MAGIC "PALINDROMES"

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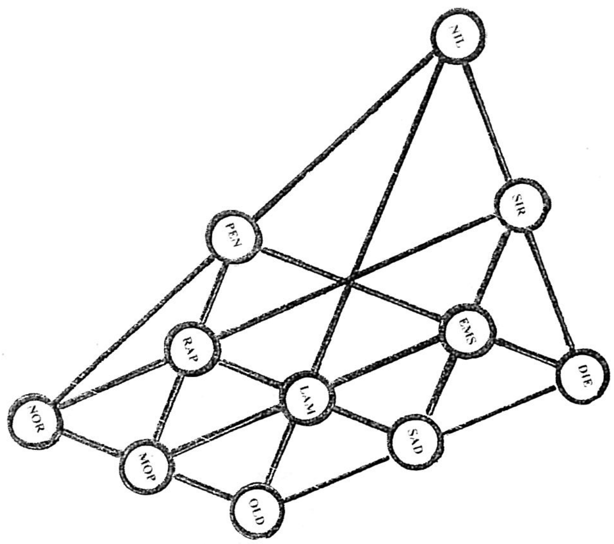
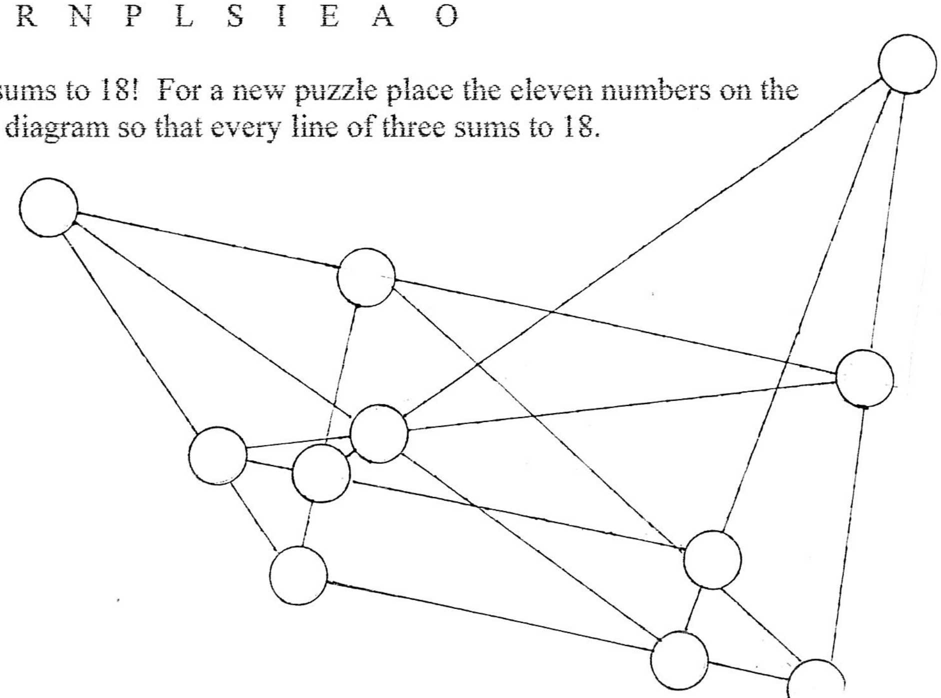
The puzzle on the back cover is an example of a (11,3) word configuration where there are eleven lines of three using eleven three-letter words (see 1,2).



The eleven letters, each used three times, are the letter of PALINDROMES. There is a striking additional number puzzle associated with this answer. If the reader takes the time to replace the letters with the following numbers and then adds the three on every node an astounding relationship is revealed.

1	2	3	4	5	6	7	8	9	10	11
D	M	R	N	P	L	S	I	E	A	O

Each node amazingly sums to 18! For a new puzzle place the eleven numbers on the nodes of the following diagram so that every line of three sums to 18.



The answer is given in Answers and Solutions. Each line of three is also an anagram of one of the eleven words used on the back cover with the number correspondence above.

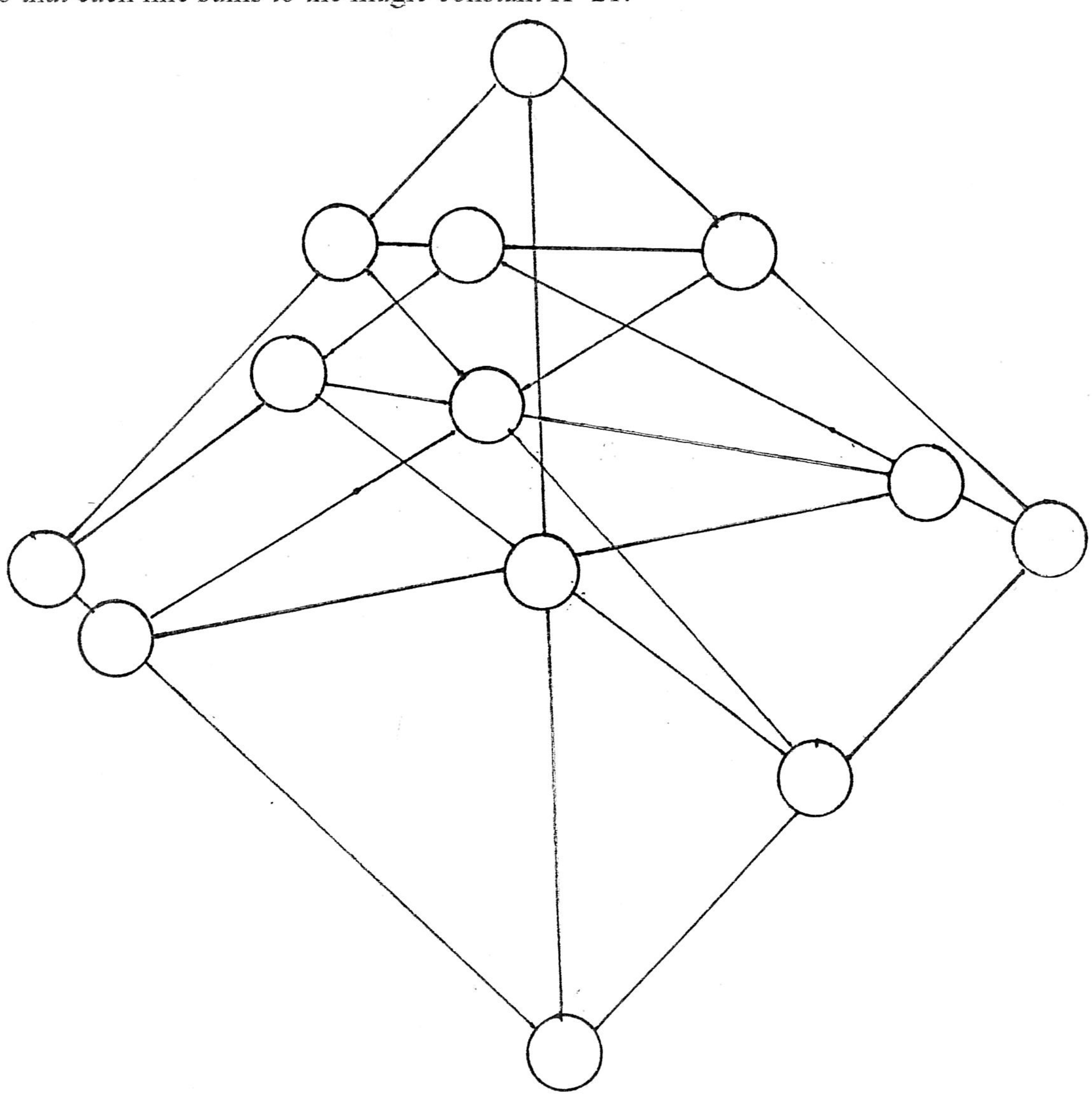
MAGIC GRAPHS

Both of our (11,3) diagrams could be viewed as similar to magic squares with magic constant 18. Martin Gardner was quite interested in magic variations. In (3) he said:

> Combinatorial problems involving magic squares, stars and other geometrical structures often can be solved by brute force computer programs that simply explore all possible permutations of numbers. When the number of permutations Is too large for a feasible running time, an algorithm can frequently be reduced to manageable time by finding ingenious shortcuts.

CONJECTURE

We guess that the (11,3) example is just the first of infinitely many such configurations. Specifically, for such (n,3) with n = 2m+1, m 5 or greater there exist magic configurations with magic constant K = 3(m+1). We have no proof of this but have other examples for n = 13 and 15. The (13,3) is especially interesting. Here is a diagram on which may be placed the thirteen spades A, 2, . . ., Q, K with Ace=1, J=11, Q=12 and K=13 so that each line sums to the magic constant K=21.



We can make a word puzzle using the letters of DOCUMENTARILY by associating the 13 letters with numbers thusly.

1	2	3	4	5	6	7	8	9	10	11	12	13
C	L	D	R	M	N	E	T	Y	A	O	U	I

Each line then anagrams into a three-letter word.

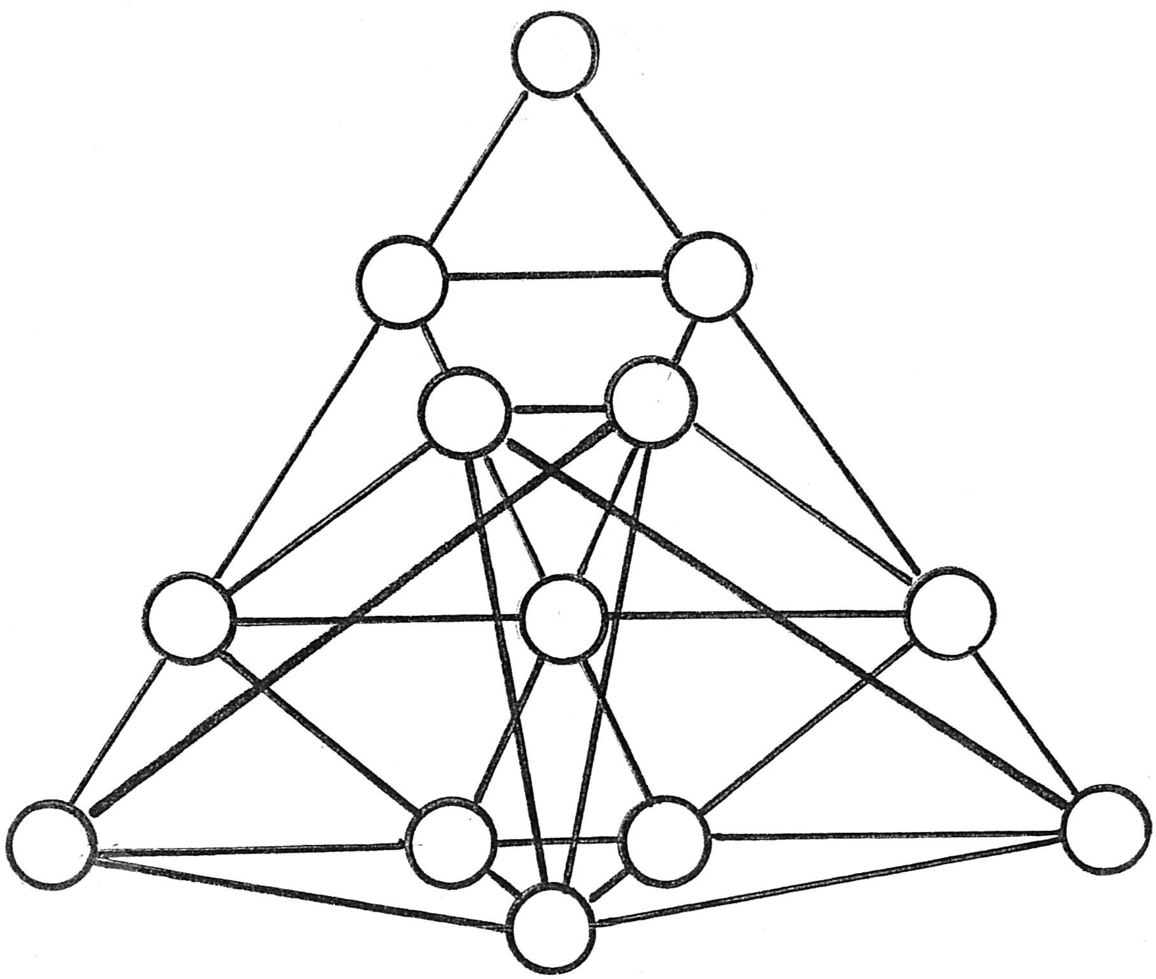
There are the two three-letter word solutions that have magic constant K=21.

(I) COY, CUT, DIM, ICE, LAY, LEU, MAN, NIL, NOR, ODE, RUM, TAD, TRY

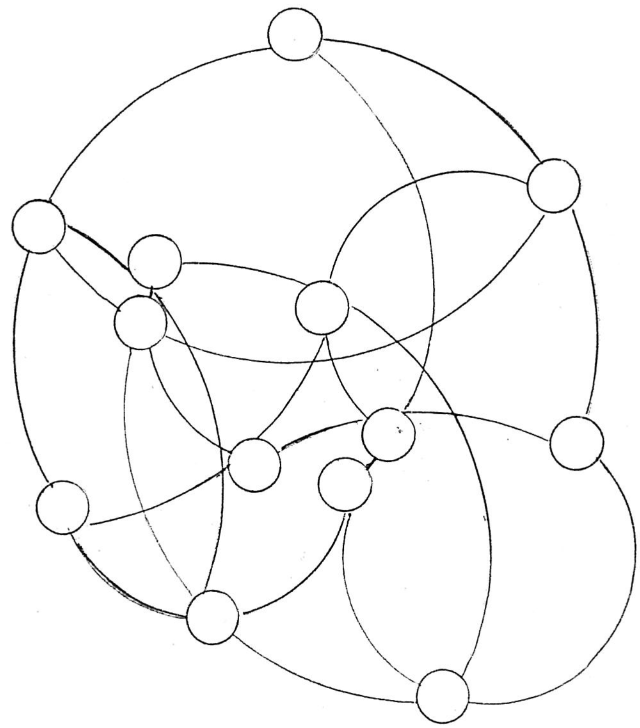
(II) ARE, COY, CUT, DIM, DUN, ICE, LAY, LOT, MAN, NIL, ODE, RUM, TRY

The solved spade diagram will result in each line being an anagram of the words in solution (I).

It is also possible to place the words of (I) on the next diagram so that each occurrence of a letter marks the vertex of a triangle.



Solution (II) can only solve the following puzzle where when the words of (II) are placed on the nodes each arc of three contains a common letter.



Solutions to these very hard problems are given in Answers and Solutions. Perhaps some computer scientists can inform us of the number of solutions.

BIBLIOGRAPHY

(1) Farrell, Jeremiah, Martin Gardner and Thomas Rodgers. "Configuration Games", *Tribute to a Mathemagician.* Ed. Cipra, B., E. Demaine, M. Demaine and T. Rodgers, 93-99, AK Peters, 2005.

(2) Farrell, Jeremiah. "Puzzles and Games on Word Configurations", *Word Ways*, 34(3), 243-249, November 2001.

(3) Gardner, Martin. "Some New Results on Magic Hexagrams", *Martin Gardner in the Twenty-First Century.* Ed. Henle, M and B. Hopkins, 2012, MAA.