

# TOURMALINE MAGIC

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The pale beige mineral-gem Tourmaline happens to be my birthstone and possesses unexpected magical properties as we will soon see. It is also of great interest logologically since as an isogram it splits nicely into five two-letter words TO-UR-MA-LI-NE all of which may be found in standard dictionaries. Other splits are possible, making this gem very special.

Further, upon separation of the five vowels and five consonants, we obtain the balanced word set:

	T	R	M	L	N
O	TO	OR	OM	LO	NO
U	UT	UR	MU	LU	NU
A	AT	RA	MA	LA	AN
I	IT	RI	MI	LI	IN
E	ET	RE	ME	EL	NE

These 25 words can be arranged in a 5x5 magic square so that no letter is repeated in any row, column or diagonal (broken or not). We present one such square as a puzzle for the reader. Six words of the 25 are given Sudoku style as starting hints, for the unique solution to the puzzle. The answer will be given overleaf.

TO				
	UR			
		MA		
			LI	
		UT		NE

The determined reader should have been able to use logic alone to arrive at this solution:

TO	ME	IN	RA	LU
AN	UR	LO	ET	MI
EL	IT	MA	NU	OR
MU	NO	RE	LI	AT
RI	LA	UT	OM	NE

We have created a pandiagonal magic square with TOURMALINE as its magic constant. This extends the results found in Word Ways articles (1) and (2). It is interesting to note

that if one gives any diagonal set of five clues with no repeated letters the resulting puzzle will always have exactly two solutions. Had we not given the sixth clue UT there would have been a second solution with OR in place of UT.

Magic squares have a long history of course, but word magic squares are newer. The aforementioned Word Ways articles have certainly contributed to these new results. The author Clifford Pickover produced an encyclopedic work, (3), that cited the results in (1) and this was later adapted by Scott Kim in (4).

There is much more to be said. For instance it is easy to turn the word square into a number magic square by assigning to the five vowels the numbers 0,1,2,3, or 4 in some order, and the five consonants the numbers 0,5,10,15 or 20 (also in any order). When the two-letter words are then totaled, the numbers 0 through 15 will occur in the grid making it magic with constant 60. In future articles we will say more about the 5-fold symmetries involved here and how the magic squares can extend their magic to the whole plane.

- (1) Farrell, J. "Magic Square Magic", *Word Ways*, 33 (2), May, 2000, pp. 83-92.
- (2) Thumpbindle, O. "Most-Perfect Word Magic", *Word Ways*, 40(4), Nov. 2007, pp. 293-296
- (3) Pickover, C.A. *The Zen of Magic Squares, Circles, and Stars*. Princeton Univ. Press, 2002. pp. 144-146.
- (4) Kim, S. "Mind Games", *Discover Magazine*, Nov. 2006, p. 74