

PROGRAM DESCRIPTION I

Page / of

Program Title MAGIC SQUARES

Contributor's Name RANDY W. SALO

Address 2125 N.W. Highland #3

City Corvallis State Oregon Zip Code 97330

Program Description, Equations, Variables This program generates a 2-dimensional, square matrix of size N (where N=1, 3, 5 or 7), which has been filled with the integers 1 through N². The unique feature of this matrix is the fact that the sums of the rows, columns and main diagonals are equal.

The initial move made by this routine is to place the 1 in Row 1, Column (N+1)/2.

The strategy is to move up, and to the left one box, and place the next integer in that box. There are four possible conflicts; 1)column pointer points out of matrix, action taken: leave row pointer the same, set column pointer to N.

2)row pointer points out of matrix, action taken: leave column pointer the same, set row pointer to N. 3)both row and column pointers point out of matrix, action taken: place entry directly below last entry. 4)a number has already been placed into the intended box, action taken: place entry directly below the last entry.

(next page)

Necessary Accessories 1-memory module, printer

Operating Limits and Warnings "MAGIC SQUARES" will only generate squares of size 1, 3, 5 or 7.

Reference(s) _____

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.

NEITHER HP NOR THE CONTRIBUTOR MAKES ANY EXPRESS OR IMPLIED WARRANTY OF ANY KIND WITH REGARD TO THIS PROGRAM MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NEITHER HP NOR THE CONTRIBUTOR SHALL BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING OUT OF THE FURNISHING, USE OR PERFORMANCE OF THIS PROGRAM MATERIAL.

Program Description, Equations, Variables (Continued)

The equation that is used for determining the location of each element in memory is:

$$(R-1)*N+C+X$$

Where: R denotes row number
N denotes size of matrix
C denotes column number
X denotes relative address

Generate a magic square of size 1.

SOLUTION:

Input	Function	Display	Comments
Example 1.			
[XEQ] [ALPHA]			
MAGIC [ALPHA]		SIZE?	PROMPT FOR SIZE
3 [R/S]		MAGIC SQUARE	
		SIZE=3	
		6 1 8	
		7 5 3	
		2 9 4	
		SIZE?	PROMPT FOR SIZE OF NEXT MAGIC SQUARE
1 [R/S]		MAGIC SQUARE	
		SIZE=1	
		1	
		SIZE?	

USER INSTRUCTIONS

SIZE: Ø65

[illegible]

PROGRAM LISTING

☐ 67 ☐ 97 ☒ 41C

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS	STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
01	LBL "MAG		INITIALIZATION	48	/		INITIALIZE POINTERS AND COUNTER
02	FIX 0			49	INT		
03	CF 29			50	STO 03		
04	CLRG			51	1		
05	"SIZE ?"		DETERMINE SIZE	52	STO 05		MOVE POINTERS TO NEXT LOCATION
06	PROMPT		DETERMINE IF SIZE IS VALID	53	STO 07		
07	STO 00			54	RCL 00		
08	X<=0?			55	+		
09	GTO 01			56	2		IF ROW=0 THEN ROW+SIZE
10	7			57	/		
11	X<Y?			58	STO 06		
12	GTO 01			59	10		
13	RCL 00			60	+		IF COLUMN=0 THEN COLUMN+SIZE
14	2			61	1		
15	/			62	STO IND		
16	INT			63	ST+ 07		
17	LASTX			64	LBL 03		DETERMINE CURRENT REGISTER
18	X=Y?			65	1		
19	GTO 02			66	ST- 05		
20	LBL 01			67	ST- 06		
21	"ONLY 1, 3,5,7"		IF SIZE=1 DO MAGIC SQUARE	68	RCL 05		CHECK TO SEE IF CURRENT LOCATION HAS BEEN FILLED
22	AVIEW			69	X=0?		
23	PSE			70	GTO 04		
24	GTO "MAG			71	RCL 06		
25	LBL 02		SIZE*SIZE=TOTAL NUMBER OF ENTRIES TO BE MADE	72	X=0?		DETERMINE REGISTER LOCATION
26	1			73	GTO 06		
27	RCL 00			74	RCL 00		
28	X=Y?			75	STO 05		
29	GTO 18		DETERMINE MAX. LENGTH OF ALL NUMERIC ENTRY	76	GTO 07		IF CURRENT LOCATION HAS BEEN FILLED OR BOTH ROW & COLUMN EQUAL 0 PLACE NEXT ENTRY DIRECTLY BELOW THE LAST ENTRY.
30	ENTER↑			77	LBL 04		
31	*			78	RCL 06		
32	STO 01			79	X=0?		
33	LOG		FIND NUMBER OF LEADING SPACES	80	GTO 05		DETERMINE REGISTER LOCATION
34	INT			81	RCL 00		
35	1			82	STO 06		
36	+			83	GTO 07		
37	STO 02			84	LBL 05		DETERMINE REGISTER LOCATION
38	RCL 00			85	XEQ 10		
39	*			86	RCL IND		
40	LASTX			87	X=0?		
41	1			88	GTO 07		DETERMINE REGISTER LOCATION
42	-			89	LBL 06		
43	+			90	1		
44	23			91	ST+ 06		
45	X<>Y			92	2		DETERMINE REGISTER LOCATION
46	-			93	ST+ 0		
47	2			94	LBL 07		
				95	XEQ 10		

☐ 67 ☐ 97 ☒ 41C

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS	STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
96	RCL	07	STORE CURRENT COUNTER POSITION INTO APPROPRIATE REGISTER	143	RCL	62	IF NO ENTRIES HAVE BEEN PRINTED YET CHECK FOR INDENTATION
97	STO	IND		144	RCL	00	
Y 98	1			145	-		
99	ST+	07	INCREMENT COUNTER DONE YET?	146	X=0?		ACCUMULATE NEXT ENTRY AND SPACE CHARACTERS
100	X<>Y			147	XEQ	13	
101	RCL	01		148	ARCL	IND	
102	X<=Y?		ARRAY ADDRESSING (R-1)N+10	09			INCREMENT ADDRES- SING POINTER AND REPEAT LOOP IF NOT DONE
103	GTO	11		149	ACA		
104	GTO	03		150	CLA		
105	LBL	10	PRINT HEADINGS	151	" "		IF LINE IS FINISHED PRINT LINE AND GO TO NEXT LINE
106	RCL	05		152	ACA		
107	1			153	CLA		
108	-		RETURN TO LABEL 18 IF SIZE=1	154	1		IF MATRIX IS PRINTED START PROGRAM OVER
109	RCL	00		155	ST+	09	
110	*			156	DSE	62	
111	RCL	06	INITIALIZE PRINTING ROUTINE	157	GTO	16	ACCUMULATE LEADING SPACES
112	+			158	PRA		
113	10			159	CLA		
114	+		LOOP 1 FOR EACH LINE	160	DSE	61	ADD EXTRA SPACES FOR PROPER COLUMN ALIGNMENT
115	RTN			161	GTO	15	
116	LBL	11		162	GTO	"MAG	
117	ADV		LOOP 2 FOR EACH CHARACTER ON EACH LINE	IC"			IF SIZE=1 PRINT A 1
118	ADV			163	LBL	12	
119	ADV			164	RCL	03	
120	"MAGIC S			165	STO	63	
121	SF	12		166	LBL	17	
122	PRA			167	CLA		
123	CF	12		168	" "		
124	ADV			169	ACA		
125	"			170	DSE	63	
SIZE="				171	GTO	17	
126	ARCL	00		172	RTN		
127	PRA			173	LBL	13	
128	CLA			174	RCL	IND	
129	PRA			09			
130	PRA			175	LOG		
131	FS?	01		176	INT		
132	RTN			177	1		
133	11			178	+		
134	STO	09		179	RCL	02	
135	RCL	00		180	X=Y?		
136	STO	61		181	RTN		
137	LBL	15		182	" "		
138	XEQ	12		183	ACA		
139	RCL	00		184	CLA		
140	STO	62		185	RTN		
141	LBL	16		186	LBL	18	
142	XEQ	13		187	SF	01	
				188	XEQ	11	
				189	CF	01	

00098C

PROGRAM LISTING

Page 7 of 8

☐ 67 ☐ 97 ☒ 41C

STEP/ _LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS	STEP/ _LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
190	SF 12			51			
191	" 1"						
192	PRA						
193	CLA						
194	CF 12						
195	GTO "MAG						
196	IC"						
196	END						
10				60			
20				70			
30				80			
40				90			
50				00			

ROW 1 (1 : 3)



ROW 2 (4 : 9)



ROW 3 (10 : 20)



ROW 4 (21 : 21)



ROW 5 (22 : 28)



ROW 6 (29 : 39)



ROW 7 (40 : 51)



ROW 8 (52 : 62)



ROW 9 (63 : 71)



ROW 10 (72 : 81)



ROW 11 (82 : 89)



ROW 12 (90 : 97)



ROW 13 (98 : 107)



ROW 14 (108 : 119)



ROW 15 (120 : 120)



ROW 16 (121 : 125)



ROW 17 (125 : 127)



ROW 18 (128 : 136)



ROW 19 (136 : 142)



ROW 20 (142 : 149)



ROW 21 (150 : 157)



ROW 22 (157 : 162)



ROW 23 (162 : 169)



ROW 24 (169 : 177)



ROW 25 (178 : 187)



ROW 26 (187 : 191)



ROW 27 (191 : 195)



ROW 28 (195 : 196)

