

PuzzleCorner

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 6) and the arithmetic operators. The problem is formally stated in the "Problems" section, and the solution to the 1995 yearly problem is in the "Solutions" section.

Problems

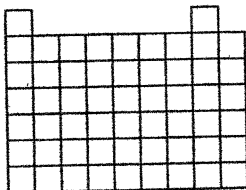
Y1996. How many integers from 1 to 100 can you form using the digits 1, 9, 9, and 6 exactly once each and the operators +, -, x (multiplication), / (division), and exponentiation. We desire solutions containing the minimum number of operators; and, among solutions having a given number of operators, those using the digits in the order 1, 9, 9, and 6 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. Now that you have just solved the yearly problem, take a crack at this variant from Philip Jacobs, who wants you to find numbers that can be formed using their own digits in a non-trivial way. That is, we do not want a trivial solution like

$$128 = 128$$

but do want the solution
 $128 = 2^{8-1}$

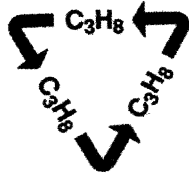
Jan 2. This problem appeared in Solomon Golomb's puzzle column in *Johns Hopkins Magazine*. You are to dissect the figure below into four congruent pieces.



SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO: ALLAN GOTTLIEB
 NEW YORK UNIVERSITY
 715 BROADWAY, 10TH FLOOR
 NEW YORK, N.Y. 10012,
 OR TO: GOTTLIEB@NYU.EDU

Speed Department

Speedy Jim Landau wants you to name the following organic compound.



Solutions

Y1995. The following solution is from John Drumheller.

- | | | | |
|----|----------------------|-----|----------------------|
| 1 | 1 ⁹⁹⁵ | 51 | 51+9-9 |
| 2 | (19-9)/5 | 52 | (9/9)+51 |
| 3 | 9-15+9 | 53 | (9*5)-1+9 |
| 4 | 95-91 | 54 | (15-9)*9 |
| 5 | 95/19 | 55 | 1+9+(9*5) |
| 6 | 1 ⁹⁹ +5 | 56 | - |
| 7 | (1+(9/9))+5 | 57 | - |
| 8 | 9-1 ⁹⁵ | 58 | 59-1 ⁹ |
| 9 | 1 ⁹⁵ +9 | 59 | 1 ⁹ *59 |
| 10 | 1 ⁹⁵ +9 | 60 | 1 ⁹ +59 |
| 11 | ((1+9)/5)+9 | 61 | - |
| 12 | 9+9-5+1 | 62 | - |
| 13 | (1*9)+9-5 | 63 | ((5+1)*9)+9 |
| 14 | 15-(9/9) | 64 | 19+(9*5) |
| 15 | 19-9+5 | 65 | - |
| 16 | 15+(9/9) | 66 | (9*9)-15 |
| 17 | (9+9)-1 ⁵ | 67 | 9+59-1 |
| 18 | ((1+9)*9)/5 | 68 | (1*9)+59 |
| 19 | (9+9)+1 ⁵ | 69 | 51+9+9 |
| 20 | (1+99)/5 | 70 | - |
| 21 | - | 71 | - |
| 22 | 9+9+5-1 | 72 | (9+9)*(5-1) |
| 23 | 19+9-5 | 73 | - |
| 24 | 1+9+9+5 | 74 | - |
| 25 | 5((1+99)) | 75 | (9*9)-5-1 |
| 26 | (9*5)-19 | 76 | 95-19 |
| 27 | (9-5-1)*9 | 77 | 91-9+5 |
| 28 | - | 78 | 19+59 |
| 29 | - | 79 | - |
| 30 | (9*9)-51 | 80 | (9*9)-1 ⁵ |
| 31 | (5*(9-1))-9 | 81 | 9((1+9)/5) |
| 32 | 91-59 | 82 | (9*9)+1 ⁵ |
| 33 | 19+9+5 | 83 | - |
| 34 | - | 84 | 99-15 |
| 35 | (9*5)-1-9 | 85 | 95-1+9 |
| 36 | 1*9*(9-5) | 86 | (95*1)-9 |
| 37 | 1-9+(9*5) | 87 | 1-9+95 |
| 38 | - | 88 | - |
| 39 | - | 89 | ((9+9)*5)-1 |
| 40 | 59-19 | 90 | ((1*9)+9)*5 |
| 41 | (5*(1+9))-9 | 91 | 1+((9+9)*5) |
| 42 | - | 92 | - |
| 43 | - | 93 | 99-1+5 |
| 44 | (5-(1/9))*9 | 94 | (1*99)-5 |
| 45 | 1 ⁹ *9*5 | 95 | 1+99-5 |
| 46 | 91-(9*5) | 96 | 1 ⁹ +95 |
| 47 | - | 97 | - |
| 48 | 99-51 | 98 | 99-1 ⁵ |
| 49 | 59-1+9 | 99 | 1 ⁵ *99 |
| 50 | (19-9)*5 | 100 | 1 ⁵ +99 |

A/S 1. We start with a Bridge problem from Doug Van Patter that occurred during an ACBL (country-wide) charity event.

		North	
		♠	Q J 10 6 5
		♥	A J 10 7
		♦	Q 7 5
		♣	3
		West	East
♠	2	♠	9 7 4 3
♥	Q 9 6 5 4 3	♥	2
♦	10 6 4 3	♦	A J 2
♣	9 5	♣	K 10 7 6 4
		South	
		♠	A K 3
		♥	K 8
		♦	K 9 8
		♣	A Q J 8 2

Your partner opens a skinny one spade. After discovering that one ace is missing, you bid six no trump (trying to protect heart king). Opening heart lead is taken by dummy's ten. The jack of clubs is finessed and the heart king cashed. A low diamond to queen is taken by East's ace, who returns a spade. Can you now make your unlikely contract?

I wonder if Bob Lax has milked a lot of cows since he is so good at the double squeeze. I am a city boy but once did milk a cow. I was in New Zealand and attended a show where they let the city slickers try their hands at milking. I was *extremely* surprised to find out how hard you had to squeeze and pull. Also after a few minutes, I had produced pretty much just a "drop in the bucket." Lax writes:

In this hand, East must save diamonds and clubs and West must save diamonds and hearts—sounds like a double squeeze. Win East's spade lead on the fifth round with the ace. Then cash the ace of clubs, discarding a small diamond from dummy. Lead the 3 of spades to dummy's queen. Now play the ace of hearts, discarding the king of spades from the South hand. Then, run dummy's good spades. On the 11th round, dummy's 6 of spades is led. If East decides to discard all his clubs, then South discards the 9 of diamonds and wins the last two tricks with the king of diamonds and the queen of clubs. If East saves the king of clubs, then South discards the queen of clubs. Now, West is squeezed; if West discards the queen of hearts, then the last two tricks are won by the jack of hearts and the king of diamonds, while if West discards a diamond, then the last two tricks are won by the king and nine diamonds.

A/S 1. Don "Hoppy" Hopkins has an arithmetical crossword puzzle for us. He often gives out the answer to 7 across as a hint since it is easy to look up, but takes time. If you wish to have this hint see the end of the column.

Unfortunately, there were two typos in A/S 2: The clue for 8 down should be "The sum of 15 Across and 27 Across" and in 33 across "105"

should be "ten to the fifth", i.e. the "5" should be a superscript. I appologize for the errors and hereby re-open the problem. Solutions will be printed in the May/June issue.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
11.				12.			13.		
14.			15.			16.			
17.			18.		19.		20.		
21.	22.	23.				24.		25.	
26.				27.			28.		
29.			30.			31.			
32.				33.					

ACROSS

- A multiple of this number is obtained by removing the first digit and placing it after the last digit.
- The year in the 20th century when Easter is earliest.
- Divisible by 7, 11, and 13.
- Multiple of 30 Down.
- When added to 16 Across is equal to the sum of 23 Down and 25 Down.
- See 26 Across.
- A multiple of 9.
- See 13 Across.
- This number has the same first and last digits.
- A multiple of 3.
- Ten times 31 Across plus five times 13 Across.
- Factorial 9.
- Multiple of 28 Across.
- Sum of 3 Down and 14 Across.
- See 8 Down.
- See 24 Across.

- See 4 Down.
- See 19 Across.
- Equal to 22 Down.
- $10^5 \times \pi$ to the nearest integer.

DOWN

- The cube of a prime number.
- A multiple of 17 Across.
- A multiple of 7.
- Sum of twice 21 Across and 29 Across
- See 10 Down.
- This number is equal to the sum of the cubes of its digits.
- A cube number.
- The sum of 15 Across and 27 Across.
- See 20 Down.
- A multiple of 5 Down.
- A square number.
- Ten times 9 Down plus 1.
- Equal to 32 Across.
- See 13 Across.
- See 13 Across.
- Factor of 12 Across.

A/S 2. Rick Hendrik wonders, given a regular dodecahedron (12 pentagonal faces) with an edge length of 10, what is the largest regular icosahedron (20 triangular faces) that will fit inside?

This appears to be a difficult problem, but one well liked by Winslow Hartford and Ken Rosato, who each sent in detailed solutions accompanied by carefully drawn diagrams. Hartford's calculations yield an answer of 11.7167, while Rosato's yield 11.7082. The proposer asserts that the answer is 11.7023. Space does not permit printing either Hartford's or Rosato's solutions, but both can be obtained from Faith Hruby at *Technology Review*.

The hint for A/S 2 is 1913.

Better Late Than Never

F/M/1. Jorgen Harmse notes that we left out a bid as the auction shown leads to 7 diamonds not 7NT. The solution printed is correct.

F/M 3. Douglas Merkle notes that a simpler solution exists. Let L be the ladder length, S be the block side length, and b be the desired height, and proceed as follows.

$$\Theta = \tan^{-1}(L/S)$$

$$\Psi = \cos^{-1}\left(\frac{2\cos\Theta}{1-\cos\Theta}\right)$$

$$x = \frac{1 \pm \sin \Psi}{\cos \Psi}$$

$$b = S(1+x)$$

Other Responders

Responses have also been received from G. Bailey, L. Beckett, M. Britten-Kelly, Rev. M. Buote, T. Cirillo, H. Cohen, K. Comer A. Curtis, C. Dale, J. Datesh, A. Demers, J. Diamond, E. Doniger, J. Drabicki, J. Dunn, W. Everts, G. Gonzales, J. Goodman, J. Grossman, A. Halberstadt, W. Hartford, R. Hess, S. Jefferson, R. Jones, T. Kaiser, R. Lax, G. Marotta, H. Meerman, A. Meissner, M. Moritz, B. Myers, K. Nahabet, B. Norton, A. Ornstein, D. Park, E. Pendergast, G. Price, M. Qubbaj, C. Rivers, K. Rosato, D. Savage, I. Schaefer, I. Shalom, R. Shorey, H. Thrasher, A. Tracht, J. Var-nick, R. Whitman, S. Whitmore, and A. Wright.

Proposer's Solution To Speed Problem

Recyclopropane.