01767D Program Description I

Program Title MAGIC SQUARES

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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:

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

Operating Limits and Warnings

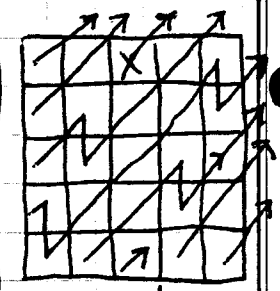
01767D Program Description II

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

	$118\frac{1}{3\phi}$	$125\frac{2}{3\phi}$	
$81\frac{26}{3\phi}$			$10\phi\frac{17}{3\phi}$
$52\frac{28}{3\phi}$			$74\frac{19}{3\phi}$
	$31\frac{7}{3\phi}$	$38\frac{14}{3\phi}$	

$45\frac{21}{3\phi}$	$118\frac{1}{3\phi}$	$125\frac{2}{3\phi}$	24
$81\frac{26}{3\phi}$	$67\frac{12}{3\phi}$	$6\phi\frac{5}{3\phi}$	$10\phi\frac{17}{3\phi}$
$52\frac{28}{3\phi}$	$96\frac{16}{3\phi}$	$89\frac{3}{3\phi}$	$74\frac{19}{3\phi}$
$132\frac{15}{3\phi}$	$31\frac{7}{3\phi}$	$38\frac{14}{3\phi}$	$11\phi\frac{21}{3\phi}$



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

5 [D] → 5.000

1 [A] → 1.000

3 [B] being the difference between successive nums → 3.000

[C] → 185.000 the constant total

find the difference between numbers in a 4×4 square which adds to 313, the lowest number being 24 (↑ even order)

4 [D] → 4.000

24 [A] → 24.000

313 [C] → 313.000

[B] → 7.233 (which is $7\frac{7}{3\phi}$)

{24, $31\frac{7}{3\phi}$, $38\frac{14}{3\phi}$, $45\frac{21}{3\phi}$, $52\frac{28}{3\phi}$, $6\phi\frac{5}{3\phi}$, $67\frac{12}{3\phi}$, $74\frac{19}{3\phi}$, $81\frac{26}{3\phi}$, $89\frac{3}{3\phi}$, $96\frac{16}{3\phi}$, $10\phi\frac{17}{3\phi}$, $11\phi\frac{24}{3\phi}$, $118\frac{1}{3\phi}$, $125\frac{8}{3\phi}$, $132\frac{15}{3\phi}$}

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 ~~post~~ 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 ~~Auth~~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)

User Instructions

MAGIC SQUARES

1 ◀ ▶ 2

lowest no. | difference | constant | rows

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	LOAD SIDE ONE			
2.	INPUT D, the number of rows	D	D	D
3.	INPUT ANY TWO			
	lowest number in SQUARE	A	A	A
	difference between 2 consec. numbers	B	B	B
	constant total	C	C	C
4.	SOLVE FOR REMAINING VARIABLE no input			
	lowest number in SQUARE		A	A
	difference between 2 consec numbers		B	B
	constant total		C	C
	EACH VARIABLE is stored in its register			
	$A \rightarrow R_A$			
	$B \rightarrow R_B$			
	$C \rightarrow R_C$			
	$D \rightarrow R_D$			
	remaining registers are available			

Program Listing I

01767D

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	LBL D	31 25 14	
	STO D	33 14	
	RTN	35 22	
	LBL A	31 25 11	
	STO A	33 11	
	F3?	35 71 03	I CROSS MY ZEROS:
	R/S	84	0
	LBL 1	31 25 01	
	RCL C	34 13	
010	RCL D	34 14	
	X^2	32 54	
	01	01	
	M	51	M = minus
	RCL D	34 14	
	RCL B	34 12	
	*	71	* = times
	02	02	
	÷	81	
	*	71	
020	M	51	
	RCL D	34 14	
	÷	81	
	STO A	33 11	
	R/S	84	
	LBL B	31 25 12	
	STO 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	
	÷	81	
	RCL A	34 11	
	2	02	
	*	71	
	M	51	
	RCL D	34 14	
040	X^2	32 54	
	1	01	
	M	51	
	÷	81	
	STO B	33 12	
	R/S	84	
	LBL C	31 25 13	
	STO 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	
	RCL B	34 12	
	RCL D	34 14	

STEP	KEY ENTRY	KEY CODE	COMMENTS
	*	71	
	2	02	
	÷	81	
060	*	71	
	RCL A	34 11	
	RCL D	34 14	
	*	71	
	+	61	
	STO C	33 13	
	R/S	84	
070			
080			
090			
100			
110			

REGISTERS

0	1	2	3	4	5	6	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I
LOWEST NUMBER	DIFFERENCE	CONSTANT	# ROWS		