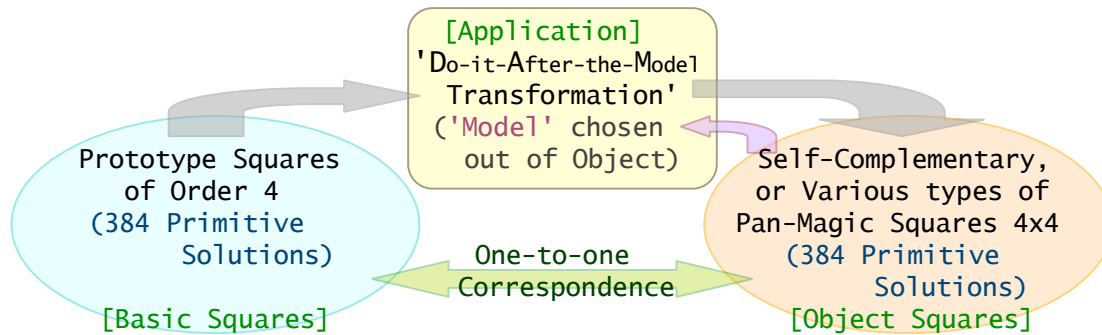


Chapter 1: Fundamental Study of 'Prototype' Squares and 'Do-it-After-the-Model' Transformation: Kanji Setsuda

Section 2-2: About Fundamental Solutions of Object Squares, Prototype Squares 4^2 and 'DAM Transformation'

Let's go on studying about the two 'parallel worlds' of magic squares and the beautiful correspondence between them. Let me take the Fundamental Solutions of those object squares and prototype ones of order 4 for the topics right here.



#1. The Fundamental Three Solutions of Object Squares of Order 4

Before all I would like to discuss again here about the Fundamental Solutions of object squares: Self-complementary type and Complete pan-magic one of order 4.

We know such kind of three solutions could be taken for the Fundamental Solutions of each type of object squares of order 4 as follows:

**** Two Types of Magic Squares 4^2 : Self-Complementary and Complete Pan-magic ****

[List 1]

*** Fundamental Three of Self-Complementary Magic Squares 4×4 ***

[1]	1/S1	[2]	3/S2	[3]	5/S3
14 4 1 15 14 4 1 15	12 6 1 15 12 6 1 15	8 10 1 15 8 10 1 15			
7 9 12 6 7 9 12 6	7 9 14 4 7 9 14 4	11 5 14 4 11 5 14 4			
11 5 8 10 11 5 8 10	13 3 8 10 13 3 8 10	13 3 12 6 13 3 12 6			
2 16 13 3 2 16 13 3	2 16 11 5 2 16 11 5	2 16 7 9 2 16 7 9			

**** Standard Solutions of Self-Complementary Magic Squares 4×4 ****

1/S1	2/S1	3/S2	4/S2	5/S3	6/S3
1 15 14 4	1 15 14 4	1 15 12 6	1 15 12 6	1 15 8 10	1 15 8 10
12 6 7 9	8 10 11 5	14 4 7 9	8 10 13 3	14 4 11 5	12 6 13 3
8 10 11 5	12 6 7 9	8 10 13 3	14 4 7 9	12 6 13 3	14 4 11 5
13 3 2 16	13 3 2 16	11 5 2 16	11 5 2 16	7 9 2 16	7 9 2 16
7/S1	8/S1	9/S3	10/S2	11/S2	12/S3
1 14 15 4	1 14 15 4	1 14 12 7	1 14 8 11	1 12 15 6	1 12 14 7
12 7 6 9	8 11 10 5	8 11 13 2	12 7 13 2	8 13 10 3	8 13 11 2
8 11 10 5	12 7 6 9	15 4 6 9	15 4 10 5	14 7 4 9	15 6 4 9
13 2 3 16	13 2 3 16	10 5 3 16	6 9 3 16	11 2 5 16	10 3 5 16
13/S1	14/S1	15/S2	16/S2	17/S3	18/S3
2 16 13 3	2 16 13 3	2 16 11 5	2 16 11 5	2 16 7 9	2 16 7 9
11 5 8 10	7 9 12 6	13 3 8 10	7 9 14 4	13 3 12 6	11 5 14 4
7 9 12 6	11 5 8 10	7 9 14 4	13 3 8 10	11 5 14 4	13 3 12 6
14 4 1 15	14 4 1 15	12 6 1 15	12 6 1 15	8 10 1 15	8 10 1 15

19/S1	20/S1	21/S3	22/S2	23/S2	24/S3
2 13 16 3	2 13 16 3	2 13 11 8	2 13 7 12	2 11 16 5	2 11 13 8
11 8 5 10	7 12 9 6	7 12 14 1	11 8 14 1	7 14 9 4	7 14 12 1
7 12 9 6	11 8 5 10	16 3 5 10	16 3 9 6	13 8 3 10	16 5 3 10
14 1 4 15	14 1 4 15	9 6 4 15	5 10 4 15	12 1 6 15	9 4 6 15
25/S3	26/S3	27/S2	28/S2	29/S2	30/S3
3 16 10 5	3 16 10 5	3 16 6 9	3 16 6 9	3 13 10 8	3 13 6 12
13 2 8 11	6 9 15 4	13 2 12 7	10 5 15 4	6 12 15 1	10 8 15 1
6 9 15 4	13 2 8 11	10 5 15 4	13 2 12 7	16 2 5 11	16 2 9 7
12 7 1 14	12 7 1 14	8 11 1 14	8 11 1 14	9 7 4 14	5 11 4 14
31/S3	32/S2	33/S3	34/S3	35/S2	36/S2
3 10 16 5	3 10 13 8	4 15 9 6	4 15 9 6	4 15 5 10	4 15 5 10
6 15 9 4	6 15 12 1	14 1 7 12	5 10 16 3	14 1 11 8	9 6 16 3
13 8 2 11	16 5 2 11	5 10 16 3	14 1 7 12	9 6 16 3	14 1 11 8
12 1 7 14	9 4 7 14	11 8 2 13	11 8 2 13	7 12 2 13	7 12 2 13
37/S2	38/S3	39/S3	40/S2	41/S1	42/S1
4 14 9 7	4 14 5 11	4 9 15 6	4 9 14 7	5 16 4 9	5 16 4 9
5 11 16 2	9 7 16 2	5 16 10 3	5 16 11 2	11 2 14 7	10 3 15 6
15 1 6 12	15 1 10 8	14 7 1 12	15 6 1 12	10 3 15 6	11 2 14 7
10 8 3 13	6 12 3 13	11 2 8 13	10 3 8 13	8 13 1 12	8 13 1 12
43/S1	44/S1	45/S1	46/S1	47/S1	48/S1
5 11 10 8	5 10 11 8	6 15 3 10	6 15 3 10	6 12 9 7	6 9 12 7
4 14 15 1	4 15 14 1	12 1 13 8	9 4 16 5	3 13 16 2	3 16 13 2
16 2 3 13	16 3 2 13	9 4 16 5	12 1 13 8	15 1 4 14	15 4 1 14
9 7 6 12	9 6 7 12	7 14 2 11	7 14 2 11	10 8 5 11	10 5 8 11

[Count = 48]

* List of the Solution Types *

{n1(==1),n2,n3,n4,n5,n9,n13}
 ={1,4,8,12,13,14,15} ... /S1
 ={1,6,8,11,12,14,15} ... /S2
 ={1,7,8,10,12,14,15} ... /S3

[List-2]

* Fundamental Three of Complete Pan-magic Squares 4x4 *

[1]	1/C1	[2]	3/C2	[3]	5/C3
5 11 8 10	5 11 8 10	3 13 8 10	3 13 8 10	3 13 12 6	3 13 12 6
4 14 1 15 4 14	1 15	6 12 1 15 6 12	1 15	10 8 1 15 10 8	1 15
9 7 12 6 9 7	12 6	9 7 14 4 9 7	14 4	5 11 14 4 5 11	14 4
16 2 13 3 16 2	13 3	16 2 11 5 16 2	11 5	16 2 7 9 16 2	7 9
5 11 8 10 5 11	8 10	3 13 8 10 3 13	8 10	3 13 12 6 3 13	12 6
4 14 1 15	4 14 1 15	6 12 1 15	6 12 1 15	10 8 1 15	10 8 1 15

** Standard Solutions of Complete Pan-magic Squares 4x4 **

1/C1	2/C1	3/C2	4/C2	5/C3	6/C3
1 15 4 14	1 15 4 14	1 15 6 12	1 15 6 12	1 15 10 8	1 15 10 8
12 6 9 7	8 10 5 11	14 4 9 7	8 10 3 13	14 4 5 11	12 6 3 13
13 3 16 2	13 3 16 2	11 5 16 2	11 5 16 2	7 9 16 2	7 9 16 2
8 10 5 11	12 6 9 7	8 10 3 13	14 4 9 7	12 6 3 13	14 4 5 11
7/C1	8/C1	9/C3	10/C2	11/C2	12/C3
1 14 4 15	1 14 4 15	1 14 7 12	1 14 11 8	1 12 6 15	1 12 7 14
12 7 9 6	8 11 5 10	8 11 2 13	12 7 2 13	8 13 3 10	8 13 2 11
13 2 16 3	13 2 16 3	10 5 16 3	6 9 16 3	11 2 16 5	10 3 16 5
8 11 5 10	12 7 9 6	15 4 9 6	15 4 5 10	14 7 9 4	15 6 9 4

13/C1	14/C1	15/C2	16/C2	17/C3	18/C3
2 16 3 13	2 16 3 13	2 16 5 11	2 16 5 11	2 16 9 7	2 16 9 7
11 5 10 8	7 9 6 12	13 3 10 8	7 9 4 14	13 3 6 12	11 5 4 14
14 4 15 1	14 4 15 1	12 6 15 1	12 6 15 1	8 10 15 1	8 10 15 1
7 9 6 12	11 5 10 8	7 9 4 14	13 3 10 8	11 5 4 14	13 3 6 12
19/C1	20/C1	21/C3	22/C2	23/C2	24/C3
2 13 3 16	2 13 3 16	2 13 8 11	2 13 12 7	2 11 5 16	2 11 8 13
11 8 10 5	7 12 6 9	7 12 1 14	11 8 1 14	7 14 4 9	7 14 1 12
14 1 15 4	14 1 15 4	9 6 15 4	5 10 15 4	12 1 15 6	9 4 15 6
7 12 6 9	11 8 10 5	16 3 10 5	16 3 6 9	13 8 10 3	16 5 10 3
25/C1	26/C1	27/C3	28/C3	29/C2	30/C2
3 16 2 13	3 16 2 13	3 16 5 10	3 16 5 10	3 16 9 6	3 16 9 6
10 5 11 8	6 9 7 12	13 2 11 8	6 9 4 15	13 2 7 12	10 5 4 15
15 4 14 1	15 4 14 1	12 7 14 1	12 7 14 1	8 11 14 1	8 11 14 1
6 9 7 12	10 5 11 8	6 9 4 15	13 2 11 8	10 5 4 15	13 2 7 12
31/C1	32/C1	33/C2	34/C3	35/C1	36/C1
3 13 2 16	3 13 2 16	3 13 8 10	3 13 12 6	4 15 1 14	4 15 1 14
10 8 11 5	6 12 7 9	6 12 1 15	10 8 1 15	9 6 12 7	5 10 8 11
15 1 14 4	15 1 14 4	9 7 14 4	5 11 14 4	16 3 13 2	16 3 13 2
6 12 7 9	10 8 11 5	16 2 11 5	16 2 7 9	5 10 8 11	9 6 12 7
37/C3	38/C3	39/C2	40/C2	41/C1	42/C1
4 15 6 9	4 15 6 9	4 15 10 5	4 15 10 5	4 14 1 15	4 14 1 15
14 1 12 7	5 10 3 16	14 1 8 11	9 6 3 16	9 7 12 6	5 11 8 10
11 8 13 2	11 8 13 2	7 12 13 2	7 12 13 2	16 2 13 3	16 2 13 3
5 10 3 16	14 1 12 7	9 6 3 16	14 1 8 11	5 11 8 10	9 7 12 6
43/C2	44/C3	45/C2	46/C3	47/C2	48/C3
4 14 7 9	4 14 11 5	5 16 2 11	5 16 3 10	6 15 1 12	6 15 4 9
5 11 2 16	9 7 2 16	4 9 7 14	4 9 6 15	3 10 8 13	3 10 5 16
10 8 13 3	6 12 13 3	15 6 12 1	14 7 12 1	16 5 11 2	13 8 11 2
15 1 12 6	15 1 8 10	10 3 13 8	11 2 13 8	9 4 14 7	12 1 14 7

[Count = 48]

* List of the Solution Types *

```
{n1(==1),n2,n3,n4,n5,n9,n13}
={1,4,8,12,13,14,15} ... /C1
={1,6,8,11,12,14,15} ... /C2
={1,7,8,10,12,14,15} ... /C3
```

How is each set of those three fundamental solutions usually selected?

It is usually selected with the set of 'list-forming inequality conditions' such as:

1. Self-Complementary MS44: $n1==1$; $n2>n3$; $n2>n5$; and $n5>n9$;
2. Complete Pan-magic S44: $n1==1$; $n2>n4$; $n2>n5$; and $n5>n13$;

Why do we have to select them with these inequality conditions, then?

- (1) Because those three solutions could recompose all the solutions of object in total by some effective transformation methods.
- (2) Because each of these three should represent its Solution Type as shown above.

Suppose you have to classify all the object solutions into some smaller groups, examining what number patterns are taken in the only row and column that include the value 1 in each solution. You don't have to care about the permutation of 7 numbers there, but you only have to care for the constant combination of those 7.

You should finally know there are only three groups such as shown above.

We want each of the F3 (Fundamental Three) to represent its own group of solution types which it belongs to, either C1, C2 or C3. We don't want any one of the same type to come in twice or three times for the F3, and don't want any one of {C1, C2 or C3} to go out and disappear, either.

Let me demonstrate here to recompose all the solutions by those Fundamental Three with some effective transformation methods.

[List 3] ** Transformation System for Self-complementary MS44 **
 #1: Basic Form and The 'Fundamental Three' Selected:

/BF	/F1	/F2	/F3
1 2 3 4	1 15 14 4	1 15 12 6	1 15 8 10
5 6 7 8	12 6 7 9	14 4 7 9	14 4 11 5
9 10 11 12	8 10 11 5	8 10 13 3	12 6 13 3
13 14 15 16	13 3 2 16	11 5 2 16	7 9 2 16

#2: 4x4 Transformation making 1 into 16

00/	01/	02/	03/
1 2 3 4	1 3 2 4	2 1 4 3	2 4 1 3
5 6 7 8	5 7 6 8	6 5 8 7	6 8 5 7
9 10 11 12	9 11 10 12	10 9 12 11	10 12 9 11
13 14 15 16	13 15 14 16	14 13 16 15	14 16 13 15
10/	11/	12/	13/
1 2 3 4	1 3 2 4	2 1 4 3	2 4 1 3
9 10 11 12	9 11 10 12	10 9 12 11	10 12 9 11
5 6 7 8	5 7 6 8	6 5 8 7	6 8 5 7
13 14 15 16	13 15 14 16	14 13 16 15	14 16 13 15
20/	21/	22/	23/
5 6 7 8	5 7 6 8	6 5 8 7	6 8 5 7
1 2 3 4	1 3 2 4	2 1 4 3	2 4 1 3
13 14 15 16	13 15 14 16	14 13 16 15	14 16 13 15
9 10 11 12	9 11 10 12	10 9 12 11	10 12 9 11
30/	31/	32/	33/
5 6 7 8	5 7 6 8	6 5 8 7	6 8 5 7
13 14 15 16	13 15 14 16	14 13 16 15	14 16 13 15
1 2 3 4	1 3 2 4	2 1 4 3	2 4 1 3
9 10 11 12	9 11 10 12	10 9 12 11	10 12 9 11

#3: 2x4 Transformation making 1 into 8

00/	01/	02/	03/
1 2 3 4	13 9 5 1	16 15 14 13	4 8 12 16
5 6 7 8	14 10 6 2	12 11 10 9	3 7 11 15
9 10 11 12	15 11 7 3	8 7 6 5	2 6 10 14
13 14 15 16	16 12 8 4	4 3 2 1	1 5 9 13
10/	11/	12/	13/
1 5 9 13	4 3 2 1	16 12 8 4	13 14 15 16
2 6 10 14	8 7 6 5	15 11 7 3	9 10 11 12
3 7 11 15	12 11 10 9	14 10 6 2	5 6 7 8
4 8 12 16	16 15 14 13	13 9 5 1	1 2 3 4

Let's apply both #2 and #3 transformation methods above to each of Fundamental Three of Self-complementary magic squares 4x4 and get 384(=3x16x8) 'primitive solutions' reconstructed. And we select the 3x16 'standard solutions' in the end by the 'list-forming inequality conditions': $n1 < n4$; $n1 < n13$, $n1 < n16$; and $n2 > n5$;

Watch the result list below and check if all the solutions are reconstructed well, and see if the solution types of them are classified beautifully into 3 groups.

Let's do the same thing to Complete Pan-magic Squares 4x4 and get all the object solutions reconstructed in the same way.

As you see, both the two sets of three Fundamental Solutions: {1/S1, 3/S2 and 5/S3} for Self-complementary MS44 and {1/C1, 3/C2 and 5/C3} for Complete PMS44 perform well as good re-constructers of all object solutions and as appropriate representatives of their solution types.

They should be regarded as the good Fundamental Threes.

But, aren't there any other good representative solutions for our F3?

Let's investigate what else could be the good F3, shall we?

Why don't you choose #1, #2 and #3 solutions for the representatives at first?

[List 5] ** Result of Examination-1 **

** Start: The New 'Fundamental Three' Assumed: **

0/BF	1/F1	2/F2	3/F3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	1 15 14 4 12 6 7 9 8 10 11 5 13 3 2 16	1 15 14 4 8 10 11 5 12 6 7 9 13 3 2 16	1 15 12 6 14 4 7 9 8 10 13 3 11 5 2 16

** Reconstruction of Self-complementary MS44 by the New Fundamental Three **

[Group of Fundamental #1]

1/S1	7/S1	13/S1	19/S1	2/S1	8/S1	14/S1	20/S1
1 15 14 4	1 14 15 4	2 16 13 3	2 13 16 3	1 15 14 4	1 14 15 4	2 16 13 3	2 13 16 3
12 6 7 9	12 7 6 9	11 5 8 10	11 8 5 10	8 10 11 5	8 11 10 5	7 9 12 6	7 12 9 6
8 10 11 5	8 11 10 5	7 9 12 6	7 12 9 6	12 6 7 9	12 7 6 9	11 5 8 10	11 8 5 10
13 3 2 16	13 2 3 16	14 4 1 15	14 1 4 15	13 3 2 16	13 2 3 16	14 4 1 15	14 1 4 15
41/S1	42/S1	45/S1	46/S1	43/S1	44/S1	47/S1	48/S1
5 16 4 9	5 16 4 9	6 15 3 10	6 15 3 10	5 11 10 8	5 10 11 8	6 12 9 7	6 9 12 7
11 2 14 7	10 3 15 6	12 1 13 8	9 4 16 5	4 14 15 1	4 15 14 1	3 13 16 2	3 16 13 2
10 3 15 6	11 2 14 7	9 4 16 5	12 1 13 8	16 2 3 13	16 3 2 13	15 1 4 14	15 4 1 14
8 13 1 12	8 13 1 12	7 14 2 11	7 14 2 11	9 7 6 12	9 6 7 12	10 8 5 11	10 5 8 11

[Group of Fundamental #2]

2/S1	8/S1	14/S1	20/S1	1/S1	7/S1	13/S1	19/S1
1 15 14 4	1 14 15 4	2 16 13 3	2 13 16 3	1 15 14 4	1 14 15 4	2 16 13 3	2 13 16 3
8 10 11 5	8 11 10 5	7 9 12 6	7 12 9 6	12 6 7 9	12 7 6 9	11 5 8 10	11 8 5 10
12 6 7 9	12 7 6 9	11 5 8 10	11 8 5 10	8 10 11 5	8 11 10 5	7 9 12 6	7 12 9 6
13 3 2 16	13 2 3 16	14 4 1 15	14 1 4 15	13 3 2 16	13 2 3 16	14 4 1 15	14 1 4 15
43/S1	44/S1	47/S1	48/S1	41/S1	42/S1	45/S1	46/S1
5 11 10 8	5 10 11 8	6 12 9 7	6 9 12 7	5 16 4 9	5 16 4 9	6 15 3 10	6 15 3 10
4 14 15 1	4 15 14 1	3 13 16 2	3 16 13 2	11 2 14 7	10 3 15 6	12 1 13 8	9 4 16 5
16 2 3 13	16 3 2 13	15 1 4 14	15 4 1 14	10 3 15 6	11 2 14 7	9 4 16 5	12 1 13 8
9 7 6 12	9 6 7 12	10 8 5 11	10 5 8 11	8 13 1 12	8 13 1 12	7 14 2 11	7 14 2 11

[Group of Fundamental #3]

3/S2	10/S2	15/S2	22/S2	4/S2	11/S2	16/S2	23/S2
1 15 12 6	1 14 8 11	2 16 11 5	2 13 7 12	1 15 12 6	1 12 15 6	2 16 11 5	2 11 16 5
14 4 7 9	12 7 13 2	13 3 8 10	11 8 14 1	8 10 13 3	8 13 10 3	7 9 14 4	7 14 9 4
8 10 13 3	15 4 10 5	7 9 14 4	16 3 9 6	14 4 7 9	14 7 4 9	13 3 8 10	13 8 3 10
11 5 2 16	6 9 3 16	12 6 1 15	5 10 4 15	11 5 2 16	11 2 5 16	12 6 1 15	12 1 6 15
27/S2	28/S2	35/S2	36/S2	29/S2	32/S2	37/S2	40/S2
3 16 6 9	3 16 6 9	4 15 5 10	4 15 5 10	3 13 10 8	3 10 13 8	4 14 9 7	4 9 14 7
13 2 12 7	10 5 15 4	14 1 11 8	9 6 16 3	6 12 15 1	6 15 12 1	5 11 16 2	5 16 11 2
10 5 15 4	13 2 12 7	9 6 16 3	14 1 11 8	16 2 5 11	16 5 2 11	15 1 6 12	15 6 1 12
8 11 1 14	8 11 1 14	7 12 2 13	7 12 2 13	9 7 4 14	9 4 7 14	10 8 3 13	10 3 8 13

[Counts = 16 x 2 = 32]

* Monitor List of Solution Correspondences between Old and New *

?: 0

1: 2 2 1 1 0 0 2 2 0 1 1 0 2 2 1 1 0 0 2 2 0 1 1 0 0 0 1 1 1 0 0 1 0 0 1 1 1 0 0 1 2 2 2 2 2 2 2

Both /F1 and /F2 of the three only remake the same solution set twice. Since no one represents the last /S3 type, the team F3 cannot make any solution of the third type. How about the case of Complete Pan-magic Squares 4x4?

[List 6] ** Result of Examination-2 **

** Start: The New 'Fundamental Three' Assumed: **

0/F0	1/F1	2/F2	3/F3
1 2 3 4	1 15 4 14	1 15 4 14	1 15 6 12
5 6 7 8	12 6 9 7	8 10 5 11	14 4 9 7
9 10 11 12	13 3 16 2	13 3 16 2	11 5 16 2
13 14 15 16	8 10 5 11	12 6 9 7	8 10 3 13

** Reconstruction of Complete PMS44 by the New Fundamental Three **

[Group of Fundamental #1]

1/C1	35/C1	41/C1	7/C1	14/C1	20/C1	32/C1	26/C1
1 15 4 14	4 15 1 14	4 14 1 15	1 14 4 15	2 16 3 13	2 13 3 16	3 13 2 16	3 16 2 13
12 6 9 7	9 6 12 7	9 7 12 6	12 7 9 6	7 9 6 12	7 12 6 9	6 12 7 9	6 9 7 12
13 3 16 2	16 3 13 2	16 2 13 3	13 2 16 3	14 4 15 1	14 1 15 4	15 1 14 4	15 4 14 1
8 10 5 11	5 10 8 11	5 11 8 10	8 11 5 10	11 5 10 8	11 8 10 5	10 8 11 5	10 5 11 8

[Group of Fundamental #2]

13/C1	19/C1	31/C1	25/C1	2/C1	36/C1	42/C1	8/C1
2 16 3 13	2 13 3 16	3 13 2 16	3 16 2 13	1 15 4 14	4 15 1 14	4 14 1 15	1 14 4 15
11 5 10 8	11 8 10 5	10 8 11 5	10 5 11 8	8 10 5 11	5 10 8 11	5 11 8 10	8 11 5 10
14 4 15 1	14 1 15 4	15 1 14 4	15 4 14 1	13 3 16 2	16 3 13 2	16 2 13 3	13 2 16 3
7 9 6 12	7 12 6 9	6 12 7 9	6 9 7 12	12 6 9 7	9 6 12 7	9 7 12 6	12 7 9 6

[Group of Fundamental #3]

2/C1	36/C1	42/C1	8/C1	13/C1	19/C1	31/C1	25/C1
1 15 4 14	4 15 1 14	4 14 1 15	1 14 4 15	2 16 3 13	2 13 3 16	3 13 2 16	3 16 2 13
8 10 5 11	5 10 8 11	5 11 8 10	8 11 5 10	11 5 10 8	11 8 10 5	10 8 11 5	10 5 11 8
13 3 16 2	16 3 13 2	16 2 13 3	13 2 16 3	14 4 15 1	14 1 15 4	15 1 14 4	15 4 14 1
12 6 9 7	9 6 12 7	9 7 12 6	12 7 9 6	7 9 6 12	7 12 6 9	6 12 7 9	6 9 7 12

[Counts = 16 x 2 = 32]

* Monitor List of Solution Correspondences between Old and New *

?: 0

1: 2 2 1 1 0 0 2 2 0 1 1 0 2 2 1 1 0 0 2 2 0 1 1 0 2 2 0 0 1 1 2 2 1 0 2 2 0 0 1 1 2 2 1 0 1 0 1 0

They also fail in reconstructing all the 48 solutions. You must not choose any one of the same solution type twice or three times for the set of three representatives.

How about choosing the set {1/S1, 3/S2 and 6/S3}, or {2/C1, 4/C2 and 6/C3}? Here you see the result reports of my recent examinations.

	25/P	26/P	27/P	28/P	29/P	30/P
	2 1 4 3	2 1 4 3	2 1 6 5	2 1 6 5	2 1 10 9	2 1 10 9
	6 5 8 7	10 9 12 11	4 3 8 7	10 9 14 13	4 3 12 11	6 5 14 13
	10 9 12 11	6 5 8 7	10 9 14 13	4 3 8 7	6 5 14 13	4 3 12 11
	14 13 16 15	14 13 16 15	12 11 16 15	12 11 16 15	8 7 16 15	8 7 16 15
	31/P	32/P	33/P	34/P	35/P	36/P
	2 4 1 3	2 4 1 3	2 4 6 8	2 4 6 8	2 4 10 12	2 4 10 12
	6 8 5 7	10 12 9 11	1 3 5 7	10 12 14 16	1 3 9 11	6 8 14 16
	10 12 9 11	6 8 5 7	10 12 14 16	1 3 5 7	6 8 14 16	1 3 9 11
	14 16 13 15	14 16 13 15	9 11 13 15	9 11 13 15	5 7 13 15	5 7 13 15
	37/P	38/P	39/P	40/P	41/P	42/P
	2 6 1 5	2 6 1 5	2 6 4 8	2 6 4 8	2 6 10 14	2 6 10 14
	4 8 3 7	10 14 9 13	1 5 3 7	10 14 12 16	1 5 9 13	4 8 12 16
	10 14 9 13	4 8 3 7	10 14 12 16	1 5 3 7	4 8 12 16	1 5 9 13
	12 16 11 15	12 16 11 15	9 13 11 15	9 13 11 15	3 7 11 15	3 7 11 15
	43/P	44/P	45/P	46/P	47/P	48/P
	2 10 1 9	2 10 1 9	2 10 4 12	2 10 4 12	2 10 6 14	2 10 6 14
	4 12 3 11	6 14 5 13	1 9 3 11	6 14 8 16	1 9 5 13	4 12 8 16
	6 14 5 13	4 12 3 11	6 14 8 16	1 9 3 11	4 12 8 16	1 9 5 13
	8 16 7 15	8 16 7 15	5 13 7 15	5 13 7 15	3 11 7 15	3 11 7 15
	49/P	50/P	51/P	52/P	53/P	54/P
	3 1 4 2	3 1 4 2	3 1 7 5	3 1 7 5	3 1 11 9	3 1 11 9
	7 5 8 6	11 9 12 10	4 2 8 6	11 9 15 13	4 2 12 10	7 5 15 13
	11 9 12 10	7 5 8 6	11 9 15 13	4 2 8 6	7 5 15 13	4 2 12 10
	15 13 16 14	15 13 16 14	12 10 16 14	12 10 16 14	8 6 16 14	8 6 16 14
					

[Count = 384]

Watch the first 6 solutions, so-called 'Principal Squares of Drs. Ollerenshaw & Brae'. What properties do they have?

It is really impressive that they have their own unique value patterns:

$n1 < n2 < n3 < n4$; $n1 < n5 < n9 < n13$; $n1 < n6 < n11 < n16$; ...

The smaller values would come up close to the left-top, while the larger ones down close to the right-bottom.

Such kind of unique solutions are found several, as many as 6 for the primitive set. But, as you see [4]~[6] are only the reflected patterns of [1]~[3], you can nominate only [1]~[3] for the Fundamental Three of Prototype squares of order 4.

How can we make these Fundamental Three into all the 384 Prototype solutions?

I like to propose you such an effective transformation system as follows:

[List 12] ** Transformation System for Prototype Squares **

* 'Principal Squares' of Order 4: Make [4]~[6] from [1]~[3] *

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

* 'Prototype Squares' with $n1 == 1$: Transform [1] -> [7],[13],[19];
 [2] -> [8],[14],[20]; [3] -> [9],[15],[21]; [4] -> [10],[16],[22]; *

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

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

- (1) First of all, make [4]~[6] by the reflection of [1]~[3].
- (2) Apply the next transformation method above to each of those six Principal Squares, and get the 24(=6x4) Prototypes with n1==1.
- (3) Apply the next method below to each of these 24 Prototypes above one after another, and transform them into all the 384(=24x16) Prototype squares.

[List 13] ** Transformation System for Prototype Squares-2 **
 * Transform each Prototype Square into 4x4 different Forms *

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

You will finally get the same list with the [List 11] (only a part presented there). Save this list of Prototypes so that you could re-use it for many purposes.

Don't worry about the difference between the Self-complementary type or Complete pan-magic one. Since the solution set of Prototype Squares is the same and common to both of those two types, you could have nothing but this only one set.

What is the correspondence between the Prototype Squares and Object ones?

Now that you have the same sort of three fundamental solutions for both types, you may naturally wonder what structure corresponds between the two sets.

But we have to study about the 'Do-it-After-the-Model Transformation' first of all.

#3. Do-it-After-the-Model Transformation: The Magic Bridge

The 'DAM Transformation' is an application for changing all Prototype solutions into all Object solutions, just as I explained in the previous section.

Though it is a single and simple transformation method designed and dictated after the Model solution that is chosen out of object set as shown below, it is so powerful and effective that it could change all prototypes into objects completely.

[List 14] ** Concept of DAMT **

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

Prototype/	/Model: SC	CC/
1 2 3 4	1 15 14 4	1 15 4 14
5 6 7 8	12 6 7 9	12 6 9 7
9 10 11 12	8 10 11 5	13 3 16 2
13 14 15 16	13 3 2 16	8 10 5 11

/* 'DAM Transformation' making Prototype into 'SC' Object */

```
void damtsc(void){
    dnm[1]=nm[1];    dnm[2]=nm[15];    dnm[3]=nm[14];    dnm[4]=nm[4];
    dnm[5]=nm[12];   dnm[6]=nm[6];    dnm[7]=nm[7];    dnm[8]=nm[9];
    dnm[9]=nm[8];    dnm[10]=nm[10];   dnm[11]=nm[11];   dnm[12]=nm[5];
    dnm[13]=nm[13];  dnm[14]=nm[3];    dnm[15]=nm[2];    dnm[16]=nm[16];
}
/**/
```

/* 'DAM Transformation' making Prototype into 'Complete' Object */

```
void damtcc(void){
    cnm[1]=nm[1];    cnm[2]=nm[15];    cnm[3]=nm[4];    cnm[4]=nm[14];
    cnm[5]=nm[12];   cnm[6]=nm[6];    cnm[7]=nm[9];    cnm[8]=nm[7];
    cnm[9]=nm[13];   cnm[10]=nm[3];   cnm[11]=nm[16];  cnm[12]=nm[2];
    cnm[13]=nm[8];   cnm[14]=nm[10];  cnm[15]=nm[5];   cnm[16]=nm[11];
}
}
```

[List 15] ** Demonstration: List of Three Types **

[Prototype Squares(/P) and Recompositions of Self-complementary(/S) and Complete(/C) Pan-magic Squares 4x4 Transformed from the common Prototype]

[1]	1/P	1/S	1/C	[2]	2/P	2/S	2/C				
1	2	3	4	1	15	14	4	1	15	4	14
5	6	7	8	12	6	7	9	12	6	9	7
9	10	11	12	8	10	11	5	13	3	16	2
13	14	15	16	13	3	2	16	8	10	5	11
[3]	3/P	3/S	3/C	[4]	4/P	4/S	4/C				
1	2	5	6	1	15	12	6	1	15	6	12
3	4	7	8	14	4	7	9	14	4	9	7
9	10	13	14	8	10	13	3	11	5	16	2
11	12	15	16	11	5	2	16	8	10	3	13
[5]	5/P	5/S	5/C	[6]	6/P	6/S	6/C				
1	2	9	10	1	15	8	10	1	15	10	8
3	4	11	12	14	4	11	5	14	4	5	11
5	6	13	14	12	6	13	3	7	9	16	2
7	8	15	16	7	9	2	16	12	6	3	13
[7]	7/P	7/S	7/C	[8]	8/P	8/S	8/C				
1	3	2	4	1	14	15	4	1	14	4	15
5	7	6	8	12	7	6	9	12	7	9	6
9	11	10	12	8	11	10	5	13	2	16	3
13	15	14	16	13	2	3	16	8	11	5	10
[9]	9/P	9/S	9/C	[10]	10/P	10/S	10/C				
1	3	5	7	1	14	12	7	1	14	7	12
2	4	6	8	15	4	6	9	15	4	9	6
9	11	13	15	8	11	13	2	10	5	16	3
10	12	14	16	10	5	3	16	8	11	2	13
[11]	11/P	11/S	11/C	[12]	12/P	12/S	12/C				
1	3	9	11	1	14	8	11	1	14	11	8
2	4	10	12	15	4	10	5	15	4	5	10
5	7	13	15	12	7	13	2	6	9	16	3
6	8	14	16	6	9	3	16	12	7	2	13

[13]	13/P	13/S	13/C	[14]	14/P	14/S	14/C
1 5 2 6	1 12 15 6	1 12 6 15	1 12 6 15	1 5 2 6	1 12 15 6	1 12 6 15	1 12 6 15
3 7 4 8	14 7 4 9	14 7 9 4	14 7 9 4	9 13 10 14	8 13 10 3	8 13 3 10	8 13 3 10
9 13 10 14	8 13 10 3	11 2 16 5	11 2 16 5	3 7 4 8	14 7 4 9	11 2 16 5	11 2 16 5
11 15 12 16	11 2 5 16	8 13 3 10	8 13 3 10	11 15 12 16	11 2 5 16	14 7 9 4	14 7 9 4
[15]	15/P	15/S	15/C	[16]	16/P	16/S	16/C
1 5 3 7	1 12 14 7	1 12 7 14	1 12 7 14	1 5 3 7	1 12 14 7	1 12 7 14	1 12 7 14
2 6 4 8	15 6 4 9	15 6 9 4	15 6 9 4	9 13 11 15	8 13 11 2	8 13 2 11	8 13 2 11
9 13 11 15	8 13 11 2	10 3 16 5	10 3 16 5	2 6 4 8	15 6 4 9	10 3 16 5	10 3 16 5
10 14 12 16	10 3 5 16	8 13 2 11	8 13 2 11	10 14 12 16	10 3 5 16	15 6 9 4	15 6 9 4
[17]	17/P	17/S	17/C	[18]	18/P	18/S	18/C
1 5 9 13	1 12 8 13	1 12 13 8	1 12 13 8	1 5 9 13	1 12 8 13	1 12 13 8	1 12 13 8
2 6 10 14	15 6 10 3	15 6 3 10	15 6 3 10	3 7 11 15	14 7 11 2	14 7 2 11	14 7 2 11
3 7 11 15	14 7 11 2	4 9 16 5	4 9 16 5	2 6 10 14	15 6 10 3	4 9 16 5	4 9 16 5
4 8 12 16	4 9 5 16	14 7 2 11	14 7 2 11	4 8 12 16	4 9 5 16	15 6 3 10	15 6 3 10
[19]	19/P	19/S	19/C	[20]	20/P	20/S	20/C
1 9 2 10	1 8 15 10	1 8 10 15	1 8 10 15	1 9 2 10	1 8 15 10	1 8 10 15	1 8 10 15
3 11 4 12	14 11 4 5	14 11 5 4	14 11 5 4	5 13 6 14	12 13 6 3	12 13 3 6	12 13 3 6
5 13 6 14	12 13 6 3	7 2 16 9	7 2 16 9	3 11 4 12	14 11 4 5	7 2 16 9	7 2 16 9
7 15 8 16	7 2 9 16	12 13 3 6	12 13 3 6	7 15 8 16	7 2 9 16	14 11 5 4	14 11 5 4
[21]	21/P	21/S	21/C	[22]	22/P	22/S	22/C
1 9 3 11	1 8 14 11	1 8 11 14	1 8 11 14	1 9 3 11	1 8 14 11	1 8 11 14	1 8 11 14
2 10 4 12	15 10 4 5	15 10 5 4	15 10 5 4	5 13 7 15	12 13 7 2	12 13 2 7	12 13 2 7
5 13 7 15	12 13 7 2	6 3 16 9	6 3 16 9	2 10 4 12	15 10 4 5	6 3 16 9	6 3 16 9
6 14 8 16	6 3 9 16	12 13 2 7	12 13 2 7	6 14 8 16	6 3 9 16	15 10 5 4	15 10 5 4
[23]	23/P	23/S	23/C	[24]	24/P	24/S	24/C
1 9 5 13	1 8 12 13	1 8 13 12	1 8 13 12	1 9 5 13	1 8 12 13	1 8 13 12	1 8 13 12
2 10 6 14	15 10 6 3	15 10 3 6	15 10 3 6	3 11 7 15	14 11 7 2	14 11 2 7	14 11 2 7
3 11 7 15	14 11 7 2	4 5 16 9	4 5 16 9	2 10 6 14	15 10 6 3	4 5 16 9	4 5 16 9
4 12 8 16	4 5 9 16	14 11 2 7	14 11 2 7	4 12 8 16	4 5 9 16	15 10 3 6	15 10 3 6
[25]	25/P	25/S	25/C	[26]	26/P	26/S	26/C
2 1 4 3	2 16 13 3	2 16 3 13	2 16 3 13	2 1 4 3	2 16 13 3	2 16 3 13	2 16 3 13
6 5 8 7	11 5 8 10	11 5 10 8	11 5 10 8	10 9 12 11	7 9 12 6	7 9 6 12	7 9 6 12
10 9 12 11	7 9 12 6	14 4 15 1	14 4 15 1	6 5 8 7	11 5 8 10	14 4 15 1	14 4 15 1
14 13 16 15	14 4 1 15	7 9 6 12	7 9 6 12	14 13 16 15	14 4 1 15	11 5 10 8	11 5 10 8
[47]	47/P	47/S	47/C	[48]	48/P	48/S	48/C
2 10 6 14	2 7 11 14	2 7 14 11	2 7 14 11	2 10 6 14	2 7 11 14	2 7 14 11	2 7 14 11
1 9 5 13	16 9 5 4	16 9 4 5	16 9 4 5	4 12 8 16	13 12 8 1	13 12 1 8	13 12 1 8
4 12 8 16	13 12 8 1	3 6 15 10	3 6 15 10	1 9 5 13	16 9 5 4	3 6 15 10	3 6 15 10
3 11 7 15	3 6 10 15	13 12 1 8	13 12 1 8	3 11 7 15	3 6 10 15	16 9 4 5	16 9 4 5
[49]	49/P	49/S	49/C	[50]	50/P	50/S	50/C
3 1 4 2	3 16 13 2	3 16 2 13	3 16 2 13	3 1 4 2	3 16 13 2	3 16 2 13	3 16 2 13
7 5 8 6	10 5 8 11	10 5 11 8	10 5 11 8	11 9 12 10	6 9 12 7	6 9 7 12	6 9 7 12
11 9 12 10	6 9 12 7	15 4 14 1	15 4 14 1	7 5 8 6	10 5 8 11	15 4 14 1	15 4 14 1
15 13 16 14	15 4 1 14	6 9 7 12	6 9 7 12	15 13 16 14	15 4 1 14	10 5 11 8	10 5 11 8
[51]	51/P	51/S	51/C	[52]	52/P	52/S	52/C
3 1 7 5	3 16 10 5	3 16 5 10	3 16 5 10	3 1 7 5	3 16 10 5	3 16 5 10	3 16 5 10
4 2 8 6	13 2 8 11	13 2 11 8	13 2 11 8	11 9 15 13	6 9 15 4	6 9 4 15	6 9 4 15
11 9 15 13	6 9 15 4	12 7 14 1	12 7 14 1	4 2 8 6	13 2 8 11	12 7 14 1	12 7 14 1
12 10 16 14	12 7 1 14	6 9 4 15	6 9 4 15	12 10 16 14	12 7 1 14	13 2 11 8	13 2 11 8
[95]	95/P	95/S	95/C	[96]	96/P	96/S	96/C
4 12 8 16	4 5 9 16	4 5 16 9	4 5 16 9	4 12 8 16	4 5 9 16	4 5 16 9	4 5 16 9
2 10 6 14	15 10 6 3	15 10 3 6	15 10 3 6	3 11 7 15	14 11 7 2	14 11 2 7	14 11 2 7
3 11 7 15	14 11 7 2	1 8 13 12	1 8 13 12	2 10 6 14	15 10 6 3	1 8 13 12	1 8 13 12
1 9 5 13	1 8 12 13	14 11 2 7	14 11 2 7	1 9 5 13	1 8 12 13	15 10 3 6	15 10 3 6
[97]	97/P	97/S	97/C	[98]	98/P	98/S	98/C
5 1 6 2	5 16 11 2	5 16 2 11	5 16 2 11	5 1 6 2	5 16 11 2	5 16 2 11	5 16 2 11
7 3 8 4	10 3 8 13	10 3 13 8	10 3 13 8	13 9 14 10	4 9 14 7	4 9 7 14	4 9 7 14
13 9 14 10	4 9 14 7	15 6 12 1	15 6 12 1	7 3 8 4	10 3 8 13	15 6 12 1	15 6 12 1
15 11 16 12	15 6 1 12	4 9 7 14	4 9 7 14	15 11 16 12	15 6 1 12	10 3 13 8	10 3 13 8

```

[ 99]  99/P          99/S          99/C    [100] 100/P          100/S          100/C
  5  1  7  3   5 16 10  3   5 16  3 10   5  1  7  3   5 16 10  3   5 16  3 10
  6  2  8  4  11  2  8 13  11  2 13  8   13  9 15 11   4  9 15  6   4  9  6 15
 13  9 15 11   4  9 15  6  14  7 12  1   6  2  8  4  11  2  8 13  14  7 12  1
 14 10 16 12  14  7  1 12   4  9  6 15   14 10 16 12  14  7  1 12  11  2 13  8

[191] 191/P          191/S          191/C    [192] 192/P          192/S          192/C
  8 16  7 15   8  1 10 15   8  1 15 10   8 16  7 15   8  1 10 15   8  1 15 10
  4 12  3 11  13 12  3  6  13 12  6  3   6 14  5 13  11 14  5  4  11 14  4  5
  6 14  5 13  11 14  5  4   2  7  9 16   4 12  3 11  13 12  3  6   2  7  9 16
  2 10  1  9   2  7 16  9  11 14  4  5   2 10  1  9   2  7 16  9  13 12  6  3

[193] 193/P          193/S          193/C    [194] 194/P          194/S          194/C
  9  1 10  2   9 16  7  2   9 16  2  7   9  1 10  2   9 16  7  2   9 16  2  7
 11  3 12  4   6  3 12 13   6  3 13 12   13  5 14  6   4  5 14 11   4  5 11 14
 13  5 14  6   4  5 14 11  15 10  8  1   11  3 12  4   6  3 12 13  15 10  8  1
 15  7 16  8  15 10  1  8   4  5 11 14   15  7 16  8  15 10  1  8   6  3 13 12

[195] 195/P          195/S          195/C    [196] 196/P          196/S          196/C
  9  1 11  3   9 16  6  3   9 16  3  6   9  1 11  3   9 16  6  3   9 16  3  6
 10  2 12  4   7  2 12 13   7  2 13 12   13  5 15  7   4  5 15 10   4  5 10 15
 13  5 15  7   4  5 15 10  14 11  8  1   10  2 12  4   7  2 12 13  14 11  8  1
 14  6 16  8  14 11  1  8   4  5 10 15   14  6 16  8  14 11  1  8   7  2 13 12
. . . . .

[377] 377/P          377/S          377/C    [378] 378/P          378/S          378/C
 16 14 15 13  16  3  2 13  16  3 13  2   16 14 15 13  16  3  2 13  16  3 13  2
  8  6  7  5   9  6  7 12   9  6 12  7   12 10 11  9   5 10 11  8   5 10  8 11
 12 10 11  9   5 10 11  8   4 15  1 14   8  6  7  5   9  6  7 12   4 15  1 14
  4  2  3  1   4 15 14  1   5 10  8 11   4  2  3  1   4 15 14  1   9  6 12  7

[379] 379/P          379/S          379/C    [380] 380/P          380/S          380/C
 16 15  8  7  16  2  9  7  16  2  7  9   16 15  8  7  16  2  9  7  16  2  7  9
 12 11  4  3   5 11  4 14   5 11 14  4   14 13  6  5   3 13  6 12   3 13 12  6
 14 13  6  5   3 13  6 12  10  8  1 15   12 11  4  3   5 11  4 14  10  8  1 15
 10  9  2  1  10  8 15  1   3 13 12  6   10  9  2  1  10  8 15  1   5 11 14  4

[381] 381/P          381/S          381/C    [382] 382/P          382/S          382/C
 16 15 12 11  16  2  5 11  16  2 11  5   16 15 12 11  16  2  5 11  16  2 11  5
  8  7  4  3   9  7  4 14   9  7 14  4   14 13 10  9   3 13 10  8   3 13  8 10
 14 13 10  9   3 13 10  8   6 12  1 15   8  7  4  3   9  7  4 14   6 12  1 15
  6  5  2  1   6 12 15  1   3 13  8 10   6  5  2  1   6 12 15  1   9  7 14  4

[383] 383/P          383/S          383/C    [384] 384/P          384/S          384/C
 16 15 14 13  16  2  3 13  16  2 13  3   16 15 14 13  16  2  3 13  16  2 13  3
  8  7  6  5   9  7  6 12   9  7 12  6   12 11 10  9   5 11 10  8   5 11  8 10
 12 11 10  9   5 11 10  8   4 14  1 15   8  7  6  5   9  7  6 12   4 14  1 15
  4  3  2  1   4 14 15  1   5 11  8 10   4  3  2  1   4 14 15  1   9  7 12  6

[Count(P/S/C) = 384/384/384] OK!

```

You have to prepare only a single Model and a single DAM Transformation method, and repeat applying it to each of prototype squares one after another as often as 384 times. Then you will have got all the object solutions completely.

The DAMT is an application that should build a beautiful bridge between the two parallel worlds and make the one-to-one correspondences realized between the two solution sets: Prototype squares and two types of Object Squares.

The problem is how you should select the Model and dictate the DAMT after it.

Do any other good Model solutions exist beside the representative No.1 above?

We also want to know how each Model actually deals with the Principal Squares of prototype set and the Fundamental Three of object set?

Let's examine precisely whether each of object solutions could perform well or not for the representative Model, making its DAM Transformation method piece by piece.

Here you see the result report of my recent examination below.

I only presented the compact list for Prototype squares with $n1=1$, especially six Principal squares and the object solutions transformed by DAMT, since it seems awful for me to list out every 384 solutions for 24 Models.

[List 16] **** Examination of the Model Assumed and its DAMT ****

* 'Prototype Squares' of Order 4 with $n1=1$: Primitive Set *

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

**** Self-Complementary and Complete Pan-magic Squares 4x4 Recomposed ****

* 'Self-Complementary' MS44 Recomposed by 'DAMT-1': **Good** *

[1] 1/S1 1 15 14 4 12 6 7 9 8 10 11 5 13 3 2 16	[2] 3/S2 1 15 12 6 14 4 7 9 8 10 13 3 11 5 2 16	[3] 5/S3 1 15 8 10 14 4 11 5 12 6 13 3 7 9 2 16	[4] 9/S3 1 14 12 7 15 4 6 9 8 11 13 2 10 5 3 16	[5] 11/S2 1 14 8 11 15 4 10 5 12 7 13 2 6 9 3 16	[6] 17/S1 1 12 8 13 15 6 10 3 14 7 11 2 4 9 5 16
[7] 2/S1 1 15 14 4 8 10 11 5 12 6 7 9 13 3 2 16	[8] 4/S2 1 15 12 6 8 10 13 3 14 4 7 9 11 5 2 16	[9] 6/S3 1 15 8 10 12 6 13 3 14 4 11 5 7 9 2 16	[10] 10/S3 1 14 12 7 8 11 13 2 15 4 6 9 10 5 3 16	[11] 12/S2 1 14 8 11 15 4 10 5 12 7 13 2 6 9 3 16	[12] 18/S1 1 12 8 13 14 7 11 2 15 6 10 3 4 9 5 16
[13] 7/S1 1 14 15 4 12 7 6 9 8 11 10 5 13 2 3 16	[14] 13/S2 1 12 15 6 14 7 4 9 8 13 10 3 11 2 5 16	[15] 19/S3 1 8 15 10 14 11 4 5 12 13 6 3 7 2 9 16	[16] 15/S3 1 12 14 7 15 6 4 9 8 13 11 2 10 3 5 16	[17] 21/S2 1 8 14 11 15 10 4 5 12 13 7 2 6 3 9 16	[18] 23/S1 1 8 12 13 15 10 6 3 14 11 7 2 4 5 9 16
[19] 8/S1 1 14 15 4 8 11 10 5 12 7 6 9 13 2 3 16	[20] 14/S2 1 12 15 6 8 13 10 3 14 7 4 9 11 2 5 16	[21] 20/S3 1 8 15 10 12 13 6 3 14 11 4 5 7 2 9 16	[22] 16/S3 1 12 14 7 8 13 11 2 15 6 4 9 10 3 5 16	[23] 22/S2 1 8 14 11 12 13 7 2 15 10 4 5 6 3 9 16	[24] 24/S1 1 8 12 13 14 11 7 2 15 10 6 3 4 5 9 16

* 'Composite & Complete' PMS44 Recomposed by 'DAMT-1': **Good** *

[1] 1/C1 1 15 4 14 12 6 9 7 13 3 16 2 8 10 5 11	[2] 3/C2 1 15 6 12 14 4 9 7 11 5 16 2 8 10 3 13	[3] 5/C3 1 15 10 8 14 4 5 11 7 9 16 2 12 6 3 13	[4] 9/C3 1 14 7 12 15 4 9 6 10 5 16 3 8 11 2 13	[5] 11/C2 1 14 11 8 15 4 5 10 6 9 16 3 12 7 2 13	[6] 17/C1 1 12 13 8 15 6 3 10 4 9 16 5 14 7 2 11
[7] 2/C1 1 15 4 14 8 10 5 11 13 3 16 2 12 6 9 7	[8] 4/C2 1 15 6 12 8 10 3 13 11 5 16 2 14 4 9 7	[9] 6/C3 1 15 10 8 12 6 3 13 7 9 16 2 14 4 5 11	[10] 10/C3 1 14 7 12 8 11 2 13 10 5 16 3 15 4 9 6	[11] 12/C2 1 14 11 8 12 7 2 13 6 9 16 3 15 4 5 10	[12] 18/C1 1 12 13 8 14 7 2 11 4 9 16 5 15 6 3 10

[13] 7/C1	[14] 13/C2	[15] 19/C3	[16] 15/C3	[17] 21/C2	[18] 23/C1
1 14 4 15	1 12 6 15	1 8 10 15	1 12 7 14	1 8 11 14	1 8 13 12
12 7 9 6	14 7 9 4	14 11 5 4	15 6 9 4	15 10 5 4	15 10 3 6
13 2 16 3	11 2 16 5	7 2 16 9	10 3 16 5	6 3 16 9	4 5 16 9
8 11 5 10	8 13 3 10	12 13 3 6	8 13 2 11	12 13 2 7	14 11 2 7
[19] 8/C1	[20] 14/C2	[21] 20/C3	[22] 16/C3	[23] 22/C2	[24] 24/C1
1 14 4 15	1 12 6 15	1 8 10 15	1 12 7 14	1 8 11 14	1 8 13 12
8 11 5 10	8 13 3 10	12 13 3 6	8 13 2 11	12 13 2 7	14 11 2 7
13 2 16 3	11 2 16 5	7 2 16 9	10 3 16 5	6 3 16 9	4 5 16 9
12 7 9 6	14 7 9 4	14 11 5 4	15 6 9 4	15 10 5 4	15 10 3 6

* 'Self-Complementary' MS44 Recomposed by 'DAMT-2': **Good** *

[1] 2/S1	[2] 4/S2	[3] 6/S3	[4] 10/S3	[5] 12/S2	[6] 18/S1
1 15 14 4	1 15 12 6	1 15 8 10	1 14 12 7	1 14 8 11	1 12 8 13
8 10 11 5	8 10 13 3	12 6 13 3	8 11 13 2	12 7 13 2	14 7 11 2
12 6 7 9	14 4 7 9	14 4 11 5	15 4 6 9	15 4 10 5	15 6 10 3
13 3 2 16	11 5 2 16	7 9 2 16	10 5 3 16	6 9 3 16	4 9 5 16
[7] 1/S1	[8] 3/S2	[9] 5/S3	[10] 9/S3	[11] 11/S2	[12] 17/S1
1 15 14 4	1 15 12 6	1 15 8 10	1 14 12 7	1 14 8 11	1 12 8 13
12 6 7 9	14 4 7 9	14 4 11 5	15 4 6 9	15 4 10 5	15 6 10 3
8 10 11 5	8 10 13 3	12 6 13 3	8 11 13 2	12 7 13 2	14 7 11 2
13 3 2 16	11 5 2 16	7 9 2 16	10 5 3 16	6 9 3 16	4 9 5 16
[13] 8/S1	[14] 14/S2	[15] 20/S3	[16] 16/S3	[17] 22/S2	[18] 24/S1
1 14 15 4	1 12 15 6	1 8 15 10	1 12 14 7	1 8 14 11	1 8 12 13
8 11 10 5	8 13 10 3	12 13 6 3	8 13 11 2	12 13 7 2	14 11 7 2
12 7 6 9	14 7 4 9	14 11 4 5	15 6 4 9	15 10 4 5	15 10 6 3
13 2 3 16	11 2 5 16	7 2 9 16	10 3 5 16	6 3 9 16	4 5 9 16
[19] 7/S1	[20] 13/S2	[21] 19/S3	[22] 15/S3	[23] 21/S2	[24] 23/S1
1 14 15 4	1 12 15 6	1 8 15 10	1 12 14 7	1 8 14 11	1 8 12 13
12 7 6 9	14 7 4 9	14 11 4 5	15 6 4 9	15 10 4 5	15 10 6 3
8 11 10 5	8 13 10 3	12 13 6 3	8 13 11 2	12 13 7 2	14 11 7 2
13 2 3 16	11 2 5 16	7 2 9 16	10 3 5 16	6 3 9 16	4 5 9 16

* 'Composite & Complete' PMS44 Recomposed by 'DAMT-2': **Good** *

[1] 2/C1	[2] 4/C2	[3] 6/C3	[4] 10/C3	[5] 12/C2	[6] 18/C1
1 15 4 14	1 15 6 12	1 15 10 8	1 14 7 12	1 14 11 8	1 12 13 8
8 10 5 11	8 10 3 13	12 6 3 13	8 11 2 13	12 7 2 13	14 7 2 11
13 3 16 2	11 5 16 2	7 9 16 2	10 5 16 3	6 9 16 3	4 9 16 5
12 6 9 7	14 4 9 7	14 4 5 11	15 4 9 6	15 4 5 10	15 6 3 10
[7] 1/C1	[8] 3/C2	[9] 5/C3	[10] 9/C3	[11] 11/C2	[12] 17/C1
1 15 4 14	1 15 6 12	1 15 10 8	1 14 7 12	1 14 11 8	1 12 13 8
12 6 9 7	14 4 9 7	14 4 5 11	15 4 9 6	15 4 5 10	15 6 3 10
13 3 16 2	11 5 16 2	7 9 16 2	10 5 16 3	6 9 16 3	4 9 16 5
8 10 5 11	8 10 3 13	12 6 3 13	8 11 2 13	12 7 2 13	14 7 2 11
[13] 8/C1	[14] 14/C2	[15] 20/C3	[16] 16/C3	[17] 22/C2	[18] 24/C1
1 14 4 15	1 12 6 15	1 8 10 15	1 12 7 14	1 8 11 14	1 8 13 12
8 11 5 10	8 13 3 10	12 13 3 6	8 13 2 11	12 13 2 7	14 11 2 7
13 2 16 3	11 2 16 5	7 2 16 9	10 3 16 5	6 3 16 9	4 5 16 9
12 7 9 6	14 7 9 4	14 11 5 4	15 6 9 4	15 10 5 4	15 10 3 6
[19] 7/C1	[20] 13/C2	[21] 19/C3	[22] 15/C3	[23] 21/C2	[24] 23/C1
1 14 4 15	1 12 6 15	1 8 10 15	1 12 7 14	1 8 11 14	1 8 13 12
12 7 9 6	14 7 9 4	14 11 5 4	15 6 9 4	15 10 5 4	15 10 3 6
13 2 16 3	11 2 16 5	7 2 16 9	10 3 16 5	6 3 16 9	4 5 16 9
8 11 5 10	8 13 3 10	12 13 3 6	8 13 2 11	12 13 2 7	14 11 2 7

* Primitive Set of Six 'Principal Squares' of Order 4 *

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

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-3' *

3/S2		1/S1		2/S1		7/S1		8/S1		14/S2	
1 15 12 6	1 15 14 4	1 15 14 4	1 14 15 4	1 14 15 4	1 12 15 6						
14 4 7 9	12 6 7 9	8 10 11 5	12 7 6 9	8 11 10 5	8 13 10 3						
8 10 13 3	8 10 11 5	12 6 7 9	8 11 10 5	12 7 6 9	14 7 4 9						
11 5 2 16	13 3 2 16	13 3 2 16	13 2 3 16	13 2 3 16	11 2 5 16						
3/C2		1/C1		2/C1		7/C1		8/C1		14/C2	
1 15 6 12	1 15 4 14	1 15 4 14	1 14 4 15	1 14 4 15	1 12 6 15						
14 4 9 7	12 6 9 7	8 10 5 11	12 7 9 6	8 11 5 10	8 13 3 10						
11 5 16 2	13 3 16 2	13 3 16 2	13 2 16 3	13 2 16 3	11 2 16 5						
8 10 3 13	8 10 5 11	12 6 9 7	8 11 5 10	12 7 9 6	14 7 9 4						

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-4' *

4/S2		2/S1		1/S1		8/S1		7/S1		13/S2	
1 15 12 6	1 15 14 4	1 15 14 4	1 14 15 4	1 14 15 4	1 12 15 6						
8 10 13 3	8 10 11 5	12 6 7 9	8 11 10 5	12 7 6 9	14 7 4 9						
14 4 7 9	12 6 7 9	8 10 11 5	12 7 6 9	8 11 10 5	8 13 10 3						
11 5 2 16	13 3 2 16	13 3 2 16	13 2 3 16	13 2 3 16	11 2 5 16						
4/C2		2/C1		1/C1		8/C1		7/C1		13/C2	
1 15 6 12	1 15 4 14	1 15 4 14	1 14 4 15	1 14 4 15	1 12 6 15						
8 10 3 13	8 10 5 11	12 6 9 7	8 11 5 10	12 7 9 6	14 7 9 4						
11 5 16 2	13 3 16 2	13 3 16 2	13 2 16 3	13 2 16 3	11 2 16 5						
14 4 9 7	12 6 9 7	8 10 5 11	12 7 9 6	8 11 5 10	8 13 3 10						

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-5' *

5/S3		6/S3		4/S2		12/S2		10/S3		16/S3	
1 15 8 10	1 15 8 10	1 15 12 6	1 14 8 11	1 14 12 7	1 12 14 7						
14 4 11 5	12 6 13 3	8 10 13 3	12 7 13 2	8 11 13 2	8 13 11 2						
12 6 13 3	14 4 11 5	14 4 7 9	15 4 10 5	15 4 6 9	15 6 4 9						
7 9 2 16	7 9 2 16	11 5 2 16	6 9 3 16	10 5 3 16	10 3 5 16						
5/C3		6/C3		4/C2		12/C2		10/C3		16/C3	
1 15 10 8	1 15 10 8	1 15 6 12	1 14 11 8	1 14 7 12	1 12 7 14						
14 4 5 11	12 6 3 13	8 10 3 13	12 7 2 13	8 11 2 13	8 13 2 11						
7 9 16 2	7 9 16 2	11 5 16 2	6 9 16 3	10 5 16 3	10 3 16 5						
12 6 3 13	14 4 5 11	14 4 9 7	15 4 5 10	15 4 9 6	15 6 9 4						

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-6' *

6/S3		5/S3		3/S2		11/S2		9/S3		15/S3	
1 15 8 10	1 15 8 10	1 15 12 6	1 14 8 11	1 14 12 7	1 12 14 7						
12 6 13 3	14 4 11 5	14 4 7 9	15 4 10 5	15 4 6 9	15 6 4 9						
14 4 11 5	12 6 13 3	8 10 13 3	12 7 13 2	8 11 13 2	8 13 11 2						
7 9 2 16	7 9 2 16	11 5 2 16	6 9 3 16	10 5 3 16	10 3 5 16						
6/C3		5/C3		3/C2		11/C2		9/C3		15/C3	
1 15 10 8	1 15 10 8	1 15 6 12	1 14 11 8	1 14 7 12	1 12 7 14						
12 6 3 13	14 4 5 11	14 4 9 7	15 4 5 10	15 4 9 6	15 6 9 4						
7 9 16 2	7 9 16 2	11 5 16 2	6 9 16 3	10 5 16 3	10 3 16 5						
14 4 5 11	12 6 3 13	8 10 3 13	12 7 2 13	8 11 2 13	8 13 2 11						

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-7': Good *

7/S1		13/S2		19/S3		15/S3		21/S2		23/S1	
1 14 15 4	1 12 15 6	1 8 15 10	1 12 14 7	1 8 14 11	1 8 12 13						
12 7 6 9	14 7 4 9	14 11 4 5	15 6 4 9	15 10 4 5	15 10 6 3						
8 11 10 5	8 13 10 3	12 13 6 3	8 13 11 2	12 13 7 2	14 11 7 2						
13 2 3 16	11 2 5 16	7 2 9 16	10 3 5 16	6 3 9 16	4 5 9 16						
7/C1		13/C2		19/C3		15/C3		21/C2		23/C1	
1 14 4 15	1 12 6 15	1 8 10 15	1 12 7 14	1 8 11 14	1 8 13 12						
12 7 9 6	14 7 9 4	14 11 5 4	15 6 9 4	15 10 5 4	15 10 3 6						
13 2 16 3	11 2 16 5	7 2 16 9	10 3 16 5	6 3 16 9	4 5 16 9						
8 11 5 10	8 13 3 10	12 13 3 6	8 13 2 11	12 13 2 7	14 11 2 7						

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-8': Good *

8/S1		14/S2		20/S3		16/S3		22/S2		24/S1	
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1 14 15 4	1 12 15 6	1 8 15 10	1 12 14 7	1 8 14 11	1 8 12 13
8 11 10 5	8 13 10 3	12 13 6 3	8 13 11 2	12 13 7 2	14 11 7 2
12 7 6 9	14 7 4 9	14 11 4 5	15 6 4 9	15 10 4 5	15 10 6 3
13 2 3 16	11 2 5 16	7 2 9 16	10 3 5 16	6 3 9 16	4 5 9 16
8/C1	14/C2	20/C3	16/C3	22/C2	24/C1
1 14 4 15	1 12 6 15	1 8 10 15	1 12 7 14	1 8 11 14	1 8 13 12
8 11 5 10	8 13 3 10	12 13 3 6	8 13 2 11	12 13 2 7	14 11 2 7
13 2 16 3	11 2 16 5	7 2 16 9	10 3 16 5	6 3 16 9	4 5 16 9
12 7 9 6	14 7 9 4	14 11 5 4	15 6 9 4	15 10 5 4	15 10 3 6

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-9' *

9/S3	15/S3	21/S2	13/S2	19/S3	20/S3
1 14 12 7	1 12 14 7	1 8 14 11	1 12 15 6	1 8 15 10	1 8 15 10
15 4 6 9	15 6 4 9	15 10 4 5	14 7 4 9	14 11 4 5	12 13 6 3
8 11 13 2	8 13 11 2	12 13 7 2	8 13 10 3	12 13 6 3	14 11 4 5
10 5 3 16	10 3 5 16	6 3 9 16	11 2 5 16	7 2 9 16	7 2 9 16
9/C3	15/C3	21/C2	13/C2	19/C3	20/C3
1 14 7 12	1 12 7 14	1 8 11 14	1 12 6 15	1 8 10 15	1 8 10 15
15 4 9 6	15 6 9 4	15 10 5 4	14 7 9 4	14 11 5 4	12 13 3 6
10 5 16 3	10 3 16 5	6 3 16 9	11 2 16 5	7 2 16 9	7 2 16 9
8 11 2 13	8 13 2 11	12 13 2 7	8 13 3 10	12 13 3 6	14 11 5 4

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-10' *

10/S3	16/S3	22/S2	14/S2	20/S3	19/S3
1 14 12 7	1 12 14 7	1 8 14 11	1 12 15 6	1 8 15 10	1 8 15 10
8 11 13 2	8 13 11 2	12 13 7 2	8 13 10 3	12 13 6 3	14 11 4 5
15 4 6 9	15 6 4 9	15 10 4 5	14 7 4 9	14 11 4 5	12 13 6 3
10 5 3 16	10 3 5 16	6 3 9 16	11 2 5 16	7 2 9 16	7 2 9 16
10/C3	16/C3	22/C2	14/C2	20/C3	19/C3
1 14 7 12	1 12 7 14	1 8 11 14	1 12 6 15	1 8 10 15	1 8 10 15
8 11 2 13	8 13 2 11	12 13 2 7	8 13 3 10	12 13 3 6	14 11 5 4
10 5 16 3	10 3 16 5	6 3 16 9	11 2 16 5	7 2 16 9	7 2 16 9
15 4 9 6	15 6 9 4	15 10 5 4	14 7 9 4	14 11 5 4	12 13 3 6

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-11' *

11/S2	17/S1	23/S1	18/S1	24/S1	22/S2
1 14 8 11	1 12 8 13	1 8 12 13	1 12 8 13	1 8 12 13	1 8 14 11
15 4 10 5	15 6 10 3	15 10 6 3	14 7 11 2	14 11 7 2	12 13 7 2
12 7 13 2	14 7 11 2	14 11 7 2	15 6 10 3	15 10 6 3	15 10 4 5
6 9 3 16	4 9 5 16	4 5 9 16	4 9 5 16	4 5 9 16	6 3 9 16
11/C2	17/C1	23/C1	18/C1	24/C1	22/C2
1 14 11 8	1 12 13 8	1 8 13 12	1 12 13 8	1 8 13 12	1 8 11 14
15 4 5 10	15 6 3 10	15 10 3 6	14 7 2 11	14 11 2 7	12 13 2 7
6 9 16 3	4 9 16 5	4 5 16 9	4 9 16 5	4 5 16 9	6 3 16 9
12 7 2 13	14 7 2 11	14 11 2 7	15 6 3 10	15 10 3 6	15 10 5 4

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-12' *

12/S2	18/S1	24/S1	17/S1	23/S1	21/S2
1 14 8 11	1 12 8 13	1 8 12 13	1 12 8 13	1 8 12 13	1 8 14 11
12 7 13 2	14 7 11 2	14 11 7 2	15 6 10 3	15 10 6 3	15 10 4 5
15 4 10 5	15 6 10 3	15 10 6 3	14 7 11 2	14 11 7 2	12 13 7 2
6 9 3 16	4 9 5 16	4 5 9 16	4 9 5 16	4 5 9 16	6 3 9 16
12/C2	18/C1	24/C1	17/C1	23/C1	21/C2
1 14 11 8	1 12 13 8	1 8 13 12	1 12 13 8	1 8 13 12	1 8 11 14
12 7 2 13	14 7 2 11	14 11 2 7	15 6 3 10	15 10 3 6	15 10 5 4
6 9 16 3	4 9 16 5	4 5 16 9	4 9 16 5	4 5 16 9	6 3 16 9
15 4 5 10	15 6 3 10	15 10 3 6	14 7 2 11	14 11 2 7	12 13 2 7

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-13' *

13/S2	7/S1	8/S1	1/S1	2/S1	4/S2
1 12 15 6	1 14 15 4	1 14 15 4	1 15 14 4	1 15 14 4	1 15 12 6
14 7 4 9	12 7 6 9	8 11 10 5	12 6 7 9	8 10 11 5	8 10 13 3
8 13 10 3	8 11 10 5	12 7 6 9	8 10 11 5	12 6 7 9	14 4 7 9
11 2 5 16	13 2 3 16	13 2 3 16	13 3 2 16	13 3 2 16	11 5 2 16

13/C2	7/C1	8/C1	1/C1	2/C1	4/C2
1 12 6 15	1 14 4 15	1 14 4 15	1 15 4 14	1 15 4 14	1 15 6 12
14 7 9 4	12 7 9 6	8 11 5 10	12 6 9 7	8 10 5 11	8 10 3 13
11 2 16 5	13 2 16 3	13 2 16 3	13 3 16 2	13 3 16 2	11 5 16 2
8 13 3 10	8 11 5 10	12 7 9 6	8 10 5 11	12 6 9 7	14 4 9 7

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-14' *

14/S2	8/S1	7/S1	2/S1	1/S1	3/S2
1 12 15 6	1 14 15 4	1 14 15 4	1 15 14 4	1 15 14 4	1 15 12 6
8 13 10 3	8 11 10 5	12 7 6 9	8 10 11 5	12 6 7 9	14 4 7 9
14 7 4 9	12 7 6 9	8 11 10 5	12 6 7 9	8 10 11 5	8 10 13 3
11 2 5 16	13 2 3 16	13 2 3 16	13 3 2 16	13 3 2 16	11 5 2 16
14/C2	8/C1	7/C1	2/C1	1/C1	3/C2
1 12 6 15	1 14 4 15	1 14 4 15	1 15 4 14	1 15 4 14	1 15 6 12
8 13 3 10	8 11 5 10	12 7 9 6	8 10 5 11	12 6 9 7	14 4 9 7
11 2 16 5	13 2 16 3	13 2 16 3	13 3 16 2	13 3 16 2	11 5 16 2
14 7 9 4	12 7 9 6	8 11 5 10	12 6 9 7	8 10 5 11	8 10 3 13

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-15' *

15/S3	9/S3	11/S2	3/S2	5/S3	6/S3
1 12 14 7	1 14 12 7	1 14 8 11	1 15 12 6	1 15 8 10	1 15 8 10
15 6 4 9	15 4 6 9	15 4 10 5	14 4 7 9	14 4 11 5	12 6 13 3
8 13 11 2	8 11 13 2	12 7 13 2	8 10 13 3	12 6 13 3	14 4 11 5
10 3 5 16	10 5 3 16	6 9 3 16	11 5 2 16	7 9 2 16	7 9 2 16
15/C3	9/C3	11/C2	3/C2	5/C3	6/C3
1 12 7 14	1 14 7 12	1 14 11 8	1 15 6 12	1 15 10 8	1 15 10 8
15 6 9 4	15 4 9 6	15 4 5 10	14 4 9 7	14 4 5 11	12 6 3 13
10 3 16 5	10 5 16 3	6 9 16 3	11 5 16 2	7 9 16 2	7 9 16 2
8 13 2 11	8 11 2 13	12 7 2 13	8 10 3 13	12 6 3 13	14 4 5 11

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-16' *

16/S3	10/S3	12/S2	4/S2	6/S3	5/S3
1 12 14 7	1 14 12 7	1 14 8 11	1 15 12 6	1 15 8 10	1 15 8 10
8 13 11 2	8 11 13 2	12 7 13 2	8 10 13 3	12 6 13 3	14 4 11 5
15 6 4 9	15 4 6 9	15 4 10 5	14 4 7 9	14 4 11 5	12 6 13 3
10 3 5 16	10 5 3 16	6 9 3 16	11 5 2 16	7 9 2 16	7 9 2 16
16/C3	10/C3	12/C2	4/C2	6/C3	5/C3
1 12 7 14	1 14 7 12	1 14 11 8	1 15 6 12	1 15 10 8	1 15 10 8
8 13 2 11	8 11 2 13	12 7 2 13	8 10 3 13	12 6 3 13	14 4 5 11
10 3 16 5	10 5 16 3	6 9 16 3	11 5 16 2	7 9 16 2	7 9 16 2
15 6 9 4	15 4 9 6	15 4 5 10	14 4 9 7	14 4 5 11	12 6 3 13

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-17': Good *

17/S1	11/S2	9/S3	5/S3	3/S2	1/S1
1 12 8 13	1 14 8 11	1 14 12 7	1 15 8 10	1 15 12 6	1 15 14 4
15 6 10 3	15 4 10 5	15 4 6 9	14 4 11 5	14 4 7 9	12 6 7 9
14 7 11 2	12 7 13 2	8 11 13 2	12 6 13 3	8 10 13 3	8 10 11 5
4 9 5 16	6 9 3 16	10 5 3 16	7 9 2 16	11 5 2 16	13 3 2 16
17/C1	11/C2	9/C3	5/C3	3/C2	1/C1
1 12 13 8	1 14 11 8	1 14 7 12	1 15 10 8	1 15 6 12	1 15 4 14
15 6 3 10	15 4 5 10	15 4 9 6	14 4 5 11	14 4 9 7	12 6 9 7
4 9 16 5	6 9 16 3	10 5 16 3	7 9 16 2	11 5 16 2	13 3 16 2
14 7 2 11	12 7 2 13	8 11 2 13	12 6 3 13	8 10 3 13	8 10 5 11

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-18': Good *

18/S1	12/S2	10/S3	6/S3	4/S2	2/S1
1 12 8 13	1 14 8 11	1 14 12 7	1 15 8 10	1 15 12 6	1 15 14 4
14 7 11 2	12 7 13 2	8 11 13 2	12 6 13 3	8 10 13 3	8 10 11 5
15 6 10 3	15 4 10 5	15 4 6 9	14 4 11 5	14 4 7 9	12 6 7 9
4 9 5 16	6 9 3 16	10 5 3 16	7 9 2 16	11 5 2 16	13 3 2 16
18/C1	12/C2	10/C3	6/C3	4/C2	2/C1
1 12 13 8	1 14 11 8	1 14 7 12	1 15 10 8	1 15 6 12	1 15 4 14
14 7 2 11	12 7 2 13	8 11 2 13	12 6 3 13	8 10 3 13	8 10 5 11

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

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-19' *

19/S3 20/S3 14/S2 22/S2 16/S3 10/S3
 1 8 15 10 1 8 15 10 1 12 15 6 1 8 14 11 1 12 14 7 1 14 12 7
 14 11 4 5 12 13 6 3 8 13 10 3 12 13 7 2 8 13 11 2 8 11 13 2
 12 13 6 3 14 11 4 5 14 7 4 9 15 10 4 5 15 6 4 9 15 4 6 9
 7 2 9 16 7 2 9 16 11 2 5 16 6 3 9 16 10 3 5 16 10 5 3 16
 19/C3 20/C3 14/C2 22/C2 16/C3 10/C3
 1 8 10 15 1 8 10 15 1 12 6 15 1 8 11 14 1 12 7 14 1 14 7 12
 14 11 5 4 12 13 3 6 8 13 3 10 12 13 2 7 8 13 2 11 8 11 2 13
 7 2 16 9 7 2 16 9 11 2 16 5 6 3 16 9 10 3 16 5 10 5 16 3
 12 13 3 6 14 11 5 4 14 7 9 4 15 10 5 4 15 6 9 4 15 4 9 6

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-20' *

20/S3 19/S3 13/S2 21/S2 15/S3 9/S3
 1 8 15 10 1 8 15 10 1 12 15 6 1 8 14 11 1 12 14 7 1 14 12 7
 12 13 6 3 14 11 4 5 14 7 4 9 15 10 4 5 15 6 4 9 15 4 6 9
 14 11 4 5 12 13 6 3 8 13 10 3 12 13 7 2 8 13 11 2 8 11 13 2
 7 2 9 16 7 2 9 16 11 2 5 16 6 3 9 16 10 3 5 16 10 5 3 16
 20/C3 19/C3 13/C2 21/C2 15/C3 9/C3
 1 8 10 15 1 8 10 15 1 12 6 15 1 8 11 14 1 12 7 14 1 14 7 12
 12 13 3 6 14 11 5 4 14 7 9 4 15 10 5 4 15 6 9 4 15 4 9 6
 7 2 16 9 7 2 16 9 11 2 16 5 6 3 16 9 10 3 16 5 10 5 16 3
 14 11 5 4 12 13 3 6 8 13 3 10 12 13 2 7 8 13 2 11 8 11 2 13

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-21' *

21/S2 23/S1 17/S1 24/S1 18/S1 12/S2
 1 8 14 11 1 8 12 13 1 12 8 13 1 8 12 13 1 12 8 13 1 14 8 11
 15 10 4 5 15 10 6 3 15 6 10 3 14 11 7 2 14 7 11 2 12 7 13 2
 12 13 7 2 14 11 7 2 14 7 11 2 15 10 6 3 15 6 10 3 15 4 10 5
 6 3 9 16 4 5 9 16 4 9 5 16 4 5 9 16 4 9 5 16 6 9 3 16
 21/C2 23/C1 17/C1 24/C1 18/C1 12/C2
 1 8 11 14 1 8 13 12 1 12 13 8 1 8 13 12 1 12 13 8 1 14 11 8
 15 10 5 4 15 10 3 6 15 6 3 10 14 11 2 7 14 7 2 11 12 7 2 13
 6 3 16 9 4 5 16 9 4 9 16 5 4 5 16 9 4 9 16 5 6 9 16 3
 12 13 2 7 14 11 2 7 14 7 2 11 15 10 3 6 15 6 3 10 15 4 5 10

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-22' *

22/S2 24/S1 18/S1 23/S1 17/S1 11/S2
 1 8 14 11 1 8 12 13 1 12 8 13 1 8 12 13 1 12 8 13 1 14 8 11
 12 13 7 2 14 11 7 2 14 7 11 2 15 10 6 3 15 6 10 3 15 4 10 5
 15 10 4 5 15 10 6 3 15 6 10 3 14 11 7 2 14 7 11 2 12 7 13 2
 6 3 9 16 4 5 9 16 4 9 5 16 4 5 9 16 4 9 5 16 6 9 3 16
 22/C2 24/C1 18/C1 23/C1 17/C1 11/C2
 1 8 11 14 1 8 13 12 1 12 13 8 1 8 13 12 1 12 13 8 1 14 11 8
 12 13 2 7 14 11 2 7 14 7 2 11 15 10 3 6 15 6 3 10 15 4 5 10
 6 3 16 9 4 5 16 9 4 9 16 5 4 5 16 9 4 9 16 5 6 9 16 3
 15 10 5 4 15 10 3 6 15 6 3 10 14 11 2 7 14 7 2 11 12 7 2 13

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-23': Good *

23/S1 21/S2 15/S3 19/S3 13/S2 7/S1
 1 8 12 13 1 8 14 11 1 12 14 7 1 8 15 10 1 12 15 6 1 14 15 4
 15 10 6 3 15 10 4 5 15 6 4 9 14 11 4 5 14 7 4 9 12 7 6 9
 14 11 7 2 12 13 7 2 8 13 11 2 12 13 6 3 8 13 10 3 8 11 10 5
 4 5 9 16 6 3 9 16 10 3 5 16 7 2 9 16 11 2 5 16 13 2 3 16
 23/C1 21/C2 15/C3 19/C3 13/C2 7/C1
 1 8 13 12 1 8 11 14 1 12 7 14 1 8 10 15 1 12 6 15 1 14 4 15
 15 10 3 6 15 10 5 4 15 6 9 4 14 11 5 4 14 7 9 4 12 7 9 6
 4 5 16 9 6 3 16 9 10 3 16 5 7 2 16 9 11 2 16 5 13 2 16 3
 14 11 2 7 12 13 2 7 8 13 2 11 12 13 3 6 8 13 3 10 8 11 5 10

* The Models and Both 'SC' and 'Complete' MS44 Recomposed by 'DAMT-24': Good *

24/S1				22/S2				16/S3				20/S3				14/S2				8/S1			
1	8	12	13	1	8	14	11	1	12	14	7	1	8	15	10	1	12	15	6	1	14	15	4
14	11	7	2	12	13	7	2	8	13	11	2	12	13	6	3	8	13	10	3	8	11	10	5
15	10	6	3	15	10	4	5	15	6	4	9	14	11	4	5	14	7	4	9	12	7	6	9
4	5	9	16	6	3	9	16	10	3	5	16	7	2	9	16	11	2	5	16	13	2	3	16
24/C1				22/C2				16/C3				20/C3				14/C2				8/C1			
1	8	13	12	1	8	11	14	1	12	7	14	1	8	10	15	1	12	6	15	1	14	4	15
14	11	2	7	12	13	2	7	8	13	2	11	12	13	3	6	8	13	3	10	8	11	5	10
4	5	16	9	6	3	16	9	10	3	16	5	7	2	16	9	11	2	16	5	13	2	16	3
15	10	3	6	15	10	5	4	15	6	9	4	14	11	5	4	14	7	9	4	12	7	9	6

[OK!]

#4. Discussion

First of all, I must confess I was surprised to have found that any one of 24 object solutions with $n1=1$ could perform equally well for the simple Model. In fact each of them could equally reconstruct all the object solutions completely by its DAMT and successfully show the beautiful one-to-one correspondence, a magic bridge built over the two worlds of Prototype squares and Object ones.

But, as far as the Principal Squares of prototype and the Solution Types of object are concerned, we could not find many complete Models but several, although it is not true that there is only one solution for the best Model.

In the list above, Principal Squares always appear as the transformed objects at the first three, each one of which is representing its own group of Solution Types.

Result reveals eight solutions could work well for the complete Model. Each one could manage to provide the solution type of {S1, S2 and S3} or {C1, C2 and C3} equally to all the solutions reconstructed from the principal squares by its DAMT.

There is no meaningless difference between Self-complementary type and Complete pan-magic one, but there is a meaningful correspondence between those two.

You may select any one you like for your Model out of {1, 2, 7, 8, 17, 18, 23 and 24}.

Whenever you have to deal with the Prototype Squares and DAM Transformation, you should keep making 'primitive solutions'. If you use any list-forming inequality conditions on the way, you might often meet some strange troubles. Try to get the 'standard solutions' only in the last end.

We have to wonder if the Principal Squares are always necessary in the process of our composing all prototype squares and making them into object solutions.

They once seemed to be necessary when Drs. Ollerenshaw & Brae eagerly proposed them to us. But, are they absolutely necessary in the process?

Before all, we must be sincerely faced with the fact that every object solution could equally become the good Model for reconstructing all the object solutions completely. Every Model could realize the beautiful one-to-one correspondence between the two worlds, without any concern of Principal Squares in the process.

What are the Principal Squares, then? What do they exist for?

I think they might be the ideal process produced by our aesthetic request. They are really beautiful, I admit, especially when we find an impressive concordance between the principal squares and the fundamental solutions of object ones. I myself want to accept this aesthetic request for my process beyond any logical necessity.

There is another important question to be discussed. Why is the Prototype set same and common to both Self-complementary and Complete magic squares 4x4?

Is that an accidental agreement? No. It doesn't seem so. What does it mean, then?

Remember how we built the solutions of Prototype Squares after the Model. Yes, we

made them by solving the 'inverse function' of DAMT in the previous section.
 We defined such the **Basic Form** and the **Basic Conditions** then as follows:

*** Make Prototype Squares 4x4 by the Two Model Solutions ***

Prototype/	/Model:SC	/Model:Complete
1 2 3 4	1 15 14 4	1 15 4 14
5 6 7 8	12 6 7 9	12 6 9 7
9 10 11 12	8 10 11 5	13 3 16 2
13 14 15 16	13 3 2 16	8 10 5 11

*** Make Prototype Squares from the Model of Self-complementary Magic Squares 4x4 ***

$n1+n15+n14+n4=C \dots r1$; | $n1+n12+n8+n13=C \dots c1$;
 $n12+n6+n7+n9=C \dots r2$; | $n15+n6+n10+n3=C \dots c2$;
 $n8+n10+n11+n5=C \dots r3$; | $n14+n7+n11+n2=C \dots c3$;
 $n13+n3+n2+n16=C \dots r4$; | $n4+n9+n5+n16=C \dots c4$;

*** Definition of Complementary Pairs for Self-complementary Magic Squares 4x4 ***

$n1+n16=n15+n2=n14+n3=n4+n13$
 $=n12+n5=n6+n11=n7+n10=n9+n8=CC \dots scc$

*** Make Prototype Squares from the Model of Complete Pan-magic Squares 4x4 ***

$n1+n15+n4+n14=C \dots rw1$; | $n1+n12+n13+n8=C \dots c11$;
 $n12+n6+n9+n7=C \dots rw2$; | $n15+n6+n3+n10=C \dots c12$;
 $n13+n3+n16+n2=C \dots rw3$; | $n4+n9+n16+n5=C \dots c13$;
 $n8+n10+n5+n11=C \dots rw4$; | $n14+n7+n2+n11=C \dots c14$;

*** Definition of Complementary Pairs for Complete Pan-magic Squares 4x4 ***

$n1+n16=n15+n2=n4+n13=n14+n3$
 $=n12+n5=n6+n11=n9+n8=n7+n10=CC \dots cc$

Watch and check the contents of two Basic Conditions above. Do you notice they are very similar, I should say, completely the same with each other?

You should always have got the same Prototype set for both MS44, whenever you make it under such the definitions as above. It is logically proved to be true.

It is natural. It is self-evident. It is not a mystery. But I cannot help wondering why.

Why do both the Self-complementary type of MS44 and the Complete pan-magic one have to be so similar in structure? What does this consistency mean, then?

I could not but think that this same set of Prototypes implies the only one 'Origin', and I had to step forward into the world of 4-dimensional Extra-cubic magic Object.

Will you please read the articles of mine in the Chapters 6 and 7, Part 4?

Now I believe both Self-complementary and Complete MS44 are the brother children of the same father 'Origin'. Don't you think so?

I am sure you might feel it, when you see the next list of DAM Transformations.

This result list is the same with the one in the previous section, but its driving program is quite different from the last one. I dictated some new procedures for the composition of common Prototype Squares only with transformation methods.

I wish you will compare this program to that one of the old.

[RESULT LIST] ** Demonstration of DAM Transformation **

**** Prototype Squares(/P), Self-complementary(/S) and Complete(/C) MS44 Reconstructed by the 'DAMT' with the common Prototypes ****

**** List of Standard Solutions of both Objects: ****

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

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

1 3 9 11	- - - -	- - - -	6 8 14 16	11 8 14 1	11 8 1 14
6 8 14 16	- - - -	- - - -	1 3 9 11	16 3 9 6	5 10 15 4
5 7 13 15	- - - -	- - - -	5 7 13 15	5 10 4 15	16 3 6 9
37/P	0/S	0/C	38/P	23/S	23/C
2 6 1 5	- - - -	- - - -	2 6 1 5	2 11 16 5	2 11 5 16
4 8 3 7	- - - -	- - - -	10 14 9 13	7 14 9 4	7 14 4 9
10 14 9 13	- - - -	- - - -	4 8 3 7	13 8 3 10	12 1 15 6
12 16 11 15	- - - -	- - - -	12 16 11 15	12 1 6 15	13 8 10 3
39/P	0/S	0/C	40/P	24/S	24/C
2 6 4 8	- - - -	- - - -	2 6 4 8	2 11 13 8	2 11 8 13
1 5 3 7	- - - -	- - - -	10 14 12 16	7 14 12 1	7 14 1 12
10 14 12 16	- - - -	- - - -	1 5 3 7	16 5 3 10	9 4 15 6
9 13 11 15	- - - -	- - - -	9 13 11 15	9 4 6 15	16 5 10 3
41/P	0/S	0/C	42/P	0/S	0/C
43/P	0/S	0/C	44/P	0/S	0/C
45/P	0/S	0/C	46/P	0/S	0/C
47/P	0/S	0/C	48/P	0/S	0/C
49/P	0/S	25/C	50/P	0/S	26/C
3 1 4 2	- - - -	3 16 2 13	3 1 4 2	- - - -	3 16 2 13
7 5 8 6	- - - -	10 5 11 8	11 9 12 10	- - - -	6 9 7 12
11 9 12 10	- - - -	15 4 14 1	7 5 8 6	- - - -	15 4 14 1
15 13 16 14	- - - -	6 9 7 12	15 13 16 14	- - - -	10 5 11 8
51/P	25/S	27/C	52/P	26/S	28/C
3 1 7 5	3 16 10 5	3 16 5 10	3 1 7 5	3 16 10 5	3 16 5 10
4 2 8 6	13 2 8 11	13 2 11 8	11 9 15 13	6 9 15 4	6 9 4 15
11 9 15 13	6 9 15 4	12 7 14 1	4 2 8 6	13 2 8 11	12 7 14 1
12 10 16 14	12 7 1 14	6 9 4 15	12 10 16 14	12 7 1 14	13 2 11 8
53/P	27/S	29/C	54/P	28/S	30/C
3 1 11 9	3 16 6 9	3 16 9 6	3 1 11 9	3 16 6 9	3 16 9 6
4 2 12 10	13 2 12 7	13 2 7 12	7 5 15 13	10 5 15 4	10 5 4 15
7 5 15 13	10 5 15 4	8 11 14 1	4 2 12 10	13 2 12 7	8 11 14 1
8 6 16 14	8 11 1 14	10 5 4 15	8 6 16 14	8 11 1 14	13 2 7 12
55/P	0/S	31/C	56/P	0/S	32/C
3 4 1 2	- - - -	3 13 2 16	3 4 1 2	- - - -	3 13 2 16
7 8 5 6	- - - -	10 8 11 5	11 12 9 10	- - - -	6 12 7 9
11 12 9 10	- - - -	15 1 14 4	7 8 5 6	- - - -	15 1 14 4
15 16 13 14	- - - -	6 12 7 9	15 16 13 14	- - - -	10 8 11 5
57/P	0/S	0/C	58/P	29/S	33/C
3 4 7 8	- - - -	- - - -	3 4 7 8	3 13 10 8	3 13 8 10
1 2 5 6	- - - -	- - - -	11 12 15 16	6 12 15 1	6 12 1 15
11 12 15 16	- - - -	- - - -	1 2 5 6	16 2 5 11	9 7 14 4
9 10 13 14	- - - -	- - - -	9 10 13 14	9 7 4 14	16 2 11 5
59/P	0/S	0/C	60/P	30/S	34/C
3 4 11 12	- - - -	- - - -	3 4 11 12	3 13 6 12	3 13 12 6
1 2 9 10	- - - -	- - - -	7 8 15 16	10 8 15 1	10 8 1 15
7 8 15 16	- - - -	- - - -	1 2 9 10	16 2 9 7	5 11 14 4
5 6 13 14	- - - -	- - - -	5 6 13 14	5 11 4 14	16 2 7 9
61/P	0/S	0/C	62/P	31/S	0/C
3 7 1 5	- - - -	- - - -	3 7 1 5	3 10 16 5	- - - -
4 8 2 6	- - - -	- - - -	11 15 9 13	6 15 9 4	- - - -
11 15 9 13	- - - -	- - - -	4 8 2 6	13 8 2 11	- - - -
12 16 10 14	- - - -	- - - -	12 16 10 14	12 1 7 14	- - - -
63/P	0/S	0/C	64/P	32/S	0/C
3 7 4 8	- - - -	- - - -	3 7 4 8	3 10 13 8	- - - -
1 5 2 6	- - - -	- - - -	11 15 12 16	6 15 12 1	- - - -
11 15 12 16	- - - -	- - - -	1 5 2 6	16 5 2 11	- - - -
9 13 10 14	- - - -	- - - -	9 13 10 14	9 4 7 14	- - - -
65/P	0/S	0/C	66/P	0/S	0/C
67/P	0/S	0/C	68/P	0/S	0/C
69/P	0/S	0/C	70/P	0/S	0/C
71/P	0/S	0/C	72/P	0/S	0/C

	73/P	0/S	35/C		74/P	0/S	36/C
4	2 3 1	- - - -	4 15 1 14	4	2 3 1	- - - -	4 15 1 14
8	6 7 5	- - - -	9 6 12 7	12	10 11 9	- - - -	5 10 8 11
12	10 11 9	- - - -	16 3 13 2	8	6 7 5	- - - -	16 3 13 2
16	14 15 13	- - - -	5 10 8 11	16	14 15 13	- - - -	9 6 12 7
	75/P	33/S	37/C		76/P	34/S	38/C
4	2 8 6	4 15 9 6	4 15 6 9	4	2 8 6	4 15 9 6	4 15 6 9
3	1 7 5	14 1 7 12	14 1 12 7	12	10 16 14	5 10 16 3	5 10 3 16
12	10 16 14	5 10 16 3	11 8 13 2	3	1 7 5	14 1 7 12	11 8 13 2
11	9 15 13	11 8 2 13	5 10 3 16	11	9 15 13	11 8 2 13	14 1 12 7
	77/P	35/S	39/C		78/P	36/S	40/C
4	2 12 10	4 15 5 10	4 15 10 5	4	2 12 10	4 15 5 10	4 15 10 5
3	1 11 9	14 1 11 8	14 1 8 11	8	6 16 14	9 6 16 3	9 6 3 16
8	6 16 14	9 6 16 3	7 12 13 2	3	1 11 9	14 1 11 8	7 12 13 2
7	5 15 13	7 12 2 13	9 6 3 16	7	5 15 13	7 12 2 13	14 1 8 11
	79/P	0/S	41/C		80/P	0/S	42/C
4	3 2 1	- - - -	4 14 1 15	4	3 2 1	- - - -	4 14 1 15
8	7 6 5	- - - -	9 7 12 6	12	11 10 9	- - - -	5 11 8 10
12	11 10 9	- - - -	16 2 13 3	8	7 6 5	- - - -	16 2 13 3
16	15 14 13	- - - -	5 11 8 10	16	15 14 13	- - - -	9 7 12 6
	81/P	0/S	0/C		82/P	37/S	43/C
4	3 8 7	- - - -	- - - -	4	3 8 7	4 14 9 7	4 14 7 9
2	1 6 5	- - - -	- - - -	12	11 16 15	5 11 16 2	5 11 2 16
12	11 16 15	- - - -	- - - -	2	1 6 5	15 1 6 12	10 8 13 3
10	9 14 13	- - - -	- - - -	10	9 14 13	10 8 3 13	15 1 12 6
	83/P	0/S	0/C		84/P	38/S	44/C
4	3 12 11	- - - -	- - - -	4	3 12 11	4 14 5 11	4 14 11 5
2	1 10 9	- - - -	- - - -	8	7 16 15	9 7 16 2	9 7 2 16
8	7 16 15	- - - -	- - - -	2	1 10 9	15 1 10 8	6 12 13 3
6	5 14 13	- - - -	- - - -	6	5 14 13	6 12 3 13	15 1 8 10
	85/P	0/S	0/C		86/P	39/S	0/C
4	8 2 6	- - - -	- - - -	4	8 2 6	4 9 15 6	- - - -
3	7 1 5	- - - -	- - - -	12	16 10 14	5 16 10 3	- - - -
12	16 10 14	- - - -	- - - -	3	7 1 5	14 7 1 12	- - - -
11	15 9 13	- - - -	- - - -	11	15 9 13	11 2 8 13	- - - -
	87/P	0/S	0/C		88/P	40/S	0/C
4	8 3 7	- - - -	- - - -	4	8 3 7	4 9 14 7	- - - -
2	6 1 5	- - - -	- - - -	12	16 11 15	5 16 11 2	- - - -
12	16 11 15	- - - -	- - - -	2	6 1 5	15 6 1 12	- - - -
10	14 9 13	- - - -	- - - -	10	14 9 13	10 3 8 13	- - - -
	89/P	0/S	0/C		90/P	0/S	0/C
	91/P	0/S	0/C		92/P	0/S	0/C
	93/P	0/S	0/C		94/P	0/S	0/C
	95/P	0/S	0/C		96/P	0/S	0/C
	97/P	0/S	0/C		98/P	0/S	45/C
5	1 6 2	- - - -	- - - -	5	1 6 2	- - - -	5 16 2 11
7	3 8 4	- - - -	- - - -	13	9 14 10	- - - -	4 9 7 14
13	9 14 10	- - - -	- - - -	7	3 8 4	- - - -	15 6 12 1
15	11 16 12	- - - -	- - - -	15	11 16 12	- - - -	10 3 13 8
	99/P	0/S	0/C		100/P	0/S	46/C
5	1 7 3	- - - -	- - - -	5	1 7 3	- - - -	5 16 3 10
6	2 8 4	- - - -	- - - -	13	9 15 11	- - - -	4 9 6 15
13	9 15 11	- - - -	- - - -	6	2 8 4	- - - -	14 7 12 1
14	10 16 12	- - - -	- - - -	14	10 16 12	- - - -	11 2 13 8
	101/P	41/S	0/C		102/P	42/S	0/C
5	1 13 9	5 16 4 9	- - - -	5	1 13 9	5 16 4 9	- - - -
6	2 14 10	11 2 14 7	- - - -	7	3 15 11	10 3 15 6	- - - -
7	3 15 11	10 3 15 6	- - - -	6	2 14 10	11 2 14 7	- - - -
8	4 16 12	8 13 1 12	- - - -	8	4 16 12	8 13 1 12	- - - -
	103/P	0/S	0/C		104/P	0/S	0/C
	105/P	0/S	0/C		106/P	43/S	0/C

5 6 7 8	- - - -	- - - -	5 6 7 8	5 11 10 8	- - - -
1 2 3 4	- - - -	- - - -	13 14 15 16	4 14 15 1	- - - -
13 14 15 16	- - - -	- - - -	1 2 3 4	16 2 3 13	- - - -
9 10 11 12	- - - -	- - - -	9 10 11 12	9 7 6 12	- - - -
	107/P	0/S		108/P	0/S
	109/P	0/S		110/P	0/S
	111/P	0/S		112/P	44/S
5 7 6 8	- - - -	- - - -	5 7 6 8	5 10 11 8	- - - -
1 3 2 4	- - - -	- - - -	13 15 14 16	4 15 14 1	- - - -
13 15 14 16	- - - -	- - - -	1 3 2 4	16 3 2 13	- - - -
9 11 10 12	- - - -	- - - -	9 11 10 12	9 6 7 12	- - - -
	113/P	0/S		114/P	0/S
	115/P	0/S		116/P	0/S
	117/P	0/S		118/P	0/S
	119/P	0/S		120/P	0/S
	121/P	0/S		122/P	0/S
6 2 5 1	- - - -	- - - -	6 2 5 1	- - - -	6 15 1 12
8 4 7 3	- - - -	- - - -	14 10 13 9	- - - -	3 10 8 13
14 10 13 9	- - - -	- - - -	8 4 7 3	- - - -	16 5 11 2
16 12 15 11	- - - -	- - - -	16 12 15 11	- - - -	9 4 14 7
	123/P	0/S		124/P	0/S
6 2 8 4	- - - -	- - - -	6 2 8 4	- - - -	6 15 4 9
5 1 7 3	- - - -	- - - -	14 10 16 12	- - - -	3 10 5 16
14 10 16 12	- - - -	- - - -	5 1 7 3	- - - -	13 8 11 2
13 9 15 11	- - - -	- - - -	13 9 15 11	- - - -	12 1 14 7
	125/P	45/S		126/P	46/S
6 2 14 10	6 15 3 10	- - - -	6 2 14 10	6 15 3 10	- - - -
5 1 13 9	12 1 13 8	- - - -	8 4 16 12	9 4 16 5	- - - -
8 4 16 12	9 4 16 5	- - - -	5 1 13 9	12 1 13 8	- - - -
7 3 15 11	7 14 2 11	- - - -	7 3 15 11	7 14 2 11	- - - -
	127/P	0/S		128/P	0/S
	129/P	0/S		130/P	47/S
6 5 8 7	- - - -	- - - -	6 5 8 7	6 12 9 7	- - - -
2 1 4 3	- - - -	- - - -	14 13 16 15	3 13 16 2	- - - -
14 13 16 15	- - - -	- - - -	2 1 4 3	15 1 4 14	- - - -
10 9 12 11	- - - -	- - - -	10 9 12 11	10 8 5 11	- - - -
	131/P	0/S		132/P	0/S
	133/P	0/S		134/P	0/S
	135/P	0/S		136/P	48/S
6 8 5 7	- - - -	- - - -	6 8 5 7	6 9 12 7	- - - -
2 4 1 3	- - - -	- - - -	14 16 13 15	3 16 13 2	- - - -
14 16 13 15	- - - -	- - - -	2 4 1 3	15 4 1 14	- - - -
10 12 9 11	- - - -	- - - -	10 12 9 11	10 5 8 11	- - - -
	137/P	0/S		138/P	0/S
	139/P	0/S		140/P	0/S
	141/P	0/S		142/P	0/S
	143/P	0/S		144/P	0/S

[Counts = 384/P, 48/S, 48/C] [OK!]

[PROGRAM LIST]

```

/** Prototype Squares, Self-complementary and Complete MS44 */
/** Reconstructed by the 'DAMT' with the common Prototypes */
/** Print the List of Standard Solutions of both Types: */
/** 'ProtoST44S&C48.c' dictated by Kanji Setsuda */
/** on Mar.8, 2003, Sep.14, 2006 and Mar.29, 2009 */
/** Working with MacOSX 10.5 & Xcode 3.0 */
/**/
#include <stdio.h>
/**/
short cnt;

```

```

short scnt, ccnt;
short nm[17];
short dnm[17], tnm[17], tcnt[17];
short pt[385][17];
short dt[192][17], et[192][17];
/**/
/* Sub-Routines */
/**/
void makeps(void);
void trnsf44(void);
void trnsf01(void), trnsf02(void);
void reflect(short x);
void trnsf11(void), trnsf12(void), trnsf13(void);
void trns10(void), trns20(void), trns30(void);
void trns01(void), trns02(void), trns03(void);
/**/
void damt(void), damt2(void);
void damtrns(short x);
void pr32ans(short x);
/**/
void sorting(void), exchnng(short x);
/**/
/* Main Program */
int main(){
short n;
cnt=384; scnt=0; ccnt=0;
for(n=0;n<17;n++){nm[n]=n; tcnt[n]=0;}
makeps(); // Make Basic 'Prototype Squares of Order 4'
trnsf44(); // 4x4 Transformations for all Prototypes
sorting(); // Data Sorting for the Smart List
damtrns(cnt/2); // Transform each PS into the 'SC' and 'Complete' MS44
printf("\n** Prototype Squares(/P), Self-complementary(/S) and Complete(/C)\n");
printf(" MS44 Reconstructed by the 'D.A.M.T.' with the common Prototypes **\n");
printf(" ** List of Standard Solutions of Both Types: **\n");
pr32ans(cnt*3/8); printf(" . . . . .\n");
printf(" [Counts = %3d/P,%3d/S,%3d/C]\n",cnt,scnt,ccnt);
printf(" [OK!]\n");
return 0;
}
/**/
/* Sub-Procedures */
/** Make the 'Prototype Squares of Order 4' **/
void makeps(){
short m,m4,n;
short tt[25][17];
for(n=1;n<17;n++){tt[0][n]=nm[n];};
trnsf01(); for(n=1;n<17;n++){tt[4][n]=tnm[n];};
trnsf02(); for(n=1;n<17;n++){tt[8][n]=tnm[n];};
trnsf02(); reflect(1); for(n=1;n<17;n++){tt[12][n]=tnm[n];};
trnsf01(); reflect(1); for(n=1;n<17;n++){tt[16][n]=tnm[n];};
reflect(0); for(n=1;n<17;n++){tt[20][n]=tnm[n];};
for(m=0;m<6;m++){m4=m*4;
for(n=1;n<17;n++){nm[n]=tt[m4][n];};
trnsf11(); for(n=1;n<17;n++){tt[m4+1][n]=tnm[n];};
trnsf12(); for(n=1;n<17;n++){tt[m4+2][n]=tnm[n];};
trnsf13(); for(n=1;n<17;n++){tt[m4+3][n]=tnm[n];};}
for(m=0;m<24;m++){for(n=1;n<17;n++){pt[m][n]=tt[m][n];};}
}
/**/
/** 4x4 Transformations **/
void trnsf44(){
short p,m,m4,n,d1,da;
short tt[17][17];
for(p=0;p<24;p++){
for(n=1;n<17;n++){nm[n]=pt[p][n]; tt[0][n]=nm[n];};

```

```

trns10(); for(n=1;n<17;n++){tt[4][n]=dnm[n];}
trns20(); for(n=1;n<17;n++){tt[8][n]=dnm[n];}
trns30(); for(n=1;n<17;n++){tt[12][n]=dnm[n];}
for(m=0;m<4;m++){m4=m*4;
for(n=1;n<17;n++){nm[n]=tt[m4][n];}
trns01(); for(n=1;n<17;n++){tt[m4+1][n]=dnm[n];}
trns02(); for(n=1;n<17;n++){tt[m4+2][n]=dnm[n];}
trns03(); for(n=1;n<17;n++){tt[m4+3][n]=dnm[n];}}
for(m=0;m<16;m++){d1=tt[m][1]; da=(d1-1)*24+tcnt[d1];
for(n=1;n<17;n++){pt[da][n]=tt[m][n];}
tcnt[d1]++;}
}
}
/**/
/* Generate All the 6 'Principal' Squares */
void trnsf01(void){
tnm[1]=nm[1]; tnm[2]=nm[2]; tnm[3]=nm[5]; tnm[4]=nm[6];
tnm[5]=nm[3]; tnm[6]=nm[4]; tnm[7]=nm[7]; tnm[8]=nm[8];
tnm[9]=nm[9]; tnm[10]=nm[10]; tnm[11]=nm[13]; tnm[12]=nm[14];
tnm[13]=nm[11]; tnm[14]=nm[12]; tnm[15]=nm[15]; tnm[16]=nm[16];
}
void trnsf02(void){
tnm[1]=nm[1]; tnm[2]=nm[2]; tnm[3]=nm[9]; tnm[4]=nm[10];
tnm[5]=nm[3]; tnm[6]=nm[4]; tnm[7]=nm[11]; tnm[8]=nm[12];
tnm[9]=nm[5]; tnm[10]=nm[6]; tnm[11]=nm[13]; tnm[12]=nm[14];
tnm[13]=nm[7]; tnm[14]=nm[8]; tnm[15]=nm[15]; tnm[16]=nm[16];
}
/**/
void reflect(short x){
short mm[17];
short n;
if(x==0){for(n=1;n<17;n++){mm[n]=nm[n];}}
else{for(n=1;n<17;n++){mm[n]=tnm[n];}}
tnm[1]=mm[1]; tnm[2]=mm[5]; tnm[3]=mm[9]; tnm[4]=mm[13];
tnm[5]=mm[2]; tnm[6]=mm[6]; tnm[7]=mm[10]; tnm[8]=mm[14];
tnm[9]=mm[3]; tnm[10]=mm[7]; tnm[11]=mm[11]; tnm[12]=mm[15];
tnm[13]=mm[4]; tnm[14]=mm[8]; tnm[15]=mm[12]; tnm[16]=mm[16];
}
/**/
/* Generate another 4 Prototype Squares */
void trnsf11(void){
tnm[1]=nm[1]; tnm[2]=nm[2]; tnm[3]=nm[3]; tnm[4]=nm[4];
tnm[5]=nm[9]; tnm[6]=nm[10]; tnm[7]=nm[11]; tnm[8]=nm[12];
tnm[9]=nm[5]; tnm[10]=nm[6]; tnm[11]=nm[7]; tnm[12]=nm[8];
tnm[13]=nm[13]; tnm[14]=nm[14]; tnm[15]=nm[15]; tnm[16]=nm[16];
}
void trnsf12(void){
tnm[1]=nm[1]; tnm[2]=nm[3]; tnm[3]=nm[2]; tnm[4]=nm[4];
tnm[5]=nm[5]; tnm[6]=nm[7]; tnm[7]=nm[6]; tnm[8]=nm[8];
tnm[9]=nm[9]; tnm[10]=nm[11]; tnm[11]=nm[10]; tnm[12]=nm[12];
tnm[13]=nm[13]; tnm[14]=nm[15]; tnm[15]=nm[14]; tnm[16]=nm[16];
}
void trnsf13(void){
tnm[1]=nm[1]; tnm[2]=nm[3]; tnm[3]=nm[2]; tnm[4]=nm[4];
tnm[5]=nm[9]; tnm[6]=nm[11]; tnm[7]=nm[10]; tnm[8]=nm[12];
tnm[9]=nm[5]; tnm[10]=nm[7]; tnm[11]=nm[6]; tnm[12]=nm[8];
tnm[13]=nm[13]; tnm[14]=nm[15]; tnm[15]=nm[14]; tnm[16]=nm[16];
}
/**/
/* Prototype Transformations */
void trns01(void){
dnm[1]=nm[2]; dnm[2]=nm[1]; dnm[3]=nm[4]; dnm[4]=nm[3];
dnm[5]=nm[6]; dnm[6]=nm[5]; dnm[7]=nm[8]; dnm[8]=nm[7];
dnm[9]=nm[10]; dnm[10]=nm[9]; dnm[11]=nm[12]; dnm[12]=nm[11];
dnm[13]=nm[14]; dnm[14]=nm[13]; dnm[15]=nm[16]; dnm[16]=nm[15];
}

```



```

damt();
damt2();
if((dnm[1]<dnm[4])&&(dnm[1]<dnm[13])&&(dnm[1]<dnm[16])&&(dnm[5]<dnm[2])){
    scnt++; dt[m][0]=scnt;
    for(n=1;n<17;n++){dt[m][n]=dnm[n];}
if((tnm[1]<tnm[4])&&(tnm[1]<tnm[13])&&(tnm[1]<tnm[16])&&(tnm[5]<tnm[2])){
    ccnt++; et[m][0]=ccnt;
    for(n=1;n<17;n++){et[m][n]=tnm[n];}
}
}
}
}
/**/
/* Print 3 Types of Solutions */
void pr32ans(short x){
    short c,d,l,l4,m,n;
    for(c=0;c<x;c=c+2){
        printf("%11d/P%11d/S%11d/C%13d/P%11d/S%11d/C\n",
            c+1,dt[c][0],et[c][0],c+2,dt[c+1][0],et[c+1][0]);
        if((dt[c][0]>0)||(dt[c+1][0]>0)||(et[c][0]>0)||(et[c+1][0]>0)){
            for(l=0;l<4;l++){l4=l*4;
                for(m=0;m<2;m++){
                    printf(" ");
                    for(n=1;n<5;n++){printf("%3d",pt[c+m][l4+n]);}
                    printf(" ");
                    for(n=1;n<5;n++){d=dt[c+m][l4+n];
                        if(d==0){printf(" -");}else{printf("%3d",d);}}
                    printf(" ");
                    for(n=1;n<5;n++){d=et[c+m][l4+n];
                        if(d==0){printf(" -");}else{printf("%3d",d);}}
                    if(m<1){printf(" ");}
                }
            printf("\n");
        }
    }
}
}
}
/**/
/* Sorting Prototype Solutions for the Smart List */
void sorting(){
    short mx,m,f;
    int d0,d1;
    mx=cnt-1;
    do{f=0;
        for(m=0;m<mx;m++){
            d0=((pt[m][1]*16+pt[m][2])*16+pt[m][3])*16+pt[m][4]*16+pt[m][5];
            d1=((pt[m+1][1]*16+pt[m+1][2])*16+pt[m+1][3])*16+pt[m+1][4]*16+pt[m+1][5];
            if(d0>d1){exchng(m); f=1;}
        }
        mx--;
    }while(f>0);
    for(m=0;m<cnt-1;m++){pt[m][0]=m+1;}
}
}
/**/
void exchng(short x){
    short n,d;
    for(n=0;n<17;n++){
        d=pt[x][n]; pt[x][n]=pt[x+1][n]; pt[x+1][n]=d;}
}
}
/**/

```

(Written by Kanji Setsuda on April 2, 2009 with MacOSX & Xcode 3)

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