

Chapter 6: Fundamental Studies of Multi-Dimensional Extra-Cubic Magic Forms and their Decomposed Ones: **Kanji Setsuda**

Section 3: Study of 6-Dimensional Extra-Cubic Magic Objects of Order 2 and their Decomposed Forms

#1. This time let's try to make a 6-dimensional magic form of order 2 in the 2 x 2 x 2 x 2 x 2 x 2 array. Why do I intend to do so? It is because I want to know of the highest symmetry of magic forms by increasing the dimensions up to 6, and because I want to find the relations among some types of magic cubes of order 4, magic squares of order 8, and the only one original concept of the highest dimension.

#2. The structural data of the consecutive whole numbers from 1 to 64 are placed in the 6-dimensional array of 2^6 . No one can directly draw a single picture of that. But without using any kind of figures, it is too difficult for us to plan to build it.

I tried to prepare several figures for those 'Decomposed Forms', so that we could make the concept clearer.

Basic Forms #1 [8x2³]

1-----2	3-----4	33-----34	35-----36
5-----6	7-----8	37-----38	39-----40
9-----10	11-----12	41-----42	43-----44
13-----14	15-----16	45-----46	47-----48
17-----18	19-----20	49-----50	51-----52
21-----22	23-----24	53-----54	55-----56
25-----26	27-----28	57-----58	59-----60
29-----30	31-----32	61-----62	63-----64

[SC4³]

1-----2	3-----4	5-----6	7-----8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64

[SC8²]

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64

[CC4³]

1-----2	3-----4	5-----6	7-----8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64

[CC8²]

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64

Decomposed form [8x2³] has 8 pieces of 3-dimensional cube of order 2 at first. All of them indicate a single 6-d extra-cubic object on the whole. It's very hard to imagine it, but don't give it up, please.

Basic Form [SC4³] also contains a 3-dimensional cube of order 4, and each

component of little cube 2^3 is taken out of the decomposed cubes above.

The next form [SC8²] is made from the cube. Four sides of the cube are placed flat on the 8^2 square, though at a whole sight the total figure looks like a 2-dimensional square of order 8.

We suppose these figures as the basic forms to make everything with.

#3. How should we think of complementary pairs of 2^6+1 ? Where are the complementary pairs such as (n1,n64), (n2,n63), (n3,n62), (n4,n61), (n5,n60), (n6,n59), ..., (n31,n34), (n32,n33) in the figures above.

They are all located reasonably and appropriately in every kind of decomposed forms. Therefore we can assume 32 complementary pairs of 65, and their symmetrical locations.

$$n1+n64=n2+n63=n3+n62=n4+n61=n5+n60=n6+n59= \dots =n31+n34=n32+n33=C(=65)$$

#4. Where are the 'axes' and the 'numbers next to the origin'?

Binary notation is always useful for you to find them.

Figure 1b [2 x 2 x (2⁴)]

000000--000100	001000--001100	010000--010100
000001--000101	001001--001101	010001--
000010--000110	001010--001110	010010--
000011--000111	001011--001111	010011--
100000--100100		110000--
100001--		
100010--		
100011--		

In the 6-dimensional system six axes must meet on the origin n1: n(0,0,0,0,0,0). The origin makes each axis with each next number adjacent to itself. There must be six next numbers adjacent to the origin. What are they?

The first three of them are n2:n(0,0,0,0,0,1), n3:n(0,0,0,0,1,0) and n5:n(0,0,0,1,0,0) no doubt. What are the last three?

They must be n9:n(0,0,1,0,0,0), n17:n(0,1,0,0,0,0), and n33:n(1,0,0,0,0,0).

We must treat them as impartially as possible. Because they have neither a rank nor a determined order by themselves.

#5. What conditions should we accept to make the object?

We cannot accept $n1+n2 = n1+n3 = n1+n5 = n1+n9 = n1+n17 = n1+n33 = C(= 65)$ to the object of order 2. Instead of giving them up, we assume such equations as below, so that the total sums of 4 entries are equal to the magic constant Q (= 130).

For example,

n1 + n2 + n3 + n4 = Q (1)		n9 + n10 + n11 + n12 = Q (7)
n1 + n2 + n5 + n6 = Q (2)		n9 + n10 + n13 + n14 = Q (8)
n1 + n3 + n5 + n7 = Q (3)		n9 + n11 + n13 + n15 = Q (9)
n2 + n4 + n6 + n8 = Q (4)		n10 + n12 + n14 + n16 = Q (10)
n3 + n4 + n7 + n8 = Q (5)		n11 + n12 + n15 + n16 = Q (11)
n5 + n6 + n7 + n8 = Q (6)		n13 + n14 + n15 + n16 = Q (12)
n17 + n18 + n19 + n20 = Q (13)		n25 + n26 + n27 + n28 = Q (19)
n17 + n18 + n21 + n22 = Q (14)		n25 + n26 + n29 + n30 = Q (20)
n17 + n19 + n21 + n23 = Q (15)		n25 + n27 + n29 + n31 = Q (21)
n18 + n20 + n22 + n24 = Q (16)		n26 + n28 + n30 + n32 = Q (22)
n19 + n20 + n23 + n24 = Q (17)		n27 + n28 + n31 + n32 = Q (23)

$$n_{21} + n_{22} + n_{23} + n_{24} = 0 \dots (18) \quad | \quad n_{29} + n_{30} + n_{31} + n_{32} = 0 \dots (24)$$

$$n_1 + n_2 + n_9 + n_{10} = 0 \dots (25) \quad | \quad n_1 + n_5 + n_9 + n_{13} = 0 \dots (31)$$

$$n_1 + n_2 + n_{17} + n_{18} = 0 \dots (26) \quad | \quad n_1 + n_5 + n_{17} + n_{21} = 0 \dots (32)$$

$$n_1 + n_2 + n_{33} + n_{34} = 0 \dots (27) \quad | \quad n_1 + n_5 + n_{33} + n_{37} = 0 \dots (33)$$

$$n_1 + n_3 + n_9 + n_{11} = 0 \dots (28) \quad | \quad n_2 + n_4 + n_{10} + n_{12} = 0 \dots (34)$$

$$n_1 + n_3 + n_{17} + n_{19} = 0 \dots (29) \quad | \quad n_2 + n_4 + n_{18} + n_{20} = 0 \dots (35)$$

$$n_1 + n_3 + n_{33} + n_{35} = 0 \dots (30) \quad | \quad n_2 + n_4 + n_{34} + n_{36} = 0 \dots (36)$$

$$n_2 + n_6 + n_{10} + n_{14} = 0 \dots (37) \quad | \quad n_3 + n_7 + n_{11} + n_{15} = 0 \dots (43)$$

$$n_2 + n_6 + n_{18} + n_{22} = 0 \dots (38) \quad | \quad n_3 + n_7 + n_{19} + n_{23} = 0 \dots (44)$$

$$n_2 + n_6 + n_{34} + n_{38} = 0 \dots (39) \quad | \quad n_3 + n_7 + n_{35} + n_{39} = 0 \dots (45)$$

$$n_3 + n_4 + n_{11} + n_{12} = 0 \dots (40) \quad | \quad n_4 + n_8 + n_{12} + n_{16} = 0 \dots (46)$$

$$n_3 + n_4 + n_{19} + n_{20} = 0 \dots (41) \quad | \quad n_4 + n_8 + n_{20} + n_{24} = 0 \dots (47)$$

$$n_3 + n_4 + n_{35} + n_{36} = 0 \dots (42) \quad | \quad n_4 + n_8 + n_{36} + n_{40} = 0 \dots (48)$$

$$n_5 + n_6 + n_{13} + n_{14} = 0 \dots (49) \quad | \quad n_6 + n_8 + n_{38} + n_{40} = 0 \dots (54)$$

$$n_5 + n_6 + n_{21} + n_{22} = 0 \dots (50) \quad | \quad n_7 + n_8 + n_{15} + n_{16} = 0 \dots (55)$$

$$n_5 + n_6 + n_{37} + n_{38} = 0 \dots (51) \quad | \quad n_7 + n_8 + n_{23} + n_{24} = 0 \dots (56)$$

$$n_6 + n_8 + n_{14} + n_{16} = 0 \dots (52) \quad | \quad n_7 + n_8 + n_{39} + n_{40} = 0 \dots (57)$$

$$n_6 + n_8 + n_{22} + n_{24} = 0 \dots (53) \quad |$$

$$n_1 + n_{17} + n_{33} + n_{49} = 0 \dots (58) \quad | \quad n_5 + n_{21} + n_{37} + n_{53} = 0 \dots (62)$$

$$n_2 + n_{18} + n_{34} + n_{50} = 0 \dots (59) \quad | \quad n_6 + n_{22} + n_{38} + n_{54} = 0 \dots (63)$$

$$n_3 + n_{19} + n_{35} + n_{51} = 0 \dots (60) \quad | \quad n_7 + n_{23} + n_{39} + n_{55} = 0 \dots (64)$$

$$n_4 + n_{20} + n_{36} + n_{52} = 0 \dots (61) \quad | \quad n_8 + n_{24} + n_{40} + n_{56} = 0 \dots (65)$$

.... , etc.

Another View-Form [8x2³]

$$\begin{array}{cccc} 1-----2 & 3-----4 & 33-----34 & 35-----36 \\ | 17-----18 & | 19-----20 & | 49-----50 & | 51-----52 \\ 5-----6 & | 7-----8 & | 37-----38 & | 39-----40 & | \\ 21-----22 & 23-----24 & 53-----54 & 55-----56 \end{array}$$

$$\begin{array}{cccc} 9-----10 & 11-----12 & 41-----42 & 43-----44 \\ | 25-----26 & | 27-----28 & | 57-----58 & | 59-----60 \\ 13-----14 & | 15-----16 & | 45-----46 & | 47-----48 & | \\ 29-----30 & 31-----32 & 61-----62 & 63-----64 \end{array}$$

All 4 entries on each surface of 8 cubes above add up to the same sum 130.

You could thus put on many simultaneous equations to the rest. But you don't have to put them all. Because half of variables are determined by the other complementary pairs by constant C (= 65).

For example,

$$\begin{aligned} n_{64} &= C - n_1, & n_{63} &= C - n_2, & n_{62} &= C - n_3, & n_{61} &= C - n_4, & n_{60} &= C - n_5, & n_{59} &= C - n_6, & n_{58} &= C - n_7, \\ n_{57} &= C - n_7, & n_{56} &= C - n_9, & n_{55} &= C - n_{10}, & n_{54} &= C - n_{11}, & n_{53} &= C - n_{12}, & n_{52} &= C - n_{13}, \\ n_{51} &= C - n_{14}, & n_{50} &= C - n_{15}, & n_{49} &= C - n_{16}, & n_{48} &= C - n_{17}, & n_{47} &= C - n_{18}, & n_{46} &= C - n_{19}, \\ n_{45} &= C - n_{20}, & n_{44} &= C - n_{21}, & n_{43} &= C - n_{22}, & n_{42} &= C - n_{23}, & n_{41} &= C - n_{24}, & n_{25} &= C - n_{40}, \\ n_{26} &= C - n_{39}, & n_{27} &= C - n_{38}, & n_{28} &= C - n_{37}, & n_{29} &= C - n_{36}, & n_{30} &= C - n_{35}, & n_{31} &= C - n_{34}, \\ n_{32} &= C - n_{33} \dots \dots (C=65) \end{aligned}$$

#6. You must make the object under these strict conditions.

How many solutions can you get? Of course, you can use your computer to count them.

The count of solutions depends on the permutations of the 'next numbers.'

Add $n_1=1, n_2>n_3>n_5>n_9>n_{17}>n_{33}$ to the conditions above, and you will get only one solution. If you assume as $n_1=1, n_2>n_3>n_{17}, n_2>n_9, n_3>n_5, n_{17}>n_{33}$, you will

get fifteen solutions.

If you don't assume any strict inequality but for $n_1=1$, you will get more solutions even up to 720.

See some parts of the largest list below. Watch and check where the six axes are. What are the next numbers adjacent to the origin n_1 ?

$$[1] \{n_2, n_3, n_5, n_9, n_{17}, n_{33}\} = \{63, 62, 60, 56, 48, 32\}$$

1	---	60	56	13	48	21	25	36		
	63	---	6	10	51	18	43	39	30	
62	-		7		11	50	19	42	38	31
4	---	57	53	16	45	24	28	33		
32	37	41	20	49	12	8	61			
34	27	23	46	15	54	58	3			
35	26	22	47	14	55	59	2			
29	40	44	17	52	9	5	64			

$$[2] \{n_2, n_3, n_5, n_9, n_{17}, n_{33}\} = \{63, 62, 60, 56, 32, 48\}$$

1	---	60	56	13	32	37	41	20		
	63	---	6	10	51	34	27	23	46	
62	-		7		11	50	35	26	22	47
4	---	57	53	16	29	40	44	17		
48	21	25	36	49	12	8	61			
18	43	39	30	15	54	58	3			
19	42	38	31	14	55	59	2			
45	24	28	33	52	9	5	64			

- | | | |
|------------------------------|------------------------------|------------------------------|
| [3] 63, 62, 60, 48, 56, 32 | [4] 63, 62, 60, 48, 32, 56 | [5] 63, 62, 60, 32, 56, 48 |
| [6] 63, 62, 60, 32, 48, 56 | [7] 63, 62, 56, 60, 48, 32 | [8] 63, 62, 56, 60, 32, 48 |
| [9] 63, 62, 56, 48, 60, 32 | [10] 63, 62, 56, 48, 32, 60 | [11] 63, 62, 56, 32, 60, 48 |
| [12] 63, 62, 56, 32, 48, 60 | [13] 63, 62, 48, 60, 56, 32 | [14] 63, 62, 48, 60, 32, 56 |
| [15] 63, 62, 48, 56, 60, 32 | [16] 63, 62, 48, 56, 32, 60 | [17] 63, 62, 48, 32, 60, 56 |
| [18] 63, 62, 48, 32, 56, 60 | [19] 63, 62, 32, 60, 56, 48 | [20] 63, 62, 32, 60, 48, 56 |

- | | | |
|------------------------------|------------------------------|------------------------------|
| [120] 63, 32, 48, 56, 60, 62 | [121] 62, 63, 60, 56, 48, 32 | [122] 62, 63, 60, 56, 32, 48 |
| [123] 62, 63, 60, 48, 56, 32 | [124] 62, 63, 60, 48, 32, 56 | [125] 62, 63, 60, 32, 56, 48 |
| [126] 62, 63, 60, 32, 48, 56 | [127] 62, 63, 56, 60, 48, 32 | [128] 62, 63, 56, 60, 32, 48 |
| [129] 62, 63, 56, 48, 60, 32 | [130] 62, 63, 56, 48, 32, 60 | [131] 62, 63, 56, 32, 60, 48 |

- | | | |
|------------------------------|------------------------------|------------------------------|
| [240] 62, 32, 48, 56, 60, 63 | [241] 60, 63, 62, 56, 48, 32 | [242] 60, 63, 62, 56, 32, 48 |
| [243] 60, 63, 62, 48, 56, 32 | [244] 60, 63, 62, 48, 32, 56 | [245] 60, 63, 62, 32, 56, 48 |
| [246] 60, 63, 62, 32, 48, 56 | [247] 60, 63, 56, 62, 48, 32 | [248] 60, 63, 56, 62, 32, 48 |
| [249] 60, 63, 56, 48, 62, 32 | [250] 60, 63, 56, 48, 32, 62 | [251] 60, 63, 56, 32, 62, 48 |

- | | | |
|------------------------------|------------------------------|------------------------------|
| [360] 60, 32, 48, 56, 62, 63 | [361] 56, 63, 62, 60, 48, 32 | [362] 56, 63, 62, 60, 32, 48 |
| [363] 56, 63, 62, 48, 60, 32 | [364] 56, 63, 62, 48, 32, 60 | [365] 56, 63, 62, 32, 60, 48 |
| [366] 56, 63, 62, 32, 48, 60 | [367] 56, 63, 60, 62, 48, 32 | [368] 56, 63, 60, 62, 32, 48 |
| [369] 56, 63, 60, 48, 62, 32 | [370] 56, 63, 60, 48, 32, 62 | [371] 56, 63, 60, 32, 62, 48 |

- | | | |
|------------------------------|------------------------------|------------------------------|
| [480] 56, 32, 48, 60, 62, 63 | [481] 48, 63, 62, 60, 56, 32 | [482] 48, 63, 62, 60, 32, 56 |
| [483] 48, 63, 62, 56, 60, 32 | [484] 48, 63, 62, 56, 32, 60 | [485] 48, 63, 62, 32, 60, 56 |
| [486] 48, 63, 62, 32, 56, 60 | [487] 48, 63, 60, 62, 56, 32 | [488] 48, 63, 60, 62, 32, 56 |
| [489] 48, 63, 60, 56, 62, 32 | [490] 48, 63, 60, 56, 32, 62 | [491] 48, 63, 60, 32, 62, 56 |

- | | | |
|------------------------------|------------------------------|------------------------------|
| [600] 48, 32, 56, 60, 62, 63 | [601] 32, 63, 62, 60, 56, 48 | [602] 32, 63, 62, 60, 48, 56 |
|------------------------------|------------------------------|------------------------------|

[603] 32, 63, 62, 56, 60, 48 [604] 32, 63, 62, 56, 48, 60 [605] 32, 63, 62, 48, 60, 56
 [606] 32, 63, 62, 48, 56, 60 [607] 32, 63, 60, 62, 56, 48 [608] 32, 63, 60, 62, 48, 56
 [609] 32, 63, 60, 56, 62, 48 [610] 32, 63, 60, 56, 48, 62 [611] 32, 63, 60, 48, 62, 56

[714] 32, 48, 60, 56, 62, 63 [715] 32, 48, 56, 63, 62, 60 [716] 32, 48, 56, 63, 60, 62
 [717] 32, 48, 56, 62, 63, 60 [718] 32, 48, 56, 62, 60, 63 [719] 32, 48, 56, 60, 63, 62
 [720] 32, 48, 56, 60, 62, 63 [Count = 720]

The 'next' numbers on the six proper axes are only 63, 62, 60, 56, 48 and 32. It is the same with one of the most important properties of 'Composite & Complete' cube of order 4.

Each number of those six is free to go anywhere on the axes. As the result some kind of rotation seems to occur. The number of permutations ${}_6P_6$ is 720.

Everything seems to imply our 'success,' doesn't it? Yes, we have succeeded in making the 6-dimensional object at last.

#7. Now let's study about the 'dimension converter.'

Basic Forms #1 (Again)

[8x2³]

1----	2	3-----	4	33-----	34	35-----	36				
	5-----	6		7-----	8		37-----	38		39-----	40
9--	-10		11--	-12		41--	-42		43--	-44	
13-----	14	15-----	16	45-----	46	47-----	48				
17-----	18	19-----	20	49-----	50	51-----	52				
	21-----	22		23-----	24		53-----	54		55-----	56
25--	-26		27--	-28		57--	-58		59--	-60	
29-----	30	31-----	32	61-----	62	63-----	64				

[SC4³]

[CC4³]

1-----	2-----	3-----	4	1-----	2-----	4-----	3												
	5-----	+6	7		8		5	6	8		7								
9-	33-	-10		34	11	35	12	36	9	37	10	38	12	40	11	39			
	13--	-37	-14--	-38	-15--	-39	-16--	-40		13	33--	-14--	-34--	-16--	-36--	-15--	-35		
17	41		18	42	19	43	20	44		25	45		26	46	28	48	27	47	
	21	45	22	46	23	47		24	48		29	41	30	42	32	44		31	43
25--	-49-	-26--	-50--	-27--	-51--	-28	52		17--	-61-	-18--	-62--	-20--	-64--	-19	63			
29	53	30	54	31	55	32	56		21	57	22	58	24	60	23	59			
57		58	59	60		53		54	56	55									
61-----	62-----	63-----	64	49-----	50-----	52-----	51												

Decomposed form [SC4³] and [CC4³] are derived from the form [8x2³]. That shows the possibility of 'dimension converter.'

Yes. Form [SC4³] is already a self-complementary magic cube of order 4.

Equations such as $n_1+n_64=n_2+n_63=n_3+n_62=...=n_{31}+n_{34}=n_{32}+n_{33}=C=65$ are still active.

Therefore the 4 primary triagonals ($n_1+n_{14}+n_{51}+n_{64}=Q$; $n_4+n_{15}+n_{50}+n_{61}=Q$; $n_{25}+n_{22}+n_{43}+n_{40}=Q$; $n_{28}+n_{23}+n_{42}+n_{37}=Q$;) are consequently active.

And $n_1+n_2+n_3+n_4=Q$; $n_1+n_5+n_{33}+n_{37}=Q$; $n_1+n_9+n_{17}+n_{25}=Q$; ...,

$n_2+n_6+n_{34}+n_{38}=Q$; $n_2+n_{10}+n_{18}+n_{26}=Q(=130)$; etc. must be true.

It has to be a magic cube.

Form [CC4³] shown above is transformed from the form [SC4³].

Exchange every 4 entries on the 3rd & 4th lines, rows and columns each other in all 3 directions, and you could get a 'Composite and Complete' magic cube of order 4. Yes. You can take the 'C & C' magic cube of order 4 out of the original 6-d object. Check all lines, rows and columns if every 4 entries of them add up to the magic

constant 130. Examine if 4 entries of any 2-by-2 block within add up to 130. And watch carefully whether all complementary pairs of 65 do exist on the pan-triagonals or not.

Where are now the six numbers next to the origin of 6-d object in our cubes? They are on the three axes of our cubes by 2 x 3.

Examine the 15 'C & C' magic cubes in the list below, and you can find that they are the same with the 'fundamental' solutions we found and classified before. It is amazing.

*** Make the Extra-Cubic Magic Objects of Order 2^6 and ***
 ** Transform into 'Composite & Complete' Magic Cubes 4^3 **
 ** Print out the List of Most Fundamental 15 Solutions **
 (Under $n1==1, n2>n5>n17, n2>n3, n5>n9, n17>n33$)

1/EC

1---63	60----6	32----34	37----27
62---4	7---57	35---29	26---40
56-- -10	13-- -51	41-- -23	20-- -46
11---53	50----16	22----44	47----17
48----18	21----43	49----15	12----54
19---45	42---24	14---52	55---9
25-- -39	36-- -30	8-- -58	61-- -3
38---28	31----33	59----5	2----64

1/SC

1-----63-----60-----6
62 4 7 57
56 32 10 34 13 37 51 27
11 35---53---29---50---26---16---40
48 41 18 23 21 20 43 46
19 22 45 44 42 47 24 17
25-49- -39-15-36-12-30 54
38 14 28 52 31 55 33 9
8 58 61 3
59-----5-----2-----64

1/CC

1-----63-----6-----60
62 4 57 7
56 35 10 29 51 40 13 26
11 32---53---34---16---27---50---37
25 22 39 44 30 17 36 47
38 41 28 23 33 46 31 20
48-59- -18-5-43-64-21 2
19 8 45 58 24 3 42 61
14 52 9 55
49-----15-----54-----12

2/EC

1---63	60----6	32----34	37----27
62---4	7---57	35---29	26---40
48-- -18	21-- -43	49-- -15	12-- -54
19---45	42----24	14----52	55----9
56----10	13----51	41----23	20----46
11---53	50---16	22---44	47---17
25-- -39	36-- -30	8-- -58	61-- -3
38---28	31----33	59----5	2----64

2/SC

1-----63-----60-----6
62 4 7 57
48 32 18 34 21 37 43 27
19 35---45---29---42---26---24---40
56 49 10 15 13 12 51 54
11 14 53 52 50 55 16 9
25-41- -39-23-36-20-30 46
38 22 28 44 31 47 33 17
8 58 61 3
59-----5-----2-----64

2/CC

1-----63-----6-----60
62 4 57 7
48 35 18 29 43 40 21 26
19 32---45---34---24---27---42---37
25 14 39 52 30 9 36 55
38 49 28 15 33 54 31 12
56-59- -10-5-51-64-13 2
11 8 53 58 16 3 50 61
22 44 17 47
41-----23-----46-----20

3/EC

1---63	60---6	48---18	21---43
62---4	7---57	19---45	42---24
32-- -34	37-- -27	49-- -15	12-- -54
35-----29	26-----40	14-----52	55-----9

56---10	13---51	25---39	36---30
11---53	50---16	38---28	31---33
41-- -23	20-- -46	8-- -58	61-- -3
22-----44	47-----17	59-----5	2-----64

3/SC

1-----63-----60-----6
62 4 7 57
32 48 34 18 37 21 27 43
35 19---29---45---26---42---40---24
56 49 10 15 13 12 51 54
11 14 53 52 50 55 16 9
41--25- -23--39--20--36--46 30
22 38 44 28 47 31 17 33
8 58 61 3
59-----5-----2-----64

3/CC

1-----63-----6-----60
62 4 57 7
32 19 34 45 27 24 37 42
35 48---29---18---40---43---26---21
41 14 23 52 46 9 20 55
22 49 44 15 17 54 47 12
56--59- -10--5--51--64--13 2
11 8 53 58 16 3 50 61
38 28 33 31
25-----39-----30-----36

4/EC

1---63	56---10	32---34	41---23
62---4	11---53	35---29	22---44
60-- -6	13-- -51	37-- -27	20-- -46
7---57	50---16	26---40	47---17

48---18	25---39	49---15	8---58
19---45	38---28	14---52	59---5
21-- -43	36-- -30	12-- -54	61-- -3
42---24	31---33	55---9	2---64

4/SC

1-----63-----56-----10
62 4 11 53
60 32 6 34 13 41 51 23
7 35---57---29---50---22---16---44
48 37 18 27 25 20 39 46
19 26 45 40 38 47 28 17
21--49- -43--15--36--8--30 58
42 14 24 52 31 59 33 5
12 54 61 3
55-----9-----2-----64

4/CC

1-----63-----10-----56
62 4 53 11
60 35 6 29 51 44 13 22
7 32---57---34---16---23---50---41
21 26 43 40 30 17 36 47
42 37 24 27 33 46 31 20
48--55- -18--9--39--64--25 2
19 12 45 54 28 3 38 61
14 52 5 59
49-----15-----58-----8

5/EC

1---63	56---10	32---34	41---23
62---4	11---53	35---29	22---44
48-- -18	25-- -39	49-- -15	8-- -58
19---45	38---28	14---52	59---5

60---6	13---51	37---27	20---46
7---57	50---16	26---40	47---17
21-- -43	36-- -30	12-- -54	61-- -3
42---24	31---33	55---9	2---64

5/SC

1-----63-----56-----10
62 4 11 53
48 32 18 34 25 41 39 23
19 35---45---29---38---22---28---44
60 49 6 15 13 8 51 58
7 14 57 52 50 59 16 5
21--37- -43--27--36--20--30 46
42 26 24 40 31 47 33 17
12 54 61 3
55-----9-----2-----64

5/CC

1-----63-----10-----56
62 4 53 11
48 35 18 29 39 44 25 22
19 32---45---34---28---23---38---41
21 14 43 52 30 5 36 59
42 49 24 15 33 58 31 8
60--55- -6--9--51--64--13 2
7 12 57 54 16 3 50 61
26 40 17 47
37-----27-----46-----20

6/EC

1---63	56---10	48---18	25---39
62---4	11---53	19---45	38---28
32-- -34	41-- -23	49-- -15	8-- -58
35-----29	22-----44	14-----52	59-----5

60----6	13----51	21----43	36----30
7---57	50---16	42---24	31---33
37-- -27	20-- -46	12-- -54	61-- -3
26-----40	47-----17	55-----9	2-----64

6/SC

1-----63-----56-----10
62 4 11 53
32 48 34 18 41 25 23 39
35 19---29---45---22---38---44---28
60 49 6 15 13 8 51 58
7 14 57 52 50 59 16 5
37--21- -27--43--20--36--46 30
26 42 40 24 47 31 17 33
12 54 61 3
55-----9-----2-----64

6/CC

1-----63-----10-----56
62 4 53 11
32 19 34 45 23 28 41 38
35 48---29---18---44---39---22---25
37 14 27 52 46 5 20 59
26 49 40 15 17 58 47 8
60--55- -6--9--51--64--13 2
7 12 57 54 16 3 50 61
42 24 33 31
21-----43-----30-----36

7/EC

1---63	48---18	32---34	49---15
62---4	19---45	35---29	14---52
60-- -6	21-- -43	37-- -27	12-- -54
7---57	42---24	26---40	55---9

56---10	25---39	41---23	8---58
11---53	38---28	22---44	59---5
13-- -51	36-- -30	20-- -46	61-- -3
50---16	31---33	47---17	2---64

7/SC

1-----63-----48-----18
62 4 19 45
60 32 6 34 21 49 43 15
7 35---57---29---42---14---24---52
56 37 10 27 25 12 39 54
11 26 53 40 38 55 28 9
13--41- -51--23--36--8--30 58
50 22 16 44 31 59 33 5
20 46 61 3
47-----17-----2-----64

7/CC

1-----63-----18-----48
62 4 45 19
60 35 6 29 43 52 21 14
7 32---57---34---24---15---42---49
13 26 51 40 30 9 36 55
50 37 16 27 33 54 31 12
56--47- -10--17--39--64--25 2
11 20 53 46 28 3 38 61
22 44 5 59
41-----23-----58-----8

8/EC

1---63	48---18	32---34	49---15
62---4	19---45	35---29	14---52
56-- -10	25-- -39	41-- -23	8-- -58
11---53	38---28	22---44	59---5

60----6	21----43	37---27	12---54
7---57	42---24	26---40	55---9
13-- -51	36-- -30	20-- -46	61-- -3
50---16	31---33	47---17	2---64

8/SC

1-----63-----48-----18
62 4 19 45
56 32 10 34 25 49 39 15
11 35---53---29---38---14---28---52
60 41 6 23 21 8 43 58
7 22 57 44 42 59 24 5
13--37- -51--27--36--12--30 54
50 26 16 40 31 55 33 9
20 46 61 3
47-----17-----2-----64

8/CC

1-----63-----18-----48
62 4 45 19
56 35 10 29 39 52 25 14
11 32---53---34---28---15---38---49
13 22 51 44 30 5 36 59
50 41 16 23 33 58 31 8
60--47- -6--17--43--64--21 2
7 20 57 46 24 3 42 61
26 40 9 55
37-----27-----54-----12

9/EC

1---63	48---18	56---10	25---39
62---4	19---45	11---53	38---28
32-- -34	49-- -15	41-- -23	8-- -58
35-----29	14-----52	22-----44	59-----5

60----6	21----43	13----51	36----30
7---57	42---24	50---16	31---33
37-- -27	12-- -54	20-- -46	61-- -3
26-----40	55-----9	47-----17	2-----64

9/SC

1-----63	-----48	-----18
62	4	19
32 56 34 10 49 25 15 39		45
35 11---29	---53	---14
60 41 6 23 21 8 43 58		38---52---28
7 22 57 44 42 59 24 5		
37--13- -27--51	---12--36--54	30
26 50 40 16 55 31 9 33		
20 46 61 3		
47-----17-----2-----64		

9/CC

1-----63	-----18	-----48
62	4	19
32 11 34 53 15 28 49 38		45
35 56---29	---10---52	---39---14---25
37 22 27 44 54 5 12 59		
26 41 40 23 9 58 55 8		
60--47- -6--17--43--64--21 2		
7 20 57 46 24 3 42 61		
50 16 33 31		
13-----51-----30-----36		

10/EC

1---63	32---34	48---18	49---15
62---4	35---29	19---45	14---52
60-- -6	37-- -27	21-- -43	12-- -54
7---57	26---40	42---24	55---9

56---10	41---23	25---39	8---58
11---53	22---44	38---28	59---5
13-- -51	20-- -46	36-- -30	61-- -3
50---16	47---17	31---33	2---64

10/SC

1-----63	-----32	-----34
62	4	35
60 48 6 18 37 49 27 15		29
7 19---57	---45	---26
56 21 10 43 41 12 23 54		14---40---52
11 42 53 24 22 55 44 9		
13--25- -51--39--20--8--46 58		
50 38 16 28 47 59 17 5		
36 30 61 3		
31-----33-----2-----64		

10/CC

1-----63	-----34	-----32
62	4	29
60 19 6 45 27 52 37 14		35
7 48---57	---18---40	---15---26---49
13 42 51 24 46 9 20 55		
50 21 16 43 17 54 47 12		
56--31- -10--33--23--64--41 2		
11 36 53 30 44 3 22 61		
38 28 5 59		
25-----39-----58-----8		

11/EC

1---63	32---34	48---18	49---15
62---4	35---29	19---45	14---52
56-- -10	41-- -23	25-- -39	8-- -58
11---53	22---44	38---28	59---5

60----6	37---27	21---43	12---54
7---57	26---40	42---24	55---9
13-- -51	20-- -46	36-- -30	61-- -3
50---16	47---17	31---33	2---64

11/SC

1-----63	-----32	-----34
62	4	35
56 48 10 18 41 49 23 15		29
11 19---53	---45	---22
60 25 6 39 37 8 27 58		14---44---52
7 38 57 28 26 59 40 5		
13--21- -51--43--20--12--46 54		
50 42 16 24 47 55 17 9		
36 30 61 3		
31-----33-----2-----64		

11/CC

1-----63	-----34	-----32
62	4	29
56 19 10 45 23 52 41 14		35
11 48---53	---18---44	---15---22---49
13 38 51 28 46 5 20 59		
50 25 16 39 17 58 47 8		
60--31- -6--33--27--64--37 2		
7 36 57 30 40 3 26 61		
42 24 9 55		
21-----43-----54-----12		

12/EC

1---63	32---34	56---10	41---23
62---4	35---29	11---53	22---44
48-- -18	49-- -15	25-- -39	8-- -58
19---45	14---52	38---28	59---5

60---6	37---27	13---51	20---46
7---57	26---40	50---16	47---17
21-- -43	12-- -54	36-- -30	61-- -3
42---24	55---9	31---33	2---64

12/SC

1-----63-----32-----34
62 4 35 29
48 56 18 10 49 41 15 23
19 11---45---53---14---22---52---44
60 25 6 39 37 8 27 58
7 38 57 28 26 59 40 5
21--13- -43-51--12--20--54 46
42 50 24 16 55 47 9 17
36 30 61 3
31-----33-----2-----64

12/CC

1-----63-----34-----32
62 4 29 35
48 11 18 53 15 44 49 22
19 56---45---10---52---23---14---41
21 38 43 28 54 5 12 59
42 25 24 39 9 58 55 8
60-31- -6-33--27--64--37 2
7 36 57 30 40 3 26 61
50 16 17 47
13-----51-----46-----20

13/EC

1---63	62---4	32---34	35---29
60---6	7---57	37---27	26---40
56-- -10	11-- -53	41-- -23	22-- -44
13---51	50---16	20---46	47---17

48---18	19---45	49---15	14---52
21---43	42---24	12---54	55---9
25-- -39	38-- -28	8-- -58	59-- -5
36---30	31---33	61---3	2---64

13/SC

1-----63-----62-----4
60 6 7 57
56 32 10 34 11 35 53 29
13 37---51---27---50---26---16---40
48 41 18 23 19 22 45 44
21 20 43 46 42 47 24 17
25--49- -39--15--38--14--28 52
36 12 30 54 31 55 33 9
8 58 59 5
61-----3-----2-----64

13/CC

1-----63-----4-----62
60 6 57 7
56 37 10 27 53 40 11 26
13 32---51---34---16---29---50---35
25 20 39 46 28 17 38 47
36 41 30 23 33 44 31 22
48-61- -18--3--45--64--19 2
21 8 43 58 24 5 42 59
12 54 9 55
49-----15-----52-----14

14/EC

1---63	62---4	32---34	35---29
60---6	7---57	37---27	26---40
48-- -18	19-- -45	49-- -15	14-- -52
21---43	42---24	12---54	55---9

56---10	11---53	41---23	22---44
13---51	50---16	20---46	47---17
25-- -39	38-- -28	8-- -58	59-- -5
36---30	31---33	61---3	2---64

14/SC

1-----63-----62-----4
60 6 7 57
48 32 18 34 19 35 45 29
21 37---43---27---42---26---24---40
56 49 10 15 11 14 53 52
13 12 51 54 50 55 16 9
25--41- -39--23--38--22--28 44
36 20 30 46 31 47 33 17
8 58 59 5
61-----3-----2-----64

14/CC

1-----63-----4-----62
60 6 57 7
48 37 18 27 45 40 19 26
21 32---43---34---24---29---42---35
25 12 39 54 28 9 38 55
36 49 30 15 33 52 31 14
56-61- -10--3--53--64--11 2
13 8 51 58 16 5 50 59
20 46 17 47
41-----23-----44-----22

15/EC

1---63	62---4	48---18	19---45
60---6	7---57	21---43	42---24
32-- -34	35-- -29	49-- -15	14-- -52
37-----27	26-----40	12-----54	55-----9
56---10	11---53	25---39	38---28
13---51	50---16	36---30	31---33
41-- -23	22-- -44	8-- -58	59-- -5
20-----46	47-----17	61-----3	2-----64

15/SC

1-----63-----62-----4
60 6 7 57
32 48 34 18 35 19 29 45
37 21---27---43---26---42---40---24
56 49 10 15 11 14 53 52
13 12 51 54 50 55 16 9
41--25- -23--39--22--38--44 28
20 36 46 30 47 31 17 33
8 58 59 5
61-----3-----2-----64

15/CC

1-----63-----4-----62
60 6 57 7
32 21 34 43 29 24 35 42
37 48---27---18---40---45---26---19
41 12 23 54 44 9 22 55
20 49 46 15 17 52 47 14
56--61- -10--3--53--64--11 2
13 8 51 58 16 5 50 59
36 30 33 31
25-----39-----28-----38

#8. You can also take the 'Self-Complementary' or 'Composite & Complete' magic square of order 8 (Form [SC8²] or [CC8²]) out of the Form [SC4³] or [CC4³] as one of grandchildren of the 6-d grandmother in the heaven.

Basic Forms #1(Again)

[SC4³]

1-----2-----3-----4
5 6 7 8
9 33 10 34 11 35 12 36
13 37---14---38---15---39---16---40
17 41 18 42 19 43 20 44
21 45 22 46 23 47 24 48
25---49- -26---50---27---51---28 52
29 53 30 54 31 55 32 56
57 58 59 60
61-----62-----63-----64

[SC8²]

1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40
41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56
57 58 59 60 61 62 63 64

[CC4³]

1-----2-----4-----3
5 6 8 7
9 37 10 38 12 40 11 39
13 33---14---34---16---36---15---35
25 45 26 46 28 48 27 47
29 41 30 42 32 44 31 43
17---61- -18---62---20---64---19 63
21 57 22 58 24 60 23 59
53 54 56 55
49-----50-----52-----51

[CC8²]

1 2 4 3 29 30 32 31
9 10 12 11 21 22 24 23
25 26 28 27 5 6 8 7
17 18 20 19 13 14 16 15
36 35 33 34 64 63 61 62
44 43 41 42 56 55 53 54
60 59 57 58 40 39 37 38
52 51 49 50 48 47 45 46

I skip explaining how I made it, but these two figures for 'start' and 'goal' might tell you almost of all.

If you stand on the side of magic squares of order 8, you had better have the Solution List No.2 below. That shows everything.

No.2 is the smallest list that contains only 10 solutions in all.

They are also 'fundamental.' Each of them one-to-one corresponds to each of "Ten Principal Squares" Drs. Ollerenshaw and Brae, English mathematicians, discovered.

** Make the Extra-Cubic Magic Objects of Order 2^6 and **
 ** Transform into Composite & Complete Magic Squares 8^2 **
 ** and Print the List of Most Fundamental 10 Solutions **
 (n1==1, n2>n9, n2>n3>n31, n9>n17>n52)

1/EC2

1	63	48	18	32	34	49	15
56	10	25	39	41	23	8	58
62	4	19	45	35	29	14	52
11	53	38	28	22	44	59	5
60	6	21	43	37	27	12	54
13	51	36	30	20	46	61	3
7	57	42	24	26	40	55	9
50	16	31	33	47	17	2	64

1	63	48	18	SCMC4/MS8											
56	10	25	39	1	63	48	18	56	10	25	39				
62	32	4	34	19	49	45	15	62	4	19	45	11	53	38	28
11	41	53	23	38	8	28	58	60	6	21	43	13	51	36	30
60	35	6	29	21	14	43	52	7	57	42	24	50	16	31	33
13	22	51	44	36	59	30	5	32	34	49	15	41	23	8	58
7	37	57	27	42	12	24	54	35	29	14	52	22	44	59	5
50	20	16	46	31	61	33	3	37	27	12	54	20	46	61	3
26	40	55	9	26	40	55	9	47	17	2	64				
47	17	2	64												

1	63	18	48	CCMC4/MS8											
56	10	39	25	1	63	18	48	50	16	33	31				
62	41	4	23	45	58	19	8	62	4	45	19	13	51	30	36
11	32	53	34	28	15	38	49	7	57	24	42	56	10	39	25
7	22	57	44	24	5	42	59	60	6	43	21	11	53	28	38
50	35	16	29	33	52	31	14	15	49	32	34	64	2	47	17
60	47	6	17	43	64	21	2	52	14	35	29	3	61	20	46
13	26	51	40	30	9	36	55	9	55	26	40	58	8	41	23
20	46	3	61	54	12	37	27	5	59	22	44				
37	27	54	12												

2/EC2

1	63	62	4	32	34	35	29
48	18	19	45	49	15	14	52
60	6	7	57	37	27	26	40
21	43	42	24	12	54	55	9
56	10	11	53	41	23	22	44
25	39	38	28	8	58	59	5
13	51	50	16	20	46	47	17
36	30	31	33	61	3	2	64

1	63	62	4	SCMC4/MS8											
48	18	19	45	1	63	62	4	48	18	19	45				
60	32	6	34	7	35	57	29	60	6	7	57	21	43	42	24
21	49	43	15	42	14	24	52	56	10	11	53	25	39	38	28
56	37	10	27	11	26	53	40	13	51	50	16	36	30	31	33
25	12	39	54	38	55	28	9	32	34	35	29	49	15	14	52
13	41	51	23	50	22	16	44	37	27	26	40	12	54	55	9
36	8	30	58	31	59	33	5	41	23	22	44	8	58	59	5
20	46	47	17	20	46	47	17	61	3	2	64				
61	3	2	64												

1-----63-----4-----62 CCMC4/MS8
 | 48 18 45 | 19 1 63 4 62 36 30 33 31
 60 49 6 15 57 52 7 14 60 6 57 7 25 39 28 38
 | 21 32---43---34---24---29---+42---35 13 51 16 50 48 18 45 19
 13 12 | 51 54 16 9 50 55 | 56 10 53 11 21 43 24 42
 | 36 37 30 27 33 40 | 31 26 29 35 32 34 64 2 61 3
 56---61---| -10--- 3---53---64---11 2 | 40 26 37 27 5 59 8 58
 25 20 39 46 28 17 38 47 17 47 20 46 52 14 49 15
 8 | 58 5 59 | 44 22 41 23 9 55 12 54
 41-----23-----44-----22

3/EC2

1----63 60---- 6 32----34 37----27
 | 48---+18 | 21---+43 | 49---+15 | 12---+54
 62--|- 4 | 7--|-57 | 35--|-29 | 26--|-40 |
 19----45 42----24 14----52 55---- 9
 56----10 13----51 41----23 20----46
 | 25---+39 | 36---+30 | 8---+58 | 61---+ 3
 11--|-53 | 50--|-16 | 22--|-44 | 47--|-17 |
 38----28 31----33 59---- 5 2----64

1-----63-----60----- 6 SCMC4/MS8
 | 48 18 21 | 43 1 63 60 6 48 18 21 43
 62 32 4 34 7 37 57 27 62 4 7 57 19 45 42 24
 | 19 49---45---15---42---12---+24---54 56 10 13 51 25 39 36 30
 56 35 | 10 29 13 26 51 40 | 11 53 50 16 38 28 31 33
 | 25 14 39 52 36 55 | 30 9 32 34 37 27 49 15 12 54
 11---41---| -53---23---50---20---16 46 | 35 29 26 40 14 52 55 9
 38 8 28 58 31 61 33 3 41 23 20 46 8 58 61 3
 22 | 44 47 17 | 22 44 47 17 59 5 2 64
 59-----5-----2-----64

1-----63-----6-----60 CCMC4/MS8
 | 48 18 43 | 21 1 63 6 60 38 28 33 31
 62 49 4 15 57 54 7 12 62 4 57 7 25 39 30 36
 | 19 32---45---34---24---27---+42---37 11 53 16 50 48 18 43 21
 11 14 | 53 52 16 9 50 55 | 56 10 51 13 19 45 24 42
 | 38 35 28 29 33 40 | 31 26 27 37 32 34 64 2 59 5
 56---59---| -10--- 5---51---64---13 2 | 40 26 35 29 3 61 8 58
 25 22 39 44 30 17 36 47 17 47 22 44 54 12 49 15
 8 | 58 3 61 | 46 20 41 23 9 55 14 52
 41-----23-----46-----20

4/EC2

1----63 56----10 32----34 41----23
 | 48---+18 | 25---+39 | 49---+15 | 8---+58
 62--|- 4 | 11--|-53 | 35--|-29 | 22--|-44 |
 19----45 38----28 14----52 59---- 5
 60---- 6 13----51 37----27 20----46
 | 21---+43 | 36---+30 | 12---+54 | 61---+ 3
 7--|-57 | 50--|-16 | 26--|-40 | 47--|-17 |
 42----24 31----33 55---- 9 2----64

1-----63-----56-----10 SCMC4/MS8
 | 48 18 25 | 39 1 63 56 10 48 18 25 39
 62 32 4 34 11 41 53 23 62 4 11 53 19 45 38 28
 | 19 49---45---15---38---8---+28---58 60 6 13 51 21 43 36 30
 60 35 | 6 29 13 22 51 44 | 7 57 50 16 42 24 31 33
 | 21 14 43 52 36 59 | 30 5 32 34 41 23 49 15 8 58
 7---37---| -57---27---50---20---16 46 | 35 29 22 44 14 52 59 5
 42 12 24 54 31 61 33 3 37 27 20 46 12 54 61 3
 26 | 40 47 17 | 26 40 47 17 55 9 2 64
 55-----9-----2-----64

1-----63-----10-----56 CCMC4/MS8
 | 48 18 39 25 1 63 10 56 42 24 33 31
 62 49 4 15 53 58 11 8 62 4 53 11 21 43 30 36
 | 19 32---45---34---28---23---38---41 7 57 16 50 48 18 39 25
 7 14 | 57 52 16 5 50 59 | 60 6 51 13 19 45 28 38
 | 42 35 24 29 33 44 | 31 22 23 41 32 34 64 2 55 9
 60---55---| 6---9---51---64---13 2 | 44 22 35 29 3 61 12 54
 21 26 43 40 30 17 36 47 17 47 26 40 58 8 49 15
 12 | 54 3 61 | 46 20 37 27 5 59 14 52
 37-----27-----46-----20

5/EC2

1---63 62---4 48---18 19---45
 | 32---34 | 35---29 | 49---15 | 14---52
 60--|-6 | 7--|-57 | 21--|-43 | 42--|-24 |
 37---27 26---40 12---54 55---9
 56---10 11---53 25---39 38---28
 | 41---23 | 22---44 | 8---58 | 59---5
 13--|-51 | 50--|-16 | 36--|-30 | 31--|-33 |
 20---46 47---17 61---3 2---64

1-----63-----62-----4 SCMC4/MS8
 | 32 34 35 | 29 1 63 62 4 32 34 35 29
 60 48 6 18 7 19 57 45 60 6 7 57 37 27 26 40
 | 37 49---27---15---26---14---40---52 56 10 11 53 41 23 22 44
 56 21 | 10 43 11 42 53 24 | 13 51 50 16 20 46 47 17
 | 41 12 23 54 22 55 | 44 9 48 18 19 45 49 15 14 52
 13---25---| 51---39---50---38---16 28 | 21 43 42 24 12 54 55 9
 20 8 46 58 47 59 17 5 25 39 38 28 8 58 59 5
 36 | 30 31 33 | 36 30 31 33 61 3 2 64
 61-----3-----2-----64

1-----63-----4-----62 CCMC4/MS8
 | 32 34 29 | 35 1 63 4 62 20 46 17 47
 60 49 6 15 57 52 7 14 60 6 57 7 41 23 44 22
 | 37 48---27---18---40---45---26---19 13 51 16 50 32 34 29 35
 13 12 | 51 54 16 9 50 55 | 56 10 53 11 37 27 40 26
 | 20 21 46 43 17 24 | 47 42 45 19 48 18 64 2 61 3
 56---61---| 10---3---53---64---11 2 | 24 42 21 43 5 59 8 58
 41 36 23 30 44 33 22 31 33 31 36 30 52 14 49 15
 8 | 58 5 59 | 28 38 25 39 9 55 12 54
 25-----39-----28-----38

6/EC2

1---63 62---4 56---10 11---53
 | 32---34 | 35---29 | 41---23 | 22---44
 60--|-6 | 7--|-57 | 13--|-51 | 50--|-16 |
 37---27 26---40 20---46 47---17
 48---18 19---45 25---39 38---28
 | 49---15 | 14---52 | 8---58 | 59---5
 21--|-43 | 42--|-24 | 36--|-30 | 31--|-33 |
 12---54 55---9 61---3 2---64

1-----63-----62-----4 SCMC4/MS8
 | 32 34 35 | 29 1 63 62 4 32 34 35 29
 60 56 6 10 7 11 57 53 60 6 7 57 37 27 26 40
 | 37 41---27---23---26---22---40---44 48 18 19 45 49 15 14 52
 48 13 | 18 51 19 50 45 16 | 21 43 42 24 12 54 55 9
 | 49 20 15 46 14 47 | 52 17 56 10 11 53 41 23 22 44
 21---25---| 43---39---42---38---24 28 | 13 51 50 16 20 46 47 17
 12 8 54 58 55 59 9 5 25 39 38 28 8 58 59 5
 36 | 30 31 33 | 36 30 31 33 61 3 2 64
 61-----3-----2-----64

1-----63-----4-----62 CCMC4/MS8
 | 32 34 29 | 35 1 63 4 62 12 54 9 55
 60 41 6 23 57 44 7 22 60 6 57 7 49 15 52 14
 | 37 56---27---10---40---53---26---11 21 43 24 42 32 34 29 35
 21 20 | 43 46 24 17 42 47 | 48 18 45 19 37 27 40 26
 | 12 13 54 51 9 16 | 55 50 53 11 56 10 64 2 61 3
 48---61---|18---3---45---64---19 2 | 16 50 13 51 5 59 8 58
 49 36 15 30 52 33 14 31 33 31 36 30 44 22 41 23
 8 | 58 5 59 | 28 38 25 39 17 47 20 46
 25-----39-----28-----38

7/EC2

1---63 62---4 60---6 7---57
 | 32---34 | 35---29 | 37---27 | 26---40
 56--|-10 | 11--|-53 | 13--|-51 | 50--|-16 |
 41---23 22---44 20---46 47---17
 48---18 19---45 21---43 42---24
 | 49---15 | 14---52 | 12---54 | 55---9
 25--|-39 | 38--|-28 | 36--|-30 | 31--|-33 |
 8---58 59---5 61---3 2---64

1-----63-----62-----4 SCMC4/MS8
 | 32 34 35 | 29 1 63 62 4 32 34 35 29
 56 60 10 6 11 7 53 57 56 10 11 53 41 23 22 44
 | 41 37---23---27---22---26---44---40 48 18 19 45 49 15 14 52
 48 13 | 18 51 19 50 45 16 | 25 39 38 28 8 58 59 5
 | 49 20 15 46 14 47 | 52 17 60 6 7 57 37 27 26 40
 25---21---|39---43---38---42---28 24 | 13 51 50 16 20 46 47 17
 8 12 58 54 59 55 5 9 21 43 42 24 12 54 55 9
 36 | 30 31 33 | 36 30 31 33 61 3 2 64
 61-----3-----2-----64

1-----63-----4-----62 CCMC4/MS8
 | 32 34 29 | 35 1 63 4 62 8 58 5 59
 56 37 10 27 53 40 11 26 56 10 53 11 49 15 52 14
 | 41 60---23---6---44---57---22---7 25 39 28 38 32 34 29 35
 25 20 | 39 46 28 17 38 47 | 48 18 45 19 41 23 44 22
 | 8 13 58 51 5 16 | 59 50 57 7 60 6 64 2 61 3
 48---61---|18---3---45---64---19 2 | 16 50 13 51 9 55 12 54
 49 36 15 30 52 33 14 31 33 31 36 30 40 26 37 27
 12 | 54 9 55 | 24 42 21 43 17 47 20 46
 21-----43-----24-----42

8/EC2

1---63 60---6 48---18 21---43
 | 32---34 | 37---27 | 49---15 | 12---54
 62--|-4 | 7--|-57 | 19--|-45 | 42--|-24 |
 35---29 26---40 14---52 55---9
 56---10 13---51 25---39 36---30
 | 41---23 | 20---46 | 8---58 | 61---3
 11--|-53 | 50--|-16 | 38--|-28 | 31--|-33 |
 22---44 47---17 59---5 2---64

1-----63-----60-----6 SCMC4/MS8
 | 32 34 37 | 27 1 63 60 6 32 34 37 27
 62 48 4 18 7 21 57 43 62 4 7 57 35 29 26 40
 | 35 49---29---15---26---12---40---54 56 10 13 51 41 23 20 46
 56 19 | 10 45 13 42 51 24 | 11 53 50 16 22 44 47 17
 | 41 14 23 52 20 55 | 46 9 48 18 21 43 49 15 12 54
 11---25---|53---39---50---36---16 30 | 19 45 42 24 14 52 55 9
 22 8 44 58 47 61 17 3 25 39 36 30 8 58 61 3
 38 | 28 31 33 | 38 28 31 33 59 5 2 64
 59-----5-----2-----64

1-----63-----6-----60 CCMC4/MS8
 | 32 34 27 | 37 1 63 6 60 22 44 17 47
 62 49 4 15 57 54 7 12 62 4 57 7 41 23 46 20
 | 35 48-29-18-40-43-26-21 11 53 16 50 32 34 27 37
 11 14 | 53 52 16 9 50 55 | 56 10 51 13 35 29 40 26
 | 22 19 44 45 17 24 | 47 42 43 21 48 18 64 2 59 5
 56-59-10-5-51-64-13 2 | 24 42 19 45 3 61 8 58
 41 38 23 28 46 33 20 31 33 31 38 28 54 12 49 15
 8 | 58 3 61 | 30 36 25 39 9 55 14 52
 25-----39-----30-----36

9/EC2

1-----63 60-----6 56-----10 13-----51
 | 32-34 | 37-27 | 41-23 | 20-46
 62--4 | 7--57 | 11--53 | 50--16 |
 35-----29 26-----40 22-----44 47-----17
 48-----18 21-----43 25-----39 36-----30
 | 49-15 | 12-54 | 8-58 | 61-3 |
 19--45 | 42--24 | 38--28 | 31--33 |
 14-----52 55-----9 59-----5 2-----64

1-----63-----60-----6 SCMC4/MS8
 | 32 34 37 | 27 1 63 60 6 32 34 37 27
 62 56 4 10 7 13 57 51 62 4 7 57 35 29 26 40
 | 35 41-29-23-26-20-40-46 48 18 21 43 49 15 12 54
 48 11 | 18 53 21 50 43 16 | 19 45 42 24 14 52 55 9
 | 49 22 15 44 12 47 | 54 17 56 10 13 51 41 23 20 46
 19-25-45-39-42-36-24 30 | 11 53 50 16 22 44 47 17
 14 8 52 58 55 61 9 3 25 39 36 30 8 58 61 3
 38 | 28 31 33 | 38 28 31 33 59 5 2 64
 59-----5-----2-----64

1-----63-----6-----60 CCMC4/MS8
 | 32 34 27 | 37 1 63 6 60 14 52 9 55
 62 41 4 23 57 46 7 20 62 4 57 7 49 15 54 12
 | 35 56-29-10-40-51-26-13 19 45 24 42 32 34 27 37
 19 22 | 45 44 24 17 42 47 | 48 18 43 21 35 29 40 26
 | 14 11 52 53 9 16 | 55 50 51 13 56 10 64 2 59 5
 48-59-18-5-43-64-21 2 | 16 50 11 53 3 61 8 58
 49 38 15 28 54 33 12 31 33 31 38 28 46 20 41 23
 8 | 58 3 61 | 30 36 25 39 17 47 22 44
 25-----39-----30-----36

10/EC2

1-----63 56-----10 48-----18 25-----39
 | 32-34 | 41-23 | 49-15 | 8-58
 62--4 | 11--53 | 19--45 | 38--28 |
 35-----29 22-----44 14-----52 59-----5
 60-----6 13-----51 21-----43 36-----30
 | 37-27 | 20-46 | 12-54 | 61-3 |
 7--57 | 50--16 | 42--24 | 31--33 |
 26-----40 47-----17 55-----9 2-----64

1-----63-----56-----10 SCMC4/MS8
 | 32 34 41 | 23 1 63 56 10 32 34 41 23
 62 48 4 18 11 25 53 39 62 4 11 53 35 29 22 44
 | 35 49-29-15-22-8-44-58 60 6 13 51 37 27 20 46
 60 19 | 6 45 13 38 51 28 | 7 57 50 16 26 40 47 17
 | 37 14 27 52 20 59 | 46 5 48 18 25 39 49 15 8 58
 7-21-57-43-50-36-16 30 | 19 45 38 28 14 52 59 5
 26 12 40 54 47 61 17 3 21 43 36 30 12 54 61 3
 42 | 24 31 33 | 42 24 31 33 55 9 2 64
 55-----9-----2-----64

