

Part 3 : New Algebraic Studies of Magic Squares: **Kanji Setsuda**
 Chapter 4: New Algebraic Study of Magic Squares of Order 6
 Section 5: About 'Classical Composition' of Magic Squares 6²

#0. What is the 'Classical Composition'?

It has long been well known to us researchers how to make magic squares of odd orders such as of 3, 5, 7 and 9 by the 'Classical Compositions'. Many guide-books used to explain it as the wise and technical art passed down to us from the very old times.

I myself wrote an article about the one for the order 5 in the former chapter as usual.

However, I knew nothing about another old, similar ways of Classical Compositions: how to make magic squares of even orders such as 4, 6, 8 and so on. I had no idea that any old and wise people anywhere really knew about it in the distant past.

It is really fortunate Dr. Arthur Babayan, an Armenian intellectual was kind enough to give me such the copies of old precious pictures as shown below. As you see, each of them shows a sample solution of the magic squares of order 3 to 9. He said they were originally recorded in some old books and could be related to the three memorable names: Manuel Moschopoulos, Henri Comelius Agrippa, and Marsilio Ficino. Their original knowledge might go back to about 1300~1510, said Dr. A. Babayan.

4	9	2
3	5	7
8	1	6

4	14	15	1
9	7	6	12
5	11	10	8
16	2	3	13

11	24	7	20	3
4	12	25	8	16
17	5	13	21	9
10	18	1	14	22
23	6	19	2	15

6	32	3	34	35	1
7	11	27	28	8	30
19	14	16	15	23	24
18	20	22	21	17	13
25	29	10	9	26	12
36	5	33	4	2	31

22	47	16	41	10	35	4
5	23	48	17	42	11	29
30	6	24	49	18	36	12
13	31	7	25	43	19	37
38	14	32	1	26	44	20
21	39	8	33	2	27	45
46	15	40	9	34	3	28

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

37	78	29	70	21	62	19	54	5
6	38	79	30	71	22	63	14	46
47	7	39	80	31	72	23	55	15
16	48	8	40	81	32	64	24	56
57	17	49	9	41	73	33	65	25
26	58	18	50	1	42	74	34	66
67	27	59	10	51	2	43	75	35
36	68	19	60	11	52	3	44	76
77	28	69	20	61	12	53	4	45

These pictures only show some application results of the supposed method handed down to them from their predecessors. No one exactly knows who the first teachers were and what the original methods looked like. I think it might go back to the ancient Orient Civilization at most, since some classical Greek philosophers wrote that their knowledge of magic squares were taught mainly by the people from 'Eastern World'.

#1. Supposed Methods of Classical Composition

Let's study each of the sample pictures above precisely and imagine what kind of Classical Method of Composition was used exactly in each case.

I am sure all of them should have been told in such the style as how to transform the Basic Forms into their Object Squares.

* **Magic Square of Order 3:** I imagine it must be composed by this well-known method.

* Basic From *	Rotate it by 45 Degrees Clockwise	Make New Positions inside	Move 4 Numbers outside to inside	* Object * Magic Square 3
	1	1	1	
1 2 3	4 2	4 - [] - 2	4 - [9] - 2	4 9 2
4 5 6	7 5 3	7 - [] - 5 - [] - 3	7 - [3] - 5 - [7] - 3	3 5 7
7 8 9	8 6	8 - [] - 6	8 - [1] - 6	8 1 6
	9	9	9	
[Start]	[Step 1]	[Step 2]	[Step 3]	[Result]

* **Magic Square of Order 4:** I imagine it could be composed by such a method as this.

* Basic From *	Select 4 Numbers to be exchanged	Exchange 2 Pairs one by one	Exchange Next 2 Pairs one by one	* Object * Magic Square 4
4 3 2 1	4 [3][2] 1	4 [14][15] 1	4 14 15 1	4 14 15 1
8 7 6 5	8 7 6 5	[8] 7 6 [5]	[9] 7 6 [12]	9 7 6 12
12 11 10 9	12 11 10 9	[12] 11 10 [9]	[5] 11 10 [8]	5 11 10 8
16 15 14 13	16 [15][14] 13	16 [2][3] 13	16 2 3 13	16 2 3 13
[Start]	[Step 1]	[Step 2]	[Step 3]	[Result]

Eight numbers on the two primary diagonals must be kept unchanged. The other 8 numbers must be exchanged between complementary pairs situated in the symmetric positions with respect to the geometric center of the square.

As a result, we could have got a typical solution of Self-complementary MS44.

But, these forms may give you an impression of 'old style'. What makes them look old? It is because the number 1 always appears on the right top of each form.

In our modern style the number 1 should always come to the left top. They should look more normal when each form is written horizontally from left to right as below.

* Basic From * Revised	Select 4 Numbers to be exchanged	Exchange 2 Pairs one by one	Exchange Next 2 Pairs one by one	* Object * Magic Square 4
1 2 3 4	1 [2][3] 4	1 [15][14] 4	1 15 14 4	1 15 14 4
5 6 7 8	5 6 7 8	[5] 6 7 [8]	[12] 6 7 [9]	12 6 7 9
9 10 11 12	9 10 11 12	[9] 10 11 [12]	[8] 10 11 [5]	8 10 11 5
13 14 15 16	13 [14][15] 16	13 [3][2] 16	13 3 2 16	13 3 2 16
[Start]	[Step 1]	[Step 2]	[Step 3]	[Result]

This modern style of composition is just the same method with what I proposed in the Section 2, Chapter 1, Part 4. I think it is one of the best ways of composing the representative Model of our Self-complementary Magic Square 4x4 and its Prototype Squares and our 'Do-it-After-the-Model Transformation'.

How to keep many numbers unchanged of the Basic Form is the key-point of this method. Old people might have known this principle: 'The more, the better'.

* **Magic Square of Order 5:** It must be also composed by this well-known method.

* Basic From *	Rotate by 45 Degrees Clockwise	Make New Positions inside it
	1	1
	6 2	6 2
1 2 3 4 5	11 7 3	11-[]-7-[]-3
6 7 8 9 10	16 12 8 4	[]-12-[]-8-[] 4
11 12 13 14 15	21 17 13 9 5	17-[]-13-[]-9
16 17 18 19 20	22 18 14 10	[]-18-[]-14-[] 10
21 22 23 24 25	23 19 15	23-[]-19-[]-15
	24 20	24 20
	25	25
	[Step 1]	[Step 2]

<p>Move 6 numbers outside to inside</p> <pre> 1 6 2 11-[24]- 7-[20]- 3 16 []-12-[25]- 8-[] 4 21 17-[]-13-[]- 9 5 22 []-18-[1]-14-[] 10 23-[6]-19-[2]-15 24 20 25 -> [Step 3] </pre>	<p>Move another 6 outside to inside</p> <pre> 1 6 2 11 24 7 20 3 16 [4]-12 25 8-[16] 4 21 17-[5]-13-[21]- 9 5 22 [10]-18 1 14-[22] 10 23 6 19 2 15 24 20 25 -> [Step 4] </pre>	<p>* Object Goal *</p> <pre> 11 24 7 20 3 4 12 25 8 16 17 5 13 21 9 10 18 1 14 22 23 6 19 2 15 </pre> <p>-> [Magic Square 5x5]</p>
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* **Magic Square of Order 6:** How could they compose MS66 by any similar method? We now know that we can make neither 'Self-complementary' MS66 nor 'Pan-diagonal' MS66. That means we cannot use any method like 'Complementary Transformation' between every two symmetrical positions for the order 6. What else can we use? Can't we compose that by such a method as below? I want to propose you here about what I have just imagined for the 'Classical Composition' interpreting that old picture.

<p>* Basic Form *</p> <pre> 6 5 4 3 2 1 12 11 10 9 8 7 18 17 16 15 14 13 24 23 22 21 20 19 30 29 28 27 26 25 36 35 34 33 32 31 </pre> <p>-> [Step 1]</p>	<p>Select 8 Numbers inside to be exchanged</p> <pre> 6 5 4 3 2 1 12 11 [10] [9] 8 7 18 [17] 16 15 [14] 13 24 [23] 22 21 [20] 19 30 29 [28] [27] 26 25 36 35 34 33 32 31 </pre> <p>-> [Step 1]</p>	<p>Exchange Numbers 4 by 4 among the same Areas</p> <pre> 6 5 4 3 2 1 12 11 [27] [28] 8 7 18 [14] 16 15 [23] 13 24 [20] 22 21 [17] 19 30 29 [10] [9] 26 25 36 35 34 33 32 31 </pre> <p>-> [Step 2]</p>	<p>Select another 8 Numbers outside to be exchanged</p> <pre> 6 [5] 4 3 [2] 1 [12] 11 27 28 8 [7] 18 14 16 15 23 13 24 20 22 21 17 19 [30] 29 10 9 26 [25] 36 [35] 34 33 [32] 31 </pre> <p>-> [Step 3]</p>
<p>Exchange Numbers 4 by 4 among the same Areas</p> <pre> 6 [32] 4 3 [35] 1 [7] 11 27 28 8 [30] 18 14 16 15 23 13 24 20 22 21 17 19 [25] 29 10 9 26 [12] 36 [5] 34 33 [2] 31 </pre> <p>-> [Step 4]</p>	<p>Select Next 8 numbers outside to be exchanged</p> <pre> 6 32 [4] [3] 35 1 7 11 27 28 8 30 [18] 14 16 15 23 [13] [24] 20 22 21 17 [19] 25 29 10 9 26 12 36 5 [34] [33] 2 31 </pre> <p>-> [Step 5]</p>	<p>Exchange Numbers 4 by 4 among the same Areas</p> <pre> 6 32 [3] [34] 35 1 7 11 27 28 8 30 [19] 14 16 15 23 [24] [18] 20 22 21 17 [13] 25 29 10 9 26 12 36 5 [33] [4] 2 31 </pre> <p>-> [Step 6]</p>	<p>* Object Goal *</p> <pre> 6 32 3 34 35 1 7 11 27 28 8 30 19 14 16 15 23 24 18 20 22 21 17 13 25 29 10 9 26 12 36 5 33 4 2 31 </pre> <p>Standard Magic Square 6</p>

You must keep all of 12 numbers on the two primary diagonals unchanged.

You must take the other 24 numbers, collect every 4 in the symmetric positions and make 6 groups. Exchange their positions in their own area, step by step just as shown above. You must not apply any Complementary Transformation between each two then, since no one can make any Self-complementary Magic Square of order 6 at all.

You should know that every 4 numbers in the same group never go out of its own area and any other number never comes into this area from elsewhere.

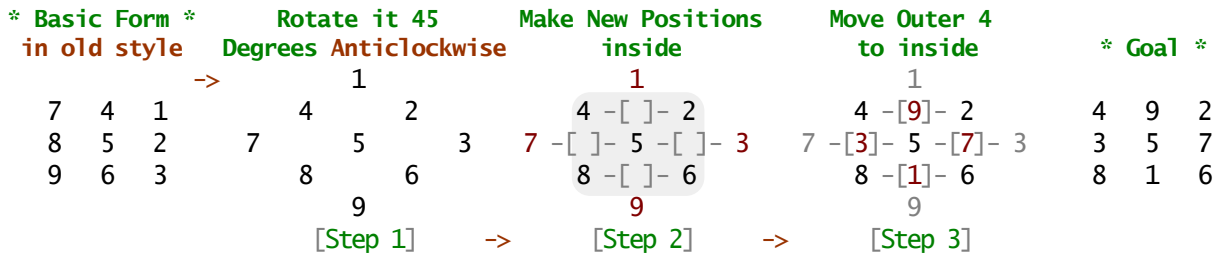
But, where each of the 4 numbers should go in its own area? It seems each number would move in its own style and where to go is not always determined in one way.

Why is each form presented in the old 'reverse' style with 1 on the right top? It is really curious. Number 1 should always be placed on the left top in our modern style.

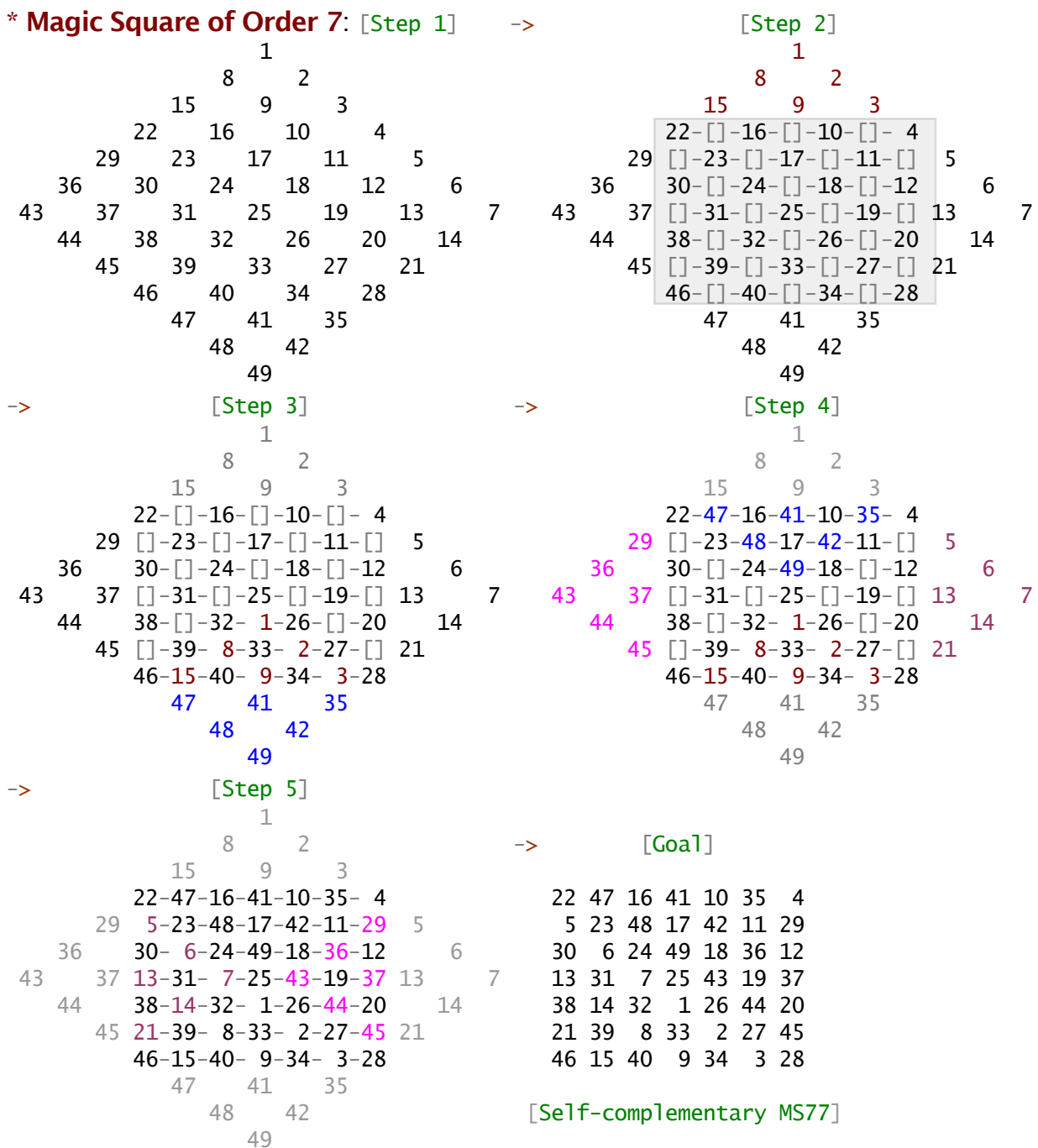
I imagine it might imply they have kept their memory of the first style of the classical method passed down from their old teachers. It might have been taught by the people who lived in East and had a cultural habit of writing everything from right to left.

How about the case of odd orders? It is now curious Basic Forms are written normally. Does it mean the Classical Methods of odd orders come from another culture?

No. Let me explain about another possibility. I cannot help imagining it this way.



Watch the step-diagrams above. People must have always started from the Step 1 diagram and they might not have been very conscious of the Basic Form. We may not deny that this method might have been taught also by the same Eastern wisdom.



The same kind of classical method should be used to make the Self-complementary

Magic Square of Order 7. The result above seems to tell everything.

#2. Advanced Study of 'Classical Composition' of Order 6

Let's study here precisely about the Classical Method of Composition of MS66.

To tell the truth, we have actually got hundreds of correct solutions for the object, just when we obey the supposed rules of composition I proposed above. We have not always got the only correct answer determined in one way. It is a problem, isn't it?

** Sample Solutions of MS66 Composed by our Supposed Classical Method **

1/	2/	3/	4/	...
1 35 34 3 32 6	1 35 34 3 32 6	1 35 34 3 32 6	1 35 34 3 32 6	
30 8 28 27 11 7	30 8 28 27 11 7	30 8 28 27 11 7	30 8 28 27 11 7	
24 23 15 16 14 19	24 17 15 16 20 19	19 23 15 16 14 24	19 17 15 16 20 24	
13 17 21 22 20 18	13 23 21 22 14 18	18 17 21 22 20 13	18 23 21 22 14 13	
12 26 9 10 29 25	12 26 9 10 29 25	12 26 9 10 29 25	12 26 9 10 29 25	
31 2 4 33 5 36	31 2 4 33 5 36	31 2 4 33 5 36	31 2 4 33 5 36	...

Do we have to make any stricter rules to get the fewer results? Do we have to make the strictest rules for the only answer? Or do we have to accept many results with our tolerant rules? Which one should we choose? But, I cannot decide it instantly now.

Let's have some experiments here for our MS66 making several variations of rules and let's find how many valid answers we could get under them, shall we?

Experiment 1:

- (1) We must keep all the 12 numbers on the two primary diagonals unchanged.
- (2) We do not make any restriction to the other 24 numbers of the square at first, but we only obey the first definitions to make the standard magic squares 6x6.

Let me show you these rules in such a style as the Basic Form and Basic Equations.

* Basic Form *	** Basic Equations: K=111 **
1 2 3 4 5 6	$n1+n2+n3+n4+n5+n6=K$(b1)
7 8 9 10 11 12	$n7+n8+n9+n10+n11+n12=K$(b2)
13 14 15 16 17 18	$n13+n14+n15+n16+n17+n18=K$(b3)
19 20 21 22 23 24	$n19+n20+n21+n22+n23+n24=K$(b4)
25 26 27 28 29 30	$n25+n26+n27+n28+n29+n30=K$(b5)
31 32 33 34 35 36	$n31+n32+n33+n34+n35+n36=K$(b6)
19 20 21 22 23 24	$n1+n7+n13+n19+n25+n31=K$(b7)
25 26 27 28 29 30	$n2+n8+n14+n20+n26+n32=K$(b8)
31 32 33 34 35 36	$n3+n9+n15+n21+n27+n33=K$(b9)
13 14 15 16 17 18	$n4+n10+n16+n22+n28+n34=K$... (b10)
7 8 9 10 11 12	$n5+n11+n17+n23+n29+n35=K$... (b11)
1 2 3 4 5 6	$n6+n12+n18+n24+n30+n36=K$... (b12)

$n1=1; n6=6; n8=8; n11=11; n15=15; n16=16;$
 $n21=21; n22=22; n26=26; n29=29; n31=31; n36=36; ...(#D2)$

I dictated a new program for this type and made my computer calculate to get the valid solutions. Let me show you my recent result below.

Special Type of MS66	1	-	-	-	-	6
with 2 Diagonals Preserved	-	8	-	-	11	-
as much as the Basic Equations	-	-	15	16	-	-
List of Standard Solutions	-	-	21	22	-	-
Calculated by Kanji Setsuda	-	26	-	-	29	-
on December 5, 2007	31	-	-	-	-	36

1/ 1 35 34 2 33 6 18 8 30 27 11 17 23 25 15 16 13 19 10 14 21 22 20 24 28 26 7 12 29 9 31 3 4 32 5 36	231702/ 1 34 35 2 33 6 25 8 24 30 11 13 20 23 15 16 19 18 27 17 21 22 14 10 7 26 12 9 29 28 31 3 4 32 5 36	395043/ 1 33 35 2 34 6 18 8 24 30 11 20 23 27 15 16 13 17 28 14 21 22 19 7 10 26 12 9 29 25 31 3 4 32 5 36	596406/ 1 32 35 3 34 6 25 8 27 30 11 10 24 23 15 16 19 14 18 20 21 22 13 17 12 26 9 7 29 28 31 2 4 33 5 36
760241/ 1 30 35 5 34 6 17 8 33 23 11 19 28 18 15 16 10 24 9 27 21 22 20 12 25 26 4 13 29 14 31 2 3 32 7 36	890629/ 1 28 35 7 34 6 13 8 32 24 11 23 33 20 15 16 10 17 19 27 21 22 18 4 14 26 5 12 29 25 31 2 3 30 9 36	1022085/ 1 27 35 9 33 6 32 8 25 17 11 18 10 28 15 16 19 23 30 20 21 22 14 4 7 26 12 13 29 24 31 2 3 34 5 36	1147358/ 1 25 35 10 34 6 23 8 28 27 11 14 24 33 15 16 18 5 19 17 21 22 12 20 13 26 9 4 29 30 31 2 3 32 7 36
1239459/ 1 24 35 12 33 6 25 8 30 23 11 14 10 32 15 16 20 18 27 19 21 22 13 9 17 26 7 4 29 28 31 2 3 34 5 36	1326193/ 1 23 35 12 34 6 19 8 32 17 11 24 7 27 15 16 18 28 20 25 21 22 10 13 33 26 5 14 29 4 31 2 3 30 9 36	1423167/ 1 20 35 17 32 6 28 8 33 12 11 19 14 30 15 16 27 9 13 25 21 22 7 23 24 26 4 10 29 18 31 2 3 34 5 36	1485741/ 1 19 35 17 33 6 20 8 30 28 11 14 34 32 15 16 9 5 13 24 21 22 4 27 12 26 3 18 29 23 31 2 7 10 25 36
1553356/ 1 18 35 17 34 6 30 8 23 20 11 19 9 33 15 16 25 13 12 24 21 22 5 27 28 26 14 4 29 10 31 2 3 32 7 36	1615628/ 1 17 35 18 34 6 10 8 30 24 11 28 23 33 15 16 5 19 14 25 21 22 20 9 32 26 7 4 29 13 31 2 3 27 12 36	1683760/ 1 14 35 23 32 6 24 8 33 7 11 28 18 27 15 16 25 10 17 34 21 22 5 12 20 26 4 13 29 19 31 2 3 30 9 36	1727108/ 1 13 35 23 33 6 28 8 27 12 11 25 20 32 15 16 19 9 7 30 21 22 14 17 24 26 10 4 29 18 31 2 3 34 5 36
1764449/ 1 12 35 23 34 6 27 8 28 20 11 17 24 30 15 16 19 7 18 33 21 22 4 13 10 26 9 5 29 32 31 2 3 25 14 36	1810378/ 1 10 35 25 34 6 24 8 28 23 11 17 7 32 15 16 14 27 18 33 21 22 4 13 30 26 9 5 29 12 31 2 3 20 19 36	1838732/ 1 9 35 27 33 6 28 8 30 10 11 24 12 32 15 16 13 23 25 34 21 22 5 4 14 26 7 17 29 18 31 2 3 19 20 36	1858763/ 1 7 35 28 34 6 23 8 25 14 11 30 12 33 15 16 18 17 24 32 21 22 9 3 20 26 13 4 29 19 31 5 2 27 10 36
1878157/ 1 5 35 30 34 6 27 8 25 17 11 23 20 32 15 16 9 19 4 33 21 22 18 13 28 26 12 2 29 14 31 7 3 24 10 36	1894688/ 1 4 35 32 33 6 28 8 20 17 11 27 25 30 15 16 12 13 3 34 21 22 7 24 23 26 18 10 29 5 31 9 2 14 19 36	1898122/ 1 3 35 32 34 6 30 8 18 17 11 27 25 28 15 16 4 23 14 33 21 22 9 12 10 26 20 19 29 7 31 13 2 5 24 36	1902241/ 1 2 35 33 34 6 27 8 23 17 11 25 24 32 15 16 20 4 19 30 21 22 7 12 9 26 14 5 29 28 31 13 3 18 10 36

[Count = 1910072] OK!

We could get more than one million solutions. They are too many for us to get the representative ones. We now know we want to have something rare and more special.

Experiment 2:

(1) We must keep all the 12 numbers on the two primary diagonals unchanged.

(2) We make some restriction to the other 24 numbers of the basic form:

We make two groups: 16 numbers in the edge areas and 8 numbers inside.

We allow each number to move freely in its own area. But we do not allow any one to go out of the same area, nor to come into the other area.

(3) We must obey the basic definitions to make the standard magic squares 6x6.

Let me show you these rules in such a style as the Basic Form and Basic Equations.

```

* Basic Form *
-----
| 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|
-----
** Basic Equations: K=111 **
n1+n2+n3+n4+n5+n6=K      ....(b1)
n7+n8+n9+n10+n11+n12=K   ....(b2)
n13+n14+n15+n16+n17+n18=K ....(b3)
n19+n20+n21+n22+n23+n24=K ....(b4)
n25+n26+n27+n28+n29+n30=K ....(b5)
n31+n32+n33+n34+n35+n36=K ....(b6)
n1+n7+n13+n19+n25+n31=K   ....(b7)
n2+n8+n14+n20+n26+n32=K   ....(b8)
n3+n9+n15+n21+n27+n33=K   ....(b9)
n4+n10+n16+n22+n28+n34=K  ... (b10)
n5+n11+n17+n23+n29+n35=K  ... (b11)
n6+n12+n18+n24+n30+n36=K  ... (b12)

n1=1; n6=6; n8=8; n11=11; n15=15; n16=16;
n21=21; n22=22; n26=26; n29=29; n31=31; n36=36;          ...(#D2)
{n2,n3,n4,n5,n7,n12,n13,n18,n19,n24,n25,n30,n32,n33,n34,n35}
={2,3,4,5,7,12,13,18,19,24,25,30,32,33,34,35}          ...(#G1)
{n9,n10,n14,n17,n20,n23,n27,n28}={9,10,14,17,20,23,27,28,24} ...(#G2)

```

I dictated an appropriate program for this type and made my computer calculate to get the valid solutions. We had a reasonable count of valid solutions for our object. Let me show you my newest result in the next list below.

```

Special Type of MS66 with      1  2  3  4  5  6      1 35 34  3 32  6
2 Diagonals and 2 Groups of   7  8  9 10 11 12   30 8 28 27 11 7
Variables and Data Preserved 13 14 15 16 17 18   24 23 15 16 14 19
List of Standard Solutions    19 20 21 22 23 24   13 17 21 22 20 18
Calculated by Kanji Setsuda   25 26 27 28 29 30   12 26  9 10 29 25
on December 27, 2007         31 32 33 34 35 36   31  2  4 33  5 36

      1/              2/              3/              4/
1 35 34  3 32  6   1 35 34  3 32  6   1 35 34  3 32  6   1 35 34  3 32  6
30 8 28 27 11 7   30 8 28 27 11 7   30 8 28 27 11 7   30 8 28 27 11 7
24 23 15 16 14 19 24 17 15 16 20 19   19 23 15 16 14 24   19 17 15 16 20 24
13 17 21 22 20 18 13 23 21 22 14 18   18 17 21 22 20 13   18 23 21 22 14 13
12 26  9 10 29 25 12 26  9 10 29 25   12 26  9 10 29 25   12 26  9 10 29 25
31  2  4 33  5 36   31  2  4 33  5 36   31  2  4 33  5 36   31  2  4 33  5 36

      5/              6/              7/              8/
1 35 34  3 32  6   1 35 34  3 32  6   1 35 34  3 32  6   1 35 34  3 32  6
12 8 28 27 11 25 12 8 28 27 11 25   12 8 28 27 11 25   12 8 28 27 11 25
24 23 15 16 14 19 24 17 15 16 20 19   19 23 15 16 14 24   19 17 15 16 20 24
13 17 21 22 20 18 13 23 21 22 14 18   18 17 21 22 20 13   18 23 21 22 14 13
30 26  9 10 29  7 30 26  9 10 29  7   30 26  9 10 29  7   30 26  9 10 29  7
31  2  4 33  5 36   31  2  4 33  5 36   31  2  4 33  5 36   31  2  4 33  5 36

      9/              11/             13/             15/
1 35 34  3 32  6   1 35 34  3 32  6   1 35 34  3 32  6   1 35 34  3 32  6
30 8 27 28 11  7   30 8 27 28 11  7   12 8 27 28 11 25   12 8 27 28 11 25
24 23 15 16 14 19 19 23 15 16 14 24   24 23 15 16 14 19   19 23 15 16 14 24
13 17 21 22 20 18 18 17 21 22 20 13   13 17 21 22 20 18   18 17 21 22 20 13
12 26 10  9 29 25 12 26 10  9 29 25   30 26 10  9 29  7   30 26 10  9 29  7
31  2  4 33  5 36   31  2  4 33  5 36   31  2  4 33  5 36   31  2  4 33  5 36

      17/             21/             25/             29/
1 35 34 33  2  6   1 35 34 33  2  6   1 35 34 33  2  6   1 35 34 33  2  6
30 8 28  9 11 25   25 8 28  9 11 30   30 8 10 27 11 25   25 8 10 27 11 30
24 23 15 16 20 13 24 23 15 16 20 13   24 23 15 16 20 13   24 23 15 16 20 13
18 14 21 22 17 19 18 14 21 22 17 19   18 14 21 22 17 19   18 14 21 22 17 19
 7 26 10 27 29 12 12 26 10 27 29  7   7 26 28  9 29 12   12 26 28  9 29  7
31  5  3  4 32 36   31  5  3  4 32 36   31  5  3  4 32 36   31  5  3  4 32 36

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33/ 1 35 34 33 2 6 19 8 27 14 11 32 25 20 15 16 28 7 30 9 21 22 17 12 5 26 10 23 29 18 31 13 4 3 24 36	34/ 1 35 34 33 2 6 19 8 14 27 11 32 25 20 15 16 28 7 30 9 21 22 17 12 5 26 23 10 29 18 31 13 4 3 24 36	35/ 1 35 33 24 12 6 3 8 27 28 11 34 25 17 15 16 20 18 32 23 21 22 9 4 19 26 10 14 29 13 31 2 5 7 30 36	36/ 1 35 33 34 2 6 30 8 28 9 11 25 24 23 15 16 20 13 18 14 21 22 17 19 7 26 10 27 29 12 31 5 4 3 32 36
44/ 1 35 33 34 2 6 30 8 10 27 11 25 24 23 15 16 20 13 18 14 21 22 17 19 7 26 28 9 29 12 31 5 4 3 32 36	52/ 1 35 32 4 33 6 25 8 10 27 11 30 34 20 15 16 14 12 18 9 21 22 17 24 2 26 28 23 29 3 31 13 5 19 7 36	53/ 1 35 32 7 30 6 33 8 28 27 11 4 3 23 15 16 20 34 24 17 21 22 9 18 19 26 10 14 29 13 31 2 5 25 12 36	55/ 1 35 32 13 24 6 33 8 27 20 11 12 25 23 15 16 28 4 18 17 21 22 14 19 3 26 9 10 29 34 31 2 7 30 5 36
57/ 1 35 32 13 24 6 33 8 27 20 11 12 25 23 15 16 28 4 18 14 21 22 17 19 3 26 9 10 29 34 31 5 7 30 2 36	59/ 1 35 32 25 12 6 33 8 28 27 11 4 3 23 15 16 20 34 24 17 21 22 9 18 19 26 10 14 29 13 31 2 5 7 30 36	61/ 1 35 32 33 4 6 18 8 27 17 11 30 34 23 15 16 20 3 2 14 21 22 28 24 25 26 9 10 29 12 31 5 7 13 19 36	72/ 1 35 25 32 12 6 34 8 20 14 11 24 33 28 15 16 17 2 5 10 21 22 23 30 7 26 27 9 29 13 31 4 3 18 19 36
76/ 1 35 25 32 12 6 33 8 28 27 11 4 13 10 15 16 23 34 30 14 21 22 17 7 3 26 20 9 29 24 31 18 2 5 19 36	78/ 1 35 24 13 32 6 30 8 23 14 11 25 33 27 15 16 17 3 4 10 21 22 20 34 12 26 9 28 29 7 31 5 19 18 2 36	86/ 1 35 24 33 12 6 25 8 28 9 11 30 34 23 15 16 10 13 18 14 21 22 17 19 2 26 20 27 29 7 31 5 3 4 32 36	89/ 1 35 19 18 32 6 30 8 23 14 11 25 33 27 15 16 17 3 4 10 21 22 20 34 12 26 9 28 29 7 31 5 24 13 2 36
97/ 1 35 19 32 18 6 7 8 27 28 11 30 13 14 15 16 20 33 34 23 21 22 9 2 25 26 17 10 29 4 31 5 12 3 24 36	99/ 1 35 18 19 32 6 30 8 27 10 11 25 34 28 15 16 14 4 3 9 21 22 23 33 12 26 17 20 29 7 31 5 13 24 2 36	107/ 1 35 13 24 32 6 30 8 27 10 11 25 34 28 15 16 14 4 3 9 21 22 23 33 12 26 17 20 29 7 31 5 18 19 2 36	115/ 1 35 12 32 25 6 7 8 28 27 11 30 33 14 15 16 20 13 34 9 21 22 23 2 5 26 17 10 29 24 31 19 18 4 3 36
116/ 1 35 12 33 24 6 34 8 27 28 11 3 7 23 15 16 20 30 13 14 21 22 9 32 25 26 17 10 29 4 31 5 19 2 18 36	119/ 1 35 7 30 32 6 18 8 27 28 11 19 3 20 15 16 23 34 33 9 21 22 14 12 25 26 17 10 29 4 31 13 24 5 2 36	121/ 1 35 7 32 30 6 19 8 27 28 11 18 33 14 15 16 20 13 2 23 21 22 9 34 25 26 17 10 29 4 31 5 24 3 12 36	122/ 1 35 4 33 32 6 30 8 28 27 11 7 24 23 15 16 14 19 13 17 21 22 20 18 12 26 9 10 29 25 31 2 34 3 5 36
143/ 1 34 33 2 35 6 25 8 28 27 11 12 30 23 15 16 9 18 5 17 21 22 14 32 19 26 10 20 29 7 31 3 4 24 13 36	153/ 1 34 32 5 33 6 35 8 27 28 11 2 19 23 15 16 14 24 13 17 21 22 20 18 12 26 9 10 29 25 31 3 7 30 4 36	189/ 1 34 24 13 33 6 35 8 10 28 11 19 30 23 15 16 20 7 12 17 21 22 14 25 2 26 9 27 29 18 31 3 32 5 4 36	196/ 1 34 18 19 33 6 32 8 27 9 11 24 30 23 15 16 20 7 12 17 21 22 14 25 5 26 28 10 29 13 31 3 2 35 4 36
201/ 1 34 13 33 24 6 30 8 27 28 11 7 12 10 15 16 23 35 32 14 21 22 20 2 5 26 17 9 29 25 31 19 18 3 4 36	203/ 1 34 7 30 33 6 35 8 27 28 11 2 19 23 15 16 14 24 13 17 21 22 20 18 12 26 9 10 29 25 31 3 32 5 4 36	232/ 1 34 2 35 33 6 32 8 27 9 11 24 30 23 15 16 20 7 12 17 21 22 14 25 5 26 28 10 29 13 31 3 18 19 4 36	236/ 1 33 35 12 24 6 18 8 28 14 11 32 34 10 15 16 23 13 2 27 21 22 20 19 25 26 9 17 29 5 31 7 3 30 4 36

250/ 1 33 34 2 35 6 25 8 28 27 11 12 30 23 15 16 9 18 5 17 21 22 14 32 19 26 10 20 29 7 31 4 3 24 13 36	275/ 1 33 32 4 35 6 25 8 10 27 11 30 34 20 15 16 14 12 18 17 21 22 9 24 2 26 28 23 29 3 31 7 5 19 13 36	317/ 1 33 30 34 7 6 32 8 14 27 11 19 18 17 15 16 20 25 24 23 21 22 9 12 5 26 28 10 29 13 31 4 3 2 35 36	318/ 1 33 24 13 34 6 35 8 10 28 11 19 30 23 15 16 20 7 12 17 21 22 14 25 2 26 9 27 29 18 31 4 32 5 3 36
326/ 1 33 18 19 34 6 32 8 27 9 11 24 30 23 15 16 20 7 12 17 21 22 14 25 5 26 28 10 29 13 31 4 2 35 3 36	335/ 1 33 13 24 34 6 19 8 10 28 11 35 18 14 15 16 23 25 30 27 21 22 9 2 12 26 20 17 29 7 31 3 32 4 5 36	337/ 1 33 12 35 24 6 25 8 23 10 11 34 32 17 15 16 28 3 4 20 21 22 14 30 18 26 27 9 29 2 31 7 13 19 5 36	338/ 1 33 7 30 34 6 35 8 27 28 11 2 19 23 15 16 14 24 13 17 21 22 20 18 12 26 9 10 29 25 31 4 32 5 3 36
367/ 1 33 2 35 34 6 32 8 27 9 11 24 30 23 15 16 20 7 12 17 21 22 14 25 5 26 28 10 29 13 31 4 18 19 3 36	371/ 1 32 35 7 30 6 33 8 28 27 11 4 3 23 15 16 20 34 24 17 21 22 9 18 19 26 10 14 29 13 31 5 2 25 12 36	382/ 1 32 34 3 35 6 30 8 28 27 11 7 24 23 15 16 14 19 13 20 21 22 17 18 12 26 9 10 29 25 31 2 4 33 5 36	472/ 1 32 33 5 34 6 30 8 20 17 11 25 35 28 15 16 10 7 12 14 21 22 23 19 2 26 9 27 29 18 31 3 13 24 4 36
502/ 1 32 24 35 13 6 33 8 9 20 11 30 34 17 15 16 27 2 5 10 21 22 28 25 7 26 23 14 29 12 31 18 19 4 3 36	503/ 1 32 18 24 30 6 33 8 14 20 11 25 35 23 15 16 10 12 4 17 21 22 28 19 7 26 9 27 29 13 31 5 34 2 3 36	505/ 1 32 7 30 35 6 18 8 27 28 11 19 3 23 15 16 20 34 33 9 21 22 14 12 25 26 17 10 29 4 31 13 24 5 2 36	507/ 1 32 5 33 34 6 7 8 28 27 11 30 19 23 15 16 14 24 35 20 21 22 10 3 18 26 17 9 29 12 31 2 25 4 13 36
545/ 1 30 35 32 7 6 24 8 28 27 11 13 34 20 15 16 14 12 3 23 21 22 17 25 18 26 10 9 29 19 31 4 2 5 33 36	608/ 1 25 35 32 12 6 33 8 28 27 11 4 30 20 15 16 23 7 13 14 21 22 17 24 3 26 10 9 29 34 31 18 2 5 19 36	680/ 1 24 34 33 13 6 30 8 20 10 11 32 25 28 15 16 9 18 19 23 21 22 14 12 5 26 17 27 29 7 31 2 4 3 35 36	701/ 1 19 35 18 32 6 33 8 27 20 11 12 5 28 15 16 23 24 34 17 21 22 14 3 7 26 9 10 29 30 31 13 4 25 2 36
710/ 1 18 35 32 19 6 33 8 28 27 11 4 30 20 15 16 23 7 13 14 21 22 17 24 3 26 10 9 29 34 31 25 2 5 12 36	779/ 1 13 35 24 32 6 18 8 28 27 11 19 3 20 15 16 23 34 33 14 21 22 9 12 25 26 10 17 29 4 31 30 2 5 7 36	842/ 1 12 35 32 25 6 24 8 28 27 11 13 33 17 15 16 23 7 4 14 21 22 20 30 18 26 10 9 29 19 31 34 2 5 3 36	857/ 1 7 35 30 32 6 33 8 27 20 11 12 24 28 15 16 23 5 19 17 21 22 14 18 3 26 9 10 29 34 31 25 4 13 2 36
892/ 1 5 35 34 30 6 33 8 10 17 11 32 25 20 15 16 23 12 19 28 21 22 14 7 2 26 27 9 29 18 31 24 3 13 4 36	927/ 1 4 35 32 33 6 24 8 28 27 11 13 34 20 15 16 14 12 3 23 21 22 17 25 18 26 10 9 29 19 31 30 2 5 7 36	939/ 1 2 35 33 34 6 30 8 27 17 11 18 25 28 15 16 20 7 19 23 21 22 14 12 5 26 9 10 29 32 31 24 4 13 3 36	

[Count = 1020] OK!

Experiment 3:

- (1) We must keep all the 12 numbers on the two primary diagonals unchanged.
- (2) We make some more restrictions to the other 24 numbers of the basic form:
We make 6 groups: Each group has 4 numbers just as in the definition list below.
We allow each number to move freely in its own area. But we do not allow any one to go out of the same area, nor to come into the other areas.
- (3) We must obey the basic definitions to make the standard magic squares 6x6.

1/Basic

```

-----
| 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|
-----

```

**** Basic Equations: K=111 ****

```

n1+n2+n3+n4+n5+n6=K      ....(b1)
n7+n8+n9+n10+n11+n12=K   ....(b2)
n13+n14+n15+n16+n17+n18=K ....(b3)
n19+n20+n21+n22+n23+n24=K ....(b4)
n25+n26+n27+n28+n29+n30=K ....(b5)
n31+n32+n33+n34+n35+n36=K ....(b6)
n1+n7+n13+n19+n25+n31=K   ....(b7)
n2+n8+n14+n20+n26+n32=K   ....(b8)
n3+n9+n15+n21+n27+n33=K   ....(b9)
n4+n10+n16+n22+n28+n34=K  ... (b10)
n5+n11+n17+n23+n29+n35=K  ... (b11)
n6+n12+n18+n24+n30+n36=K  ... (b12)

```

2/Objective

```

-----
| 1|35|34| 3|32| 6|
|---+---+---+---+---+
|30| 8|28|27|11| 7|
|---+---+---+---+---+
|24|23|15|16|14|19|
|---+---+---+---+---+
|13|17|21|22|20|18|
|---+---+---+---+---+
|12|26| 9|10|29|25|
|---+---+---+---+---+
|31| 2| 4|33| 5|36|
-----

```

n1=1;n6=6;n8=8;n11=11;n15=15;n16=16;n21=21;n22=22;n26=26;n29=29;n31=31;n36=36;

G1:{n2,n5,n32,n35}={2,5,32,35};

G2:{n3,n4,n33,n34}={3,4,33,34};

G3:{n7,n12,n25,n30}={7,12,25,30};

G4:{n13,n18,n19,n24}={13,18,19,24};

G5:{n9,n10,n27,n28}={9,10,27,28};

G6:{n14,n17,n20,n23}={14,17,20,23}; ... (p2d6g)

I dictated a 'C' program as follows. Next I will show you my recent result.

```

/**/
/** Special Type of Magic Squares of Order 6 **/
/** Preserving 2 Diagonals of the Basic Form **/
/** 'MS66PT2D.c' Built by Kanji Setsuda **/
/** on Dec.27, 2007 on MacOSX & Xcode 2 **/
/**/
#include <stdio.h>
/* Global Variables */
short int cnt, cnt2, cnt3;
short LSM;
short nm[37], uflg[37];
short g1nm[5], g2nm[5], g3nm[5], g4nm[5], g5nm[5], g6nm[5];
short anm[5][37];
/* Sub-Routines */
void stp01(void);
void stp08(void), stp09(void);
void stp10(void), stp11(void), stp12(void);
void stp13(void), stp14(void), stp15(void);
void stp16(void), stp17(void), stp18(void);
void stp19(void), stp20(void), stp21(void);
void stp22(void), stp23(void), stp24(void);
void stp25(void), stp26(void), stp27(void);
void stp28(void), stp29(void), stp30(void);
void stp31(void);
void ansprint(void);
void pr4ans(short x), pr2ans(void);
/**/
/* Main Program for Research */
int main(){
short n;
printf("\n");
printf("Special Type of MS66 Preserving      1  2  3  4  5  6      1 35 34  3 32  6\n");
printf(" 2 Diagonals and 6 Groups of          7  8  9 10 11 12    30  8 28 27 11  7\n");
printf("Variables as much as the Basic        13 14 15 16 17 18    24 23 15 16 14 19\n");
printf("* List of Standard Solutions *      19 20 21 22 23 24    13 17 21 22 20 18\n");
printf("  Calculated by Kanji Setsuda         25 26 27 28 29 30    12 26  9 10 29 25\n");
printf("    on December 27, 2007              31 32 33 34 35 36    31  2  4 33  5 36\n");
LSM=111; cnt=0; cnt3=0;

```

```

    for(n=0;n<37;n++){nm[n]=0; uflg[n]=0;}
/* Exchangeable Groups */
g1nm[0]=2; g1nm[1]=5; g1nm[2]=32; g1nm[3]=35;
g2nm[0]=3; g2nm[1]=4; g2nm[2]=33; g2nm[3]=34;
g3nm[0]=7; g3nm[1]=12; g3nm[2]=25; g3nm[3]=30;
g4nm[0]=13; g4nm[1]=18; g4nm[2]=19; g4nm[3]=24;
g5nm[0]=9; g5nm[1]=10; g5nm[2]=27; g5nm[3]=28;
g6nm[0]=14; g6nm[1]=17; g6nm[2]=20; g6nm[3]=23;
/* Begin the Calculations */
stp01();
if(cnt3>0){pr4ans(cnt3);}
printf("\n [Count = %d] OK!\n",cnt);
return 0;
}
/**/
/* Begin the Calculations */
/* Copy the Original Data of 2 Diagonals */
void stp01(){
nm[1]=1; uflg[1]=1; nm[6]=6; uflg[6]=1; nm[8]=8; uflg[8]=1;
nm[11]=11; uflg[11]=1; nm[15]=15; uflg[15]=1; nm[16]=16; uflg[16]=1;
nm[21]=21; uflg[21]=1; nm[22]=22; uflg[22]=1; nm[26]=26; uflg[26]=1;
nm[29]=29; uflg[29]=1; nm[31]=31; uflg[31]=1; nm[36]=36; uflg[36]=1;
stp08();
}
/* Search Level 2: */
/* Set n2 */
void stp08(){
short a,n;
for(n=3;n>=0;n--){a=g1nm[n];
if(uflg[a]==0){
nm[2]=a; uflg[a]=1;
stp09();
uflg[a]=0; nm[2]=0;}
}
}
/* Set n5 */
void stp09(){
short a,n;
for(n=3;n>=0;n--){a=g1nm[n];
if(uflg[a]==0){
nm[5]=a; uflg[a]=1;
stp10();
uflg[a]=0; nm[5]=0;}
}
}
/* Set n3 */
void stp10(){
short a,n;
for(n=3;n>=0;n--){a=g2nm[n];
if(uflg[a]==0){
nm[3]=a; uflg[a]=1;
stp11();
uflg[a]=0; nm[3]=0;}
}
}
/* Set n4=111-n1-n2-n3-n5-n6 */
void stp11(){
short a,n;
for(n=0;n<4;n++){a=g2nm[n];
if(uflg[a]==0){

```

```

        if(nm[1]+nm[2]+nm[3]+a+nm[5]+nm[6]==LSM){
            nm[4]=a; uflg[a]=1;
            stp12();
            uflg[a]=0; nm[4]=0;}}
    }
}
/* Set n32 */
void stp12(){
    short a,n;
    for(n=0;n<4;n++){a=g1nm[n];
        if(uflg[a]==0){
            nm[32]=a; uflg[a]=1;
            stp13();
            uflg[a]=0; nm[32]=0;}}
    }
}
/* Set n35 */
void stp13(){
    short a,n;
    for(n=0;n<4;n++){a=g1nm[n];
        if(uflg[a]==0){
            nm[35]=a; uflg[a]=1;
            stp14();
            uflg[a]=0; nm[35]=0;}}
    }
}
/* Set n33 */
void stp14(){
    short a,n;
    for(n=0;n<4;n++){a=g2nm[n];
        if(uflg[a]==0){
            nm[33]=a; uflg[a]=1;
            stp15();
            uflg[a]=0; nm[33]=0;}}
    }
}
/* Set n34=111-n31-n32-n33-n35-n36 */
void stp15(){
    short a,n;
    for(n=3;n>=0;n--){a=g2nm[n];
        if(uflg[a]==0){
            if(nm[31]+nm[32]+nm[33]+a+nm[35]+nm[36]==LSM){
                nm[34]=a; uflg[a]=1;
                stp16();
                uflg[a]=0; nm[34]=0;}}
    }
}
/* Search Level 3: */
/* Set n9 */
void stp16(){
    short a,n;
    for(n=3;n>=0;n--){a=g5nm[n];
        if(uflg[a]==0){
            nm[9]=a; uflg[a]=1;
            stp17();
            uflg[a]=0; nm[9]=0;}}
    }
}
/* Set n27=111-n3-n9-n15-n21-n33 */
void stp17(){

```

```

short a,n;
for(n=0;n<4;n++){a=g5nm[n];
  if(uflg[a]==0){
    if(nm[3]+nm[9]+nm[15]+nm[21]+a+nm[33]==LSM){
      nm[27]=a; uflg[a]=1;
      stp18();
      uflg[a]=0; nm[27]=0;}}
}
}
/* Set n10 */
void stp18(){
  short a,n;
  for(n=3;n>=0;n--){a=g5nm[n];
    if(uflg[a]==0){
      nm[10]=a; uflg[a]=1;
      stp19();
      uflg[a]=0; nm[10]=0;}
  }
}
/* Set n28=111-n4-n10-n16-n22-n34 */
void stp19(){
  short a,n;
  for(n=0;n<4;n++){a=g5nm[n];
    if(uflg[a]==0){
      if(nm[4]+nm[10]+nm[16]+nm[22]+a+nm[34]==LSM){
        nm[28]=a; uflg[a]=1;
        stp20();
        uflg[a]=0; nm[28]=0;}}
  }
}
/* Search Level 4: */
/* Set n7 */
void stp20(){
  short a,n;
  for(n=3;n>=0;n--){a=g3nm[n];
    if(uflg[a]==0){
      nm[7]=a; uflg[a]=1;
      stp21();
      uflg[a]=0; nm[7]=0;}
  }
}
/* Set n12=111-n7-n8-n9-n10-n11 */
void stp21(){
  short a,n;
  for(n=0;n<4;n++){a=g3nm[n];
    if(uflg[a]==0){
      if(nm[7]+nm[8]+nm[9]+nm[10]+nm[11]+a==LSM){
        nm[12]=a; uflg[a]=1;
        stp22();
        uflg[a]=0; nm[12]=0;}}
  }
}
/* Set n25 */
void stp22(){
  short a,n;
  for(n=0;n<4;n++){a=g3nm[n];
    if(uflg[a]==0){
      nm[25]=a; uflg[a]=1;
      stp23();
      uflg[a]=0; nm[25]=0;}
  }
}

```

```

}
}
/* Set n30=111-n25-n26-n27-n28-n29 */
void stp23(){
short a,n;
for(n=3;n>=0;n--){a=g3nm[n];
if(uflg[a]==0){
if(nm[25]+nm[26]+nm[27]+nm[28]+nm[29]+a==LSM){
nm[30]=a; uflg[a]=1;
stp24();
uflg[a]=0; nm[30]=0;}}
}
}
/* Search Level 5: */
/* Set n13 */
void stp24(){
short a,n;
for(n=3;n>=0;n--){a=g4nm[n];
if(uflg[a]==0){
nm[13]=a; uflg[a]=1;
stp25();
uflg[a]=0; nm[13]=0;}
}
}
/* Set n19=111-n1-n7-n13-n25-n31 */
void stp25(){
short a,n;
for(n=0;n<4;n++){a=g4nm[n];
if(uflg[a]==0){
if(nm[1]+nm[7]+nm[13]+a+nm[25]+nm[31]==LSM){
nm[19]=a; uflg[a]=1;
stp26();
uflg[a]=0; nm[19]=0;}}
}
}
/* Set n18 */
void stp26(){
short a,n;
for(n=3;n>=0;n--){a=g4nm[n];
if(uflg[a]==0){
nm[18]=a; uflg[a]=1;
stp27();
uflg[a]=0; nm[18]=0;}
}
}
/* Set n24=111-n6-n12-n18-n30-n36 */
void stp27(){
short a,n;
for(n=0;n<4;n++){a=g4nm[n];
if(uflg[a]==0){
if(nm[6]+nm[12]+nm[18]+a+nm[30]+nm[36]==LSM){
nm[24]=a; uflg[a]=1;
stp28();
uflg[a]=0; nm[24]=0;}}
}
}
/* Search Level 6: */
/* Set n14 */
void stp28(){
short a,n;

```

```

for(n=3;n>=0;n--){a=g6nm[n];
  if(uflg[a]==0){
    nm[14]=a; uflg[a]=1; cnt2=0;
    stp29();
    uflg[a]=0; nm[14]=0;}
}
}
/* Set n20=111-n2-n8-n14-n26-n32 */
void stp29(){
  short a,n;
  for(n=0;n<4;n++){a=g6nm[n];
    if(uflg[a]==0){
      if(nm[2]+nm[8]+nm[14]+a+nm[26]+nm[32]==LSM){
        nm[20]=a; uflg[a]=1;
        stp30();
        uflg[a]=0; nm[20]=0;}}
  }
}
/* Set n17=111-n13-n14-n15-n16-n18 */
void stp30(){
  short a,n;
  for(n=0;n<4;n++){a=g6nm[n];
    if(uflg[a]==0){
      if(nm[13]+nm[14]+nm[15]+nm[16]+a+nm[18]==LSM){
        nm[17]=a; uflg[a]=1;
        stp31();
        uflg[a]=0; nm[17]=0;}}
  }
}
/* Set n23=111-n5-n11-n17-n29-n35 */
void stp31(){
  short a,b;
  a=LSM-nm[5]-nm[11]-nm[17]-nm[29]-nm[35];
  b=LSM-nm[19]-nm[20]-nm[21]-nm[22]-nm[24];
  if((0<a)&&(a<37)){
    if((a==b)&&(uflg[a]==0)){
      nm[23]=a; uflg[a]=1;
      ansprint();
      uflg[a]=0; nm[23]=0;}}
}
/**/
/* Print the Answers */
void ansprint(){
  short n;
  cnt2++;
  if(cnt2==1){anm[cnt3][0]=cnt+1;
    for(n=1;n<37;n++){anm[cnt3][n]=nm[n];}
    cnt3++;
    if(cnt3==4){pr4ans(cnt3); cnt3=0;}
    //if(cnt3==2){pr2ans(); cnt3=0;}
  }
  cnt++;
}
/**/
/* Print 4 Answers */
void pr4ans(short x){
  short l,l6,m,n;
  for(m=0;m<x;m++){
    printf("%18d/",anm[m][0]);
    if(m<(x-1)){printf(" ");}
  }
}

```

```

}
printf("\n");
for(l=0;l<6;l++){l6=l*6;
  for(m=0;m<x;m++){printf(" ");
    for(n=1;n<7;n++){printf("%3d",anm[m][l6+n]);}
    if(m<(x-1)){printf(" ");}}
  printf("\n");}
}
/**/
/* Print 2 Answers with /EOP */
void pr2ans(){
short l,l6,m,n;
printf("%18d/ /EOP%26d/ /EOP\n",anm[0][0],anm[1][0]);
for(l=0;l<6;l++){l6=l*6;
  for(m=0;m<2;m++){
    printf(" ");
    for(n=1;n<7;n++){printf("%3d",anm[m][l6+n]);}
    printf(" ");
    for(n=1;n<7;n++){printf("%2d",anm[m][l6+n]%2);}
    if(m<1){printf(" ");}
  }
  printf("\n");}
}
/**/

```

Here you see the result list below with a reasonably small count of solutions, though a little more than we had expected. I suppose many important solutions might exist intensively in this area.

I put the table of 'Even-Odd Patterns' aside to each of the first 8 solutions as follows.

Special Type of MS66 Preserving	1	2	3	4	5	6	1	35	34	3	32	6
2 Diagonals and 6 Groups of	7	8	9	10	11	12	30	8	28	27	11	7
Variables as much as the Basic	13	14	15	16	17	18	24	23	15	16	14	19
* List of Standard Solutions *	19	20	21	22	23	24	13	17	21	22	20	18
Calculated by Kanji Setsuda	25	26	27	28	29	30	12	26	9	10	29	25
on December 27, 2007	31	32	33	34	35	36	31	2	4	33	5	36

	1/	/EOP		2/	/EOP
1 35 34 3 32 6	1 1 0 1 0 0		1 35 34 3 32 6	1 1 0 1 0 0	
30 8 28 27 11 7	0 0 0 1 1 1		30 8 28 27 11 7	0 0 0 1 1 1	
24 23 15 16 14 19	0 1 1 0 0 1		24 17 15 16 20 19	0 1 1 0 0 1	
13 17 21 22 20 18	1 1 1 0 0 0		13 23 21 22 14 18	1 1 1 0 0 0	
12 26 9 10 29 25	0 0 1 0 1 1		12 26 9 10 29 25	0 0 1 0 1 1	
31 2 4 33 5 36	1 0 0 1 1 0		31 2 4 33 5 36	1 0 0 1 1 0	
	3/	/EOP		4/	/EOP
1 35 34 3 32 6	1 1 0 1 0 0		1 35 34 3 32 6	1 1 0 1 0 0	
30 8 28 27 11 7	0 0 0 1 1 1		30 8 28 27 11 7	0 0 0 1 1 1	
19 23 15 16 14 24	1 1 1 0 0 0		19 17 15 16 20 24	1 1 1 0 0 0	
18 17 21 22 20 13	0 1 1 0 0 1		18 23 21 22 14 13	0 1 1 0 0 1	
12 26 9 10 29 25	0 0 1 0 1 1		12 26 9 10 29 25	0 0 1 0 1 1	
31 2 4 33 5 36	1 0 0 1 1 0		31 2 4 33 5 36	1 0 0 1 1 0	
	5/	/EOP		6/	/EOP
1 35 34 3 32 6	1 1 0 1 0 0		1 35 34 3 32 6	1 1 0 1 0 0	
12 8 28 27 11 25	0 0 0 1 1 1		12 8 28 27 11 25	0 0 0 1 1 1	
24 23 15 16 14 19	0 1 1 0 0 1		24 17 15 16 20 19	0 1 1 0 0 1	
13 17 21 22 20 18	1 1 1 0 0 0		13 23 21 22 14 18	1 1 1 0 0 0	
30 26 9 10 29 7	0 0 1 0 1 1		30 26 9 10 29 7	0 0 1 0 1 1	
31 2 4 33 5 36	1 0 0 1 1 0		31 2 4 33 5 36	1 0 0 1 1 0	

	7/	/EOP		8/	/EOP
1 35 34 3 32 6	1 1 0 1 0 0		1 35 34 3 32 6	1 1 0 1 0 0	
12 8 28 27 11 25	0 0 0 1 1 1		12 8 28 27 11 25	0 0 0 1 1 1	
19 23 15 16 14 24	1 1 1 0 0 0		19 17 15 16 20 24	1 1 1 0 0 0	
18 17 21 22 20 13	0 1 1 0 0 1		18 23 21 22 14 13	0 1 1 0 0 1	
30 26 9 10 29 7	0 0 1 0 1 1		30 26 9 10 29 7	0 0 1 0 1 1	
31 2 4 33 5 36	1 0 0 1 1 0		31 2 4 33 5 36	1 0 0 1 1 0	
	9/		10/		11/
1 35 34 3 32 6	1 35 34 3 32 6		1 35 34 3 32 6		1 35 34 3 32 6
30 8 27 28 11 7	30 8 27 28 11 7		30 8 27 28 11 7		30 8 27 28 11 7
24 23 15 16 14 19	24 17 15 16 20 19		19 23 15 16 14 24		19 17 15 16 20 24
13 17 21 22 20 18	13 23 21 22 14 18		18 17 21 22 20 13		18 23 21 22 14 13
12 26 10 9 29 25	12 26 10 9 29 25		12 26 10 9 29 25		12 26 10 9 29 25
31 2 4 33 5 36	31 2 4 33 5 36		31 2 4 33 5 36		31 2 4 33 5 36
	13/		14/		15/
1 35 34 3 32 6	1 35 34 3 32 6		1 35 34 3 32 6		1 35 34 3 32 6
12 8 27 28 11 25	12 8 27 28 11 25		12 8 27 28 11 25		12 8 27 28 11 25
24 23 15 16 14 19	24 17 15 16 20 19		19 23 15 16 14 24		19 17 15 16 20 24
13 17 21 22 20 18	13 23 21 22 14 18		18 17 21 22 20 13		18 23 21 22 14 13
30 26 10 9 29 7	30 26 10 9 29 7		30 26 10 9 29 7		30 26 10 9 29 7
31 2 4 33 5 36	31 2 4 33 5 36		31 2 4 33 5 36		31 2 4 33 5 36
	17/		19/		21/
1 35 4 33 32 6	1 35 4 33 32 6		1 35 4 33 32 6		1 35 4 33 32 6
30 8 28 27 11 7	30 8 28 27 11 7		12 8 28 27 11 25		12 8 28 27 11 25
24 23 15 16 14 19	19 23 15 16 14 24		24 23 15 16 14 19		19 23 15 16 14 24
13 17 21 22 20 18	18 17 21 22 20 13		13 17 21 22 20 18		18 17 21 22 20 13
12 26 9 10 29 25	12 26 9 10 29 25		30 26 9 10 29 7		30 26 9 10 29 7
31 2 34 3 5 36	31 2 34 3 5 36		31 2 34 3 5 36		31 2 34 3 5 36
	25/		27/		29/
1 35 4 33 32 6	1 35 4 33 32 6		1 35 4 33 32 6		1 35 4 33 32 6
30 8 27 28 11 7	30 8 27 28 11 7		12 8 27 28 11 25		12 8 27 28 11 25
24 23 15 16 14 19	19 23 15 16 14 24		24 23 15 16 14 19		19 23 15 16 14 24
13 17 21 22 20 18	18 17 21 22 20 13		13 17 21 22 20 18		18 17 21 22 20 13
12 26 10 9 29 25	12 26 10 9 29 25		30 26 10 9 29 7		30 26 10 9 29 7
31 2 34 3 5 36	31 2 34 3 5 36		31 2 34 3 5 36		31 2 34 3 5 36
	33/		37/		41/
1 35 34 33 2 6	1 35 34 33 2 6		1 35 34 33 2 6		1 35 34 33 2 6
30 8 28 9 11 25	25 8 28 9 11 30		30 8 10 27 11 25		25 8 10 27 11 30
24 23 15 16 20 13	24 23 15 16 20 13		24 23 15 16 20 13		24 23 15 16 20 13
18 14 21 22 17 19	18 14 21 22 17 19		18 14 21 22 17 19		18 14 21 22 17 19
7 26 10 27 29 12	12 26 10 27 29 7		7 26 28 9 29 12		12 26 28 9 29 7
31 5 3 4 32 36	31 5 3 4 32 36		31 5 3 4 32 36		31 5 3 4 32 36
	49/		53/		57/
1 35 33 34 2 6	1 35 33 34 2 6		1 35 33 34 2 6		1 35 33 34 2 6
30 8 28 9 11 25	25 8 28 9 11 30		30 8 10 27 11 25		25 8 10 27 11 30
24 23 15 16 20 13	24 23 15 16 20 13		24 23 15 16 20 13		24 23 15 16 20 13
18 14 21 22 17 19	18 14 21 22 17 19		18 14 21 22 17 19		18 14 21 22 17 19
7 26 10 27 29 12	12 26 10 27 29 7		7 26 28 9 29 12		12 26 28 9 29 7
31 5 4 3 32 36	31 5 4 3 32 36		31 5 4 3 32 36		31 5 4 3 32 36
	65/		97/		129/
1 32 34 3 35 6	1 32 4 33 35 6		1 32 34 33 5 6		1 32 33 34 5 6
30 8 28 27 11 7	30 8 28 27 11 7		30 8 28 27 11 7		30 8 28 27 11 7
24 23 15 16 14 19	24 23 15 16 14 19		24 23 15 16 14 19		24 23 15 16 14 19
13 20 21 22 17 18	13 20 21 22 17 18		13 20 21 22 17 18		13 20 21 22 17 18
12 26 9 10 29 25	12 26 9 10 29 25		12 26 10 9 29 25		12 26 10 9 29 25
31 2 4 33 5 36	31 2 34 3 5 36		31 2 3 4 35 36		31 2 4 3 35 36

193/	209/	225/	265/
1 5 34 33 32 6	1 5 33 34 32 6	1 2 34 33 35 6	1 2 33 34 35 6
30 8 28 9 11 25	30 8 28 9 11 25	30 8 28 27 11 7	30 8 28 27 11 7
24 23 15 16 20 13	24 23 15 16 20 13	24 23 15 16 14 19	24 23 15 16 14 19
18 14 21 22 17 19	18 14 21 22 17 19	13 20 21 22 17 18	13 20 21 22 17 18
7 26 10 27 29 12	7 26 10 27 29 12	12 26 10 9 29 25	12 26 10 9 29 25
31 35 3 4 2 36	31 35 4 3 2 36	31 32 3 4 5 36	31 32 4 3 5 36

[Count = 288] OK!

Experiment 4: How do we make such the strictest rules as to get the only answer?

- (1) We must keep all the 12 numbers on the two primary diagonals unchanged.
- (2) We put such the limitation to the other 24 numbers of the basic form as:

We make 6 groups: Each group has 4 numbers just in the same color below.

We make each pair of numbers in the same reverse color shift to the opposite side in its own area. Repeat shifting every pairs in the reverse colors, and you will have the only answer, since the other 6 pair partners should be determined in one way then.

- (3) We must obey the basic definitions to make the standard magic squares 6x6.

[Step 1] Select	->	[Step 2] Move	->	[Step 3] Select
1 2 3 4 5 6		1 2 3 4 5 6		1 2 3 4 5 6
7 8 [9] [10] 11 12		7 8 [28] [27] 11 12		[7] 8 28 27 11 [12]
13 [14] 15 16 [17] 18		13 [23] 15 16 [14] 18		13 23 15 16 14 18
19 [20] 21 22 [23] 24		19 [17] 21 22 [20] 24		19 17 21 22 20 24
25 26 [27] [28] 29 30		25 26 [9] [10] 29 30		[25] 26 9 10 29 [30]
31 32 33 34 35 36		31 32 33 34 35 36		31 [32] 33 34 [35] 36

-> [Step 4] Move	->	[Step 5] Select	->	[Step 6] Move
1 [35] 3 4 [32] 6		1 35 [3] [4] 32 6		1 35 [34] [3] 32 6
[30] 8 28 27 11 [7]		30 8 28 27 11 7		30 8 28 27 11 7
13 23 15 16 14 18		[13] 23 15 16 14 [18]		[24] 23 15 16 14 [19]
19 17 21 22 20 24		[19] 17 21 22 20 [24]		[13] 17 21 22 20 [18]
[12] 26 9 10 29 [25]		12 26 9 10 29 25		12 26 9 10 29 25
31 [2] 33 34 [5] 36		31 2 [33] [34] 5 36		31 2 [4] [33] 5 36

I wonder if this might have been the first method that the oldest wisdom taught and handed down to us. But it seems rather hard for us to memorize easily and pass over to any successors of the next generation many times.

I myself prefer to take the method presented in the Experiment 3 and get the 288 solutions. I think we don't have to get the only answer of the standard MS66.

Additional Experiment:

/** 'Do-it-After-the-Model Transformation' **/

```
void damt(void){
    d[1]=c[1];   d[2]=c[35];  d[3]=c[34];   d[4]=c[3];   d[5]=c[32];  d[6]=c[6];
    d[7]=c[30];  d[8]=c[8];   d[9]=c[28];   d[10]=c[27]; d[11]=c[11]; d[12]=c[7];
    d[13]=c[24]; d[14]=c[23]; d[15]=c[15];   d[16]=c[16];  d[17]=c[14]; d[18]=c[19];
    d[19]=c[13]; d[20]=c[17]; d[21]=c[21];   d[22]=c[22];  d[23]=c[20]; d[24]=c[18];
    d[25]=c[12]; d[26]=c[26]; d[27]=c[9];    d[28]=c[10];  d[29]=c[29]; d[30]=c[25];
    d[31]=c[31]; d[32]=c[2];   d[33]=c[4];   d[34]=c[33]; d[35]=c[5];  d[36]=c[36];
}
```

Let's take this old sample solution of MS66 for the representative 'Model', build the set of 'Prototype Squares 6x6', and apply our 'Do-it-After-the-Model Transformation'.

We want to reconstruct all the 288 solutions of special MS66 again by the Prototype Squares and DAM Transformation and know whether our old sample could really be the most appropriate Model or not.

**** Reconstruction of 288 Special MS66 by Prototype Squares and 'DAMT' ****

1/P R/1						2/P R/2																	
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6
7	8	9	10	11	12	30	8	28	27	11	7	7	8	9	10	11	12	30	8	28	27	11	7
13	14	15	16	17	18	24	23	15	16	14	19	13	20	15	16	23	18	24	17	15	16	20	19
19	20	21	22	23	24	13	17	21	22	20	18	19	14	21	22	17	24	13	23	21	22	14	18
25	26	27	28	29	30	12	26	9	10	29	25	25	26	27	28	29	30	12	26	9	10	29	25
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36
3/P R/3						4/P R/4																	
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6
7	8	9	10	11	12	30	8	28	27	11	7	7	8	9	10	11	12	30	8	28	27	11	7
18	14	15	16	17	13	19	23	15	16	14	24	18	20	15	16	23	13	19	17	15	16	20	24
24	20	21	22	23	19	18	17	21	22	20	13	24	14	21	22	17	19	18	23	21	22	14	13
25	26	27	28	29	30	12	26	9	10	29	25	25	26	27	28	29	30	12	26	9	10	29	25
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36
5/P R/5						6/P R/6																	
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6
25	8	9	10	11	30	12	8	28	27	11	25	25	8	9	10	11	30	12	8	28	27	11	25
13	14	15	16	17	18	24	23	15	16	14	19	13	20	15	16	23	18	24	17	15	16	20	19
19	20	21	22	23	24	13	17	21	22	20	18	19	14	21	22	17	24	13	23	21	22	14	18
7	26	27	28	29	12	30	26	9	10	29	7	7	26	27	28	29	12	30	26	9	10	29	7
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36
7/P R/7						8/P R/8																	
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6
25	8	9	10	11	30	12	8	28	27	11	25	25	8	9	10	11	30	12	8	28	27	11	25
18	14	15	16	17	13	19	23	15	16	14	24	18	20	15	16	23	13	19	17	15	16	20	24
24	20	21	22	23	19	18	17	21	22	20	13	24	14	21	22	17	19	18	23	21	22	14	13
7	26	27	28	29	12	30	26	9	10	29	7	7	26	27	28	29	12	30	26	9	10	29	7
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36
9/P R/9						11/P R/11																	
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6
7	8	10	9	11	12	30	8	27	28	11	7	7	8	10	9	11	12	30	8	27	28	11	7
13	14	15	16	17	18	24	23	15	16	14	19	18	14	15	16	17	13	19	23	15	16	14	24
19	20	21	22	23	24	13	17	21	22	20	18	24	20	21	22	23	19	18	17	21	22	20	13
25	26	28	27	29	30	12	26	10	9	29	25	25	26	28	27	29	30	12	26	10	9	29	25
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36
13/P R/13						15/P R/15																	
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6
25	8	10	9	11	30	12	8	27	28	11	25	25	8	10	9	11	30	12	8	27	28	11	25
13	14	15	16	17	18	24	23	15	16	14	19	18	14	15	16	17	13	19	23	15	16	14	24
19	20	21	22	23	24	13	17	21	22	20	18	24	20	21	22	23	19	18	17	21	22	20	13
7	26	28	27	29	12	30	26	10	9	29	7	7	26	28	27	29	12	30	26	10	9	29	7
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36
17/P R/17						21/P R/21																	
1	5	33	3	32	6	1	35	34	33	2	6	1	5	33	3	32	6	1	35	34	33	2	6
25	8	10	27	11	7	30	8	28	9	11	25	30	8	10	27	11	12	25	8	28	9	11	30
18	20	15	16	14	19	24	23	15	16	20	13	18	20	15	16	14	19	24	23	15	16	20	13
13	17	21	22	23	24	18	14	21	22	17	19	13	17	21	22	23	24	18	14	21	22	17	19
12	26	9	28	29	30	7	26	10	27	29	12	7	26	9	28	29	25	12	26	10	27	29	7
31	2	4	34	35	36	31	5	3	4	32	36	31	2	4	34	35	36	31	5	3	4	32	36
25/P R/25						29/P R/29																	
1	5	33	3	32	6	1	35	34	33	2	6	1	5	33	3	32	6	1	35	34	33	2	6
25	8	28	9	11	7	30	8	10	27	11	25	30	8	28	9	11	12	25	8	10	27	11	30
18	20	15	16	14	19	24	23	15	16	20	13	18	20	15	16	14	19	24	23	15	16	20	13
13	17	21	22	23	24	18	14	21	22	17	19	13	17	21	22	23	24	18	14	21	22	17	19
12	26	27	10	29	30	7	26	28	9	29	12	7	26	27	10	29	25	12	26	28	9	29	7
31	2	4	34	35	36	31	5	3	4	32	36	31	2	4	34	35	36	31	5	3	4	32	36

<p style="text-align: center;">33/P R/33</p> <p>1 5 34 4 32 6 1 35 33 34 2 6 25 8 10 27 11 7 30 8 28 9 11 25 18 20 15 16 14 19 24 23 15 16 20 13 13 17 21 22 23 24 18 14 21 22 17 19 12 26 9 28 29 30 7 26 10 27 29 12 31 2 3 33 35 36 31 5 4 3 32 36</p> <p style="text-align: center;">49/P R/49</p> <p>1 2 33 34 5 6 1 35 4 33 32 6 7 8 9 10 11 12 30 8 28 27 11 7 13 14 15 16 17 18 24 23 15 16 14 19 19 20 21 22 23 24 13 17 21 22 20 18 25 26 27 28 29 30 12 26 9 10 29 25 31 32 3 4 35 36 31 2 34 3 5 36</p> <p style="text-align: center;">65/P R/65</p> <p>1 2 3 4 5 6 1 32 34 3 35 6 7 8 9 10 11 12 30 8 28 27 11 7 13 14 15 16 20 18 24 23 15 16 14 19 19 17 21 22 23 24 13 20 21 22 17 18 25 26 27 28 29 30 12 26 9 10 29 25 31 35 33 34 32 36 31 2 4 33 5 36</p> <p style="text-align: center;">137/P R/137</p> <p>1 2 34 4 35 6 1 32 33 34 5 6 7 8 10 9 11 12 30 8 28 27 11 7 13 14 15 16 20 18 24 23 15 16 14 19 19 17 21 22 23 24 13 20 21 22 17 18 25 26 27 28 29 30 12 26 10 9 29 25 31 5 3 33 32 36 31 2 4 3 35 36</p> <p style="text-align: center;">193/P R/193</p> <p>1 35 33 3 2 6 1 5 34 33 32 6 25 8 10 27 11 7 30 8 28 9 11 25 18 20 15 16 14 19 24 23 15 16 20 13 13 17 21 22 23 24 18 14 21 22 17 19 12 26 9 28 29 30 7 26 10 27 29 12 31 32 4 34 5 36 31 35 3 4 2 36</p> <p style="text-align: center;">225/P R/225</p> <p>1 32 33 3 5 6 1 2 34 33 35 6 7 8 10 9 11 12 30 8 28 27 11 7 13 14 15 16 20 18 24 23 15 16 14 19 19 17 21 22 23 24 13 20 21 22 17 18 25 26 27 28 29 30 12 26 10 9 29 25 31 35 4 34 2 36 31 32 3 4 5 36</p>	<p style="text-align: center;">41/P R/41</p> <p>1 5 34 4 32 6 1 35 33 34 2 6 25 8 28 9 11 7 30 8 10 27 11 25 18 20 15 16 14 19 24 23 15 16 20 13 13 17 21 22 23 24 18 14 21 22 17 19 12 26 27 10 29 30 7 26 28 9 29 12 31 2 3 33 35 36 31 5 4 3 32 36</p> <p style="text-align: center;">57/P R/57</p> <p>1 2 33 34 5 6 1 35 4 33 32 6 7 8 10 9 11 12 30 8 27 28 11 7 13 14 15 16 17 18 24 23 15 16 14 19 19 20 21 22 23 24 13 17 21 22 20 18 25 26 28 27 29 30 12 26 10 9 29 25 31 32 3 4 35 36 31 2 34 3 5 36</p> <p style="text-align: center;">97/P R/97</p> <p>1 2 33 3 35 6 1 32 34 33 5 6 7 8 10 9 11 12 30 8 28 27 11 7 13 14 15 16 20 18 24 23 15 16 14 19 19 17 21 22 23 24 13 20 21 22 17 18 25 26 27 28 29 30 12 26 10 9 29 25 31 5 4 34 32 36 31 2 3 4 35 36</p> <p style="text-align: center;">161/P R/161</p> <p>1 2 33 34 5 6 1 32 4 33 35 6 7 8 9 10 11 12 30 8 28 27 11 7 13 14 15 16 20 18 24 23 15 16 14 19 19 17 21 22 23 24 13 20 21 22 17 18 25 26 27 28 29 30 12 26 9 10 29 25 31 35 3 4 32 36 31 2 34 3 5 36</p> <p style="text-align: center;">209/P R/209</p> <p>1 35 34 4 2 6 1 5 33 34 32 6 25 8 10 27 11 7 30 8 28 9 11 25 18 20 15 16 14 19 24 23 15 16 20 13 13 17 21 22 23 24 18 14 21 22 17 19 12 26 9 28 29 30 7 26 10 27 29 12 31 32 3 33 5 36 31 35 4 3 2 36</p> <p style="text-align: center;">265/P R/265</p> <p>1 32 34 4 5 6 1 2 33 34 35 6 7 8 10 9 11 12 30 8 28 27 11 7 13 14 15 16 20 18 24 23 15 16 14 19 19 17 21 22 23 24 13 20 21 22 17 18 25 26 27 28 29 30 12 26 10 9 29 25 31 35 3 33 2 36 31 32 4 3 5 36</p>
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[Count = 288/P R/288] OK!

Each solution number 'R/n' in this list indicates the original number of reconstructed solution searched and referred to in the old list we have got before.

This result means we have successfully reconstructed all the 288 standard MS66 and it also means our old sample could act as the best representative Model.

But aren't there any other good 'Models' beside our old sample? How many MS66 could be those good Models? It seems to me that each of 288 solutions could equally be one of the good Models. I think we have to have another additional experiment.

Additional Experiment 2:

I took No.4 solution in the old list for our new Model, and built the new set of Prototype Squares, and reconstructed all object squares by our new DAMT.

**** Reconstruction of 288 MS66 by New Prototype Squares and 'DAMT' ****

1/P						R/4						2/P						R/3						
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6	
7	8	9	10	11	12	30	8	28	27	11	7	7	8	9	10	11	12	30	8	28	27	11	7	
13	14	15	16	17	18	19	17	15	16	20	24	13	20	15	16	23	18	19	23	15	16	14	24	
19	20	21	22	23	24	18	23	21	22	14	13	19	14	21	22	17	24	18	17	21	22	20	13	
25	26	27	28	29	30	12	26	9	10	29	25	25	26	27	28	29	30	12	26	9	10	29	25	
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36	
3/P						R/2						4/P						R/1						
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6	
7	8	9	10	11	12	30	8	28	27	11	7	7	8	9	10	11	12	30	8	28	27	11	7	
18	14	15	16	17	13	24	17	15	16	20	19	18	20	15	16	23	13	24	23	15	16	14	19	
24	20	21	22	23	19	13	23	21	22	14	18	24	14	21	22	17	19	13	17	21	22	20	18	
25	26	27	28	29	30	12	26	9	10	29	25	25	26	27	28	29	30	12	26	9	10	29	25	
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36	
5/P						R/8						6/P						R/7						
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6	
25	8	9	10	11	30	12	8	28	27	11	25	25	8	9	10	11	30	12	8	28	27	11	25	
13	14	15	16	17	18	19	17	15	16	20	24	13	20	15	16	23	18	19	23	15	16	14	24	
19	20	21	22	23	24	18	23	21	22	14	13	19	14	21	22	17	24	18	17	21	22	20	13	
7	26	27	28	29	12	30	26	9	10	29	7	7	26	27	28	29	12	30	26	9	10	29	7	
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36	
7/P						R/6						8/P						R/5						
1	2	3	4	5	6	1	35	34	3	32	6	1	2	3	4	5	6	1	35	34	3	32	6	
25	8	9	10	11	30	12	8	28	27	11	25	25	8	9	10	11	30	12	8	28	27	11	25	
18	14	15	16	17	13	24	17	15	16	20	19	18	20	15	16	23	13	24	23	15	16	14	19	
24	20	21	22	23	19	13	23	21	22	14	18	24	14	21	22	17	19	13	17	21	22	20	18	
7	26	27	28	29	12	30	26	9	10	29	7	7	26	27	28	29	12	30	26	9	10	29	7	
31	32	33	34	35	36	31	2	4	33	5	36	31	32	33	34	35	36	31	2	4	33	5	36	
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Though I list out only the first 8 solutions instead of all, I must report this new Model proved to be one of the best Models building all Prototype Squares and reconstructing all object squares successfully. It belongs to the set of 'brother solutions' for our Model. I mean all the 288 object solutions could equally be those 'Model brothers'.

This is another reason why I prefer to get those 288 object MS66 when composed by the supposed Classical Method of Composition. I would like to say "The conceptual idea is the same and the only one, but its actual solutions could appear to us as the 288 different 'phenomena'."

In the case of MS44, the actual solution is determined in one way, just when we keep the two primary diagonals unchanged. It is because we want to compose the Self-complementary type of MS44 before all for our object.

However, in the case of MS66, we can compose neither the Self-complementary type nor the Pan-diagonal one. We can not but compose only the Standard type of MS66.

We should have a lot of solutions then, more than we expect. It is an inevitable problem in the case of composing standard MS66. We have to accept it, don't we?

What did they think of this problem in the classical age? Did the oldest teachers really know anything about these native difficulties we must face now? They did, I suppose.

My imagination grew wilder and wilder, and made me almost mad.

(Originally Written in Japanese by Kanji Setsuda on January 14, 2008;
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