

Chapter 2: Fundamental Study of 'Prototype Squares' and 'Do-it-After-the-Model Transformation' II

Section 6: Prototype Squares of Order 7: Kanji Setsuda

In the case of order 6, we always fail to find any correspondence between the two worlds: 'Prototype Squares' and some typical magic objects, since we can make none of self-complementary type and none of pan-diagonal type of order 6, either.

How about in the case of order 7, then?

We already know that there certainly exist three types of magic squares of order 7: (1) Self-complementary, (2) Pan-diagonal, and (3) Simultaneous magic squares: both self-complementary and pan-diagonal.

We have really got some samples of them, but we haven't got the complete list of any type yet. We haven't known the total counts of their solutions, either.

It is really a hard job to count up any types of MS77 to the last, for it always takes a very long time, say, too long for us to go on doing those jobs.

Though we want to know about outlines of the Prototype Squares of order 7, we haven't yet got them, since we don't know how many object solutions there exist.

But we must not give it up now. Let's try to make those Prototype Squares of order 7 to get some objects reconstructed by our 'DAM Transformations'.

First of all, we must find the best Model out of the solution set of our object. We want to use it to make the rules of 'Do-it-After-the-Model Transformation' for any type and learn from it and know what conditions the Prototype Squares should have.

See the next figures. The Prototype Square is made after the regular array 7x7.

```

** Basic Forms for 'Prototype Squares' of Order 7 **
  /Prototype Square                /Object Model
47 48 49 43 44 45 46 47 48 49 43 44 45      . 49 . . . . . 49 . .
5 6 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 2 3      . . | 1 | . | . | . | . | . | . | 1 .
-----+-----+-----+-----+-----+-----+-----+-----+
12 13 14 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 8 9 10      . . | . | 9 | . | . | . | . | . | 9 .
-----+-----+-----+-----+-----+-----+-----+
19 20 21 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 15 16 17      . . | . | . | 17 | . | . | . | . | . .
-----+-----+-----+-----+-----+-----+
26 27 28 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 22 23 24      . . | . | . | . | 25 | . | . | . | . .
-----+-----+-----+-----+-----+-----+
33 34 35 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 29 30 31      . . | . | . | . | . | 33 | . | . | . .
-----+-----+-----+-----+-----+-----+
40 41 42 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 36 37 38      41 . | . | . | . | . | . | . | 41 . .
-----+-----+-----+-----+-----+-----+
47 48 49 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 43 44 45      . 49 | . | . | . | . | . | . | 49 . .
5 6 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 2 3      . . | 1 | . | . | . | . | . | . | 1 .

```

What model solution should we have?

Just as in the case of order 5, we want to have the only one common Model for those three types of magic squares of order 7.

#1. Best Models for Simultaneous MS77: Self-Complementary and Pan-Diagonal

Let's find the best models out of the solution set of Simultaneous MS77.

What do we have to do, then?

Let's pick up each solution and test it by applying 'DAM Transformation' to itself

and checking if the result should come back to the basic form of prototypes above.

**** Find the Best Models for Simultaneous MS77: Both Self-Complementary ****
**** and Pan-Diagonal Type: and the Prototype Squares of Order 7 Reduced ****

184/T0	/T1	/T2	/T3
1 21 34 47 11 24 37	1 27 46 16 42 12 31	1 2 3 4 5 6 7	1 21 34 47 11 24 37
45 9 22 42 6 19 32	39 9 35 5 24 43 20	8 9 10 11 12 13 14	45 9 22 42 6 19 32
40 4 17 30 43 14 27	28 47 17 36 13 32 2	15 16 17 18 19 20 21	40 4 17 30 43 14 27
35 48 12 25 38 2 15	10 29 6 25 44 21 40	22 23 24 25 26 27 28	35 48 12 25 38 2 15
23 36 7 20 33 46 10	48 18 37 14 33 3 22	29 30 31 32 33 34 35	23 36 7 20 33 46 10
18 31 44 8 28 41 5	30 7 26 45 15 41 11	36 37 38 39 40 41 42	18 31 44 8 28 41 5
13 26 39 3 16 29 49	19 38 8 34 4 23 49	43 44 45 46 47 48 49	13 26 39 3 16 29 49

256/T0	/T1	/T2	/T3
1 24 47 21 37 11 34	1 2 3 4 5 6 7	1 24 47 21 37 11 34	1 2 3 4 5 6 7
42 9 32 6 22 45 19	8 9 10 11 12 13 14	42 9 32 6 22 45 19	8 9 10 11 12 13 14
27 43 17 40 14 30 4	15 16 17 18 19 20 21	27 43 17 40 14 30 4	15 16 17 18 19 20 21
12 35 2 25 48 15 38	22 23 24 25 26 27 28	12 35 2 25 48 15 38	22 23 24 25 26 27 28
46 20 36 10 33 7 23	29 30 31 32 33 34 35	46 20 36 10 33 7 23	29 30 31 32 33 34 35
31 5 28 44 18 41 8	36 37 38 39 40 41 42	31 5 28 44 18 41 8	36 37 38 39 40 41 42
16 39 13 29 3 26 49	43 44 45 46 47 48 49	16 39 13 29 3 26 49	43 44 45 46 47 48 49

315/T0	/T1	/T2	/T3
1 27 46 16 42 12 31	1 21 34 47 11 24 37	1 2 3 4 5 6 7	1 27 46 16 42 12 31
39 9 35 5 24 43 20	45 9 22 42 6 19 32	8 9 10 11 12 13 14	39 9 35 5 24 43 20
28 47 17 36 13 32 2	40 4 17 30 43 14 27	15 16 17 18 19 20 21	28 47 17 36 13 32 2
10 29 6 25 44 21 40	35 48 12 25 38 2 15	22 23 24 25 26 27 28	10 29 6 25 44 21 40
48 18 37 14 33 3 22	23 36 7 20 33 46 10	29 30 31 32 33 34 35	48 18 37 14 33 3 22
30 7 26 45 15 41 11	18 31 44 8 28 41 5	36 37 38 39 40 41 42	30 7 26 45 15 41 11
19 38 8 34 4 23 49	13 26 39 3 16 29 49	43 44 45 46 47 48 49	19 38 8 34 4 23 49

491/T0	/T1	/T2	/T3
1 38 26 14 44 32 20	1 35 13 40 18 45 23	1 2 3 4 5 6 7	1 38 26 14 44 32 20
28 9 46 34 15 3 40	31 9 36 21 48 26 4	8 9 10 11 12 13 14	28 9 46 34 15 3 40
48 29 17 5 42 23 11	12 39 17 44 22 7 34	15 16 17 18 19 20 21	48 29 17 5 42 23 11
19 7 37 25 13 43 31	42 20 47 25 3 30 8	22 23 24 25 26 27 28	19 7 37 25 13 43 31
39 27 8 45 33 21 2	16 43 28 6 33 11 38	29 30 31 32 33 34 35	39 27 8 45 33 21 2
10 47 35 16 4 41 22	46 24 2 29 14 41 19	36 37 38 39 40 41 42	10 47 35 16 4 41 22
30 18 6 36 24 12 49	27 5 32 10 37 15 49	43 44 45 46 47 48 49	30 18 6 36 24 12 49

510/T0	/T1	/T2	/T3
1 39 28 10 48 30 19	1 21 34 47 11 24 37	1 8 15 22 29 36 43	1 27 46 16 42 12 31
27 9 47 29 18 7 38	45 9 22 42 6 19 32	2 9 16 23 30 37 44	39 9 35 5 24 43 20
46 35 17 6 37 26 8	40 4 17 30 43 14 27	3 10 17 24 31 38 45	28 47 17 36 13 32 2
16 5 36 25 14 45 34	35 48 12 25 38 2 15	4 11 18 25 32 39 46	10 29 6 25 44 21 40
42 24 13 44 33 15 4	23 36 7 20 33 46 10	5 12 19 26 33 40 47	48 18 37 14 33 3 22
12 43 32 21 3 41 23	18 31 44 8 28 41 5	6 13 20 27 34 41 48	30 7 26 45 15 41 11
31 20 2 40 22 11 49	13 26 39 3 16 29 49	7 14 21 28 35 42 49	19 38 8 34 4 23 49

624/T0	/T1	/T2	/T3
1 45 40 35 23 18 13	1 27 46 16 42 12 31	1 8 15 22 29 36 43	1 21 34 47 11 24 37
21 9 4 48 36 31 26	39 9 35 5 24 43 20	2 9 16 23 30 37 44	45 9 22 42 6 19 32
34 22 17 12 7 44 39	28 47 17 36 13 32 2	3 10 17 24 31 38 45	40 4 17 30 43 14 27
47 42 30 25 20 8 3	10 29 6 25 44 21 40	4 11 18 25 32 39 46	35 48 12 25 38 2 15
11 6 43 38 33 28 16	48 18 37 14 33 3 22	5 12 19 26 33 40 47	23 36 7 20 33 46 10
24 19 14 2 46 41 29	30 7 26 45 15 41 11	6 13 20 27 34 41 48	18 31 44 8 28 41 5
37 32 27 15 10 5 49	19 38 8 34 4 23 49	7 14 21 28 35 42 49	13 26 39 3 16 29 49

672/T0	/T1	/T2	/T3
1 46 42 31 27 16 12	1 19 30 48 10 28 39	1 2 3 4 5 6 7	1 46 42 31 27 16 12
20 9 5 43 39 35 24	47 9 27 38 7 18 29	8 9 10 11 12 13 14	20 9 5 43 39 35 24
32 28 17 13 2 47 36	37 6 17 35 46 8 26	15 16 17 18 19 20 21	32 28 17 13 2 47 36
44 40 29 25 21 10 6	34 45 14 25 36 5 16	22 23 24 25 26 27 28	44 40 29 25 21 10 6
14 3 48 37 33 22 18	24 42 4 15 33 44 13	29 30 31 32 33 34 35	14 3 48 37 33 22 18
26 15 11 7 45 41 30	21 32 43 12 23 41 3	36 37 38 39 40 41 42	26 15 11 7 45 41 30
38 34 23 19 8 4 49	11 22 40 2 20 31 49	43 44 45 46 47 48 49	38 34 23 19 8 4 49

747/T0										/T1							/T2							/T3						
1	48	39	30	28	19	10	1	2	3	4	5	6	7	1	48	39	30	28	19	10	1	2	3	4	5	6	7			
18	9	7	47	38	29	27	8	9	10	11	12	13	14	18	9	7	47	38	29	27	8	9	10	11	12	13	14			
35	26	17	8	6	46	37	15	16	17	18	19	20	21	35	26	17	8	6	46	37	15	16	17	18	19	20	21			
45	36	34	25	16	14	5	22	23	24	25	26	27	28	45	36	34	25	16	14	5	22	23	24	25	26	27	28			
13	4	44	42	33	24	15	29	30	31	32	33	34	35	13	4	44	42	33	24	15	29	30	31	32	33	34	35			
23	21	12	3	43	41	32	36	37	38	39	40	41	42	23	21	12	3	43	41	32	36	37	38	39	40	41	42			
40	31	22	20	11	2	49	43	44	45	46	47	48	49	40	31	22	20	11	2	49	43	44	45	46	47	48	49			

The list above shows the result of recursive test of 'DAMT' applied to each object solution, whose primary diagonal is only made up of {1, 9, 17, 25, 33, 41 and 49}.

Though I took No.510 and 624 before, I found No. 256 and No. 747 were better for the Models. I want to take [No.747](#) above for the Best Model this time.

The next sample list shows how the Prototype Squares look like. I have got it by reducing the object solutions by our new 'DAM Transformation'.

** Simul taneous MS77: Both Sel f-Compl ementary and Pan-Di agonal **
 ** and Reduced 'Prototype Squares' 7x7 with Decomposed Patterns **

1/S /D7i														1/P /D7i													
1	48	39	30	28	19	10	0654321	0531642	1	2	3	4	5	6	7	0000000	0123456										
18	9	7	47	38	29	27	2106543	3164205	8	9	10	11	12	13	14	1111111	0123456										
35	26	17	8	6	46	37	4321065	6420531	15	16	17	18	19	20	21	2222222	0123456										
45	36	34	25	16	14	5	6543210	2053164	22	23	24	25	26	27	28	3333333	0123456										
13	4	44	42	33	24	15	1065432	5316420	29	30	31	32	33	34	35	4444444	0123456										
23	21	12	3	43	41	32	3210654	1642053	36	37	38	39	40	41	42	5555555	0123456										
40	31	22	20	11	2	49	5432106	4205316	43	44	45	46	47	48	49	6666666	0123456										
2/S /D7i														2/P /D7i													
1	46	42	31	27	16	12	0654321	0362514	1	4	7	3	6	2	5	0000000	0362514										
20	9	5	43	39	35	24	2106543	5140362	13	9	12	8	11	14	10	1111111	5140362										
32	28	17	13	2	47	36	4321065	3625140	18	21	17	20	16	19	15	2222222	3625140										
44	40	29	25	21	10	6	6543210	1403625	23	26	22	25	28	24	27	3333333	1403625										
14	3	48	37	33	22	18	1065432	6251403	35	31	34	30	33	29	32	4444444	6251403										
26	15	11	7	45	41	30	3210654	4036251	40	36	39	42	38	41	37	5555555	4036251										
38	34	23	19	8	4	49	5432106	2514036	45	48	44	47	43	46	49	6666666	2514036										
3/S /D7i														3/P /D7i													
1	45	40	35	23	18	13	0654321	0246135	1	5	2	6	3	7	4	0000000	0415263										
21	9	4	48	36	31	26	2106543	6135024	12	9	13	10	14	11	8	1111111	4152630										
34	22	17	12	7	44	39	4321065	5024613	16	20	17	21	18	15	19	2222222	1526304										
47	42	30	25	20	8	3	6543210	4613502	27	24	28	25	22	26	23	3333333	5263041										
11	6	43	38	33	28	16	1065432	3502461	31	35	32	29	33	30	34	4444444	2630415										
24	19	14	2	46	41	29	3210654	2461350	42	39	36	40	37	41	38	5555555	6304152										
37	32	27	15	10	5	49	5432106	1350246	46	43	47	44	48	45	49	6666666	3041526										
4/S /D7i														4/P /D7i													
1	42	27	12	46	31	16	0531642	0654321	1	8	15	22	29	36	43	0123456	0000000										
24	9	43	35	20	5	39	3164205	2106543	2	9	16	23	30	37	44	0123456	1111111										
47	32	17	2	36	28	13	6420531	4321065	3	10	17	24	31	38	45	0123456	2222222										
21	6	40	25	10	44	29	2053164	6543210	4	11	18	25	32	39	46	0123456	3333333										
37	22	14	48	33	18	3	5316420	1065432	5	12	19	26	33	40	47	0123456	4444444										
11	45	30	15	7	41	26	1642053	3210654	6	13	20	27	34	41	48	0123456	5555555										
34	19	4	38	23	8	49	4205316	5432106	7	14	21	28	35	42	49	0123456	6666666										
5/S /D7i														5/P /D7i													
1	39	28	10	48	30	19	0531642	0362514	1	11	21	24	34	37	47	0123456	0362514										
27	9	47	29	18	7	38	3164205	5140362	6	9	19	22	32	42	45	0123456	5140362										
46	35	17	6	37	26	8	6420531	3625140	4	14	17	27	30	40	43	0123456	3625140										
16	5	36	25	14	45	34	2053164	1403625	2	12	15	25	35	38	48	0123456	1403625										
42	24	13	44	33	15	4	5316420	6251403	7	10	20	23	33	36	46	0123456	6251403										
12	43	32	21	3	41	23	1642053	4036251	5	8	18	28	31	41	44	0123456	4036251										
31	20	2	40	22	11	49	4205316	2514036	3	13	16	26	29	39	49	0123456	2514036										

	6/S	/D7i		6/P	/D7i												
1	38	26	14	44	32	20	0531642	0246135	1	12	16	27	31	42	46	0123456	0415263
28	9	46	34	15	3	40	3164205	6135024	5	9	20	24	35	39	43	0123456	4152630
48	29	17	5	42	23	11	6420531	5024613	2	13	17	28	32	36	47	0123456	1526304
19	7	37	25	13	43	31	2053164	4613502	6	10	21	25	29	40	44	0123456	5263041
39	27	8	45	33	21	2	5316420	3502461	3	14	18	22	33	37	48	0123456	2630415
10	47	35	16	4	41	22	1642053	2461350	7	11	15	26	30	41	45	0123456	6304152
30	18	6	36	24	12	49	4205316	1350246	4	8	19	23	34	38	49	0123456	3041526

#2. Basic Forms and Conditions for the Prototype Squares of Order 7

How many Prototype Squares are there for each type of magic squares 7x7?

What equations do we have to define for those Prototype Squares?

First of all let's make the Prototype Squares for Simultaneous type of magic squares of order 7: both Self-complementary and Pan-diagonal.

The next diagrams and equations below show how I finally defined for them.

** Basic Forms and Conditions for 'Prototype Squares' of Order 7 **

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

** Basic Conditions for Prototype Squares 7x7: **

```

n1+n48+n39+n30+n28+n19+n10=C ... rw1; | n1+n18+n35+n45+n13+n23+n40=C ... cl 1;
n18+n9+n7+n47+n38+n29+n27=C ... rw2; | n48+n9+n26+n36+n4+n21+n31=C ... cl 2;
n35+n26+n17+n8+n6+n46+n37=C ... rw3; | n39+n7+n17+n34+n44+n12+n22=C ... cl 3;
n45+n36+n34+n25+n16+n14+n5=C ... rw4; | n30+n47+n8+n25+n42+n3+n20=C ... cl 4;
n13+n4+n44+n42+n33+n24+n15=C ... rw5; | n28+n38+n6+n16+n33+n43+n11=C ... cl 5;
n23+n21+n12+n3+n43+n41+n32=C ... rw6; | n19+n29+n46+n14+n24+n41+n2=C ... cl 6;
n40+n31+n22+n20+n11+n2+n49=C ... rw7; | n10+n27+n37+n5+n15+n32+n49=C ... cl 7;

```

** Pan-diagonal Conditions for Prototype Squares 7x7: **

```

n1+n9+n17+n25+n33+n41+n49=C ... pd1; | n1+n27+n46+n16+n42+n12+n31=C ... pb1;
n48+n7+n8+n16+n24+n32+n40=C ... pd2; | n48+n18+n37+n14+n33+n3+n22=C ... pb2;
n39+n47+n6+n14+n15+n23+n31=C ... pd3; | n39+n9+n35+n5+n24+n43+n20=C ... pb3;
n30+n38+n46+n5+n13+n21+n22=C ... pd4; | n30+n7+n26+n45+n15+n41+n11=C ... pb4;
n28+n29+n37+n45+n4+n12+n20=C ... pd5; | n28+n47+n17+n36+n13+n32+n2=C ... pb5;
n19+n27+n35+n36+n44+n3+n11=C ... pd6; | n19+n38+n8+n34+n4+n23+n49=C ... pb6;
n10+n18+n26+n34+n42+n43+n2=C ... pd7; | n10+n29+n6+n25+n44+n21+n40=C ... pb7;

```

** Self-complementary Conditions for Prototype Squares 7x7: **

```

n1+n49=n48+n2=n39+n11=n30+n20=n28+n22=n19+n31=
n10+n40=n18+n32=n9+n41=n7+n43=n47+n3=n38+n12=n29+n21=
n27+n23=n35+n15=n26+n24=n17+n33=n8+n42=n6+n44=n46+n4=
n37+n13=n45+n5=n36+n14=n34+n16=n25+n25=SC ... scc

```

** List-forming Inequality Conditions: **

```

n1<n49, n1<n10, n1<n40 and n48>n18;

```

```

/**/

```

```

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

```

```

void damt(){
    d[1]=c[1];    d[2]=c[48];    d[3]=c[39];    d[4]=c[30];    d[5]=c[28];    d[6]=c[19];    d[7]=c[10];
    d[8]=c[18];    d[9]=c[9];     d[10]=c[7];    d[11]=c[47];   d[12]=c[38];   d[13]=c[29];   d[14]=c[27];
    d[15]=c[35];   d[16]=c[26];   d[17]=c[17];   d[18]=c[8];    d[19]=c[6];    d[20]=c[46];   d[21]=c[37];
    d[22]=c[45];   d[23]=c[36];   d[24]=c[34];   d[25]=c[25];   d[26]=c[16];   d[27]=c[14];   d[28]=c[5];
    d[29]=c[13];   d[30]=c[4];    d[31]=c[44];   d[32]=c[42];   d[33]=c[33];   d[34]=c[24];   d[35]=c[15];
    d[36]=c[23];   d[37]=c[21];   d[38]=c[12];   d[39]=c[3];    d[40]=c[43];   d[41]=c[41];   d[42]=c[32];
    d[43]=c[40];   d[44]=c[31];   d[45]=c[22];   d[46]=c[20];   d[47]=c[11];   d[48]=c[2];    d[49]=c[49];
}
/**/

```

These are all the necessary conditions that Prototype Squares should have, and the 'DAM Transformation' procedure dictated.

Nothing else is necessary at all. We don't always have to have the equality of Cross-sums, nor the sum of any outer pair should be always equal to sum of inner one.

Those definitions above must be adequate for our Prototype Squares, but I found they were unsatisfactory, because I could only make them very slowly.

The next list shows all I could have got during the several hour calculations. It is too slow for us to go on listing them up to the last. Say, it is indeed impractical, while we have to make so many solutions as hundreds of thousands.

You can read the program list of mine at the end of this article.

```

** 'Prototype Squares' of Order 7 and Simul taneous Magi c Squares **
** Recomposed by 'DAMT': Both Sel f-compl ementary and Pan-di agonal **

```

1/P /S														2/P /S													
1	2	21	17	8	20	5	1	48	47	32	27	16	4	1	2	34	11	8	20	5	1	48	47	31	32	12	4
10	6	4	3	11	31	24	12	6	5	29	39	41	43	10	9	4	3	6	28	15	21	9	5	16	44	43	37
14	13	22	12	16	18	9	36	35	22	10	20	33	19	26	14	33	21	12	19	7	24	27	33	10	20	39	22
23	7	15	25	35	43	27	42	26	37	25	13	24	8	18	13	23	25	27	37	32	42	35	36	25	14	15	8
41	32	34	38	28	37	36	31	17	30	40	28	15	14	43	31	38	29	17	36	24	28	11	30	40	17	23	26
26	19	39	47	46	44	40	7	9	11	21	45	44	38	35	22	44	47	46	41	40	13	7	6	34	45	41	29
45	30	42	33	29	48	49	46	34	23	18	3	2	49	45	30	42	39	16	48	49	46	38	18	19	3	2	49
6/P /S														14/P /S													
1	2	36	15	10	18	6	1	48	47	29	34	9	7	1	2	38	9	15	30	8	1	48	47	28	33	13	5
12	5	7	3	4	31	20	23	5	6	14	46	42	39	19	7	5	3	16	36	6	29	7	8	12	34	46	39
24	17	37	23	9	21	8	26	28	37	12	18	35	19	32	10	27	29	13	22	4	18	26	27	19	30	41	14
16	11	22	25	28	39	34	40	30	33	25	17	20	10	17	11	24	25	26	39	33	35	44	40	25	10	6	15
42	29	41	27	13	33	26	31	15	32	38	13	22	24	46	28	37	21	23	40	18	36	9	20	31	23	24	32
30	19	46	47	43	45	38	11	8	4	36	44	45	27	44	14	34	47	45	43	31	11	4	16	38	42	43	21
44	32	40	35	14	48	49	43	41	16	21	3	2	49	42	20	35	41	12	48	49	45	37	17	22	3	2	49
22/P /S														31/P /S													
1	2	32	5	12	24	14	1	48	47	27	35	13	4	1	2	35	8	13	10	7	1	48	47	26	36	11	6
8	9	4	3	10	29	11	17	9	14	18	40	43	34	12	9	6	3	4	29	18	22	9	7	15	46	45	31
22	6	19	17	13	23	7	28	30	19	8	24	45	21	27	20	33	22	11	24	5	23	34	33	12	10	42	21
15	16	20	25	30	34	35	38	39	44	25	6	11	12	14	19	16	25	34	31	36	37	32	30	25	20	18	13
43	27	37	33	31	44	28	29	5	26	42	31	20	22	45	26	39	28	17	30	23	29	8	40	38	17	16	27
39	21	40	47	46	41	42	16	7	10	32	36	41	33	32	21	46	47	44	41	38	19	5	4	35	43	41	28
36	26	38	45	18	48	49	46	37	15	23	3	2	49	43	40	37	42	15	48	49	44	39	14	24	3	2	49
48/P /S														72/P /S													
1	2	44	12	16	22	11	1	48	47	24	35	13	7	1	2	40	11	18	20	6	1	48	47	23	38	14	4
9	8	7	3	5	33	14	27	8	11	6	45	46	32	24	9	4	3	15	43	21	28	9	6	10	35	45	42
31	21	40	27	13	26	4	19	30	40	9	22	38	17	33	16	31	28	14	27	5	17	37	31	24	20	39	7
15	18	20	25	30	32	35	34	36	29	25	21	14	16	12	8	13	25	37	42	38	32	29	34	25	16	21	18
46	24	37	23	10	29	19	33	12	28	41	10	20	31	45	23	36	22	19	34	17	43	11	30	26	19	13	33
36	17	45	47	43	42	41	18	4	5	44	39	42	23	29	7	35	47	46	41	26	8	5	15	40	44	41	22
39	28	34	38	6	48	49	43	37	15	26	3	2	49	44	30	32	39	10	48	49	46	36	12	27	3	2	49

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

	793/P /S		858/P /S
1 2 35 4 21 18 14	1 48 47 6 42 26 5	1 2 36 4 13 15 16	1 48 47 5 44 19 11
22 7 5 3 16 40 17	38 7 14 15 34 30 37	22 7 11 3 10 42 26	30 7 16 14 40 27 41
41 23 31 38 26 44 20	9 39 31 22 18 46 10	33 18 29 30 19 45 23	17 38 29 22 15 46 8
8 13 11 25 39 37 42	29 33 27 25 23 17 21	6 9 12 25 38 41 44	37 24 32 25 18 26 13
30 6 24 12 19 27 9	40 4 32 28 19 11 41	27 5 31 20 21 32 17	42 4 35 28 21 12 33
33 10 34 47 45 43 28	13 20 16 35 36 43 12	24 8 40 47 39 43 28	9 23 10 36 34 43 20
36 32 29 46 15 48 49	45 24 8 44 3 2 49	34 35 37 46 14 48 49	39 31 6 45 3 2 49
	899/P /S		956/P /S
1 2 36 7 15 19 17	1 48 47 4 41 29 5	1 2 28 17 12 30 9	1 48 46 35 29 11 5
13 12 5 3 11 42 30	26 12 17 14 39 27 40	10 3 5 4 13 31 14	18 3 9 22 37 44 42
34 22 32 26 29 46 23	16 44 32 13 19 43 8	16 7 23 18 11 15 6	34 26 23 10 30 33 19
9 10 6 25 44 40 41	35 20 28 25 22 30 15	21 8 24 25 26 42 29	38 36 43 25 7 14 12
27 4 21 24 18 28 16	42 7 31 37 18 6 34	44 35 39 32 27 43 34	31 17 20 40 27 24 16
20 8 39 47 45 38 37	10 23 11 36 33 38 24	36 19 37 46 45 47 40	8 6 13 28 41 47 32
33 31 35 43 14 48 49	45 21 9 46 3 2 49	41 20 38 33 22 48 49	45 39 21 15 4 2 49
	1872/P /S		3311/P /S
1 2 18 19 11 28 7	1 48 45 37 24 17 3	1 2 22 18 10 14 3	1 48 44 37 30 11 4
6 4 3 5 15 27 16	14 4 7 32 35 42 41	8 5 4 6 7 24 23	17 5 3 28 43 41 38
12 10 20 14 17 13 8	38 29 20 6 28 31 23	15 16 31 17 11 13 9	35 29 31 8 14 32 10
26 9 21 25 29 41 24	39 34 40 25 10 16 11	20 12 21 25 29 38 30	40 27 34 25 16 23 26
42 37 33 36 30 40 38	27 19 22 44 30 21 12	41 37 39 33 19 34 35	24 18 36 42 19 21 15
34 23 35 45 47 46 44	9 8 15 18 43 46 36	27 26 43 44 46 45 42	12 9 7 22 47 45 33
43 22 39 31 32 48 49	47 33 26 13 5 2 49	47 36 40 32 28 48 49	46 39 20 13 6 2 49
	4707/P /S		6633/P /S
1 2 26 13 12 16 5	1 48 43 39 30 10 4	1 2 18 26 11 35 3	1 48 42 41 17 20 6
6 9 4 7 8 22 15	17 9 5 24 42 47 31	10 7 6 8 22 34 19	14 7 3 32 28 46 45
18 14 29 17 10 11 3	32 27 29 6 16 37 28	12 13 23 14 20 9 4	38 29 23 10 35 24 16
20 19 23 25 27 31 30	38 35 36 25 14 15 12	33 5 21 25 29 45 17	39 31 37 25 13 19 11
47 39 40 33 21 36 32	22 13 34 44 21 23 18	46 41 30 36 27 37 38	34 26 15 40 27 21 12
35 28 42 43 46 41 44	19 3 8 26 45 41 33	31 16 28 42 44 43 40	5 4 22 18 47 43 36
45 34 38 37 24 48 49	46 40 20 11 7 2 49	47 15 39 24 32 48 49	44 30 33 9 8 2 49
	8343/P /S		10652/P /S
1 2 17 14 13 19 3	1 48 41 43 26 10 6	1 2 20 23 9 32 3	1 48 40 45 19 15 7
11 5 6 9 15 20 8	21 5 3 33 35 46 32	6 8 7 10 17 26 14	16 8 3 30 33 46 39
16 12 23 21 10 7 4	34 22 23 11 19 36 30	13 12 28 16 15 5 4	37 21 28 6 32 27 24
24 18 28 25 22 32 26	37 42 38 25 12 8 13	31 11 29 25 21 39 19	41 36 38 25 12 14 9
46 43 40 29 27 38 34	20 14 31 39 27 28 16	46 45 35 34 22 38 37	26 23 18 44 22 29 13
42 30 35 41 44 45 39	18 4 15 17 47 45 29	36 24 33 40 43 42 44	11 4 17 20 47 42 34
47 31 37 36 33 48 49	44 40 24 7 9 2 49	47 18 41 27 30 48 49	43 35 31 5 10 2 49

.....

If you add such conditions to the basic as follows, you can surely have a faster, practical program for your Prototype Squares.

1. Equality of Cross-sums:

$n1+n9=n2+n8$; $n2+n10=n3+n9$; $n3+n11=n4+n10$; $n4+n12=n5+n11$; ...
 $n8+n16=n9+n15$; $n9+n17=n10+n16$; $n10+n18=n11+n17$; $n11+n19=n12+n18$; ...
 $n15+n23=n16+n22$; $n16+n24=n17+n23$; $n17+n25=n18+n24$; $n18+n26=n19+n25$; ...
... $n46+n3=n45+n4$; $n47+n4=n46+n5$; $n48+n5=n47+n6$; $n49+n6=n48+n7$;

2. Equality of Cross-sums Type 2:

$n1+n10=n3+n8$; $n2+n11=n4+n9$; $n3+n12=n5+n10$; $n4+n13=n6+n11$; ...
 $n8+n17=n10+n15$; $n9+n18=n11+n16$; $n10+n19=n12+n17$; $n11+n20=n13+n18$; ...
 $n15+n24=n17+n22$; $n16+n25=n18+n23$; $n17+n26=n19+n24$; $n18+n27=n20+n25$; ...
.....

3. Equality of Cross-sums Type 3:

$n1+n16=n2+n15$; $n2+n17=n3+n16$; $n3+n18=n4+n17$; $n4+n19=n5+n18$; ...
 $n8+n23=n9+n22$; $n9+n24=n10+n23$; $n10+n25=n11+n24$; $n11+n26=n12+n25$; ...
 $n15+n30=n16+n29$; $n16+n31=n17+n30$; $n17+n32=n18+n31$; $n18+n33=n19+n32$; ...
.....

But you can make only a small part of the standard solutions with those additions.

#3. List of Fundamental Prototype Squares and Simultaneous MS77 Recomposed

The next list shows the 768 'Prototype Squares' made under the new larger set of basic equations and the object solutions recomposed by DAM Transformation.

They must mean anything fundamental, I think.

** 'Prototype' Squares 7x7 and Simultaneous Magic Squares **

** Transformed: Both Self-complementary and Pan-diagonal **

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

577/P /S		609/P /S
8 1 15 22 29 43 36	8 49 27 5 39 31 16	9 2 16 23 30 44 37
9 2 16 23 30 44 37	24 2 36 35 20 12 46	9 48 28 5 39 31 15
10 3 17 24 31 45 38	40 32 17 9 43 28 6	8 1 15 22 29 43 36
11 4 18 25 32 46 39	21 13 47 25 3 37 29	24 1 37 34 21 12 46
12 5 19 26 33 47 40	44 22 7 41 33 18 10	40 32 17 8 44 27 7
13 6 20 27 34 48 41	4 38 30 15 14 48 26	10 3 17 24 31 45 38
14 7 21 28 35 49 42	34 19 11 45 23 1 42	40 32 17 8 44 27 7
		11 4 18 25 32 46 39
		20 14 47 25 3 36 30
		12 5 19 26 33 47 40
		43 23 6 42 33 18 10
		14 7 21 28 35 49 42
		4 38 29 16 13 49 26
		13 6 20 27 34 48 41
		35 19 11 45 22 2 41
641/P /S		673/P /S
10 3 17 24 31 45 38	10 47 28 6 39 30 15	12 5 19 26 33 47 40
8 1 15 22 29 43 36	23 1 38 33 21 13 46	12 45 28 6 39 30 15
9 2 16 23 30 44 37	41 32 16 8 45 26 7	8 1 15 22 29 43 36
11 4 18 25 32 46 39	19 14 48 25 2 36 31	23 1 40 31 21 13 46
13 6 20 27 34 48 41	43 24 5 42 34 18 9	9 2 16 23 30 44 37
14 7 21 28 35 49 42	4 37 29 17 12 49 27	41 32 16 8 47 24 7
12 5 19 26 33 47 40	35 20 11 44 22 3 40	11 4 18 25 32 46 39
		17 14 48 25 2 36 33
		13 6 20 27 34 48 41
		43 26 3 42 34 18 9
		14 7 21 28 35 49 42
		4 37 29 19 10 49 27
		10 3 17 24 31 45 38
		35 20 11 44 22 5 38
705/P /S		737/P /S
13 6 20 27 34 48 41	13 44 28 5 39 31 15	14 7 21 28 35 49 42
8 1 15 22 29 43 36	24 1 41 30 21 12 46	14 43 27 5 39 31 16
10 3 17 24 31 45 38	40 32 17 8 48 23 7	9 2 16 23 30 44 37
11 4 18 25 32 46 39	16 14 47 25 3 36 34	24 2 42 29 20 12 46
12 5 19 26 33 47 40	43 27 2 42 33 18 10	10 3 17 24 31 45 38
14 7 21 28 35 49 42	4 38 29 20 9 49 26	40 32 17 9 49 22 6
9 2 16 23 30 44 37	35 19 11 45 22 6 37	11 4 18 25 32 46 39
		15 13 47 25 3 37 35
		12 5 19 26 33 47 40
		44 28 1 41 33 18 10
		13 6 20 27 34 48 41
		4 38 30 21 8 48 26
		8 1 15 22 29 43 36
		34 19 11 45 23 7 36

[Count = 768] OK!

We already know there are more standard solutions of Simultaneous squares, far more than hundreds of thousands. But we can not recompose all of them under these conditions. It may mean the smallest set of 576 solutions above should be anything fundamental to those far more standard ones.

#4. Prototype Squares of Order 7 for Pan-Diagonal Magic Squares 7x7

Let's study about the Prototype Squares for pan-diagonal magic squares 7x7 next. We want to have the same Model with the previous one for Simultaneous type. But we have to define the new basic conditions for the new Prototype Squares.

** Basic Forms and Conditions for 'Prototype Squares' of Order 7 **

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

** Basic Conditions for Prototype Squares 7x7: **

n1+n48+n39+n30+n28+n19+n10=C ... rw1;	n1+n18+n35+n45+n13+n23+n40=C ... cl 1;
n18+n9+n7+n47+n38+n29+n27=C ... rw2;	n48+n9+n26+n36+n4+n21+n31=C ... cl 2;
n35+n26+n17+n8+n6+n46+n37=C ... rw3;	n39+n7+n17+n34+n44+n12+n22=C ... cl 3;
n45+n36+n34+n25+n16+n14+n5=C ... rw4;	n30+n47+n8+n25+n42+n3+n20=C ... cl 4;
n13+n4+n44+n42+n33+n24+n15=C ... rw5;	n28+n38+n6+n16+n33+n43+n11=C ... cl 5;
n23+n21+n12+n3+n43+n41+n32=C ... rw6;	n19+n29+n46+n14+n24+n41+n2=C ... cl 6;

$n_{40}+n_{31}+n_{22}+n_{20}+n_{11}+n_2+n_{49}=C \dots rw7$; | $n_{10}+n_{27}+n_{37}+n_5+n_{15}+n_{32}+n_{49}=C \dots cl 7$;
**** Pan-diagonal Conditions for Prototype Squares 7x7: ****
 $n_1+n_9+n_{17}+n_{25}+n_{33}+n_{41}+n_{49}=C \dots pd1$; | $n_1+n_{27}+n_{46}+n_{16}+n_{42}+n_{12}+n_{31}=C \dots pb1$;
 $n_{48}+n_7+n_8+n_{16}+n_{24}+n_{32}+n_{40}=C \dots pd2$; | $n_{48}+n_{18}+n_{37}+n_{14}+n_{33}+n_3+n_{22}=C \dots pb2$;
 $n_{39}+n_{47}+n_6+n_{14}+n_{15}+n_{23}+n_{31}=C \dots pd3$; | $n_{39}+n_9+n_{35}+n_5+n_{24}+n_{43}+n_{20}=C \dots pb3$;
 $n_{30}+n_{38}+n_{46}+n_5+n_{13}+n_{21}+n_{22}=C \dots pd4$; | $n_{30}+n_7+n_{26}+n_{45}+n_{15}+n_{41}+n_{11}=C \dots pb4$;
 $n_{28}+n_{29}+n_{37}+n_{45}+n_4+n_{12}+n_{20}=C \dots pd5$; | $n_{28}+n_{47}+n_{17}+n_{36}+n_{13}+n_{32}+n_2=C \dots pb5$;
 $n_{19}+n_{27}+n_{35}+n_{36}+n_{44}+n_3+n_{11}=C \dots pd6$; | $n_{19}+n_{38}+n_8+n_{34}+n_4+n_{23}+n_{49}=C \dots pb6$;
 $n_{10}+n_{18}+n_{26}+n_{34}+n_{42}+n_{43}+n_2=C \dots pd7$; | $n_{10}+n_{29}+n_6+n_{25}+n_{44}+n_{21}+n_{40}=C \dots pb7$;
**** List-forming Inequality Conditions: ****
 $n_1 < n_{49}$, $n_1 < n_{10}$, $n_1 < n_{40}$ and $n_{48} > n_{18}$;

These are all the new definitions I dictated. Self-Complementary equations are no longer necessary for this type.

Those equations above must be adequate for our new Prototype Squares, but I found they were also unsatisfactory. They were very slow, say, too slow for us to go on making all solutions up to the last. It was so impractical that I had to give it up, while I had to make so many solutions as hundreds of millions.

When you add such conditions to the basic as follows, you can surely have a faster, practical program for your Prototype Squares.

1. Equality of Cross-sums:

$n_1+n_9=n_2+n_8$; $n_2+n_{10}=n_3+n_9$; $n_3+n_{11}=n_4+n_{10}$; $n_4+n_{12}=n_5+n_{11}$; ...
 $n_8+n_{16}=n_9+n_{15}$; $n_9+n_{17}=n_{10}+n_{16}$; $n_{10}+n_{18}=n_{11}+n_{17}$; $n_{11}+n_{19}=n_{12}+n_{18}$; ...
 $n_{15}+n_{23}=n_{16}+n_{22}$; $n_{16}+n_{24}=n_{17}+n_{23}$; $n_{17}+n_{25}=n_{18}+n_{24}$; $n_{18}+n_{26}=n_{19}+n_{25}$; ...
 ...
 $n_{46}+n_3=n_{45}+n_4$; $n_{47}+n_4=n_{46}+n_5$; $n_{48}+n_5=n_{47}+n_6$; $n_{49}+n_6=n_{48}+n_7$;

2. Equality of Cross-sums Type 2:

$n_1+n_{10}=n_3+n_8$; $n_2+n_{11}=n_4+n_9$; $n_3+n_{12}=n_5+n_{10}$; $n_4+n_{13}=n_6+n_{11}$; ...
 $n_8+n_{17}=n_{10}+n_{15}$; $n_9+n_{18}=n_{11}+n_{16}$; $n_{10}+n_{19}=n_{12}+n_{17}$; $n_{11}+n_{20}=n_{13}+n_{18}$; ...
 $n_{15}+n_{24}=n_{17}+n_{22}$; $n_{16}+n_{25}=n_{18}+n_{23}$; $n_{17}+n_{26}=n_{19}+n_{24}$; $n_{18}+n_{27}=n_{20}+n_{25}$; ...
 ...

3. Equality of Cross-sums Type 3:

$n_1+n_{16}=n_2+n_{15}$; $n_2+n_{17}=n_3+n_{16}$; $n_3+n_{18}=n_4+n_{17}$; $n_4+n_{19}=n_5+n_{18}$; ...
 $n_8+n_{23}=n_9+n_{22}$; $n_9+n_{24}=n_{10}+n_{23}$; $n_{10}+n_{25}=n_{11}+n_{24}$; $n_{11}+n_{26}=n_{12}+n_{25}$; ...
 $n_{15}+n_{30}=n_{16}+n_{29}$; $n_{16}+n_{31}=n_{17}+n_{30}$; $n_{17}+n_{32}=n_{18}+n_{31}$; $n_{18}+n_{33}=n_{19}+n_{32}$; ...
 ...

But those additions could make only a small part of standard solutions. You can no longer recompose all the solutions of our object.

#5. List of Fundamental Prototype Squares and Pan-diagonal MS77 Recomposed

The next list shows the 'Prototype Squares' made under the new larger set of basic equations and the object solutions recomposed by DAM Transformation. They must mean anything fundamental, I suppose.

We could recompose only a small part of the standard solutions of Pan-diagonal MS77. No one knows the total count of all the standard solutions yet.

It is really a hard job to make all of them by any method whatever you could imagine, since any type of solutions of order 7 must be too many for us to count up to the last piece by piece. It is also too many for us to analyze and study them precisely each by each, even if we could know the total count of solutions itself.

*** List of 'Prototype Squares' of Order 7 and Pan-Diagonal ***
 ** Magic Squares of Order 7 Recomposed by 'DAM Transformation' **

*** Standard Solutions under $n1 < n49$, $n1 < n7$, $n1 < n43$ and $n8 < n2$ **

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

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

P/ 23/R														P/ 0/R													
1	2	3	4	5	6	7	1	48	32	23	42	19	10	1	8	15	36	22	29	43	0	0	0	0	0	0	0
8	9	10	11	12	13	14	18	9	7	47	31	22	41	2	9	16	37	23	30	44	0	0	0	0	0	0	0
15	16	17	18	19	20	21	28	40	17	8	6	46	30	3	10	17	38	24	31	45	0	0	0	0	0	0	0
36	37	38	39	40	41	42	45	29	27	39	16	14	5	4	11	18	39	25	32	46	0	0	0	0	0	0	0
22	23	24	25	26	27	28	13	4	44	35	26	38	15	5	12	19	40	26	33	47	0	0	0	0	0	0	0
29	30	31	32	33	34	35	37	21	12	3	43	34	25	6	13	20	41	27	34	48	0	0	0	0	0	0	0
43	44	45	46	47	48	49	33	24	36	20	11	2	49	7	14	21	42	28	35	49	0	0	0	0	0	0	0

P/ 31/R														P/ 0/R													
1	2	3	4	5	6	7	1	41	32	23	49	19	10	1	8	15	43	22	29	36	0	0	0	0	0	0	0
8	9	10	11	12	13	14	18	9	7	40	31	22	48	2	9	16	44	23	30	37	0	0	0	0	0	0	0
15	16	17	18	19	20	21	28	47	17	8	6	39	30	3	10	17	45	24	31	38	0	0	0	0	0	0	0
43	44	45	46	47	48	49	38	29	27	46	16	14	5	4	11	18	46	25	32	39	0	0	0	0	0	0	0
22	23	24	25	26	27	28	13	4	37	35	26	45	15	5	12	19	47	26	33	40	0	0	0	0	0	0	0
29	30	31	32	33	34	35	44	21	12	3	36	34	25	6	13	20	48	27	34	41	0	0	0	0	0	0	0
36	37	38	39	40	41	42	33	24	43	20	11	2	42	7	14	21	49	28	35	42	0	0	0	0	0	0	0

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

P/ 67/R														P/ 68/R													
1	2	3	4	5	6	7	1	48	39	23	21	33	10	1	8	29	15	22	36	43	1	42	20	12	46	24	30
8	9	10	11	12	13	14	32	9	7	47	38	22	20	2	9	30	16	23	37	44	17	9	43	28	34	5	39
29	30	31	32	33	34	35	28	19	31	8	6	46	37	3	10	31	17	24	38	45	47	25	31	2	36	21	13
15	16	17	18	19	20	21	45	36	27	18	30	14	5	4	11	32	18	25	39	46	35	6	40	18	10	44	22
22	23	24	25	26	27	28	13	4	44	42	26	17	29	5	12	33	19	26	40	47	37	15	14	48	26	32	3
36	37	38	39	40	41	42	16	35	12	3	43	41	25	6	13	34	20	27	41	48	11	45	23	29	7	41	19
43	44	45	46	47	48	49	40	24	15	34	11	2	49	7	14	35	21	28	42	49	27	33	4	38	16	8	49

P/ 91/R														P/ 92/R													
1	2	3	4	5	6	7	1	48	32	23	21	40	10	1	8	36	15	22	29	43	1	35	20	12	46	24	37
8	9	10	11	12	13	14	39	9	7	47	31	22	20	2	9	37	16	23	30	44	17	9	43	28	41	5	32
36	37	38	39	40	41	42	28	19	38	8	6	46	30	3	10	38	17	24	31	45	47	25	38	2	29	21	13
15	16	17	18	19	20	21	45	29	27	18	37	14	5	4	11	39	18	25	32	46	42	6	33	18	10	44	22
22	23	24	25	26	27	28	13	4	44	35	26	17	36	5	12	40	19	26	33	47	30	15	14	48	26	39	3
29	30	31	32	33	34	35	16	42	12	3	43	34	25	6	13	41	20	27	34	48	11	45	23	36	7	34	19
43	44	45	46	47	48	49	33	24	15	41	11	2	49	7	14	42	21	28	35	49	27	40	4	31	16	8	49

P/ O/R
 1 2 3 4 5 6 7 0 0 0 0 0 0 0
 8 9 10 11 12 13 14 0 0 0 0 0 0 0
 43 44 45 46 47 48 49 0 0 0 0 0 0 0
 15 16 17 18 19 20 21 0 0 0 0 0 0 0
 22 23 24 25 26 27 28 0 0 0 0 0 0 0
 29 30 31 32 33 34 35 0 0 0 0 0 0 0
 36 37 38 39 40 41 42 0 0 0 0 0 0 0

P/109/R
 1 8 43 15 22 29 36 1 35 20 12 39 24 44
 2 9 44 16 23 30 37 17 9 36 28 48 5 32
 3 10 45 17 24 31 38 40 25 45 2 29 21 13
 4 11 46 18 25 32 39 49 6 33 18 10 37 22
 5 12 47 19 26 33 40 30 15 14 41 26 46 3
 6 13 48 20 27 34 41 11 38 23 43 7 34 19
 7 14 49 21 28 35 42 27 47 4 31 16 8 42

P/121/R
 1 2 3 4 5 6 7 1 48 39 30 28 12 17
 15 16 17 18 19 20 21 11 16 7 47 38 29 27
 8 9 10 11 12 13 14 35 26 10 15 6 46 37
 22 23 24 25 26 27 28 45 36 34 25 9 21 5
 29 30 31 32 33 34 35 20 4 44 42 33 24 8
 36 37 38 39 40 41 42 23 14 19 3 43 41 32
 43 44 45 46 47 48 49 40 31 22 13 18 2 49

P/122/R
 1 15 8 22 29 36 43 1 42 27 19 46 31 9
 2 16 9 23 30 37 44 24 16 43 35 13 5 39
 3 17 10 24 31 38 45 47 32 10 2 36 28 20
 4 18 11 25 32 39 46 14 6 40 25 17 44 29
 5 19 12 26 33 40 47 37 22 21 48 33 11 3
 6 20 13 27 34 41 48 18 45 30 8 7 41 26
 7 21 14 28 35 42 49 34 12 4 38 23 15 49

P/241/R
 1 2 3 4 5 6 7 1 48 39 30 21 12 24
 22 23 24 25 26 27 28 11 23 7 47 38 29 20
 8 9 10 11 12 13 14 35 19 10 22 6 46 37
 15 16 17 18 19 20 21 45 36 34 18 9 28 5
 29 30 31 32 33 34 35 27 4 44 42 33 17 8
 36 37 38 39 40 41 42 16 14 26 3 43 41 32
 43 44 45 46 47 48 49 40 31 15 13 25 2 49

P/242/R
 1 22 8 15 29 36 43 1 42 20 26 46 31 9
 2 23 9 16 30 37 44 17 23 43 35 13 5 39
 3 24 10 17 31 38 45 47 32 10 2 36 21 27
 4 25 11 18 32 39 46 14 6 40 18 24 44 29
 5 26 12 19 33 40 47 37 15 28 48 33 11 3
 6 27 13 20 34 41 48 25 45 30 8 7 41 19
 7 28 14 21 35 42 49 34 12 4 38 16 22 49

P/361/R
 1 2 3 4 5 6 7 1 48 39 23 21 12 31
 29 30 31 32 33 34 35 11 30 7 47 38 22 20
 8 9 10 11 12 13 14 28 19 10 29 6 46 37
 15 16 17 18 19 20 21 45 36 27 18 9 35 5
 22 23 24 25 26 27 28 34 4 44 42 26 17 8
 36 37 38 39 40 41 42 16 14 33 3 43 41 25
 43 44 45 46 47 48 49 40 24 15 13 32 2 49

P/362/R
 1 29 8 15 22 36 43 1 42 20 33 46 24 9
 2 30 9 16 23 37 44 17 30 43 28 13 5 39
 3 31 10 17 24 38 45 47 25 10 2 36 21 34
 4 32 11 18 25 39 46 14 6 40 18 31 44 22
 5 33 12 19 26 40 47 37 15 35 48 26 11 3
 6 34 13 20 27 41 48 32 45 23 8 7 41 19
 7 35 14 21 28 42 49 27 12 4 38 16 29 49

P/721/R
 1 2 3 4 5 7 6 1 49 39 30 27 19 10
 8 9 10 11 12 14 13 18 9 6 47 38 29 28
 15 16 17 18 19 21 20 34 26 17 8 7 46 37
 22 23 24 25 26 28 27 45 36 35 25 16 13 5
 29 30 31 32 33 35 34 14 4 44 41 33 24 15
 36 37 38 39 40 42 41 23 20 12 3 43 42 32
 43 44 45 46 47 49 48 40 31 22 21 11 2 48

P/722/R
 1 8 15 22 29 36 43 1 41 28 12 46 31 16
 2 9 16 23 30 37 44 24 9 43 34 21 5 39
 3 10 17 24 31 38 45 47 32 17 2 36 27 14
 4 11 18 25 32 39 46 20 7 40 25 10 44 29
 5 12 19 26 33 40 47 37 22 13 49 33 18 3
 7 14 21 28 35 42 49 11 45 30 15 6 42 26
 6 13 20 27 34 41 48 35 19 4 38 23 8 48

P/1441/R
 1 2 3 4 6 5 7 1 47 39 30 28 20 10
 8 9 10 11 13 12 14 18 9 7 48 38 29 26
 15 16 17 18 20 19 21 35 27 17 8 5 46 37
 22 23 24 25 27 26 28 45 36 33 25 16 14 6
 29 30 31 32 34 33 35 12 4 44 42 34 24 15
 36 37 38 39 41 40 42 23 21 13 3 43 40 32
 43 44 45 46 48 47 49 41 31 22 19 11 2 49

P/1442/R
 1 8 15 22 29 36 43 1 42 26 13 46 31 16
 2 9 16 23 30 37 44 24 9 43 35 19 6 39
 3 10 17 24 31 38 45 48 32 17 2 36 28 12
 4 11 18 25 32 39 46 21 5 41 25 10 44 29
 6 13 20 27 34 41 48 37 22 14 47 34 18 3
 5 12 19 26 33 40 47 11 45 30 15 7 40 27
 7 14 21 28 35 42 49 33 20 4 38 23 8 49

P/2881/R
 1 2 3 4 7 5 6 1 47 39 30 27 21 10
 8 9 10 11 14 12 13 18 9 6 49 38 29 26
 15 16 17 18 21 19 20 34 28 17 8 5 46 37
 22 23 24 25 28 26 27 45 36 33 25 16 13 7
 29 30 31 32 35 33 34 12 4 44 41 35 24 15
 36 37 38 39 42 40 41 23 20 14 3 43 40 32
 43 44 45 46 49 47 48 42 31 22 19 11 2 48

P/2882/R
 1 8 15 22 29 36 43 1 41 26 14 46 31 16
 2 9 16 23 30 37 44 24 9 43 34 19 7 39
 3 10 17 24 31 38 45 49 32 17 2 36 27 12
 4 11 18 25 32 39 46 20 5 42 25 10 44 29
 7 14 21 28 35 42 49 37 22 13 47 35 18 3
 5 12 19 26 33 40 47 11 45 30 15 6 40 28
 6 13 20 27 34 41 48 33 21 4 38 23 8 48

P/4321/R
 1 2 3 5 4 6 7 1 48 40 30 28 18 10
 8 9 10 12 11 13 14 19 9 7 46 38 29 27
 15 16 17 19 18 20 21 35 25 17 8 6 47 37
 22 23 24 26 25 27 28 45 36 34 26 16 14 4
 29 30 31 33 32 34 35 13 5 44 42 32 24 15
 36 37 38 40 39 41 42 23 21 11 3 43 41 33
 43 44 45 47 46 48 49 39 31 22 20 12 2 49

P/4322/R
 1 8 15 22 29 36 43 1 42 27 11 47 31 16
 2 9 16 23 30 37 44 24 9 43 35 20 4 40
 3 10 17 24 31 38 45 46 33 17 2 36 28 13
 5 12 19 26 33 40 47 21 6 39 26 10 44 29
 4 11 18 25 32 39 46 37 22 14 48 32 19 3
 6 13 20 27 34 41 48 12 45 30 15 7 41 25
 7 14 21 28 35 42 49 34 18 5 38 23 8 49

P/8641/R

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

P/12961/R

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

P/17281/R

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

P/34561/R

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

P/51841/R

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

P/69121/R

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

P/86401/R

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

P/172801/R

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

P/8642/R

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

P/12962/R

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

P/17282/R

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

P/34562/R

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

P/51842/R

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

P/69122/R

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

P/86402/R

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

P/172802/R

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

P/259201/R														P/259202/R													
1	5	2	3	4	6	7	1	48	38	33	28	18	9	1	8	15	22	29	36	43	1	42	27	11	45	30	19
8	12	9	10	11	13	14	17	12	7	46	37	29	27	5	12	19	26	33	40	47	23	12	43	35	20	4	38
15	19	16	17	18	20	21	35	25	16	8	6	45	40	2	9	16	23	30	37	44	46	31	16	5	36	28	13
22	26	23	24	25	27	28	44	36	34	24	19	14	4	3	10	17	24	31	38	45	21	6	39	24	9	47	29
29	33	30	31	32	34	35	13	3	47	42	32	23	15	4	11	18	25	32	39	46	40	22	14	48	32	17	2
36	40	37	38	39	41	42	26	21	11	2	43	41	31	6	13	20	27	34	41	48	10	44	33	15	7	41	25
43	47	44	45	46	48	49	39	30	22	20	10	5	49	7	14	21	28	35	42	49	34	18	3	37	26	8	49
P/345601/R														P/345602/R													
1	6	2	3	4	5	7	1	47	38	34	28	18	9	1	8	15	22	29	36	43	1	42	26	11	45	30	20
8	13	9	10	11	12	14	17	13	7	46	37	29	26	6	13	20	27	34	41	48	23	13	43	35	19	4	38
15	20	16	17	18	19	21	35	25	16	8	5	45	41	2	9	16	23	30	37	44	46	31	16	6	36	28	12
22	27	23	24	25	26	28	44	36	33	24	20	14	4	3	10	17	24	31	38	45	21	5	39	24	9	48	29
29	34	30	31	32	33	35	12	3	48	42	32	23	15	4	11	18	25	32	39	46	41	22	14	47	32	17	2
36	41	37	38	39	40	42	27	21	11	2	43	40	31	5	12	19	26	33	40	47	10	44	34	15	7	40	25
43	48	44	45	46	47	49	39	30	22	19	10	6	49	7	14	21	28	35	42	49	33	18	3	37	27	8	49
P/432001/R														P/432002/R													
1	7	2	3	4	5	6	1	47	38	35	27	18	9	1	8	15	22	29	36	43	1	41	26	11	45	30	21
8	14	9	10	11	12	13	17	14	6	46	37	29	26	7	14	21	28	35	42	49	23	14	43	34	19	4	38
15	21	16	17	18	19	20	34	25	16	8	5	45	42	2	9	16	23	30	37	44	46	31	16	7	36	27	12
22	28	23	24	25	26	27	44	36	33	24	21	13	4	3	10	17	24	31	38	45	20	5	39	24	9	49	29
29	35	30	31	32	33	34	12	3	49	41	32	23	15	4	11	18	25	32	39	46	42	22	13	47	32	17	2
36	42	37	38	39	40	41	28	20	11	2	43	40	31	5	12	19	26	33	40	47	10	44	35	15	6	40	25
43	49	44	45	46	47	48	39	30	22	19	10	7	48	6	13	20	27	34	41	48	33	18	3	37	28	8	48
P/ O/R							P/ O/R							P/518401/R													
8	9	10	11	12	13	14	0	0	0	0	0	0	0	8	1	15	22	29	36	43	8	42	27	5	46	31	16
1	2	3	4	5	6	7	0	0	0	0	0	0	0	9	2	16	23	30	37	44	24	2	43	35	20	12	39
15	16	17	18	19	20	21	0	0	0	0	0	0	0	10	3	17	24	31	38	45	47	32	17	9	36	28	6
22	23	24	25	26	27	28	0	0	0	0	0	0	0	11	4	18	25	32	39	46	21	13	40	25	3	44	29
29	30	31	32	33	34	35	0	0	0	0	0	0	0	12	5	19	26	33	40	47	37	22	7	48	33	18	10
36	37	38	39	40	41	42	0	0	0	0	0	0	0	13	6	20	27	34	41	48	4	45	30	15	14	41	26
43	44	45	46	47	48	49	0	0	0	0	0	0	0	14	7	21	28	35	42	49	34	19	11	38	23	1	49
P/ O/R							P/ O/R							P/820801/R													
15	16	17	18	19	20	21	0	0	0	0	0	0	0	15	1	22	8	29	36	43	15	42	13	5	46	31	23
1	2	3	4	5	6	7	0	0	0	0	0	0	0	16	2	23	9	30	37	44	10	2	43	35	27	19	39
22	23	24	25	26	27	28	0	0	0	0	0	0	0	17	3	24	10	31	38	45	47	32	24	16	36	14	6
8	9	10	11	12	13	14	0	0	0	0	0	0	0	18	4	25	11	32	39	46	28	20	40	11	3	44	29
29	30	31	32	33	34	35	0	0	0	0	0	0	0	19	5	26	12	33	40	47	37	8	7	48	33	25	17
36	37	38	39	40	41	42	0	0	0	0	0	0	0	20	6	27	13	34	41	48	4	45	30	22	21	41	12
43	44	45	46	47	48	49	0	0	0	0	0	0	0	21	7	28	14	35	42	49	34	26	18	38	9	1	49
P/ O/R							P/ O/R							P/959041/R													
22	23	24	25	26	27	28	0	0	0	0	0	0	0	22	1	29	8	36	15	43	22	21	13	5	46	38	30
1	2	3	4	5	6	7	0	0	0	0	0	0	0	23	2	30	9	37	16	44	10	2	43	42	34	26	18
29	30	31	32	33	34	35	0	0	0	0	0	0	0	24	3	31	10	38	17	45	47	39	31	23	15	14	6
8	9	10	11	12	13	14	0	0	0	0	0	0	0	25	4	32	11	39	18	46	35	27	19	11	3	44	36
36	37	38	39	40	41	42	0	0	0	0	0	0	0	26	5	33	12	40	19	47	16	8	7	48	40	32	24
15	16	17	18	19	20	21	0	0	0	0	0	0	0	27	6	34	13	41	20	48	4	45	37	29	28	20	12
43	44	45	46	47	48	49	0	0	0	0	0	0	0	28	7	35	14	42	21	49	41	33	25	17	9	1	49

[Count = 997920] OK!

#6. Another Approach must be Made for this Study.

We now know there are 'Complete Euler Squares' of order 7 among Simultaneous type and Pan-diagonal one, and we know all those MS77 are not always 'Complete Euler Squares'. The amount of 'Complete Euler Squares' is far smaller than that of 'Non-Euler Squares', but it is reasonably small, say, small enough for us to study them precisely piece by piece.

Why don't you study these 'Complete Euler Squares' of order 7 of Simultaneous type and Pan-diagonal one? And why don't you make Prototype Squares for them?

But this time let me only show the sample list of 'Complete Euler Squares' and the

basic diagrams for the Prototype Squares of order 7 as below.

** 'Complete Euler Squares' of Simultaneous Magic Type **
 ** Both Self-Complementary and Pan-Diagonal of Order 7 **

1/ /D7i							2/ /D7i						
1 48 39 30 28 19 10	0654321	0531642	1 46 42 31 27 16 12	0654321	0362514								
18 9 7 47 38 29 27	2106543	3164205	20 9 5 43 39 35 24	2106543	5140362								
35 26 17 8 6 46 37	4321065	6420531	32 28 17 13 2 47 36	4321065	3625140								
45 36 34 25 16 14 5	6543210	2053164	44 40 29 25 21 10 6	6543210	1403625								
13 4 44 42 33 24 15	1065432	5316420	14 3 48 37 33 22 18	1065432	6251403								
23 21 12 3 43 41 32	3210654	1642053	26 15 11 7 45 41 30	3210654	4036251								
40 31 22 20 11 2 49	5432106	4205316	38 34 23 19 8 4 49	5432106	2514036								
3/ /D7i							4/ /D7i						
1 45 40 35 23 18 13	0654321	0246135	1 42 27 12 46 31 16	0531642	0654321								
21 9 4 48 36 31 26	2106543	6135024	24 9 43 35 20 5 39	3164205	2106543								
34 22 17 12 7 44 39	4321065	5024613	47 32 17 2 36 28 13	6420531	4321065								
47 42 30 25 20 8 3	6543210	4613502	21 6 40 25 10 44 29	2053164	6543210								
11 6 43 38 33 28 16	1065432	3502461	37 22 14 48 33 18 3	5316420	1065432								
24 19 14 2 46 41 29	3210654	2461350	11 45 30 15 7 41 26	1642053	3210654								
37 32 27 15 10 5 49	5432106	1350246	34 19 4 38 23 8 49	4205316	5432106								
5/ /D7i							6/ /D7i						
1 39 28 10 48 30 19	0531642	0362514	1 38 26 14 44 32 20	0531642	0246135								
27 9 47 29 18 7 38	3164205	5140362	28 9 46 34 15 3 40	3164205	6135024								
46 35 17 6 37 26 8	6420531	3625140	48 29 17 5 42 23 11	6420531	5024613								
16 5 36 25 14 45 34	2053164	1403625	19 7 37 25 13 43 31	2053164	4613502								
42 24 13 44 33 15 4	5316420	6251403	39 27 8 45 33 21 2	5316420	3502461								
12 43 32 21 3 41 23	1642053	4036251	10 47 35 16 4 41 22	1642053	2461350								
31 20 2 40 22 11 49	4205316	2514036	30 18 6 36 24 12 49	4205316	1350246								

** Basic Forms for 'Prototype Square' of Order 7 and Object Model **

[Prototype]	[Decomposed]	[High]	[Low]
47 48 49 43 44 45 46 47 48 49 43 44 45	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	4 5 6 0 1 2 3 4 5 6 0 1 2	
5 6 7 1 2 3 4 5 6 7 1 2 3	0 0 0 0 0 0 0 0 0 0 0 0	4 5 6 0 1 2 3 4 5 6 0 1 2	
12 13 14 8 9 10 11 12 13 14 8 9 10	1 1 1 1 1 1 1 1 1 1 1 1	4 5 6 0 1 2 3 4 5 6 0 1 2	
19 20 21 15 16 17 18 19 20 21 15 16 17	2 2 2 2 2 2 2 2 2 2 2 2	4 5 6 0 1 2 3 4 5 6 0 1 2	
26 27 28 22 23 24 25 26 27 28 22 23 24	3 3 3 3 3 3 3 3 3 3 3 3	4 5 6 0 1 2 3 4 5 6 0 1 2	
33 34 35 29 30 31 32 33 34 35 29 30 31	4 4 4 4 4 4 4 4 4 4 4 4	4 5 6 0 1 2 3 4 5 6 0 1 2	
40 41 42 36 37 38 39 40 41 42 36 37 38	5 5 5 5 5 5 5 5 5 5 5 5	4 5 6 0 1 2 3 4 5 6 0 1 2	
47 48 49 43 44 45 46 47 48 49 43 44 45	6 6 6 6 6 6 6 6 6 6 6 6	4 5 6 0 1 2 3 4 5 6 0 1 2	
5 6 7 1 2 3 4 5 6 7 1 2 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 5 6 0 1 2 3 4 5 6 0 1 2	
[Object Model]	[Decomposed]	[High]	[Low]
11 2 49 40 31 22 20 11 2 49 40 31 22	1 0 6 5 4 3 2 1 0 6 5 4 3	3 1 6 4 2 0 5 3 1 6 4 2 0	
28 19 10 1 48 39 30 28 19 10 1 48 39	3 2 1 0 6 5 4 3 2 1 0 6 5	6 4 2 0 5 3 1 6 4 2 0 5 3	
38 29 27 18 9 7 47 38 29 27 18 9 7	5 4 3 2 1 0 6 5 4 3 2 1 0	2 0 5 3 1 6 4 2 0 5 3 1 6	
6 46 37 35 26 17 8 6 46 37 35 26 17	0 6 5 4 3 2 1 0 6 5 4 3 2	5 3 1 6 4 2 0 5 3 1 6 4 2	
16 14 5 45 36 34 25 16 14 5 45 36 34	2 1 0 6 5 4 3 2 1 0 6 5 4	1 6 4 2 0 5 3 1 6 4 2 0 5	
33 24 15 13 4 44 42 33 24 15 13 4 44	4 3 2 1 0 6 5 4 3 2 1 0 6	4 2 0 5 3 1 6 4 2 0 5 3 1	
43 41 32 23 21 12 3 43 41 32 23 21 12	6 5 4 3 2 1 0 6 5 4 3 2 1	0 5 3 1 6 4 2 0 5 3 1 6 4	
11 2 49 40 31 22 20 11 2 49 40 31 22	1 0 6 5 4 3 2 1 0 6 5 4 3	3 1 6 4 2 0 5 3 1 6 4 2 0	
28 19 10 1 48 39 30 28 19 10 1 48 39	3 2 1 0 6 5 4 3 2 1 0 6 5	6 4 2 0 5 3 1 6 4 2 0 5 3	

Let me report about the precise study result of 'Complete Euler Squares' of order 7 of mine in another article of another chapter. Please read them, will you?

(Original: July 10, 2001; New Revised Edition: Oct 19, 2006;

Written by Kanji Setsuda; Worked on MacOS X and Xcode 2.2.1)

*** E-Mail Address:<jag12001@nifty.ne.jp>

```
/** 'Prototype Squares' of Order 7 and Simul taneous Magi c Squares **/
/** Recomposed by 'DAMT': Both Sel f-complementary and Pan-di agonal **/
/** 'ProtoTS7Sml 2.c' bui lt by Kanji Setsuda **/
/** on Mar. 24, '01; Mar. 21, '03; Sep. 30, '06 **/
/** Working on MacOSX and Xcode 2.2.1 **/
/**/
#include <stdio.h>
/* Global Variables */
short int cnt, cnt2, cnt3;
short LSM, CC, S6N;
short nm[50], uflg[50];
short c[50], d[50];
short anm[5][50];
short nt08[36], nt09[34], nt11[30], nt12[28];
short nt15[22], nt18[16];
/**/
/* Sub-Routi ens 1 */
void stp01(void), stp02(void), stp03(void), stp04(void);
void stp05(void), stp06(void), stp07(void), stp08(void);
void stp09(void), stp10(void), stp11(void), stp12(void);
void stp13(void), stp14(void), stp15(void), stp16(void);
void stp17(void), stp18(void), stp19(void), stp20(void);
void stp21(void), stp22(void), stp23(void), stp24(void);
void stp25(void), stp26(void);
void makeans(void);
void pr2ans(void);
void damt7(void);
/**/
/* Main Program */
int main(){
short n;
printf("\n** 'Prototype Squares' of Order 7 and Simul taneous Magi c Squares **\n");
printf("** Recomposed by 'DAMT': Both Sel f-complementary and Pan-di agonal **\n");
for(n=0;n<50;n++){nm[n]=0; uflg[n]=0;}
cnt=0; cnt3=0;
LSM=175; CC=50; S6N=150;
nm[25]=25; uflg[25]=1;
stp01();
if(cnt3>0){pr2ans();}
uflg[25]=0;
printf("\n [Count = %d] OK!\n", cnt);
return 0;
}
/**/
/* Defi ne Level 1: */
/* Set N1 & n49 & n1<n49 */
void stp01(){
short a, b;
for(a=1;a<25;a++){b=CC-a;
if((uflg[a]==0)&&(uflg[b]==0)){
nm[1]=a; nm[49]=b;
uflg[a]=1; uflg[b]=1;
stp02();
}
```

```

        ufl g[b]=0; ufl g[a]=0; }
    }
}
/* Set N48 & n2 */
void stp02(){
    short a, b;
    for(a=49; a>0; a--){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[48]=a; nm[2]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp03();
            ufl g[b]=0; ufl g[a]=0; }
        }
}
/* Set N39 & n11 */
void stp03(){
    short a, b;
    for(a=49; a>0; a--){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[39]=a; nm[11]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp04();
            ufl g[b]=0; ufl g[a]=0; }
        }
}
/* Set N30 & n20 */
void stp04(){
    short a, b;
    for(a=49; a>0; a--){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[30]=a; nm[20]=b;
            ufl g[a]=1; ufl g[b]=1; cnt2=0;
            stp05();
            ufl g[b]=0; ufl g[a]=0; }
        }
}
/* Set N28 & n22 */
void stp05(){
    short a, b;
    for(a=49; a>0; a--){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[28]=a; nm[22]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp06();
            ufl g[b]=0; ufl g[a]=0; }
        }
}
/* Set N19 & n31 */
void stp06(){
    short a, b;
    for(a=49; a>0; a--){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[19]=a; nm[31]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp07();
            ufl g[b]=0; ufl g[a]=0; }
        }
}
/* Set n10=LSM-n1-n48-n39-n30-n28-n19 & n1<n10 & n40(>n1) */
void stp07(){
    short a, b;
    a=LSM-nm[1]-nm[48]-nm[39]-nm[30]-nm[28]-nm[19];
    if((nm[1]<a)&&(a<50)){
        b=LSM-nm[31]-nm[22]-nm[20]-nm[11]-nm[2]-nm[49];
    }
}

```

```

    i f((b>nm[1])&&(a+b==CC)){
    i f((ufl g[a]==0)&&(ufl g[b]==0)){
        nm[10]=a; nm[40]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp08();
        ufl g[b]=0; ufl g[a]=0; }}}
}
/* Defi ne Level 2: */
/* Set N9 & n41 */
voi d stp08(){
    short a, b, n, m;
    m=1;
    for(n=1; n<50; n++){ i f(ufl g[n]==0){nt08[m]=n; m++; }}
    nt08[m]=0;
    for(n=1; n<m; n++){
        a=nt08[n]; b=CC-a;
        nm[9]=a; nm[41]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp09();
        ufl g[b]=0; ufl g[a]=0;
    }
}
/* Set N35 & n15 */
voi d stp09(){
    short a, b, n, m;
    m=1;
    for(n=1; n<50; n++){ i f(ufl g[n]==0){nt09[m]=n; m++; }}
    nt09[m]=0;
    for(n=m-1; n>0; n--){
        a=nt09[n]; b=CC-a;
        nm[35]=a; nm[15]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp10();
        ufl g[b]=0; ufl g[a]=0;
    }
}
/* Set n18=150-n1-n48-n39-n9-n35 & n18<n48 & n32 */
voi d stp10(){
    short a, b;
    a=S6N-nm[1]-nm[48]-nm[39]-nm[9]-nm[35];
    i f((0<a)&&(a<nm[48])){
        b=S6N-nm[49]-nm[2]-nm[11]-nm[41]-nm[15];
        i f(a+b==CC){
            i f((ufl g[a]==0)&&(ufl g[b]==0)){
                nm[18]=a; nm[32]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp11();
                ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set N45 & n5 */
voi d stp11(){
    short a, b, n, m;
    m=1;
    for(n=1; n<50; n++){ i f(ufl g[n]==0){nt11[m]=n; m++; }}
    nt11[m]=0;
    for(n=m-1; n>0; n--){
        a=nt11[n]; b=CC-a;
        nm[45]=a; nm[5]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp12();
        ufl g[b]=0; ufl g[a]=0;
    }
}
/* Set N13 & n37 */

```

```

void stp12(){
short a, b, n, m;
m=1;
for(n=1; n<50; n++){if(ufl g[n]==0){nt12[m]=n; m++; }}
nt12[m]=0;
for(n=1; n<m; n++){
a=nt12[n]; b=CC-a;
nm[13]=a; nm[37]=b;
ufl g[a]=1; ufl g[b]=1;
stp13();
ufl g[b]=0; ufl g[a]=0;
}
}
/* Set n23=LSM-n1-n18-n35-n45-n13-n40 & n27 */
void stp13(){
short a, b;
a=LSM-nm[1]-nm[18]-nm[35]-nm[45]-nm[13]-nm[40];
if((0<a)&&(a<50)){
b=LSM-nm[10]-nm[37]-nm[5]-nm[15]-nm[32]-nm[49];
if(a+b==CC){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[23]=a; nm[27]=b;
ufl g[a]=1; ufl g[b]=1;
stp14();
ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n29=150-n28-n19-n10-n27-n37 & n21 */
void stp14(){
short a, b;
a=S6N-nm[28]-nm[19]-nm[10]-nm[27]-nm[37];
if((0<a)&&(a<50)){
b=S6N-nm[22]-nm[31]-nm[40]-nm[23]-nm[13];
if(a+b==CC){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[29]=a; nm[21]=b;
ufl g[a]=1; ufl g[b]=1;
stp15();
ufl g[b]=0; ufl g[a]=0; }}}
}
/* Define Level 3: */
/* Set N26 & n24 */
void stp15(){
short a, b, n, m;
m=1;
for(n=1; n<50; n++){if(ufl g[n]==0){nt15[m]=n; m++; }}
nt15[m]=0;
for(n=m-1; n>0; n--){
a=nt15[n]; b=CC-a;
nm[26]=a; nm[24]=b;
ufl g[a]=1; ufl g[b]=1;
stp16();
ufl g[b]=0; ufl g[a]=0;
}
}
/* Set n7=LSM-n30-n26-n45-n15-n41-n11 & n43 */
void stp16(){
short a, b;
a=LSM-nm[30]-nm[26]-nm[45]-nm[15]-nm[41]-nm[11];
if((0<a)&&(a<50)){
b=LSM-nm[39]-nm[9]-nm[35]-nm[5]-nm[24]-nm[20];
if(a+b==CC){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[7]=a; nm[43]=b;
ufl g[a]=1; ufl g[b]=1;
}
}
}
}

```

```

        stp17();
        ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n44=150-n19-n7-n29-n27-n24 & n6 */
void stp17(){
short a, b;
a=S6N-nm[19]-nm[7]-nm[29]-nm[27]-nm[24];
if((0<a)&&(a<50)){
b=S6N-nm[31]-nm[43]-nm[21]-nm[23]-nm[26];
if(a+b==CC){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[44]=a; nm[6]=b;
ufl g[a]=1; ufl g[b]=1;
stp18();
ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n38 & n12 */
void stp18(){
short a, b, n, m;
m=1;
for(n=1; n<50; n++){if(ufl g[n]==0){nt18[m]=n; m++; }}
nt18[m]=0;
for(n=m-1; n>0; n--){
a=nt18[n]; b=CC-a;
nm[38]=a; nm[12]=b;
ufl g[a]=1; ufl g[b]=1;
stp19();
ufl g[b]=0; ufl g[a]=0;
}
}
/* Set n46=LSM-n30-n38-n5-n13-n21-n22 & n4 */
void stp19(){
short a, b;
a=LSM-nm[30]-nm[38]-nm[5]-nm[13]-nm[21]-nm[22];
if((0<a)&&(a<50)){
b=LSM-nm[28]-nm[29]-nm[37]-nm[45]-nm[12]-nm[20];
if(a+b==CC){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[46]=a; nm[4]=b;
ufl g[a]=1; ufl g[b]=1;
stp20();
ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n47=LSM-n18-n9-n7-n38-n29-n27 & n3 */
void stp20(){
short a, b;
a=LSM-nm[18]-nm[9]-nm[7]-nm[38]-nm[29]-nm[27];
if((0<a)&&(a<50)){
b=LSM-nm[23]-nm[21]-nm[12]-nm[43]-nm[41]-nm[32];
if(a+b==CC){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[47]=a; nm[3]=b;
ufl g[a]=1; ufl g[b]=1;
stp21();
ufl g[b]=0; ufl g[a]=0; }}}
}
/* Define Level 4: */
/* Set n36=LSM-n48-n9-n26-n4-n21-n31 & n14 */
void stp21(){
short a, b, c, d;
a=LSM-nm[48]-nm[9]-nm[26]-nm[4]-nm[21]-nm[31];
if((0<a)&&(a<50)){
b=LSM-nm[19]-nm[29]-nm[46]-nm[24]-nm[41]-nm[2];
if(a+b==CC){

```

```

c=LSM-nm[19]-nm[27]-nm[35]-nm[44]-nm[3]-nm[11];
d=LSM-nm[39]-nm[47]-nm[6]-nm[15]-nm[23]-nm[31];
if((a==c)&&(b==d)){
    if((ufl g[a]==0)&&(ufl g[b]==0)){
        nm[36]=a; nm[14]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp22();
        ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n17=LSM-n28-n47-n36-n13-n32-n2 & n33 */
void stp22(){
    short a, b;
    a=LSM-nm[28]-nm[47]-nm[36]-nm[13]-nm[32]-nm[2];
    if((0<a)&&(a<50)){
        b=LSM-nm[48]-nm[18]-nm[37]-nm[14]-nm[3]-nm[22];
        if(a+b==CC){
            if((ufl g[a]==0)&&(ufl g[b]==0)){
                nm[17]=a; nm[33]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp23();
                ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n8=LSM-n15-n16-n17-n19-n20-n21 & n42 */
void stp23(){
    short a, b;
    a=LSM-nm[35]-nm[26]-nm[17]-nm[6]-nm[46]-nm[37];
    if((0<a)&&(a<50)){
        b=LSM-nm[13]-nm[4]-nm[44]-nm[33]-nm[24]-nm[15];
        if(a+b==CC){
            if((ufl g[a]==0)&&(ufl g[b]==0)){
                nm[8]=a; nm[42]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp24();
                ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n34=LSM-n39-n7-n17-n44-n12-n22 & n16 */
void stp24(){
    short a, b, c, d, e, f;
    a=LSM-nm[39]-nm[7]-nm[17]-nm[44]-nm[12]-nm[22];
    if((0<a)&&(a<50)){
        b=LSM-nm[28]-nm[38]-nm[6]-nm[33]-nm[43]-nm[11];
        if(a+b==CC){
            c=LSM-nm[10]-nm[18]-nm[26]-nm[42]-nm[43]-nm[2];
            d=LSM-nm[48]-nm[7]-nm[8]-nm[24]-nm[32]-nm[40];
            e=LSM-nm[19]-nm[38]-nm[8]-nm[4]-nm[23]-nm[49];
            f=LSM-nm[1]-nm[27]-nm[46]-nm[42]-nm[12]-nm[31];
            if((a==c)&&(b==d)&&(a==e)&&(b==f)){
                if((ufl g[a]==0)&&(ufl g[b]==0)){
                    nm[34]=a; nm[16]=b;
                    ufl g[a]=1; ufl g[b]=1;
                    stp25();
                    ufl g[b]=0; ufl g[a]=0; }}}
}
/* Check The Pan-Diagonal s */
void stp25(){
    short sm1, sm2, sm3, sm4;
    sm1=nm[1]+nm[9]+nm[17]+nm[25]+nm[33]+nm[41]+nm[49];
    sm2=nm[10]+nm[29]+nm[6]+nm[25]+nm[44]+nm[21]+nm[40];
    sm3=nm[30]+nm[47]+nm[8]+nm[25]+nm[42]+nm[3]+nm[20];
    sm4=nm[45]+nm[36]+nm[34]+nm[25]+nm[16]+nm[14]+nm[5];
    if((sm1==LSM)&&(sm2==LSM)&&(sm3==LSM)&&(sm4==LSM)){makeans();}
}
/**/
/* Make the Answer List */

```



```

void makeans(){
short c2, n;
cnt++; cnt2++;
if(cnt2==1){
c2=cnt3*2;
anm[c2][0]=cnt;
for(n=1;n<50;n++){anm[c2][n]=nm[n]; c[n]=nm[n];}
damt7();
for(n=1;n<50;n++){anm[c2+1][n]=d[n];}
for(n=0;n<50;n++){anm[c2+2][n]=0;}
cnt3++;
if(cnt3==2){pr2ans(); cnt3=0;}}
}
/**/
/* Print the 2 Answers */
void pr2ans(){
short l, l7, n;
printf("%20d/P /S%39d/P /S\n", anm[0][0], anm[2][0]);
for(l=0;l<7;l++){l7=l*7;
printf(" ");
for(n=1;n<8;n++){printf("%3d", anm[0][l7+n]);}
printf(" ");
for(n=1;n<8;n++){printf("%3d", anm[1][l7+n]);}
printf(" ");
for(n=1;n<8;n++){printf("%3d", anm[2][l7+n]);}
printf(" ");
for(n=1;n<8;n++){printf("%3d", anm[3][l7+n]);}
printf("\n");
}
}
/**/
/* Do-it-After-the-Model Transformation */
/*
1 2 3 4 5 6 7 1 48 39 30 28 19 10
8 9 10 11 12 13 14 18 9 7 47 38 29 27
15 16 17 18 19 20 21 35 26 17 8 6 46 37
22 23 24 25 26 27 28 45 36 34 25 16 14 5
29 30 31 32 33 34 35 13 4 44 42 33 24 15
36 37 38 39 40 41 42 23 21 12 3 43 41 32
43 44 45 46 47 48 49 40 31 22 20 11 2 49
*/
void damt7(){
d[1]=c[1]; d[2]=c[48]; d[3]=c[39]; d[4]=c[30]; d[5]=c[28]; d[6]=c[19]; d[7]=c[10];
d[8]=c[18]; d[9]=c[9]; d[10]=c[7]; d[11]=c[47]; d[12]=c[38]; d[13]=c[29]; d[14]=c[27];
d[15]=c[35]; d[16]=c[26]; d[17]=c[17]; d[18]=c[8]; d[19]=c[6]; d[20]=c[46]; d[21]=c[37];
d[22]=c[45]; d[23]=c[36]; d[24]=c[34]; d[25]=c[25]; d[26]=c[16]; d[27]=c[14]; d[28]=c[5];
d[29]=c[13]; d[30]=c[4]; d[31]=c[44]; d[32]=c[42]; d[33]=c[33]; d[34]=c[24]; d[35]=c[15];
d[36]=c[23]; d[37]=c[21]; d[38]=c[12]; d[39]=c[3]; d[40]=c[43]; d[41]=c[41]; d[42]=c[32];
d[43]=c[40]; d[44]=c[31]; d[45]=c[22]; d[46]=c[20]; d[47]=c[11]; d[48]=c[2]; d[49]=c[49];
}
/**/

```