many as possible of the integers from 1 to 100 using the digits 1, 9, 9, and 3 exactly once each and the operators +, -, x (multiplication), / (division), and exponentiation. We desire solutions containing the minimum number of operators; and, among solutions having a given number of operators, those using the digits in the order 1, 9, 9, and 3 are preferred. Parenthesis may be used for grouping; they do not count as operators. A leading minus sign *does* count as an operator.

JAN 1. Edward Wallner sent us the following problem from "the gamesman" column in *IEEE Potentials,* where it was credited to Cindy Furst. Ms. Furst claims that every electrical engineer should be able to fill in the four blanks:

10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, __, __, __, __, 100.

JAN 2. Temple Patton has a plot of land in the form of a right triangle with all sides an integral number of feet. If the short side is 30 feet, what is the area? What if the short side is 31 feet?

Speed Department

Donald Zalkin has some strange theory about reducing fractions. He cancels the 6s in 16/64 to get 1/4. How generally does this work? Specifically, what other fractions with numerators and denominators under 100 have this cancellation property?

SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO ALLAN J. GOTTLIEB, '67, THE COURANT INSTITUTE, NEW YORK UNIVERSITY, 251 MERCER ST., NEW YORK, N.Y. 10012, OR TO: GOTTLIEB@NYU.EDU

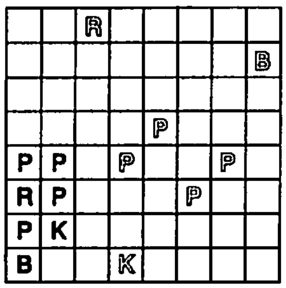
Solutions

Y1992. The following solution is from David Brahm, who points out that 1993 will be a better year (at least as far as our yearly problem is concerned). Eric Osman tried all four digit years and reports that for no year are all 100 values possible. The best possible, according to Eric, is 98 out of 100. But that won't happen again until 2347; it last occurred in 1983. I just checked my files and indeed we found 98 solutions.

1 = 1^992	28 = 29 - 1^9	69 = 9 * 9 - 12
2 = 1^99 * 2	29 = 19 * 2 - 9	70 = (1+9) * (9-2)
3 = 1^99 + 2	30 = 19 + 9 + 2	71 = 9^2 - 1 - 9
4 = 1 + 9/9 + 2	33 = 99 / (1+2)	72 = (1+9-2) * 9
5 = (19-9) / 2	34 = 2 * (9+9-1)	73 = 92 - 19
6 = 9 - 12 + 9	35 = 2 * (9+9) - 1	74 = 2 + 9 * (9-1)
7 = 1^9 * (9-2)	36 = 1 * (9+9) * 2	78 = 99 - 21
8 = 19 - 9 - 2	37 = 19 + 9 * 2	79 = 1 * 9 * 9 - 2
9 = 1^92 * 9	38 = 29 + 9 * 1	80 = 91 - 2 - 9
10 = 29 - 19	39 = 29 + 9 + 1	81 = 1^9 * 9^2
11 = 12 - 9/9	40 = (9*9 - 1) / 2	82 = 92 - 1 - 9
12 = 19 - 9 + 2	41 = (91-9) / 2	83 = 1 * 92 - 9
13 = 12 + 9/9	45 = (1+9) * 9 / 2	84 = 1 - 9 + 92
14 = (19+9) / 2	47 = 19 * 2 + 9	87 = 99 - 12
15 = 9 + 9 - 1 - 2	48 = 19 + 29	88 = (1+9) * 9 - 2
16 = 1 * (9+9-2)	49 = (99-1) / 2	89 = 9^2 - 1 + 9
17 = 1 + 9 + 9 - 2	50 = (1+99) / 2	90 = 1 * 9 + 9^2
18 = 1^9 * 9 * 2	54 = (1+2) * (9+9)	91 = 92 - 1^9
19 = 29 - 9 - 1	55 = (9-1)^2 - 9	92 = 1^9 * 92
20 = (19-9) * 2	56 = (19+9) * 2	93 = 1^9 + 92
21 = 29 - 9 + 1	57 = (2^9 + 1) / 9	96 = 99 - 1 - 2
22 = 21 + 9/9	60 = 9 * 9 - 21	97 = 1 * 99 - 2
25 = 2 * (9-1) + 9	62 = 91 - 29	98 = 1 + 99 - 2
26 = 19 + 9 - 2	63 = 1 * 9 * (9-2)	99 = 12 * 9 - 9
27 = (12-9) * 9	64 = 1 + 9 * (9-2)	100 = 19 + 9^2

A/S 1. Unfortunately, APR 1 was misprinted so that white and black pieces were indistinguishable. As a result we are offering it again but with the colors indicated as intended. We apologize for the error.

White is to move and mate in 12.



Apparently this is hard even when the white and black pieces are distinguishable. Only the proposer offered a solution.

1. B-Kt8	K-Kt8	7. R-B5	K-Kt8
2. R-B1ch	K-Kt7	8. R-B4ch	K-Kt7
3. R-B6	K-Kt8	9. R-K4	K-Kt8
4. B-R7ch	K-Kt7	10. R-K3ch	K-Kt7
5. R-Kt6	K-Kt8	11. R-Q3	K-Kt8
6. R-Kt5ch	K-Kt7	12. RxPmate	

A/S 2. A real cute one from Jan Davis, who writes:

The wife of a man who grew barley
Was also the sister of Charlie.
Her Neighbour grew hay
And was married to Ray,
And one of these girls was named Carly.

The girl who was married to Wayne
Lived next to the farm that grew grain.
She liked to eat celery
That was grown by Valerie,
And she weighed 80 pounds more than Jane.

The woman whose husband grew dill
Was never married to Bill
When Jane married Benny
And Ray married Jenny,
She went out drinking with Jill.

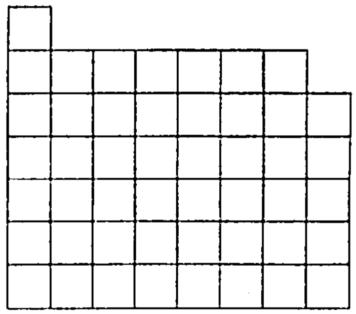
NOTE: ONLY ONE COUPLE HAS RHYMING NAMES.

My assistant, Nancy Cruz, remarks that preparing for the LSATs has finally had a tangible reward; her solution follows:

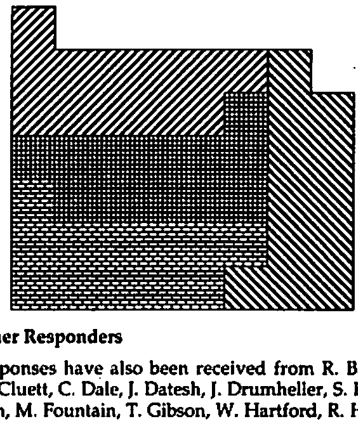
A	B	C	D	E
Bill	Wayne	Ray	Charlie	Benny
Jill	Carly	Jenny	Valerie	Jane
Grain	Barley	Hay	Celery	Dill

Both A and C are B's neighbors.
Celery-eating Carly is Charlie's sister.

A/S 3. Our last regular problem is "Golomb's Gambits" edited by Solomon Golomb in the *Johns Hopkins* magazine. You are to dissect the figure below into four congruent pieces.



A beautiful picture from Bill Mills:



Other Responders

Responses have also been received from R. Bator, W. Cluett, C. Dale, J. Datesh, J. Drumheller, S. Feldman, M. Fountain, T. Gibson, W. Hartford, R. Hess, R. High, D. Hopkins, A. Katzenstein, E. Kim, M. Lindenberg, A. Lowenstein, E. Lund, T. Lydon, P. Oliveira, A. Ornstein, D. Plass, K. Rosato, A. Tracht, C. Whittle.

Proposer's Solution to Speed Problem

19/95, 49/98, and 26/65.