

01767D Program Description I

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Program Title MAGIC SQUARES

Contributor's Name NORMAN F NEUBERGER III

Address the DyNama Collection 7400 Roads Rd Route 9

City Hillsboro

State Ohio

Zip Code 45133

Program Description, Equations, Variables

Given any 2 of the following variables of a MAGIC SQUARE - a square of numbers whose columns, rows and diagonals each add to the same total - then the calculator will find the third:

1. lowest number to be used in SQUARE = A

2. difference between any two consecutive numbers used in SQUARE = B

3. the constant total = C

needed to find any answer is the number of rows = D

Here are the formulas added to the equation skeleton called "Equation KeyStrokes Only" in HP Key Notes vol 1 no 1:

$$A = \frac{C - \left[\frac{BD}{2} (D^2 - 1) \right]}{D}$$

$$B = \frac{\frac{2C}{D} - 2A}{D^2 - 1}$$

$$C = AD + \frac{BD}{2} (D^2 - 1)$$

Operating Limits and Warnings

This program has been verified only with respect to the numerical example given in Program Description II. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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Sketch(es)

49	70	1	22	43
67	13	19	40	46
10	16	37	58	64
28	34	55	61	7
31	52	73	4	25

	$118\frac{1}{3\phi}$	$125\frac{8}{3\phi}$	
$81\frac{26}{3\phi}$			$103\frac{17}{3\phi}$
$52\frac{28}{3\phi}$			$74\frac{19}{3\phi}$
	$31\frac{7}{3\phi}$	$38\frac{14}{3\phi}$	

$45\frac{21}{3\phi}$	$118\frac{1}{3\phi}$	$125\frac{8}{3\phi}$	24
$81\frac{26}{3\phi}$	$67\frac{12}{3\phi}$	$60\frac{5}{3\phi}$	$103\frac{17}{3\phi}$
$52\frac{28}{3\phi}$	$96\frac{10}{3\phi}$	$89\frac{3}{3\phi}$	$74\frac{19}{3\phi}$
$132\frac{15}{3\phi}$	$31\frac{7}{3\phi}$	$38\frac{14}{3\phi}$	$110\frac{24}{3\phi}$

upward broken diagonals

Sample Problem(s) to find the constant total (C) of a 5x5 magic square using the numbers 1, 4, 7, 10, 13, ..., 73

5 $\square \rightarrow 5.\phi\phi\phi$

$\uparrow$
odd order

1 $\square \rightarrow 1.\phi\phi\phi$

3 $\square$ being the difference between successive num's $\rightarrow 3.\phi\phi\phi$

$\square \rightarrow 185.\phi\phi\phi$ the constant total

find the difference between numbers in a 4x4 square which adds to 313, the lowest number being 24

4 $\square \rightarrow 4.\phi\phi\phi$

$\uparrow$
even order

24 $\square \rightarrow 24.\phi\phi\phi$

313 $\square \rightarrow 313.\phi\phi\phi$

$\square \rightarrow 7.233$ (which is $7\frac{7}{3\phi}$)

$\{ 24, 31\frac{7}{3\phi}, 38\frac{14}{3\phi}, 45\frac{21}{3\phi}, 52\frac{28}{3\phi}, 60\frac{5}{3\phi}, 67\frac{12}{3\phi}, 74\frac{19}{3\phi}, 81\frac{26}{3\phi}, 89\frac{3}{3\phi}, 96\frac{10}{3\phi}, 103\frac{17}{3\phi}, 110\frac{24}{3\phi}, 118\frac{1}{3\phi}, 125\frac{8}{3\phi}, 132\frac{15}{3\phi} \}$

Solution(s) Here is the De la Loubère method of construction of an ^{ODD-ORDER} MAGIC SQUARE: Write the lowest number at the top of the middle column. Fill in in order the remaining positions of the upward broken diagonal. When blocked begin with the next number immediately below the preceding number. See above for illustration. For even order squares draw the square and ~~put~~ cross it thru the diagonals. Then number the square from the bottom left to right and up leaving any crossed positions blank (but continue numbering). Then starting over ~~at~~ number the square again right to left and down from the top numbering only the crossed positions, skipping numbers for the filled positions like before. See above.

Reference(s)

Program Listing I

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	LBL D	31 25 14			*	71	
	STD D	33 14			2	02	
	RTN	55 22			÷	81	
	LBL A	31 25 11		060	*	71	
	STD A	33 11			RCL A	34 11	
	F3?	35 71 03	I CROSS MY ZEROS:		RCL D	34 14	
	R/S	84	Ø		*	71	
	LBL I	31 25 01			+	61	
	RCL C	34 13			STD C	33 13	
010	RCL D	34 14			R/S	84	
	X ²	32 54					
	Ø1	01					
	M	51	M = MINUS				
	RCL D	34 14		070			
	RCL B	34 12					
	*	71	* = TIMES				
	Ø2	02					
	÷	81					
	*	71					
020	M	51					
	RCL D	34 14					
	÷	81					
	STD A	33 11		080			
	R/S	84					
	LBL B	31 25 12					
	STD B	33 12					
	F3?	35 71 03					
	R/S	84					
	LBL 2	31 25 02					
030	RCL C	34 13					
	2	02					
	*	71					
	RCL D	34 14		090			
	÷	81					
	RCL A	34 11					
	Z	02					
	*	71					
	M	51					
	RCL D	34 14					
040	X ²	32 54					
	1	01					
	M	51					
	÷	81					
	STD B	33 12		100			
	R/S	84					
	LBL C	31 25 13					
	STD C	33 13					
	F3?	35 71 03					
	R/S	84					
050	LBL 3	31 25 03					
	RCL D	34 14					
	X ²	32 54					
	1	01					
	M	51		110			
	RCL B	34 12					
	RCL D	34 14					

REGISTERS

0	1	2	3	4	5	6	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
A LOWEST NUMBER	B DIFFERENCE	C CONSTANT	D # ROWS	E	I				