

Part 4: "New Advanced Study of Magic Squares and Cubes"

Chapter 4: Commentary Articles No.2 by **Kanji Setsuda**:  
"Various Arts and Tools for Studying Magic Squares"

## Section 4: The Newest Study of Prototype Squares of Order 7 and 'Do-it-After-the-Model Transformation' II

### #1. Improve our Study by new Discoveries about 'Complete Euler Squares'

In the previous sections we have come to know all the solutions of two types of 'Complete Euler Squares' of order 7: (1) Pan-diagonal Magic Squares 7x7 and (2) Simultaneous Magic Squares 7x7: both Self-complementary and Pan-diagonal type.

Let's improve our study of 'Prototype Squares' of order 7 and 'Do-it-After-the-Model Transformation' by this new knowledge we have got about 'CES', shall we?

We knew about the two representative models in 2002 and so many composed solutions of Prototype Squares of order 7. But we now know they are not enough to reconstruct all of the object squares. We could have known only a small part of all.

We have to discover the other best representative Model and the new solution set of Prototype Squares 7x7. But how can we have got them?

### #2. 'Reversibility Test' by applying DAMT to itself

Let's find the very best Model out of the solutions of Simultaneous type, so that it could be the common model for those two types of Prototype Squares 7x7.

Why don't you pick up the candidates out of 3456 'Complete Euler Squares', and examine them by making 'DAMT' for each and applying it to themselves?

Suppose each solution is put in the memory array 'sol[n]'.

Dictate such a procedure program to your computer as follows:

```
/**/  
/* Program for 'Reversibility' Test */  
void revtest(){  
  short n;  
  for(n=1; n<50; n++){  
    new1sol [n]=sol [sol [n]];  
    new2sol [n]=new1sol [sol [n]];  
    new3sol [n]=new2sol [sol [n]];  
    ...  
  }  
}  
/**/
```

Yes. It is made with indirect access mode of memories. Re-using each value for the new location address is the secret of 'DAM Transformation'.

Run this procedure, and it repeats such the transformation three times.

See the result list below. It shows the original and three transformed patterns of DAMT applied to themselves. If the result could come back to the primary form of Prototype Squares, it can certainly demonstrate its 'reversibility'. The solution that is reversible can really be one of the best Models for the DAM Transformation.

Let's find them among the solutions whose primary diagonals are only made up of {1, 9, 17, 25, 33, 41 and 49}.

**\*\* Find the Best Models for Prototype Squares of Order 7 \*\***

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

How beautiful the solutions [No.256](#) and [No.747](#) could perform! They could come back to the basic form of Prototype Squares only by a single transformation. They are really reversible. But they are not compatible with each other in the smart list.

I select the last [No.747](#) for the best Model for our new jobs, and I dictate such the rules of transformation as follows, for they could well reconstruct all object squares from the prototype ones.

```

/* 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];
}
/**/

```

### #3. How to make 'Prototype Euler Squares' 7x7

The next job we have to do is to compose the solution set of Prototype Squares. Let's take the one for Simultaneous type of objects at first.

We want to have just the complete set of 3456 Prototype Squares this time. Can we make this kind of solutions as many as 3456? How can we do that?

```

** Basic Forms of '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: \*\***

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

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

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

**\*\* List-forming Inequality Conditions: \*\***

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

Do we know what conditions we have to presume for the Prototype Squares?

Yes, we do. We can learn them from the Model itself. We know those conditions above would be all right for our purpose, as we studied them in the lower orders.

But when we dictate such an ordinary program to our computer as usual and make it run, we have to wait for a very long time to get all we want. They are very slow, say, too slow to get the whole set of solutions. We had to give it up often on our way.

I have long wondered how we can improve our program to make it run much faster.

How about using 'Greco-Latinian Method' to make Prototype Squares, defining two layers individually decomposed by the Positional Number System of Base 7?

As we have to deal with the 'Complete Euler Squares' of 3456 Simultaneous Squares, we can surely compose the 3456 Prototype ones by our 'New Euler's Method,' I believe.

It is a very reasonable idea, isn't it? Why don't you do that?

But what does it look like? See the next list below, please.

**\*\* Simultaneous MS77: Both Self-Complementary and Pan-Diagonal \*\***

**\*\* and Reduced 'Prototype Squares' 7x7 with Decomposed Layers \*\***

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

First of all we want to make those decomposed patterns on the right, combine them, calculate directly and recompose the Object Squares on the left.

I prepared the next basic diagrams below for our new method of composition.

**\*\* Basic Forms of 'Prototype Euler Squares' of Order 7 \*\***

[Prototype]		[Decomposed]
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
[Model ]	[Hi gh]	[Decomposed]
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
[Hi gh]		[Low]

\* Basic Conditions for Prototype Euler Squares of Order 7: \*

$n1+n48+n39+n30+n28+n19+n10=21 \dots$	<code>rw1</code>		$n1+n18+n35+n45+n13+n23+n40=21 \dots$	<code>cl 1</code>
$n18+n9+n7+n47+n38+n29+n27=21 \dots$	<code>rw2</code>		$n48+n9+n26+n36+n4+n21+n31=21 \dots$	<code>cl 2</code>
$n35+n26+n17+n8+n6+n46+n37=21 \dots$	<code>rw3</code>		$n39+n7+n17+n34+n44+n12+n22=21 \dots$	<code>cl 3</code>
$n45+n36+n34+n25+n16+n14+n5=21 \dots$	<code>rw4</code>		$n30+n47+n8+n25+n42+n3+n20=21 \dots$	<code>cl 4</code>
$n13+n4+n44+n42+n33+n24+n15=21 \dots$	<code>rw5</code>		$n28+n38+n6+n16+n33+n43+n11=21 \dots$	<code>cl 5</code>
$n23+n21+n12+n3+n43+n41+n32=21 \dots$	<code>rw6</code>		$n19+n29+n46+n14+n24+n41+n2=21 \dots$	<code>cl 6</code>
$n40+n31+n22+n20+n11+n2+n49=21 \dots$	<code>rw7</code>		$n10+n27+n37+n5+n15+n32+n49=21 \dots$	<code>cl 7</code>

\* Self-Complementary Conditions: for Prototype Squares of Order 7: \*

$n1+n49=n2+n48=n3+n47=n4+n46=n5+n45=n6+n44=n7+n43$   
 $=n8+n42=n9+n41=n10+n40=n11+n39=n12+n38=n13+n37=n14+n36$   
 $=n15+n35=n16+n34=n17+n33=n18+n32=n19+n31=n20+n30=n21+n29$   
 $=n22+n28=n23+n27=n24+n26=n25+n25=6 \dots$  `scc`

\* Pandiagonal Conditions: for Prototype Euler Squares of Order 7: \*

$n1+n9+n17+n25+n33+n41+n49=21 \dots$	<code>pd1</code>		$n1+n27+n46+n16+n42+n12+n31=21 \dots$	<code>pq1</code>
$n48+n7+n8+n16+n24+n32+n40=21 \dots$	<code>pd2</code>		$n48+n18+n37+n14+n33+n3+n22=21 \dots$	<code>pq2</code>
$n39+n47+n6+n14+n15+n23+n31=21 \dots$	<code>pd3</code>		$n39+n9+n35+n5+n24+n43+n20=21 \dots$	<code>pq3</code>
$n30+n38+n46+n5+n13+n21+n22=21 \dots$	<code>pd4</code>		$n30+n7+n26+n45+n15+n41+n11=21 \dots$	<code>pq4</code>
$n28+n29+n37+n45+n4+n12+n20=21 \dots$	<code>pd5</code>		$n28+n47+n17+n36+n13+n32+n2=21 \dots$	<code>pq5</code>
$n19+n27+n35+n36+n44+n3+n11=21 \dots$	<code>pd6</code>		$n19+n38+n8+n34+n4+n23+n49=21 \dots$	<code>pq6</code>
$n10+n18+n26+n34+n42+n43+n2=21 \dots$	<code>pd7</code>		$n10+n29+n6+n25+n44+n21+n40=21 \dots$	<code>pq7</code>

You may be already used to that kind of diagrams and conditions, but let me explain a few things about them.

First of all we have to change our classical notation into the 'mathematical' notation.

- (1) Subtract one from each number, divide each result by 7 and put the integer part of quotient into high layer and put the remainder into low one. Yes. We use the Positional Writing System of Base 7 to handle with our new Prototype Squares.
- (2) In each layer we must take any value of {0, 1, 2, 3, 4, 5, 6} strictly once for every line corresponding to every row, every column and every pandiagonal in the object Model. Under these conditions the sum of every line is forced to be equal to the Magic Constant, because  $(0+1+2+3+4+5+6) \times 7 + (0+1+2+3+4+5+6) = 21 \times 7 + 21 = 168$  (Dec)  
The sum 168 here is logically equivalent to 175 in our classical notation.
- (3) On top of that you must take any combination of high value and low one strictly once on the whole. I mean you must use {00, 01, 02, 03, 04, 05, 06, 10, 11, 12, 13, 14, 15, 16, 20, 21, 22, ..., 56, 60, 61, 62, 63, 64, 65, 66<sup>(N7i)</sup>} for every number of Prototype Squares on the whole, strictly once for each.

We must make such a single 'Latin Square' for the elementary decomposed layer as having those conditions above. How many patterns can we make in all?

In order to prevent us from double counting of any simple rotations and reflections, I put the list-forming inequality conditions in the end as follows:

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

The next list shows the whole program I dictated this time.

```
/** 'Prototype Squares' 7x7 and Simul taneous Type of MS77 Recomposed **/
/** by 'New Euler' s Method' : Both Sel f-compl ementary and Pan-di agonal **/
/** 'CESPT7Sml.c' Made by Kanji Setsuda **/
/** on July 19, 2005; and Oct. 1, 2006; **/
/** Working with MacOSX and Xcode 2.2.1 **/
/**/
#include <stdio.h>
/**/
short int cnt, bcnt;
short lcnt, hcnt, cnt2, cnt3;
short CC, LSM;
short u1, u2;
```

```

short nm[50], flg[50];
short c[50], d[50];
short anm[5][53];
short pt[3457][53];
char thlu[25][50], tllu[193][50];
char mtc[25][193];
/**/
short rw[8][7], cl[8][7];
short pd[8][7], pb[8][7];
/**/
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 ansrecord(void);
void prlunit(void);
void cmbcmp(void);
void recans(void);
void damt7(void);
void prallans(short x, short y);
void ptsort(short x), excpt(short x);
/**/
/* Main Program */
int main(){
short m, n;
printf("\n** Compose 'Prototype Squares' 7x7 by our 'New Euler's Method', Transform **\n");
printf("*** them into Simultaneous MS77: Both Self-complementary and Pan-diagonal **\n");
printf("*** by our 'DAM Transformation' and List out the Standard Solutions(Part) **\n");
for(n=0; n<50; n++){nm[n]=-1; }
for(m=1; m<8; m++){
for(n=0; n<7; n++){rw[m][n]=0; cl[m][n]=0; pd[m][n]=0; pb[m][n]=0; }
}
CC=6; LSM=21; hcnt=0; cnt=0; bcnt=0; cnt3=0;
nm[25]=3;
rw[4][3]=1; cl[4][3]=1; pd[1][3]=1; pb[7][3]=1;
stp01(); // Calculations
lcnt=cnt;
printf("[List of Latin Units]\n");
prlunit();
printf("\n[Compositions of 'Prototype Squares'");
printf(" and 'Simultaneous MS77': Both SC and PD]\n");
cnt=0; cnt3=0;
cmbcmp();
printf("\n['Prototype Squares' and Simultaneous MS77: ");
printf("Both Self-complementary and Pan-diagonal]\n");
ptsort(cnt);
prallans(1, 8); printf("\n");
prallans(191, 198); printf("\n");
prallans(383, 390); printf("\n");
prallans(767, 774); printf("\n");
prallans(1535, 1542); printf(" . . . . .\n\n");
prallans(cnt-9, cnt);
printf("\n [Count = %d] OK!\n", cnt);
return 0;
}
/* The Calculations */
/* Define Level 1: */
/* Set n1{1, 1, 1, 1} & n49{7, 7, 1, 6} */
void stp01(){
short p1=1, p2=1, p3=1, p4=1;
short q1=7, q2=7, q3=1, q4=6;
short a, b;

```

```

for(a=0; a<7; a++){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[1]=a; nm[49]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp02();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Set n48{1, 2, 2, 2} & n2{7, 6, 7, 5} */
void stp02(){
  short p1=1, p2=2, p3=2, p4=2;
  short q1=7, q2=6, q3=7, q4=5;
  short a, b;
  for(a=6; a>=0; a--){b=CC-a;
    if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
      if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
        nm[48]=a; nm[2]=b;
        rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
        rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
        stp03();
        rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
        rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
      }}
}
/* Set n39{1, 3, 3, 3} & n11{7, 5, 6, 4} */
void stp03(){
  short p1=1, p2=3, p3=3, p4=3;
  short q1=7, q2=5, q3=6, q4=4;
  short a, b;
  for(a=6; a>=0; a--){b=CC-a;
    if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
      if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
        nm[39]=a; nm[11]=b;
        rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
        rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
        stp04();
        rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
        rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
      }}
}
/* Set n30{1, 4, 4, 4} & n20{7, 4, 5, 3} */
void stp04(){
  short p1=1, p2=4, p3=4, p4=4;
  short q1=7, q2=4, q3=5, q4=3;
  short a, b;
  for(a=6; a>=0; a--){b=CC-a;
    if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
      if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
        nm[30]=a; nm[20]=b;
        rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
        rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
        stp05();
        rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
        rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
      }}
}
/* Set n28{1, 5, 5, 5} & n22{7, 3, 4, 2} */
void stp05(){
  short p1=1, p2=5, p3=5, p4=5;
  short q1=7, q2=3, q3=4, q4=2;
  short a, b;

```



```

for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[28]=a; nm[22]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp06();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Set n19{1, 6, 6, 6} & n31{7, 2, 3, 1} */
void stp06(){
short p1=1, p2=6, p3=6, p4=6;
short q1=7, q2=2, q3=3, q4=1;
short a, b;
  for(a=6; a>=0; a--){b=CC-a;
    if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
      if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
        nm[19]=a; nm[31]=b;
        rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
        rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
        stp07();
        rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
        rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
      }}
  }
}
/* Set n10{1, 7, 7, 7} & n40{7, 1, 2, 7} */
void stp07(){
short p1=1, p2=7, p3=7, p4=7;
short q1=7, q2=1, q3=2, q4=7;
short a, b;
  for(a=0; a<7; a++){b=CC-a;
    if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
      if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
        nm[10]=a; nm[40]=b;
        rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
        rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
        stp08();
        rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
        rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
      }}
  }
}
/* Define Level 2: */
/* Set n18{2, 1, 7, 2} & n32{6, 7, 2, 5} */
void stp08(){
short p1=2, p2=1, p3=7, p4=2;
short q1=6, q2=7, q3=2, q4=5;
short a, b;
  for(a=0; a<7; a++){b=CC-a;
    if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
      if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
        nm[18]=a; nm[32]=b;
        rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
        rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
        stp09();
        rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
        rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
      }}
  }
}
/* Set n9{2, 2, 1, 3} & n41{6, 6, 1, 4} */
void stp09(){
short p1=2, p2=2, p3=1, p4=3;
short q1=6, q2=6, q3=1, q4=4;

```

```

short a, b;
for(a=0; a<7; a++){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[9]=a; nm[41]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp10();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Set n7{2, 3, 2, 4} & n43{6, 5, 7, 3} */
void stp10(){
short p1=2, p2=3, p3=2, p4=4;
short q1=6, q2=5, q3=7, q4=3;
short a, b;
for(a=0; a<7; a++){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[7]=a; nm[43]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp11();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Set n47{2, 4, 3, 5} & n3{6, 4, 6, 2} */
void stp11(){
short p1=2, p2=4, p3=3, p4=5;
short q1=6, q2=4, q3=6, q4=2;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[47]=a; nm[3]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp12();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Set n38{2, 5, 4, 6} & n12{6, 3, 5, 1} */
void stp12(){
short p1=2, p2=5, p3=4, p4=6;
short q1=6, q2=3, q3=5, q4=1;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[38]=a; nm[12]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp13();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Set n29{2, 6, 5, 7} & n21{6, 2, 4, 7} */
void stp13(){
short p1=2, p2=6, p3=5, p4=7;
short q1=6, q2=2, q3=4, q4=7;

```

```

short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[29]=a; nm[21]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp14();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Set n27{2, 7, 6, 1} & n23{6, 1, 3, 6} */
void stp14(){
short p1=2, p2=7, p3=6, p4=1;
short q1=6, q2=1, q3=3, q4=6;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[27]=a; nm[23]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp15();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Define Level 3: */
/* Set n35{3, 1, 6, 3} & n15{5, 7, 3, 4} */
void stp15(){
short p1=3, p2=1, p3=6, p4=3;
short q1=5, q2=7, q3=3, q4=4;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[35]=a; nm[15]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp16();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Set n26{3, 2, 7, 4} & n24{5, 6, 2, 3} */
void stp16(){
short p1=3, p2=2, p3=7, p4=4;
short q1=5, q2=6, q3=2, q4=3;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[26]=a; nm[24]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp17();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}
}
/* Set n17{3, 3, 1, 5} & n33{5, 5, 1, 2} */
void stp17(){
short p1=3, p2=3, p3=1, p4=5;

```

```

short q1=5, q2=5, q3=1, q4=2;
short a, b;
for(a=0; a<7; a++){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[17]=a; nm[33]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp18();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}}
}
/* Set n8{3, 4, 2, 6} & n42{5, 4, 7, 1} */
void stp18(){
short p1=3, p2=4, p3=2, p4=6;
short q1=5, q2=4, q3=7, q4=1;
short a, b;
for(a=0; a<7; a++){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[8]=a; nm[42]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp19();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}}
}
/* Set n6{3, 5, 3, 7} & n44{5, 3, 6, 7} */
void stp19(){
short p1=3, p2=5, p3=3, p4=7;
short q1=5, q2=3, q3=6, q4=7;
short a, b;
for(a=0; a<7; a++){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[6]=a; nm[44]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp20();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}}
}
/* Set n46{3, 6, 4, 1} & n4{5, 2, 5, 6} */
void stp20(){
short p1=3, p2=6, p3=4, p4=1;
short q1=5, q2=2, q3=5, q4=6;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[46]=a; nm[4]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp21();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}}
}
/* Set n37{3, 7, 5, 2} & n13{5, 1, 4, 5} */
void stp21(){
short p1=3, p2=7, p3=5, p4=2;

```

```

short q1=5, q2=1, q3=4, q4=5;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[37]=a; nm[13]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp22();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}}
}
/* Define Level 4: */
/* Set n45{4, 1, 5, 4} & n5{4, 7, 4, 3} */
void stp22(){
short p1=4, p2=1, p3=5, p4=4;
short q1=4, q2=7, q3=4, q4=3;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[45]=a; nm[5]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp23();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}}
}
/* Set n36{4, 2, 6, 5} & n14{4, 6, 3, 2} */
void stp23(){
short p1=4, p2=2, p3=6, p4=5;
short q1=4, q2=6, q3=3, q4=2;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[36]=a; nm[14]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      stp24();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}}
}
/* Set n34{4, 3, 7, 6} & n16{4, 5, 2, 1} */
void stp24(){
short p1=4, p2=3, p3=7, p4=6;
short q1=4, q2=5, q3=2, q4=1;
short a, b;
for(a=6; a>=0; a--){b=CC-a;
  if((rw[p1][a]==0)&&(cl [p2][a]==0)&&(pd[p3][a]==0)&&(pb[p4][a]==0)){
    if((rw[q1][b]==0)&&(cl [q2][b]==0)&&(pd[q3][b]==0)&&(pb[q4][b]==0)){
      nm[34]=a; nm[16]=b;
      rw[p1][a]=1; cl [p2][a]=1; pd[p3][a]=1; pb[p4][a]=1;
      rw[q1][b]=1; cl [q2][b]=1; pd[q3][b]=1; pb[q4][b]=1;
      ansrecord();
      rw[p1][a]=0; cl [p2][a]=0; pd[p3][a]=0; pb[p4][a]=0;
      rw[q1][b]=0; cl [q2][b]=0; pd[q3][b]=0; pb[q4][b]=0;
    }}}
}
/**/
/* Record the Answers */

```

```

void ansrecord(){
short n;
cnt++;
tll u[cnt-1][0]=cnt;
for(n=1; n<50; n++){tll u[cnt-1][n]=nm[n]; }
if((nm[1]<nm[49])&&(nm[1]<nm[10])&&(nm[1]<nm[40])&&(nm[48]>nm[18])){
hcnt++;
thl u[hcnt-1][0]=hcnt;
for(n=1; n<50; n++){thl u[hcnt-1][n]=nm[n]; }
}
}
/**/
/* Classify the Latin Units */
void prluni t(){
short t, l, l7, m, n;
printf(" [for High]\n");
for(t=0; t<hcnt; t=t+8){
printf("%8d/%8d/%8d/%8d/%8d/%8d/%8d/%8d/\n",
t+1, t+2, t+3, t+4, t+5, t+6, t+7, t+8);
for(l=0; l<7; l++){l7=l*7;
for(m=t; m<(t+8); m++){
printf(" ");
for(n=1; n<8; n++){printf("%d", thl u[m][l7+n]); }
}
printf("\n");
}
}
printf(" [for Low]\n");
for(t=0; t<cnt; t=t+32){
printf("%8d/%8d/%8d/%8d/%8d/%8d/%8d/%8d/\n",
t+1, t+2, t+3, t+4, t+5, t+6, t+7, t+8);
for(l=0; l<7; l++){l7=l*7;
for(m=t; m<(t+8); m++){
printf(" ");
for(n=1; n<8; n++){printf("%d", tll u[m][l7+n]); }
}
}
printf("\n");
}
}
printf(" [Counts of Latin Units = %dH/%dL]\n", hcnt, cnt);
for(m=0; m<hcnt; m++){
for(n=0; n<cnt; n++){
t=0;
for(l=1; l<50; l++){if(thl u[m][l]==tll u[n][l]){t++; }}
mtc[m][n]=t;
t=0;
for(l=1; l<50; l++){if(thl u[m][l]+tll u[n][l]==6){t++; }}
if(mtc[m][n]<t){mtc[m][n]=t; }
if(mtc[m][n]==7){bcnt++; }
}
}
printf("\n [Reference Table for the Best Combination = %d]\n", bcnt);
printf(" I\\h|", t);
for(n=0; n<hcnt; n++){printf("%3d", n+1); }
printf("\n-----+-----");
for(m=0; m<hcnt; m++){
printf("\n%4d|", m+1);
for(n=0; n<hcnt; n++){printf("%3d", mtc[n][m]); }
}
printf("\n\n I\\h|", t);
for(n=0; n<hcnt; n++){printf("%3d", n+1); }
printf("\n-----+-----");
for(m=lcnt-hcnt; m<lcnt; m++){
printf("\n%4d|", m+1);
}

```

```

        for(n=0; n<hcnt; n++){printf("%3d", mtc[n][m]); }
    }
    printf("\n");
}
/**/
/* Combine and Compose */
void cmbcmp(){
    short n, d, fc;
    for(u1=0; u1<hcnt; u1++){cnt2=0;
        for(u2=0; u2<lcnt; u2++){
            if(mtc[u1][u2]==7){
                for(n=1; n<50; n++){flg[n]=0; }
                for(n=1; n<50; n++){
                    d=thl u[u1][n]*7+tl l u[u2][n]+1;
                    nm[n]=d; flg[d]++;
                }
                fc=0;
                for(n=1; n<50; n++){if(fl g[n]==1){fc++; }el se{break; }}
                if(fc==49){
                    if((nm[1]<nm[49])&&(nm[1]<nm[10])&&(nm[1]<nm[40])&&(nm[48]>nm[18])){
                        recans(); }
                }
            }
        }
    }
}
/**/
/* Print the Answers */
void recans(){
    short n;
    pt[cnt][0]=cnt+1;
    for(n=1; n<50; n++){pt[cnt][n]=nm[n]; }
    pt[cnt][51]=u1+1; pt[cnt][52]=u2+1;
    cnt++; cnt2++;
}
/**/
/* Do-it-After-the-Model Transformati on */
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];
}
/**/
/* Print All the Answers */
void pralans(short x, short y){
    short ct, ctm, l, l7, m, n;
    for(ct=x-1; ct<y; ct=ct+2){
        for(m=0; m<2; m++){ctm=ct+m;
            for(n=0; n<53; n++){c[n]=pt[ctm][n]; anm[m][n]=c[n]; }
            damt7();
            for(n=1; n<50; n++){anm[m+2][n]=d[n]; }
            printf("%5d/H%4d/L%6d/P S/%d", anm[m][51], anm[m][52], anm[m][0], ctm+1);
            if(m<1){
                if(ctm<11){printf(" "); }
                if((10<ctm)&&(ctm<101)){printf(" "); }
                if((100<ctm)&&(ctm<1001)){printf(" "); }
                if(1000<ctm){printf(" "); }
            }
            printf("\n");
            for(l=0; l<7; l++){l7=l*7;

```

```

    for(m=0; m<2; m++){
        for(n=1; n<8; n++){printf("%3d", anm[m][l 7+n]); }
        printf(" ");
        for(n=1; n<8; n++){printf("%3d", anm[m+2][l 7+n]); }
        if(m<1){printf(" ");}
    }
    printf("\n");
}
}
}
/**/
/* Sort the Prototype Squares */
void ptsort(short x){
    short mx, n, f;
    int d1, d2, d3, d4;
    mx=x-1;
    do{f=0;
        for(n=0; n<mx; n++){
            d1=(((pt[n][1]*50+pt[n][2])*50+pt[n][3])*50+pt[n][4])*50+pt[n][5];
            d2=(((pt[n+1][1]*50+pt[n+1][2])*50+pt[n+1][3])*50+pt[n+1][4])*50+pt[n+1][5];
            d3=(((pt[n][8]*50+pt[n][15])*50+pt[n][22])*50+pt[n][29])*50+pt[n][36];
            d4=(((pt[n+1][8]*50+pt[n+1][15])*50+pt[n+1][22])*50+pt[n+1][29])*50+pt[n+1][36];
            if(d1>d2){excpt(n); f=1;}
            else if((d1==d2)&&(d3>d4)){excpt(n); f=1;}
        }
        mx--;
    }while(f>0);
}
/**/
void excpt(short x){
    short n, d;
    for(n=0; n<53; n++){d=pt[x][n]; pt[x][n]=pt[x+1][n]; pt[x+1][n]=d;}
}
/**/

```

As you see, I dictated the program by our 'New Euler's Method', just in the same way as I made an ordinary 'Complete Euler Squares' of order 7 before.

At first I try to design and make every single 'Latin' unit for decomposed layers of the Prototype Squares. I plan to pick up a couple of any Latin units and combine them to assume for the real decomposed layers and recombine the solution by our direct calculations:  $d = \text{thl u}[u1][n] * 7 + \text{tll u}[u2][n] + 1$ ;

I always define each variable in the four directions:  $rw[i][j]$ ,  $cl[i][j]$ ,  $pd[i][j]$  and  $pb[i][j]$ ; and checked carefully if any direction uses each number of {0, 1, 2, 3, 4, 5 and 6} strictly once under the basic conditions defined with the basic diagrams.

You must not use any number twice or more often, nor neglect anyone of them.

I could surely have got such a high-speed, practical program as listed above, that I took only a few minutes to count all the solutions through.

The next list shows the result of my recent experiment.

#### #4. 'Prototype Squares' of Order 7 and 'Simultaneous Euler Squares' 7x7

[List of Latin Units] [for High]

1/	2/	3/	4/	5/	6/	7/	8/
0000000	0000000	0000000	0000000	0000000	0000000	0000000	0000000
1111111	1111111	2222222	2222222	4444444	4444444	5555555	5555555
2222222	4444444	1111111	5555555	1111111	5555555	2222222	4444444
3333333	3333333	3333333	3333333	3333333	3333333	3333333	3333333
4444444	2222222	5555555	1111111	5555555	1111111	4444444	2222222
5555555	5555555	4444444	4444444	2222222	2222222	1111111	1111111
6666666	6666666	6666666	6666666	6666666	6666666	6666666	6666666



9/	10/	11/	12/	13/	14/	15/	16/
0123456	0143256	0213546	0253146	0365241	0364152	0362154	0361245
0123456	0143256	0213546	0253146	2410365	1520364	1540362	2450361
0123456	0143256	0213546	0253146	3652410	3641520	3621540	3612450
0123456	0143256	0213546	0253146	4103652	5203641	5403621	4503612
0123456	0143256	0213546	0253146	6524103	6415203	6215403	6124503
0123456	0143256	0213546	0253146	1036524	2036415	4036215	5036124
0123456	0143256	0213546	0253146	5241036	4152036	2154036	1245036
17/	18/	19/	20/	21/	22/	23/	24/
1023465	1043265	1042653	1024653	1111111	1111111	1354062	1352064
1023465	1043265	0426531	0246531	2222222	4444444	0621354	0641352
1023465	1043265	4265310	2465310	0000000	0000000	3540621	3520641
1023465	1043265	2653104	4653102	3333333	3333333	6213540	6413520
1023465	1043265	6531042	6531024	6666666	6666666	5406213	5206413
1023465	1043265	5310426	5310246	4444444	2222222	2135406	4135206
1023465	1043265	3104265	3102465	5555555	5555555	4062135	2064135

[for Low]

1/	2/	3/	4/	5/	6/	7/	8/
0000000	0000000	0000000	0000000	0000000	0000000	0000000	0000000
1111111	1111111	2222222	2222222	4444444	4444444	5555555	5555555
2222222	4444444	1111111	5555555	1111111	5555555	2222222	4444444
3333333	3333333	3333333	3333333	3333333	3333333	3333333	3333333
4444444	2222222	5555555	1111111	5555555	1111111	4444444	2222222
5555555	5555555	4444444	4444444	2222222	2222222	1111111	1111111
6666666	6666666	6666666	6666666	6666666	6666666	6666666	6666666
33/	34/	35/	36/	37/	38/	39/	40/
1023465	1043265	1042653	1024653	1111111	1111111	1111111	1111111
1023465	1043265	0426531	0246531	0000000	0000000	2222222	2222222
1023465	1043265	4265310	2465310	2222222	4444444	0000000	6666666
1023465	1043265	2653104	4653102	3333333	3333333	3333333	3333333
1023465	1043265	6531042	6531024	4444444	2222222	6666666	0000000
1023465	1043265	5310426	5310246	6666666	6666666	4444444	4444444
1023465	1043265	3104265	3102465	5555555	5555555	5555555	5555555
65/	66/	67/	68/	69/	70/	71/	72/
2013564	2053164	2051643	2015643	2103654	2163054	2160543	2106543
2013564	2053164	0516432	0156432	2103654	2163054	1605432	1065432
2013564	2053164	5164320	1564320	2103654	2163054	6054321	0654321
2013564	2053164	1643205	5643201	2103654	2163054	0543216	6543210
2013564	2053164	6432051	6432015	2103654	2163054	5432160	5432106
2013564	2053164	4320516	4320156	2103654	2163054	4321605	4321065
2013564	2053164	3205164	3201564	2103654	2163054	3216054	3210654
97/	98/	99/	100/	101/	102/	103/	104/
4013562	4053162	4051623	4015623	4103652	4163052	4160523	4106523
4013562	4053162	0516234	0156234	4103652	4163052	1605234	1065234
4013562	4053162	5162340	1562340	4103652	4163052	6052341	0652341
4013562	4053162	1623405	5623401	4103652	4163052	0523416	6523410
4013562	4053162	6234051	6234015	4103652	4163052	5234160	5234106
4013562	4053162	2340516	2340156	4103652	4163052	2341605	2341065
4013562	4053162	3405162	3401562	4103652	4163052	3416052	3410652
129/	130/	131/	132/	133/	134/	135/	136/
5023461	5043261	5042613	5024613	5203641	5263041	5260413	5206413
5023461	5043261	0426135	0246135	5203641	5263041	2604135	2064135
5023461	5043261	4261350	2461350	5203641	5263041	6041352	0641352
5023461	5043261	2613504	4613502	5203641	5263041	0413526	6413520
5023461	5043261	6135042	6135024	5203641	5263041	4135260	4135206
5023461	5043261	1350426	1350246	5203641	5263041	1352604	1352064
5023461	5043261	3504261	3502461	5203641	5263041	3526041	3520641

161/	162/	163/	164/	165/	166/	167/	168/
6123450	6143250	6142503	6124503	6213540	6253140	6251403	6215403
6123450	6143250	1425036	1245036	6213540	6253140	2514036	2154036
6123450	6143250	4250361	2450361	6213540	6253140	5140362	1540362
6123450	6143250	2503614	4503612	6213540	6253140	1403625	5403621
6123450	6143250	5036142	5036124	6213540	6253140	4036251	4036215
6123450	6143250	0361425	0361245	6213540	6253140	0362514	0362154
6123450	6143250	3614250	3612450	6213540	6253140	3625140	3621540

[Counts of Latin Units = 24H/192L]

[' Prototype Squares' and Simul tanous MS77: Both Sel f-compl ementary and Pan-di agonal ]

1/H	9/L	1/P	S/1	/D7i
0000000	0123456	1 2 3 4 5 6 7	1 48 39 30 28 19 10	0654321 0531642
1111111	0123456	8 9 10 11 12 13 14	18 9 7 47 38 29 27	2106543 3164205
2222222	0123456	15 16 17 18 19 20 21	35 26 17 8 6 46 37	4321065 6420531
3333333	0123456	22 23 24 25 26 27 28	45 36 34 25 16 14 5	6543210 2053164
4444444	0123456	29 30 31 32 33 34 35	13 4 44 42 33 24 15	1065432 5316420
5555555	0123456	36 37 38 39 40 41 42	23 21 12 3 43 41 32	3210654 1642053
6666666	0123456	43 44 45 46 47 48 49	40 31 22 20 11 2 49	5432106 4205316
2/H	9/L	145/P	S/2	/D7i
0000000	0123456	1 2 3 4 5 6 7	1 48 39 16 28 33 10	0652341 0531642
1111111	0123456	8 9 10 11 12 13 14	32 9 7 47 38 15 27	4106523 3164205
4444444	0123456	29 30 31 32 33 34 35	21 26 31 8 6 46 37	2341065 6420531
3333333	0123456	22 23 24 25 26 27 28	45 36 20 25 30 14 5	6523410 2053164
2222222	0123456	15 16 17 18 19 20 21	13 4 44 42 19 24 29	1065234 5316420
5555555	0123456	36 37 38 39 40 41 42	23 35 12 3 43 41 18	3410652 1642053
6666666	0123456	43 44 45 46 47 48 49	40 17 22 34 11 2 49	5234106 4205316
3/H	9/L	289/P	S/3	/D7i
0000000	0123456	1 2 3 4 5 6 7	1 48 32 37 28 12 17	0645312 0531642
2222222	0123456	15 16 17 18 19 20 21	11 16 7 47 31 36 27	1206453 3164205
1111111	0123456	8 9 10 11 12 13 14	42 26 10 15 6 46 30	5312064 6420531
3333333	0123456	22 23 24 25 26 27 28	45 29 41 25 9 21 5	6453120 2053164
5555555	0123456	36 37 38 39 40 41 42	20 4 44 35 40 24 8	2064531 5316420
4444444	0123456	29 30 31 32 33 34 35	23 14 19 3 43 34 39	3120645 1642053
6666666	0123456	43 44 45 46 47 48 49	33 38 22 13 18 2 49	4531206 4205316
4/H	9/L	433/P	S/4	/D7i
0000000	0123456	1 2 3 4 5 6 7	1 48 32 9 28 40 17	0641352 0531642
2222222	0123456	15 16 17 18 19 20 21	39 16 7 47 31 8 27	5206413 3164205
5555555	0123456	36 37 38 39 40 41 42	14 26 38 15 6 46 30	1352064 6420531
3333333	0123456	22 23 24 25 26 27 28	45 29 13 25 37 21 5	6413520 2053164
1111111	0123456	8 9 10 11 12 13 14	20 4 44 35 12 24 36	2064135 5316420
4444444	0123456	29 30 31 32 33 34 35	23 42 19 3 43 34 11	3520641 1642053
6666666	0123456	43 44 45 46 47 48 49	33 10 22 41 18 2 49	4135206 4205316
5/H	9/L	577/P	S/5	/D7i
0000000	0123456	1 2 3 4 5 6 7	1 48 18 37 28 12 31	0625314 0531642
4444444	0123456	29 30 31 32 33 34 35	11 30 7 47 17 36 27	1406253 3164205
1111111	0123456	8 9 10 11 12 13 14	42 26 10 29 6 46 16	5314062 6420531
3333333	0123456	22 23 24 25 26 27 28	45 15 41 25 9 35 5	6253140 2053164
5555555	0123456	36 37 38 39 40 41 42	34 4 44 21 40 24 8	4062531 5316420
2222222	0123456	15 16 17 18 19 20 21	23 14 33 3 43 20 39	3140625 1642053
6666666	0123456	43 44 45 46 47 48 49	19 38 22 13 32 2 49	2531406 4205316
6/H	9/L	721/P	S/6	/D7i
0000000	0123456	1 2 3 4 5 6 7	1 48 18 9 28 40 31	0621354 0531642
4444444	0123456	29 30 31 32 33 34 35	39 30 7 47 17 8 27	5406213 3164205
5555555	0123456	36 37 38 39 40 41 42	14 26 38 29 6 46 16	1354062 6420531
3333333	0123456	22 23 24 25 26 27 28	45 15 13 25 37 35 5	6213540 2053164
1111111	0123456	8 9 10 11 12 13 14	34 4 44 21 12 24 36	4062135 5316420
2222222	0123456	15 16 17 18 19 20 21	23 42 33 3 43 20 11	3540621 1642053
6666666	0123456	43 44 45 46 47 48 49	19 10 22 41 32 2 49	2135406 4205316

7/H	9/L	865/P	S/7	/D7i
0000000	0123456	1 2 3 4 5 6 7	1 48 11 30 28 19 38	0614325 0531642
5555555	0123456	36 37 38 39 40 41 42	18 37 7 47 10 29 27	2506143 3164205
2222222	0123456	15 16 17 18 19 20 21	35 26 17 36 6 46 9	4325061 6420531
3333333	0123456	22 23 24 25 26 27 28	45 8 34 25 16 42 5	6143250 2053164
4444444	0123456	29 30 31 32 33 34 35	41 4 44 14 33 24 15	5061432 5316420
1111111	0123456	8 9 10 11 12 13 14	23 21 40 3 43 13 32	3250614 1642053
6666666	0123456	43 44 45 46 47 48 49	12 31 22 20 39 2 49	1432506 4205316

8/H	9/L	1009/P	S/8	/D7i
0000000	0123456	1 2 3 4 5 6 7	1 48 11 16 28 33 38	0612345 0531642
5555555	0123456	36 37 38 39 40 41 42	32 37 7 47 10 15 27	4506123 3164205
4444444	0123456	29 30 31 32 33 34 35	21 26 31 36 6 46 9	2345061 6420531
3333333	0123456	22 23 24 25 26 27 28	45 8 20 25 30 42 5	6123450 2053164
2222222	0123456	15 16 17 18 19 20 21	41 4 44 14 19 24 29	5061234 5316420
1111111	0123456	8 9 10 11 12 13 14	23 35 40 3 43 13 18	3450612 1642053
6666666	0123456	43 44 45 46 47 48 49	12 17 22 34 39 2 49	1234506 4205316

7/H	32/L	888/P	S/191	8/H	32/L	1032/P	S/192
1 6 5 4 3 2 7			1 44 11 34 28 17 40	1 6 5 4 3 2 7			1 44 11 20 28 31 40
36 41 40 39 38 37 42			18 41 7 45 12 29 23	36 41 40 39 38 37 42			32 41 7 45 12 15 23
15 20 19 18 17 16 21			35 24 19 36 2 46 13	29 34 33 32 31 30 35			21 24 33 36 2 46 13
22 27 26 25 24 23 28			47 8 30 25 20 42 3	22 27 26 25 24 23 28			47 8 16 25 34 42 3
29 34 33 32 31 30 35			37 4 48 14 31 26 15	15 20 19 18 17 16 21			37 4 48 14 17 26 29
8 13 12 11 10 9 14			27 21 38 5 43 9 32	8 13 12 11 10 9 14			27 35 38 5 43 9 18
43 48 47 46 45 44 49			10 33 22 16 39 6 49	43 48 47 46 45 44 49			10 19 22 30 39 6 49

9/H	1/L	1153/P	S/193	9/H	2/L	1154/P	S/194
1 8 15 22 29 36 43			1 42 27 12 46 31 16	1 8 15 22 29 36 43			1 42 27 10 46 33 16
2 9 16 23 30 37 44			24 9 43 35 20 5 39	2 9 16 23 30 37 44			26 9 43 35 20 3 39
3 10 17 24 31 38 45			47 32 17 2 36 28 13	5 12 19 26 33 40 47			45 32 19 2 36 28 13
4 11 18 25 32 39 46			21 6 40 25 10 44 29	4 11 18 25 32 39 46			21 6 38 25 12 44 29
5 12 19 26 33 40 47			37 22 14 48 33 18 3	3 10 17 24 31 38 45			37 22 14 48 31 18 5
6 13 20 27 34 41 48			11 45 30 15 7 41 26	6 13 20 27 34 41 48			11 47 30 15 7 41 24
7 14 21 28 35 42 49			34 19 4 38 23 8 49	7 14 21 28 35 42 49			34 17 4 40 23 8 49

9/H	3/L	1155/P	S/195	9/H	4/L	1156/P	S/196
1 8 15 22 29 36 43			1 42 26 13 46 30 17	1 8 15 22 29 36 43			1 42 26 9 46 34 17
3 10 17 24 31 38 45			23 10 43 35 19 6 39	3 10 17 24 31 38 45			27 10 43 35 19 2 39
2 9 16 23 30 37 44			48 32 16 3 36 28 12	6 13 20 27 34 41 48			44 32 20 3 36 28 12
4 11 18 25 32 39 46			21 5 41 25 9 45 29	4 11 18 25 32 39 46			21 5 37 25 13 45 29
6 13 20 27 34 41 48			38 22 14 47 34 18 2	2 9 16 23 30 37 44			38 22 14 47 30 18 6
5 12 19 26 33 40 47			11 44 31 15 7 40 27	5 12 19 26 33 40 47			11 48 31 15 7 40 23
7 14 21 28 35 42 49			33 20 4 37 24 8 49	7 14 21 28 35 42 49			33 16 4 41 24 8 49

9/H	5/L	1157/P	S/197	9/H	6/L	1158/P	S/198
1 8 15 22 29 36 43			1 42 24 13 46 30 19	1 8 15 22 29 36 43			1 42 24 9 46 34 19
5 12 19 26 33 40 47			23 12 43 35 17 6 39	5 12 19 26 33 40 47			27 12 43 35 17 2 39
2 9 16 23 30 37 44			48 32 16 5 36 28 10	6 13 20 27 34 41 48			44 32 20 5 36 28 10
4 11 18 25 32 39 46			21 3 41 25 9 47 29	4 11 18 25 32 39 46			21 3 37 25 13 47 29
6 13 20 27 34 41 48			40 22 14 45 34 18 2	2 9 16 23 30 37 44			40 22 14 45 30 18 6
3 10 17 24 31 38 45			11 44 33 15 7 38 27	3 10 17 24 31 38 45			11 48 33 15 7 38 23
7 14 21 28 35 42 49			31 20 4 37 26 8 49	7 14 21 28 35 42 49			31 16 4 41 26 8 49

13/H	29/L	1749/P	S/383	13/H	32/L	1752/P	S/384
1 27 47 38 16 35 11			1 23 48 42 19 32 10	1 27 47 39 17 30 14			1 23 46 41 21 31 12
20 33 10 2 28 46 36			21 33 11 3 22 44 41	15 34 12 4 24 44 42			18 34 14 3 26 43 37
26 45 37 21 32 8 6			24 43 37 20 35 12 4	22 48 40 18 31 9 7			28 45 40 15 30 11 6
31 9 7 25 43 41 19			34 14 5 25 45 36 16	29 13 5 25 45 37 21			33 8 2 25 48 42 17
44 42 18 29 13 5 24			46 38 15 30 13 7 26	43 41 19 32 10 2 28			44 39 20 35 10 5 22
14 4 22 48 40 17 30			9 6 28 47 39 17 29	8 6 26 46 38 16 35			13 7 24 47 36 16 32
39 15 34 12 3 23 49			40 18 31 8 2 27 49	36 20 33 11 3 23 49			38 19 29 9 4 27 49

1/H 33/L 25/P	S/385	2/H 33/L 169/P	S/386
2 1 3 4 5 7 6	2 49 39 29 27 19 10	2 1 3 4 5 7 6	2 49 39 15 27 33 10
9 8 10 11 12 14 13	18 8 6 47 38 30 28	9 8 10 11 12 14 13	32 8 6 47 38 16 28
16 15 17 18 19 21 20	34 26 17 9 7 46 36	30 29 31 32 33 35 34	20 26 31 9 7 46 36
23 22 24 25 26 28 27	45 37 35 25 15 13 5	23 22 24 25 26 28 27	45 37 21 25 29 13 5
30 29 31 32 33 35 34	14 4 43 41 33 24 16	16 15 17 18 19 21 20	14 4 43 41 19 24 30
37 36 38 39 40 42 41	22 20 12 3 44 42 32	37 36 38 39 40 42 41	22 34 12 3 44 42 18
44 43 45 46 47 49 48	40 31 23 21 11 1 48	44 43 45 46 47 49 48	40 17 23 35 11 1 48
3/H 33/L 313/P	S/387	4/H 33/L 457/P	S/388
2 1 3 4 5 7 6	2 49 32 36 27 12 17	2 1 3 4 5 7 6	2 49 32 8 27 40 17
16 15 17 18 19 21 20	11 15 6 47 31 37 28	16 15 17 18 19 21 20	39 15 6 47 31 9 28
9 8 10 11 12 14 13	41 26 10 16 7 46 29	37 36 38 39 40 42 41	13 26 38 16 7 46 29
23 22 24 25 26 28 27	45 30 42 25 8 20 5	23 22 24 25 26 28 27	45 30 14 25 36 20 5
37 36 38 39 40 42 41	21 4 43 34 40 24 9	9 8 10 11 12 14 13	21 4 43 34 12 24 37
30 29 31 32 33 35 34	22 13 19 3 44 35 39	30 29 31 32 33 35 34	22 41 19 3 44 35 11
44 43 45 46 47 49 48	33 38 23 14 18 1 48	44 43 45 46 47 49 48	33 10 23 42 18 1 48
5/H 33/L 601/P	S/389	6/H 33/L 745/P	S/390
2 1 3 4 5 7 6	2 49 18 36 27 12 31	2 1 3 4 5 7 6	2 49 18 8 27 40 31
30 29 31 32 33 35 34	11 29 6 47 17 37 28	30 29 31 32 33 35 34	39 29 6 47 17 9 28
9 8 10 11 12 14 13	41 26 10 30 7 46 15	37 36 38 39 40 42 41	13 26 38 30 7 46 15
23 22 24 25 26 28 27	45 16 42 25 8 34 5	23 22 24 25 26 28 27	45 16 14 25 36 34 5
37 36 38 39 40 42 41	35 4 43 20 40 24 9	9 8 10 11 12 14 13	35 4 43 20 12 24 37
16 15 17 18 19 21 20	22 13 33 3 44 21 39	16 15 17 18 19 21 20	22 41 33 3 44 21 11
44 43 45 46 47 49 48	19 38 23 14 32 1 48	44 43 45 46 47 49 48	19 10 23 42 32 1 48
13/H 61/L 1773/P	S/767	13/H 64/L 1776/P	S/768
2 28 47 38 15 34 11	2 22 49 41 19 32 10	2 28 47 39 17 29 13	2 22 46 42 20 31 12
21 33 10 1 27 46 37	20 33 11 3 23 43 42	16 35 12 4 24 43 41	18 35 13 3 26 44 36
26 45 36 20 32 9 7	24 44 36 21 34 12 4	23 49 40 18 31 8 6	27 45 40 16 29 11 7
31 8 6 25 44 42 19	35 13 5 25 45 37 15	30 14 5 25 45 36 20	33 9 1 25 49 41 17
43 41 18 30 14 5 24	46 38 16 29 14 6 26	44 42 19 32 10 1 27	43 39 21 34 10 5 23
13 4 23 49 40 17 29	8 7 27 47 39 17 30	9 7 26 46 38 15 34	14 6 24 47 37 15 32
39 16 35 12 3 22 48	40 18 31 9 1 28 48	37 21 33 11 3 22 48	38 19 30 8 4 28 48
1/H 65/L 49/P	S/769	2/H 65/L 193/P	S/770
3 1 2 4 6 7 5	3 49 39 29 26 20 9	3 1 2 4 6 7 5	3 49 39 15 26 34 9
10 8 9 11 13 14 12	18 8 5 48 37 31 28	10 8 9 11 13 14 12	32 8 5 48 37 17 28
17 15 16 18 20 21 19	33 27 16 10 7 46 36	31 29 30 32 34 35 33	19 27 30 10 7 46 36
24 22 23 25 27 28 26	44 38 35 25 15 12 6	24 22 23 25 27 28 26	44 38 21 25 29 12 6
31 29 30 32 34 35 33	14 4 43 40 34 23 17	17 15 16 18 20 21 19	14 4 43 40 20 23 31
38 36 37 39 41 42 40	22 19 13 2 45 42 32	38 36 37 39 41 42 40	22 33 13 2 45 42 18
45 43 44 46 48 49 47	41 30 24 21 11 1 47	45 43 44 46 48 49 47	41 16 24 35 11 1 47
3/H 65/L 337/P	S/771	4/H 65/L 481/P	S/772
3 1 2 4 6 7 5	3 49 32 36 26 13 16	3 1 2 4 6 7 5	3 49 32 8 26 41 16
17 15 16 18 20 21 19	11 15 5 48 30 38 28	17 15 16 18 20 21 19	39 15 5 48 30 10 28
10 8 9 11 13 14 12	40 27 9 17 7 46 29	38 36 37 39 41 42 40	12 27 37 17 7 46 29
24 22 23 25 27 28 26	44 31 42 25 8 19 6	24 22 23 25 27 28 26	44 31 14 25 36 19 6
38 36 37 39 41 42 40	21 4 43 33 41 23 10	10 8 9 11 13 14 12	21 4 43 33 13 23 38
31 29 30 32 34 35 33	22 12 20 2 45 35 39	31 29 30 32 34 35 33	22 40 20 2 45 35 11
45 43 44 46 48 49 47	34 37 24 14 18 1 47	45 43 44 46 48 49 47	34 9 24 42 18 1 47
5/H 65/L 625/P	S/773	6/H 65/L 769/P	S/774
3 1 2 4 6 7 5	3 49 18 36 26 13 30	3 1 2 4 6 7 5	3 49 18 8 26 41 30
31 29 30 32 34 35 33	11 29 5 48 16 38 28	31 29 30 32 34 35 33	39 29 5 48 16 10 28
10 8 9 11 13 14 12	40 27 9 31 7 46 15	38 36 37 39 41 42 40	12 27 37 31 7 46 15
24 22 23 25 27 28 26	44 17 42 25 8 33 6	24 22 23 25 27 28 26	44 17 14 25 36 33 6
38 36 37 39 41 42 40	35 4 43 19 41 23 10	10 8 9 11 13 14 12	35 4 43 19 13 23 38
17 15 16 18 20 21 19	22 12 34 2 45 21 39	17 15 16 18 20 21 19	22 40 34 2 45 21 11
45 43 44 46 48 49 47	20 37 24 14 32 1 47	45 43 44 46 48 49 47	20 9 24 42 32 1 47

13/H 125/L 1821/P

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

1/H 129/L 97/P

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

3/H 129/L 385/P

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

5/H 129/L 673/P

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

...

24/H 191/L 3455/P

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

23/H 185/L 3305/P

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

23/H 187/L 3307/P

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

S/1535

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

S/1537

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

S/1539

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

S/1541

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

S/3447

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

S/3449

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

S/3451

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

13/H 128/L 1824/P

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

2/H 129/L 241/P

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

4/H 129/L 529/P

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

6/H 129/L 817/P

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

S/1536

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

S/1538

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

S/1540

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

S/1542

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

24/H 192/L 3456/P

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

23/H 186/L 3306/P

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

23/H 188/L 3308/P

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

S/3448

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

S/3450

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

S/3452

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





How beautiful the last Monitor List is! It shows us we could successfully compose the complete set of 3456 Prototype solution, and it also shows that there is really the one-to-one correspondence between the two solution sets: Prototype and Object Solutions. Both of them are 'Complete Euler Squares' of order 7.

### #5. Prototype Squares for Pan-diagonal Magic Squares of Order 7

Can you compose the Prototype solutions for Pan-diagonal magic squares 7x7 as many as 38102400? Yes, you can, I believe. But it should be harder than before.

The conditions you have to assume at first are so similar to the Simultaneous case.

\*\* Basic Forms of 'Prototype Euler Squares' of Order 7 \*\*

[Prototype]							[Decomposed]						
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 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 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 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 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	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 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 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			

[Model]							[Decomposed]						
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					

\* Basic Conditions for Prototype Euler Squares of Order 7: \*

n1+n48+n39+n30+n28+n19+n10=21 ... rw1		n1+n18+n35+n45+n13+n23+n40=21 ... cl 1
n18+n9+n7+n47+n38+n29+n27=21 ... rw2		n48+n9+n26+n36+n4+n21+n31=21 ... cl 2
n35+n26+n17+n8+n6+n46+n37=21 ... rw3		n39+n7+n17+n34+n44+n12+n22=21 ... cl 3
n45+n36+n34+n25+n16+n14+n5=21 ... rw4		n30+n47+n8+n25+n42+n3+n20=21 ... cl 4
n13+n4+n44+n42+n33+n24+n15=21 ... rw5		n28+n38+n6+n16+n33+n43+n11=21 ... cl 5
n23+n21+n12+n3+n43+n41+n32=21 ... rw6		n19+n29+n46+n14+n24+n41+n2=21 ... cl 6
n40+n31+n22+n20+n11+n2+n49=21 ... rw7		n10+n27+n37+n5+n15+n32+n49=21 ... cl 7

\* Pandiagonal Conditions: for Prototype Euler Squares of Order 7: \*

n1+n9+n17+n25+n33+n41+n49=21 ... pd1		n1+n27+n46+n16+n42+n12+n31=21 ... pq1
n48+n7+n8+n16+n24+n32+n40=21 ... pd2		n48+n18+n37+n14+n33+n3+n22=21 ... pq2
n39+n47+n6+n14+n15+n23+n31=21 ... pd3		n39+n9+n35+n5+n24+n43+n20=21 ... pq3
n30+n38+n46+n5+n13+n21+n22=21 ... pd4		n30+n7+n26+n45+n15+n41+n11=21 ... pq4
n28+n29+n37+n45+n4+n12+n20=21 ... pd5		n28+n47+n17+n36+n13+n32+n2=21 ... pq5
n19+n27+n35+n36+n44+n3+n11=21 ... pd6		n19+n38+n8+n34+n4+n23+n49=21 ... pq6
n10+n18+n26+n34+n42+n43+n2=21 ... pd7		n10+n29+n6+n25+n44+n21+n40=21 ... pq7

You don't have to define all the complementary pairs of 50 and their symmetrical



locations any longer for the first definitions.

After I tried and erred a lot, I have finally found the next program below would be practical for that type. Let me show you only an essential part of it.

```

/** 'Prototype Squares' for 'Pandiagonal Euler Squares' of Order 7 **/
/** Composed by 'New Euler's Method' and by 'DAM Transformation' **/
/**/
/* The Calculations */
/* Define Level 1: */
/* Set n1{1, 1, 1, 1} */
void stp01(){
  short r=1, c=1, d=1, b=1;
  short a;
  for(a=0; a<7; a++){
    if((rw[r][a]==0)&&(cl[c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
      nm[1]=a;
      rw[r][a]=1; cl[c][a]=1; pd[d][a]=1; pb[b][a]=1;
      stp02();
      rw[r][a]=0; cl[c][a]=0; pd[d][a]=0; pb[b][a]=0;
    }
  }
}
/* Set n49{7, 7, 1, 6} */
void stp02(){
  short r=7, c=7, d=1, b=6;
  short a;
  for(a=6; a>=0; a--){
    if((rw[r][a]==0)&&(cl[c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
      nm[49]=a;
      rw[r][a]=1; cl[c][a]=1; pd[d][a]=1; pb[b][a]=1;
      stp03();
      rw[r][a]=0; cl[c][a]=0; pd[d][a]=0; pb[b][a]=0;
    }
  }
}
/* Set n9{2, 2, 1, 3} */
void stp03(){
  short r=2, c=2, d=1, b=3;
  short a;
  for(a=0; a<7; a++){
    if((rw[r][a]==0)&&(cl[c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
      nm[9]=a;
      rw[r][a]=1; cl[c][a]=1; pd[d][a]=1; pb[b][a]=1;
      stp04();
      rw[r][a]=0; cl[c][a]=0; pd[d][a]=0; pb[b][a]=0;
    }
  }
}
/* Set n41{6, 6, 1, 4} */
void stp04(){
  short r=6, c=6, d=1, b=4;
  short a;
  for(a=6; a>=0; a--){
    if((rw[r][a]==0)&&(cl[c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
      nm[41]=a;
      rw[r][a]=1; cl[c][a]=1; pd[d][a]=1; pb[b][a]=1;
      stp05();
      rw[r][a]=0; cl[c][a]=0; pd[d][a]=0; pb[b][a]=0;
    }
  }
}
/* Set n17{3, 3, 1, 5} */
void stp05(){
  short r=3, c=3, d=1, b=5;
  short a;
  for(a=0; a<7; a++){
    if((rw[r][a]==0)&&(cl[c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
      nm[17]=a;

```

```

        rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
        stp06();
        rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
    }}
}
/* Set n33{5, 5, 1, 2} */
void stp06(){
    short r=5, c=5, d=1, b=2;
    short a;
    for(a=6; a>=0; a--){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[33]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp07();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}
/* Set n25{4, 4, 1, 7} */
void stp07(){
    short r=4, c=4, d=1, b=7;
    short a;
    for(a=0; a<7; a++){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[25]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp08();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}
/* Define Level 2: */
/* Set n48{1, 2, 2, 2} */
void stp08(){
    short r=1, c=2, d=2, b=2;
    short a;
    for(a=6; a>=0; a--){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[48]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp09();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}
/* Set n2{7, 6, 7, 5} */
void stp09(){
    short r=7, c=6, d=7, b=5;
    short a;
    for(a=0; a<7; a++){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[2]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp10();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}
/* Set n39{1, 3, 3, 3} */
void stp10(){
    short r=1, c=3, d=3, b=3;
    short a;
    for(a=6; a>=0; a--){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[39]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp11();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}

```

```

    }}
}
/* Set n11{7, 5, 6, 4} */
void stp11(){
    short r=7, c=5, d=6, b=4;
    short a;
    for(a=0; a<7; a++){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[11]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp12();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}
/* Set n30{1, 4, 4, 4} */
void stp12(){
    short r=1, c=4, d=4, b=4;
    short a;
    for(a=6; a>=0; a--){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[30]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp13();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}
/* Set n20{7, 4, 5, 3} */
void stp13(){
    short r=7, c=4, d=5, b=3;
    short a;
    for(a=0; a<7; a++){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[20]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp14();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}
/* Set n28{1, 5, 5, 5} */
void stp14(){
    short r=1, c=5, d=5, b=5;
    short a;
    for(a=6; a>=0; a--){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[28]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp15();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}
/* Set n22{7, 3, 4, 2} */
void stp15(){
    short r=7, c=3, d=4, b=2;
    short a;
    for(a=0; a<7; a++){
        if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
            nm[22]=a;
            rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
            stp16();
            rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
        }
    }
}
/* Set n19{1, 6, 6, 6} */
void stp16(){

```

```

short r=1, c=6, d=6, b=6;
short a;
for(a=6; a>=0; a--){
    if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
        nm[19]=a;
        rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
        stp17();
        rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
    }
}
}
/* Set n31{7, 2, 3, 1} */
void stp17(){
short r=7, c=2, d=3, b=1;
short a;
for(a=6; a>=0; a--){
    if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
        nm[31]=a;
        rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
        stp18();
        rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
    }
}
}
/* Set n10{1, 7, 7, 7} */
void stp18(){
short r=1, c=7, d=7, b=7;
short a;
for(a=0; a<7; a++){
    if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
        nm[10]=a;
        rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
        stp19();
        rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
    }
}
}
/* Set n40{7, 1, 2, 7} */
void stp19(){
short r=7, c=1, d=2, b=7;
short a;
for(a=6; a>=0; a--){
    if((rw[r][a]==0)&&(cl [c][a]==0)&&(pd[d][a]==0)&&(pb[b][a]==0)){
        nm[40]=a;
        rw[r][a]=1; cl [c][a]=1; pd[d][a]=1; pb[b][a]=1;
        stp20();
        rw[r][a]=0; cl [c][a]=0; pd[d][a]=0; pb[b][a]=0;
    }
}
}
}
/* Define Level 3: */
/* Set n45{4, 1, 5, 4} */
/* Set n5{4, 7, 4, 3} */
/* Set n13{5, 1, 4, 5} */
/* Set n37{3, 7, 5, 2} */
/* Set n35{3, 1, 6, 3} */
/* Set n15{5, 7, 3, 4} */
/* Set n18{2, 1, 7, 2} */
/* Set n32{6, 7, 2, 5} */
/* Set n23{6, 1, 3, 6} */
/* Set n27{2, 7, 6, 1} */
/**/
/* Define Level 4: */
/* Set n47{2, 4, 3, 5} */
. . . . .

```

This program seems quite similar to that one for Simultaneous type, but it is rather simple, though it is much longer. The order of defining variables is really important

for you to improve the execution speed of your program. Please do the same thing after me.

But you have to add some 'sort' procedures before listing to your program, while you can make it run faster.

The next list demonstrates a part of the recent result of my experiment.

```
*** Compose 'Prototype Squares' of Order 7 by 'New Euler's Method', ***
** and Transform them into Pan-diagonal MS77 by 'DAM Transformation' **
[List of Layer Units]
[for High]
```

1/	2/	3/	4/	5/	6/	7/	8/
0000000	0000000	0000000	0000000	0000000	0000000	0000000	0000000
1111111	1111111	1111111	1111111	1111111	1111111	1111111	1111111
2222222	2222222	2222222	2222222	2222222	2222222	2222222	2222222
3333333	3333333	3333333	3333333	3333333	3333333	4444444	4444444
4444444	4444444	5555555	5555555	6666666	6666666	3333333	3333333
5555555	6666666	4444444	6666666	4444444	5555555	5555555	6666666
6666666	5555555	6666666	4444444	5555555	4444444	6666666	5555555
505/	506/	507/	508/	509/	510/	511/	512/
0231456	0231465	0231546	0231564	0231546	0231645	0231654	0231645
0231456	0231465	0231546	0231564	2315460	0231645	0231654	2316450
0231456	0231465	0231546	0231564	3154602	0231645	0231654	3164502
0231456	0231465	0231546	0231564	1546023	0231645	0231654	1645023
0231456	0231465	0231546	0231564	5460231	0231645	0231654	6450231
0231456	0231465	0231546	0231564	4602315	0231645	0231654	4502316
0231456	0231465	0231546	0231564	6023154	0231645	0231654	5023164
1009/	1010/	1011/	1012/	1013/	1014/	1015/	1016/
0514263	0514236	0514263	0514362	0514326	0514362	0514326	0514623
0514263	2360514	2630514	0514362	3260514	3620514	5143260	5146230
0514263	5142360	5142630	0514362	5143260	5143620	1432605	1462305
0514263	3605142	6305142	0514362	2605143	6205143	4326051	4623051
0514263	1423605	1426305	0514362	1432605	1436205	3260514	6230514
0514263	6051423	3051426	0514362	6051432	2051436	2605143	2305146
0514263	4236051	4263051	0514362	4326051	4362051	6051432	3051462
1513/	1514/	1515/	1516/	1517/	1518/	1519/	1520/
1052346	1052364	1052436	1052436	1052463	1052634	1052643	1052634
1052346	1052364	0524361	1052436	1052463	0526341	0526431	1052634
1052346	1052364	5243610	1052436	1052463	5263410	5264310	1052634
1052346	1052364	2436105	1052436	1052463	2634105	2643105	1052634
1052346	1052364	4361052	1052436	1052463	6341052	6431052	1052634
1052346	1052364	3610524	1052436	1052463	3410526	4310526	1052634
1052346	1052364	6105243	1052436	1052463	4105263	3105264	1052634
2017/	2018/	2019/	2020/	2021/	2022/	2023/	2024/
1526430	1530246	1530264	1530426	1530462	1530624	1530642	1532046
5264301	1530246	1530264	1530426	1530462	1530624	1530642	0461532
2643015	1530246	1530264	1530426	1530462	1530624	1530642	5320461
6430152	1530246	1530264	1530426	1530462	1530624	1530642	4615320
4301526	1530246	1530264	1530426	1530462	1530624	1530642	3204615
3015264	1530246	1530264	1530426	1530462	1530624	1530642	6153204
0152643	1530246	1530264	1530426	1530462	1530624	1530642	2046153

[**for Low**]

1/	2/	3/	4/	5/	6/	7/	8/
0000000	0000000	0000000	0000000	0000000	0000000	0000000	0000000
1111111	1111111	1111111	1111111	1111111	1111111	1111111	1111111
2222222	2222222	2222222	2222222	2222222	2222222	2222222	2222222
3333333	3333333	3333333	3333333	3333333	3333333	4444444	4444444
4444444	4444444	5555555	5555555	6666666	6666666	3333333	3333333
5555555	6666666	4444444	6666666	4444444	5555555	5555555	6666666
6666666	5555555	6666666	4444444	5555555	4444444	6666666	5555555

4033/	4034/	4035/	4036/	4037/	4038/	4039/	4040/
1230456	1230465	1230456	1230465	1230456	1230465	1230546	1230564
1230456	1230465	2304561	2304651	4561230	4651230	1230546	1230564
1230456	1230465	3045612	3046512	2304561	2304651	1230546	1230564
1230456	1230465	0456123	0465123	5612304	6512304	1230546	1230564
1230456	1230465	4561230	4651230	3045612	3046512	1230546	1230564
1230456	1230465	5612304	6512304	6123045	5123046	1230546	1230564
1230456	1230465	6123045	5123046	0456123	0465123	1230546	1230564
8065/	8066/	8067/	8068/	8069/	8070/	8071/	8072/
2530146	2530164	2530146	2530164	2530146	2530164	2530416	2530461
1462530	1642530	2530146	2530164	5301462	5301642	2530416	2530461
5301462	5301642	2530146	2530164	3014625	3016425	2530416	2530461
4625301	6425301	2530146	2530164	0146253	0164253	2530416	2530461
3014625	3016425	2530146	2530164	1462530	1642530	2530416	2530461
6253014	4253016	2530146	2530164	4625301	6425301	2530416	2530461
0146253	0164253	2530146	2530164	6253014	4253016	2530416	2530461
12097/	12098/	12099/	12100/	12101/	12102/	12103/	12104/
4150236	4150263	4150236	4150263	4150236	4150263	4150326	4150362
1502364	1502634	2364150	2634150	4150236	4150263	1503264	1503624
5023641	5026341	1502364	1502634	4150236	4150263	5032641	5036241
0236415	0263415	3641502	6341502	4150236	4150263	0326415	0362415
2364150	2634150	5023641	5026341	4150236	4150263	3264150	3624150
3641502	6341502	6415023	3415026	4150236	4150263	2641503	6241503
6415023	3415026	0236415	0263415	4150236	4150263	6415032	2415036
16129/	16130/	16131/	16132/	16133/	16134/	16135/	16136/
5460123	5460132	5460123	5460132	5460123	5460132	5460213	5460231
1235460	1325460	4601235	4601325	5460123	5460132	2135460	2315460
4601235	4601325	6012354	6013254	5460123	5460132	4602135	4602315
2354601	3254601	0123546	0132546	5460123	5460132	1354602	3154602
6012354	6013254	1235460	1325460	5460123	5460132	6021354	6023154
3546012	2546013	2354601	3254601	5460123	5460132	3546021	1546023
0123546	0132546	3546012	2546013	5460123	5460132	0213546	0231546

[Counts of Layer Units = 2520H/20160L]

[List #1: 'Prototype Squares' of Order 7 and Pan-diagonal MS77 Recomposed]

1/H	721/L								1/P	/S								/D7i
0000000	0123456	1	2	3	4	5	6	7	1	48	39	30	28	19	10	0654321	0531642	
1111111	0123456	8	9	10	11	12	13	14	18	9	7	47	38	29	27	2106543	3164205	
2222222	0123456	15	16	17	18	19	20	21	35	26	17	8	6	46	37	4321065	6420531	
3333333	0123456	22	23	24	25	26	27	28	45	36	34	25	16	14	5	6543210	2053164	
4444444	0123456	29	30	31	32	33	34	35	13	4	44	42	33	24	15	1065432	5316420	
5555555	0123456	36	37	38	39	40	41	42	23	21	12	3	43	41	32	3210654	1642053	
6666666	0123456	43	44	45	46	47	48	49	40	31	22	20	11	2	49	5432106	4205316	
1/H	722/L								2/P	/S								/D7i
0000000	0123456	1	2	3	4	5	6	7	1	47	37	34	24	21	11	0654321	0415263	
1111111	1234560	9	10	11	12	13	14	8	20	10	7	46	36	33	23	2106543	5263041	
2222222	2345601	17	18	19	20	21	15	16	32	22	19	9	6	45	42	4321065	3041526	
3333333	3456012	25	26	27	28	22	23	24	44	41	31	28	18	8	5	6543210	1526304	
4444444	4560123	33	34	35	29	30	31	32	14	4	43	40	30	27	17	1065432	6304152	
5555555	5601234	41	42	36	37	38	39	40	26	16	13	3	49	39	29	3210654	4152630	
6666666	6012345	49	43	44	45	46	47	48	38	35	25	15	12	2	48	5432106	2630415	
1/H	723/L								3/P	/S								/D7i
0000000	0123456	1	2	3	4	5	6	7	1	44	38	32	26	20	14	0654321	0123456	
1111111	4560123	12	13	14	8	9	10	11	19	13	7	43	37	31	25	2106543	4560123	
2222222	1234560	16	17	18	19	20	21	15	30	24	18	12	6	49	36	4321065	1234560	
3333333	5601234	27	28	22	23	24	25	26	48	42	29	23	17	11	5	6543210	5601234	
4444444	2345601	31	32	33	34	35	29	30	10	4	47	41	35	22	16	1065432	2345601	
5555555	6012345	42	36	37	38	39	40	41	28	15	9	3	46	40	34	3210654	6012345	
6666666	3456012	46	47	48	49	43	44	45	39	33	27	21	8	2	45	5432106	3456012	

1/H	724/L	4/P	/S	/D7i
0000000	0123465	1 2 3 4 5 7 6	1 49 39 30 27 19 10	0654321 0631542
1111111	0123465	8 9 10 11 12 14 13	18 9 6 47 38 29 28	2106543 3154206
2222222	0123465	15 16 17 18 19 21 20	34 26 17 8 7 46 37	4321065 5420631
3333333	0123465	22 23 24 25 26 28 27	45 36 35 25 16 13 5	6543210 2063154
4444444	0123465	29 30 31 32 33 35 34	14 4 44 41 33 24 15	1065432 6315420
5555555	0123465	36 37 38 39 40 42 41	23 20 12 3 43 42 32	3210654 1542063
6666666	0123465	43 44 45 46 47 49 48	40 31 22 21 11 2 48	5432106 4206315

1/H	725/L	5/P	/S	/D7i
0000000	0123465	1 2 3 4 5 7 6	1 47 37 35 24 20 11	0654321 0416253
1111111	1234650	9 10 11 12 14 13 8	21 10 6 46 36 33 23	2106543 6253041
2222222	2346501	17 18 19 21 20 15 16	32 22 19 9 7 45 41	4321065 3041625
3333333	3465012	25 26 28 27 22 23 24	44 42 31 27 18 8 5	6543210 1625304
4444444	4650123	33 35 34 29 30 31 32	13 4 43 40 30 28 17	1065432 5304162
5555555	6501234	42 41 36 37 38 39 40	26 16 14 3 48 39 29	3210654 4162530
6666666	5012346	48 43 44 45 46 47 49	38 34 25 15 12 2 49	5432106 2530416

1/H	726/L	6/P	/S	/D7i
0000000	0123465	1 2 3 4 5 7 6	1 44 38 32 26 21 13	0654321 0123465
1111111	4650123	12 14 13 8 9 10 11	19 14 6 43 37 31 25	2106543 4650123
2222222	1234650	16 17 18 19 21 20 15	30 24 18 12 7 48 36	4321065 1234650
3333333	6501234	28 27 22 23 24 25 26	49 41 29 23 17 11 5	6543210 6501234
4444444	2346501	31 32 33 35 34 29 30	10 4 47 42 34 22 16	1065432 2346501
5555555	5012346	41 36 37 38 39 40 42	27 15 9 3 46 40 35	3210654 5012346
6666666	3465012	46 47 49 48 43 44 45	39 33 28 20 8 2 45	5432106 3465012

1/H	727/L	7/P	/S	/D7i
0000000	0123546	1 2 3 4 6 5 7	1 47 39 30 28 20 10	0654321 0431652
1111111	0123546	8 9 10 11 13 12 14	18 9 7 48 38 29 26	2106543 3165204
2222222	0123546	15 16 17 18 20 19 21	35 27 17 8 5 46 37	4321065 6520431
3333333	0123546	22 23 24 25 27 26 28	45 36 33 25 16 14 6	6543210 2043165
4444444	0123546	29 30 31 32 34 33 35	12 4 44 42 34 24 15	1065432 4316520
5555555	0123546	36 37 38 39 41 40 42	23 21 13 3 43 40 32	3210654 1652043
6666666	0123546	43 44 45 46 48 47 49	41 31 22 19 11 2 49	5432106 5204316

1/H	728/L	8/P	/S	/D7i
0000000	0123546	1 2 3 4 6 5 7	1 48 37 33 24 21 11	0654321 0514263
1111111	1235460	9 10 11 13 12 14 8	19 10 7 46 36 34 23	2106543 4263051
2222222	2354601	17 18 20 19 21 15 16	32 22 20 9 5 45 42	4321065 3051426
3333333	3546012	25 27 26 28 22 23 24	44 40 31 28 18 8 6	6543210 1426305
4444444	5460123	34 33 35 29 30 31 32	14 4 43 41 30 26 17	1065432 6305142
5555555	4601235	40 42 36 37 38 39 41	27 16 12 3 49 39 29	3210654 5142630
6666666	6012354	49 43 44 45 46 48 47	38 35 25 15 13 2 47	5432106 2630514

1/H	729/L	9/P	/S	/D7i
0000000	0123546	1 2 3 4 6 5 7	1 44 38 32 27 19 14	0654321 0123546
1111111	5460123	13 12 14 8 9 10 11	20 12 7 43 37 31 25	2106543 5460123
2222222	1235460	16 17 18 20 19 21 15	30 24 18 13 5 49 36	4321065 1235460
3333333	4601235	26 28 22 23 24 25 27	47 42 29 23 17 11 6	6543210 4601235
4444444	2354601	31 32 34 33 35 29 30	10 4 48 40 35 22 16	1065432 2354601
5555555	6012354	42 36 37 38 39 41 40	28 15 9 3 46 41 33	3210654 6012354
6666666	3546012	46 48 47 49 43 44 45	39 34 26 21 8 2 45	5432106 3546012

1/H	730/L	10/P	/S	/D7i
0000000	0123564	1 2 3 4 6 7 5	1 49 39 30 26 20 10	0654321 0631452
1111111	0123564	8 9 10 11 13 14 12	18 9 5 48 38 29 28	2106543 3145206
2222222	0123564	15 16 17 18 20 21 19	33 27 17 8 7 46 37	4321065 4520631
3333333	0123564	22 23 24 25 27 28 26	45 36 35 25 16 12 6	6543210 2063145
4444444	0123564	29 30 31 32 34 35 33	14 4 44 40 34 24 15	1065432 6314520
5555555	0123564	36 37 38 39 41 42 40	23 19 13 3 43 42 32	3210654 1452063
6666666	0123564	43 44 45 46 48 49 47	41 31 22 21 11 2 47	5432106 5206314

1/H	731/L							11/P	/S							/D7i	
0000000	0123564	1	2	3	4	6	7	5	1	48	37	35	24	19	11	0654321	0516243
1111111	1235640	9	10	11	13	14	12	8	21	10	5	46	36	34	23	2106543	6243051
2222222	2356401	17	18	20	21	19	15	16	32	22	20	9	7	45	40	4321065	3051624
3333333	3564012	25	27	28	26	22	23	24	44	42	31	26	18	8	6	6543210	1624305
4444444	5640123	34	35	33	29	30	31	32	12	4	43	41	30	28	17	1065432	4305162
5555555	6401235	42	40	36	37	38	39	41	27	16	14	3	47	39	29	3210654	5162430
6666666	4012356	47	43	44	45	46	48	49	38	33	25	15	13	2	49	5432106	2430516

1/H	732/L							12/P	/S							/D7i	
0000000	0123564	1	2	3	4	6	7	5	1	44	38	32	27	21	12	0654321	0123564
1111111	5640123	13	14	12	8	9	10	11	20	14	5	43	37	31	25	2106543	5640123
2222222	1235640	16	17	18	20	21	19	15	30	24	18	13	7	47	36	4321065	1235640
3333333	6401235	28	26	22	23	24	25	27	49	40	29	23	17	11	6	6543210	6401235
4444444	2356401	31	32	34	35	33	29	30	10	4	48	42	33	22	16	1065432	2356401
5555555	4012356	40	36	37	38	39	41	42	26	15	9	3	46	41	35	3210654	4012356
6666666	3564012	46	48	49	47	43	44	45	39	34	28	19	8	2	45	5432106	3564012

1H	733L	13/P	/S							1H	734L	14/P	/S														
1	2	3	4	7	5	6	1	47	39	30	27	21	10	1	2	3	4	7	6	5	1	48	39	30	26	21	10
8	9	10	11	14	12	13	18	9	6	49	38	29	26	8	9	10	11	14	13	12	18	9	5	49	38	29	27
15	16	17	18	21	19	20	34	28	17	8	5	46	37	15	16	17	18	21	20	19	33	28	17	8	6	46	37
22	23	24	25	28	26	27	45	36	33	25	16	13	7	22	23	24	25	28	27	26	45	36	34	25	16	12	7
29	30	31	32	35	33	34	12	4	44	41	35	24	15	29	30	31	32	35	34	33	13	4	44	40	35	24	15
36	37	38	39	42	40	41	23	20	14	3	43	40	32	36	37	38	39	42	41	40	23	19	14	3	43	41	32
43	44	45	46	49	47	48	42	31	22	19	11	2	48	43	44	45	46	49	48	47	42	31	22	20	11	2	47

1H	735L	15/P	/S							1H	736L	16/P	/S														
1	2	3	4	7	5	6	1	49	37	33	24	20	11	1	2	3	4	7	6	5	1	49	37	34	24	19	11
9	10	11	14	12	13	8	19	10	6	46	36	35	23	9	10	11	14	13	12	8	20	10	5	46	36	35	23
17	18	21	19	20	15	16	32	22	21	9	5	45	41	17	18	21	20	19	15	16	32	22	21	9	6	45	40
25	28	26	27	22	23	24	44	40	31	27	18	8	7	25	28	27	26	22	23	24	44	41	31	26	18	8	7
35	33	34	29	30	31	32	13	4	43	42	30	26	17	35	34	33	29	30	31	32	12	4	43	42	30	27	17
40	41	36	37	38	39	42	28	16	12	3	48	39	29	41	40	36	37	38	39	42	28	16	13	3	47	39	29
48	43	44	45	46	49	47	38	34	25	15	14	2	47	47	43	44	45	46	49	48	38	33	25	15	14	2	48

1H	737L	17/P	/S							1H	738L	18/P	/S														
1	2	3	4	7	5	6	1	44	38	32	28	19	13	1	2	3	4	7	6	5	1	44	38	32	28	20	12
14	12	13	8	9	10	11	21	12	6	43	37	31	25	14	13	12	8	9	10	11	21	13	5	43	37	31	25
16	17	18	21	19	20	15	30	24	18	14	5	48	36	16	17	18	21	20	19	15	30	24	18	14	6	47	36
26	27	22	23	24	25	28	47	41	29	23	17	11	7	27	26	22	23	24	25	28	48	40	29	23	17	11	7
31	32	35	33	34	29	30	10	4	49	40	34	22	16	31	32	35	34	33	29	30	10	4	49	41	33	22	16
41	36	37	38	39	42	40	27	15	9	3	46	42	33	40	36	37	38	39	42	41	26	15	9	3	46	42	34
46	49	47	48	43	44	45	39	35	26	20	8	2	45	46	49	48	47	43	44	45	39	35	27	19	8	2	45

1H	739L	19/P	/S							1H	740L	20/P	/S														
1	2	3	5	4	6	7	1	48	40	30	28	18	10	1	2	3	5	4	7	6	1	49	40	30	27	18	10
8	9	10	12	11	13	14	19	9	7	46	38	29	27	8	9	10	12	11	14	13	19	9	6	46	38	29	28
15	16	17	19	18	20	21	35	25	17	8	6	47	37	15	16	17	19	18	21	20	34	25	17	8	7	47	37
22	23	24	26	25	27	28	45	36	34	26	16	14	4	22	23	24	26	25	28	27	45	36	35	26	16	13	4
29	30	31	33	32	34	35	13	5	44	42	32	24	15	29	30	31	33	32	35	34	14	5	44	41	32	24	15
36	37	38	40	39	41	42	23	21	11	3	43	41	33	36	37	38	40	39	42	41	23	20	11	3	43	42	33
43	44	45	47	46	48	49	39	31	22	20	12	2	49	43	44	45	47	46	49	48	39	31	22	21	12	2	48

1H	741L	21/P	/S							1H	742L	22/P	/S														
1	2	3	5	4	6	7	1	46	37	34	24	21	12	1	2	3	5	4	7	6	1	46	37	35	24	20	12
9	10	12	11	13	14	8	20	10	7	47	36	32	23	9	10	12	11	14	13	8	21	10	6	47	36	32	23
17	19	18	20	21	15	16	33	22	18	9	6	45	42	17	19	18	21	20	15	16	33	22	18	9	7	45	41
26	25	27	28	22	23	24	44	41	31	28	19	8	4	26	25	28	27	22	23	24	44	42	31	27	19	8	4
32	34	35	29	30	31	33	14	5	43	39	30	27	17	32	35	34	29	30	31	33	13	5	43	39	30	28	17
41	42	36	37	38	40	39	25	16	13	3	49	40	29	42	41	36	37	38	40	39	25	16	14	3	48	40	29
49	43	44	45	47	46	48	38	35	26	15	11	2	48	48	43	44	45	47	46	49	38	34	26	15	11	2	49



1H 743L	23/P	/S	1H 744L	24/P	/S
1 2 3 5 4 6 7		1 44 38 33 25 20 14	1 2 3 5 4 7 6		1 44 38 33 25 21 13
11 13 14 8 9 10 12		18 13 7 43 37 31 26	11 14 13 8 9 10 12		18 14 6 43 37 31 26
16 17 19 18 20 21 15		30 24 19 11 6 49 36	16 17 19 18 21 20 15		30 24 19 11 7 48 36
27 28 22 23 24 26 25		48 42 29 23 17 12 4	28 27 22 23 24 26 25		49 41 29 23 17 12 4
31 33 32 34 35 29 30		10 5 46 41 35 22 16	31 33 32 35 34 29 30		10 5 46 42 34 22 16
42 36 37 38 40 39 41		28 15 9 3 47 39 34	41 36 37 38 40 39 42		27 15 9 3 47 39 35
47 46 48 49 43 44 45		40 32 27 21 8 2 45	47 46 49 48 43 44 45		40 32 28 20 8 2 45

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[List #2: 'Prototype Squares' of Order 7 and Pan-diagonal MS77 Recomposed]

1H 721L	1/P	/S	2H 721L	15121/P	/S
1 2 3 4 5 6 7		1 48 39 30 28 19 10	1 2 3 4 5 6 7		1 41 46 30 28 19 10
8 9 10 11 12 13 14		18 9 7 47 38 29 27	8 9 10 11 12 13 14		18 9 7 40 45 29 27
15 16 17 18 19 20 21		35 26 17 8 6 46 37	15 16 17 18 19 20 21		35 26 17 8 6 39 44
22 23 24 25 26 27 28		45 36 34 25 16 14 5	22 23 24 25 26 27 28		38 43 34 25 16 14 5
29 30 31 32 33 34 35		13 4 44 42 33 24 15	29 30 31 32 33 34 35		13 4 37 49 33 24 15
36 37 38 39 40 41 42		23 21 12 3 43 41 32	43 44 45 46 47 48 49		23 21 12 3 36 48 32
43 44 45 46 47 48 49		40 31 22 20 11 2 49	36 37 38 39 40 41 42		47 31 22 20 11 2 42
3H 721L	30241/P	/S	4H 721L	45361/P	/S
1 2 3 4 5 6 7		1 48 32 37 28 19 10	1 2 3 4 5 6 7		1 34 46 37 28 19 10
8 9 10 11 12 13 14		18 9 7 47 31 36 27	8 9 10 11 12 13 14		18 9 7 33 45 36 27
15 16 17 18 19 20 21		42 26 17 8 6 46 30	15 16 17 18 19 20 21		42 26 17 8 6 32 44
22 23 24 25 26 27 28		45 29 41 25 16 14 5	22 23 24 25 26 27 28		31 43 41 25 16 14 5
36 37 38 39 40 41 42		13 4 44 35 40 24 15	36 37 38 39 40 41 42		13 4 30 49 40 24 15
29 30 31 32 33 34 35		23 21 12 3 43 34 39	43 44 45 46 47 48 49		23 21 12 3 29 48 39
43 44 45 46 47 48 49		33 38 22 20 11 2 49	29 30 31 32 33 34 35		47 38 22 20 11 2 35
5H 721L	60481/P	/S	6H 721L	75601/P	/S
1 2 3 4 5 6 7		1 41 32 44 28 19 10	1 2 3 4 5 6 7		1 34 39 44 28 19 10
8 9 10 11 12 13 14		18 9 7 40 31 43 27	8 9 10 11 12 13 14		18 9 7 33 38 43 27
15 16 17 18 19 20 21		49 26 17 8 6 39 30	15 16 17 18 19 20 21		49 26 17 8 6 32 37
22 23 24 25 26 27 28		38 29 48 25 16 14 5	22 23 24 25 26 27 28		31 36 48 25 16 14 5
43 44 45 46 47 48 49		13 4 37 35 47 24 15	43 44 45 46 47 48 49		13 4 30 42 47 24 15
29 30 31 32 33 34 35		23 21 12 3 36 34 46	36 37 38 39 40 41 42		23 21 12 3 29 41 46
36 37 38 39 40 41 42		33 45 22 20 11 2 42	29 30 31 32 33 34 35		40 45 22 20 11 2 35
7H 721L	90721/P	/S	8H 721L	105841/P	/S
1 2 3 4 5 6 7		1 48 39 23 35 19 10	1 2 3 4 5 6 7		1 41 46 23 35 19 10
8 9 10 11 12 13 14		18 9 7 47 38 22 34	8 9 10 11 12 13 14		18 9 7 40 45 22 34
15 16 17 18 19 20 21		28 33 17 8 6 46 37	15 16 17 18 19 20 21		28 33 17 8 6 39 44
29 30 31 32 33 34 35		45 36 27 32 16 14 5	29 30 31 32 33 34 35		38 43 27 32 16 14 5
22 23 24 25 26 27 28		13 4 44 42 26 31 15	22 23 24 25 26 27 28		13 4 37 49 26 31 15
36 37 38 39 40 41 42		30 21 12 3 43 41 25	43 44 45 46 47 48 49		30 21 12 3 36 48 25
43 44 45 46 47 48 49		40 24 29 20 11 2 49	36 37 38 39 40 41 42		47 24 29 20 11 2 42
9H 721L	120961/P	/S	10H 721L	136081/P	/S
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11H 721L	151201/P	/S	12H 721L	166321/P	/S
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13H 721L 181441/P /S  
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15H 721L 211681/P /S  
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17H 721L 241921/P /S  
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19H 721L 272161/P /S  
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21H 721L 302401/P /S  
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23H 721L 332641/P /S  
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25H 721L 362881/P /S  
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27H 721L 393121/P /S  
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14H 721L 196561/P /S  
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16H 721L 226801/P /S  
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18H 721L 257041/P /S  
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20H 721L 287281/P /S  
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22H 721L 317521/P /S  
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24H 721L 347761/P /S  
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26H 721L 378001/P /S  
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28H 721L 408241/P /S  
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29H 721L 423361/P /S  
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31H 721L 453601/P /S  
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33H 721L 483841/P /S  
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35H 721L 514081/P /S  
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359H 721L 5412961/P /S  
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361H 1L 5443201/P /S  
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363H 1L 5473441/P /S  
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719H 1L 10856161/P /S  
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30H 721L 438481/P /S  
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32H 721L 468721/P /S  
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34H 721L 498961/P /S  
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36H 721L 529201/P /S  
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360H 721L 5428081/P /S  
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362H 1L 5458321/P /S  
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364H 1L 5488561/P /S  
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720H 1L 10871281/P /S  
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723H 1L 10916641/P /S		724H 1L 10931761/P /S	
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1439H 1L 21742561/P /S		1440H 1L 21757681/P /S	
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1443H 1L 21803041/P /S		1444H 1L 21818161/P /S	
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2159H 1L 32628961/P /S		2160H 1L 32644081/P /S	
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2161H 1L 32659201/P /S		2162H 1L 32674321/P /S	
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2163H 1L 32689441/P /S		2164H 1L 32704561/P /S	
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2447H 1L 36983521/P /S

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2448H 1L 36998641/P /S

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2449H 1L 37013761/P /S

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2450H 1L 37028881/P /S

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2451H 1L 37044001/P /S

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28	7	42	14	35	21	49	34	40	25	17	9	1	49

2452H 1L 37059121/P /S

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

2515H 721L 38011681/P /S

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

2516H 721L 38026801/P /S

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

2517H 721L 38041921/P /S

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

2518H 721L 38057041/P /S

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

2519H 721L 38072161/P /S

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

2520H 721L 38087281/P /S

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

[Count = 38102400] OK!

We have succeeded in composing the whole set of Prototype Squares of order 7 and recomposing all the Pan-diagonal Euler Squares by 'DAM Transformation'.

Our success is wonderful, but the true existence of such a correspondence between

those two large sets of solutions is more impressive in itself.

What do the prototype squares mean to the object squares?

They seem to act as 'variety generators' for the objects. They also seem to be the basis of the latter, or I should say, the real 'prototypes' of the objects.

(Originally written on April 19, 2003; Revised on October 20, 2006;  
Worked on MacOSX and Xcode 2.2.1 by Kanji Setsuda)

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\*\*\* **Appendix:** \*\*\*

The next diagrams demonstrate how to compose the object Model from the basic form of prototype squares step by step. Do the same thing after the step diagrams one after another, please. And you will surely get what you want.

\*\*\* **Make a Simultaneous Model Square 7x7 Step by step** \*\*\*

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

**[Step 1] Copy Primary Diagonal**

```

. 49 . . . . . 49 . .
. . | 1 | . | . | . | . | . | . | 1 .
. . | . | 9 | . | . | . | . | . | . 9
. . | . | . |17| . | . | . | . | . .
. . | . | . | . |25| . | . | . | . .
. . | . | . | . | . |33| . | . | . .
41 . | . | . | . | . | . |41| . | . .
. 49 | . | . | . | . | . | . |49 | . .
. . | 1 | . | . | . | . | . | . | 1 .
          
```

**[Step 2] Place 1~7**

```

 2 49 . . . . . 2 49 . .
. . | 1 | . | . | . | . | . | . | 1 .
. . | . | 9 | 7 | . | . | . | . | . 9
. . | . | . |17| . | 6 | . | . | . .
. 5 | . | . | . |25| . | . | . | 5 . .
. . | . | 4 | . | . |33| . | . | . 4
41 . | . | . | . | 3 | . |41| . | . .
 2 49 | . | . | . | . | . | 2 |49 | . .
. . | 1 | . | . | . | . | . | . | 1 .
          
```

[Step 3] Place 8-14

2	49	.	.	.	.	11	2	49	.	.
.	10	1	.	.	.	.	.	10	1	.
.	.	.	9	7	.	.	.	.	.	9
.	.	.	.	17	8	6	.	.	.	.
14	5	.	.	.	25	.	14	5	.	.
.	.	13	4	.	.	33	.	.	13	4
41	.	.	.	12	3	.	41	.	.	.
2	49	.	.	.	.	11	2	49	.	.
.	10	1	.	.	.	.	.	10	1	.

[Step 4] Place 15-21

2	49	.	.	.	.	20	11	2	49	.	.
19	10	1	.	.	.	.	.	19	10	1	.
.	.	.	18	9	7	.	.	.	.	18	9
.	.	.	.	17	8	6	.	.	.	.	.
14	5	.	.	.	25	16	14	5	.	.	
.	15	13	4	.	.	33	.	15	13	4	
41	.	.	21	12	3	.	41	.	.	21	
2	49	.	.	.	.	20	11	2	49	.	.
19	10	1	.	.	.	.	.	19	10	1	.

[Step 5] Place 22-28

2	49	.	.	22	20	11	2	49	.	.
19	10	1	.	.	.	28	19	10	1	.
.	27	18	9	7	.	.	.	27	18	9
.	.	.	26	17	8	6	.	.	.	26
14	5	.	.	.	25	16	14	5	.	.
24	15	13	4	.	.	33	24	15	13	4
41	.	23	21	12	3	.	41	.	23	21
2	49	.	.	22	20	11	2	49	.	.
19	10	1	.	.	.	28	19	10	1	.

[Step 6] Place 29-35

2	49	.	31	22	20	11	2	49	.	31
19	10	1	.	.	.	30	28	19	10	1
29	27	18	9	7	.	.	29	27	18	9
.	.	35	26	17	8	6	.	.	35	26
14	5	.	.	34	25	16	14	5	.	.
24	15	13	4	.	.	33	24	15	13	4
41	32	23	21	12	3	.	41	32	23	21
2	49	.	31	22	20	11	2	49	.	31
19	10	1	.	.	.	30	28	19	10	1

[Step 7] Place 36-42

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

[Step 8] Place 43-49

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

[Start]

48 49 43 44 45 46 47 48 49 43 44

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

[Goal ]

2 49 40 31 22 20 11 2 49 40 31

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