

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

Section 7: Prototype Squares of Order 8: Kanji Setsuda

Let's study about the 'prototype squares' of order 8. Instead of looking after all possible types of squares of that order, I want to concentrate our study here only on the case of 'Composite and Complete' magic squares of order 8.

#1. What Properties does the 'Prototype Square' have?

Figure 1 below shows the primary representative form of prototype squares. As usual it is designed and made after the regular array 8 x 8.

[Figure 1: Primary Representative Form of Prototype Squares 8 x 8]

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

[Extended Form]

1. All 32 complementary pairs of 65 are located symmetrically.

$$1+64=2+63=3+62=4+61=5+60=6+59= \dots =31+34=32+33=65$$

It has the same property as any type of 'self-complementary' square has.

2. How about the sums of 8 entries on pan-diagonals?

$1+10+19+28+37+46+55+64=260;$	$1+16+23+30+37+44+51+58=260;$
$2+11+20+29+38+47+56+57=260;$	$2+9+24+31+38+45+52+59=260;$
$3+12+21+30+39+48+49+58=260;$	$3+10+17+32+39+46+53+60=260;$
$4+13+22+31+40+41+50+59=260;$	$4+11+18+25+40+47+54+61=260;$
$5+14+23+32+33+42+51+60=260;$	$5+12+19+26+33+48+55+62=260;$
$6+15+24+25+34+43+52+61=260;$	$6+13+20+27+34+41+56+63=260;$
$7+16+17+26+35+44+53+62=260;$	$7+14+21+28+35+42+49+64=260;$
$8+9+18+27+36+45+54+63=260;$	$8+15+22+29+36+43+50+57=260;$

Every 8 entries on any pan-diagonal add up to the same constant 260.

The primary representative form of prototype is thus already 'simultaneous' square of both self-complementary and pan-diagonal, although neither any row nor any column add up to the same sum 260.

3. You could find some other interesting properties such as:

$$1+10=2+9, \quad 2+11=3+10, \quad 3+12=4+11, \quad 4+13=5+12, \quad 5+14=6+13, \quad 6+15=7+14, \\ 7+16=8+15, \quad 8+9=1+16, \quad 9+18=10+17, \quad 10+19=11+18, \quad 11+20=12+19, \quad \dots,$$

$53+62=54+61$, $54+63=55+62$, $55+64=56+63$, $56+57=49+64$,
 $57+2=58+1$, $58+3=59+2$, $59+4=60+3$, $60+5=61+4$, , $62+7=63+6$, $63+8=64+7$,
 $64+1=57+8$ (Equalities of Cross-sums)
 $1+18=2+17$, $2+19=3+18$, $3+20=4+19$, , $1+11=3+9$, $2+12=4+10$, $3+13=5+11$,
 $4+14=6+12$, , $47+64=48+63$, $54+64=56+62$
 (Equalities of Cross-sums in broader sense)
 $1+8=2+7=3+6=4+5=9$, $9+16=10+15=11+14=12+13=25$, ,
 $1+57=9+49=17+41=25+33=58$, $2+58=10+50=18+42=26+34=60$,
 (Sums of outer pairs are equal to inner pairs.)

4. Try to permute and rearrange all entries under these conditions. How many different patterns could you make for the prototype squares?

#2. Which Object do you select for the Representative Model?

I want you to select your object Model from the set of solutions of 'Composite and Complete' magic squares of order 8.

It isn't true that there is only one for the best model and nothing else. You may select anyone you like. You can even make the model by yourself according to such series of transformations and recompositions shown as below.

[Figure 2: How to make the Model from the Start]

```

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

--> Exchange each Complementary pair of 65 -->
      1 63  3 ( )  ( )  6 58  8      1 63  3 61 60  6 58  8
     56 10 ( ) 12 13 ( ) 15 49      56 10 ( ) 12 13 ( ) 15 49
     17 ( ) 19 ( )  ( ) 22 ( ) 24      17 ( ) 19 ( )  ( ) 22 ( ) 24
      ( ) 26 ( ) 28 29 ( ) 31 ( )      40 26 ( ) 28 29 ( ) 31 33
      ( ) 34 ( ) 36 37 ( ) 39 ( )      32 34 ( ) 36 37 ( ) 39 25
     41 ( ) 43 ( )  ( ) 46 ( ) 48      41 ( ) 43 ( )  ( ) 46 ( ) 48
     16 50 ( ) 52 53 ( ) 55  9      16 50 ( ) 52 53 ( ) 55  9
     57  7 59 ( )  ( ) 62  2 64      57  7 59  5  4 62  2 64

--> Exchange each Complementary pair of 65 --> [Goal]
      1 63  3 61 60  6 58  8      1 63  3 61 60  6 58  8
     56 10 54 12 13 51 15 49      56 10 54 12 13 51 15 49
     17 47 19 ( )  ( ) 22 42 24      17 47 19 45 44 22 42 24
     40 26 ( ) 28 29 ( ) 31 33      40 26 38 28 29 35 31 33
     32 34 ( ) 36 37 ( ) 39 25      32 34 30 36 37 27 39 25
     41 23 43 ( )  ( ) 46 18 48      41 23 43 21 20 46 18 48
     16 50 14 52 53 11 55  9      16 50 14 52 53 11 55  9
     57  7 59  5  4 62  2 64      57  7 59  5  4 62  2 64

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

[Figure 3]

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

We now select Goal-2 on the right hand side above for the best model.

Compare the prototype and the object model carefully, and put the right conditions to the prototype.

#3. What Conditions do you have to put to the Prototype?

1. The object model is a 'Composite and Complete' magic square 8x8. It must have all complementary pairs of 65 strictly on all pan-diagonals. They are originally the complementary pairs located symmetrically in the prototype, and are reused and rearranged so to make the object 'complete'. Each pandiagonal is made up of 4 complementary pairs of 65 and adds up to the magic constant 260.

You must keep all complementary pairs of 65 active in the prototype and place them symmetrically.

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

2. Every 4 entries of any 2 x 2 block within the object must add up to the magic constant 130. It is defined for the property of 'composite' squares (sometimes called as 'most-perfect' squares).

For example, $n1+n2+n9+n10=1+63+56+10=130$, $n2+n3+n10+n11=63+3+10+54=130$,

\dots , $n49+n50+n57+n58=41+23+32+34=130$, \dots , $n55+n56+n63+n64=46+20+27+37=130$

What and how do they correspond to in the original?

In the prototype we know $n1+n10=n2+n9$, $n55+n64=n56+n63$ and $n1+n64=65$,
 $n2+n63=65$, $n9+n56=65$, $n10+n55=65$

$$\begin{aligned} \text{Therefore, } n1+n63+n56+n10 &= (n1+n10) + (n63+n56) = (n2+n9) + ((65-n2) + (65-n9)) \\ &= (n2+n9) - (n2+n9) + 130 = 130 \end{aligned}$$

If you put all complementary pairs of 65 and many equations of cross-sums to the prototype, composite conditions of the object are surely made active.

$$\begin{aligned} n1+n10=n2+n9, \quad n2+n11=n3+n10, \quad n3+n12=n4+n11, \quad n4+n13=n5+n12, \quad n5+n14=n6+n13, \\ n6+n15=n7+n14, \quad n7+n16=n8+n15, \quad n8+n9=n1+n16, \quad n9+n18=n10+n17, \quad n10+n19=n11+n18, \\ n11+n20=n12+n19, \quad \dots, \end{aligned}$$

$$\begin{aligned} n53+n62=n54+n61, \quad n54+n63=n55+n62, \quad n55+n64=n56+n63, \quad n56+n57=n49+n64, \\ n57+n2=n58+n1, \quad n58+n3=n59+n2, \quad n59+n4=n60+n3, \quad n60+n5=n61+n4, \quad \dots, \\ n62+n7=n63+n6, \quad n63+n8=n64+n7, \quad n64+n1=n57+n8 \quad (\text{Equalities of Cross-sums}) \end{aligned}$$

$$\begin{aligned} n1+n18=n2+n17, \quad n2+n19=n3+n18, \quad n3+n20=n4+n19, \quad \dots, \quad n1+n11=n3+n9, \\ n2+n12=n4+n10, \quad n3+n13=n5+n11, \quad n4+n14=n6+n12, \quad \dots, \quad n47+n64=n48+n63, \\ n54+n64=n56+n62 \end{aligned}$$

(Equalities of Cross-sums in broader sense)

How about the sum of every row or every column? For example:

$$\begin{aligned} \text{In the object: } P &= (n1+n9+n17+n25+n33+n41+n49+n57); \\ \text{and } Q &= (n8+n16+n24+n32+n40+n48+n56+n64); \end{aligned}$$

[Figure 3(Again): We made the best Model]

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

$$P+Q=(n1+n64)+(n8+n57)+(n9+n56)+(n16+n49)+(n17+n48)+(n24+n41)+(n25+n40)+n32+n33=8 \times 65=520$$

$$P+Q=(n1+n16+n17+n32+n40+n41+n56+n57)+(n8+n9+n24+n25+n33+n48+n49+n64)=R+S$$

$$R+S=(n1+n16+n17+n32+n40+n41+n56+n57)+(n1+n16+n17+n32+n40+n41+n56+n57)=520$$

Because $n1+n16=n8+n9$, $n17+n32=n24+n25$, $n40+n41=n33+n48$, $n56+n57=n49+n64$
 $R+S=520$; $R+R=520$; Therefore, $R=260$; $S=260$

Put the prototype all complementary pairs of 65 located symmetrically and many equations of cross-sums, and every row and every column of the object should add up to the same constant 260.

#4. Rules of "Do-it-After-the-Model" Transformation

We must make the rules of transformation as usual out of the selected model.

- (1) Put the value of $n1$ (in the original) into $n1$ (in the object).
- (2) Put the value of $n63$ (in the original) into $n2$ (in the object).
- (3) Put the value of $n3$ (in the original) into $n3$ (in the object).
- (4) Put the value of $n61$ (in the original) into $n4$ (in the object).
- (5) Put the value of $n8$ (in the original) into $n5$ (in the object).
- (6) Put the value of $n58$ (in the original) into $n6$ (in the object).
-
- (63) Put the value of $n27$ (in the original) into $n63$ (in the object).
- (64) Put the value of $n37$ (in the original) into $n64$ (in the object).

```

/**/
/* The Rules of Transformation */
/**/
void damt8(){
    d[1]=c[1];  d[2]=c[63];  d[3]=c[3];  d[4]=c[61];  d[5]=c[8];  d[6]=c[58];  d[7]=c[6];  d[8]=c[60];
    d[9]=c[56];  d[10]=c[10];  d[11]=c[54];  d[12]=c[12];  d[13]=c[49];  d[14]=c[15];  d[15]=c[51];  d[16]=c[13];
    d[17]=c[17];  d[18]=c[47];  d[19]=c[19];  d[20]=c[45];  d[21]=c[24];  d[22]=c[42];  d[23]=c[22];  d[24]=c[44];
    d[25]=c[40];  d[26]=c[26];  d[27]=c[38];  d[28]=c[28];  d[29]=c[33];  d[30]=c[31];  d[31]=c[35];  d[32]=c[29];
    d[33]=c[57];  d[34]=c[7];  d[35]=c[59];  d[36]=c[5];  d[37]=c[64];  d[38]=c[2];  d[39]=c[62];  d[40]=c[4];
    d[41]=c[16];  d[42]=c[50];  d[43]=c[14];  d[44]=c[52];  d[45]=c[9];  d[46]=c[55];  d[47]=c[11];  d[48]=c[53];
    d[49]=c[41];  d[50]=c[23];  d[51]=c[43];  d[52]=c[21];  d[53]=c[48];  d[54]=c[18];  d[55]=c[46];  d[56]=c[20];
    d[57]=c[32];  d[58]=c[34];  d[59]=c[30];  d[60]=c[36];  d[61]=c[25];  d[62]=c[39];  d[63]=c[27];  d[64]=c[37];
}
/**/

```

Apply these rules to the prototype solutions one after another, and you will get the corresponding object solutions automatically one after another.

Put the inequality conditions as $n1 < n32 < n60$ and $n1 < n37$; showing our respect to the object model, and list out and count the standard solutions of 'C&C' MS88.

Under these strict conditions we should be able to find 368640 solutions in all.

Check each composed result whether it is correct or not, finding neither repetition

nor drop-off of a certain number in that solution.

The list below shows you some extract examples of solution-pairs:

** 'Prototype Squares' of Order 8 and 'Composite and Complete'																**															
** Magic Squares Recomposed: List of Standard Solutions(Part)																**															
1/P /CC								305/P /CC																							
1 2 3 4 5 6 7 8	1 63 3 61 8 58 6 60	1 2 4 3 6 5 7 8	1 63 4 62 8 58 5 59	9 10 11 12 13 14 15 16	56 10 54 12 49 15 51 13	9 10 12 11 14 13 15 16	56 10 53 11 49 15 52 14	17 18 19 20 21 22 23 24	17 47 19 45 24 42 22 44	17 18 20 19 22 21 23 24	17 47 20 46 24 42 21 43	25 26 27 28 29 30 31 32	40 26 38 28 33 31 35 29	25 26 28 27 30 29 31 32	40 26 37 27 33 31 36 30	33 34 35 36 37 38 39 40	57 7 59 5 64 2 62 4	33 34 36 35 38 37 39 40	57 7 60 6 64 2 61 3	41 42 43 44 45 46 47 48	16 50 14 52 9 55 11 53	41 42 44 43 46 45 47 48	16 50 13 51 9 55 12 54	49 50 51 52 53 54 55 56	41 23 43 21 48 18 46 20	49 50 52 51 54 53 55 56	41 23 44 22 48 18 45 19	57 58 59 60 61 62 63 64	32 34 30 36 25 39 27 37	57 58 60 59 62 61 63 64	32 34 29 35 25 39 28 38
609/P /CC								889/P /CC																							
1 2 5 3 6 4 7 8	1 63 5 62 8 58 4 59	1 2 6 4 5 3 7 8	1 63 6 61 8 58 3 60	9 10 13 11 14 12 15 16	56 10 52 11 49 15 53 14	9 10 14 12 13 11 15 16	56 10 51 12 49 15 54 13	17 18 21 19 22 20 23 24	17 47 21 46 24 42 20 43	17 18 22 20 21 19 23 24	17 47 22 45 24 42 19 44	25 26 29 27 30 28 31 32	40 26 36 27 33 31 37 30	25 26 30 28 29 27 31 32	40 26 35 28 33 31 38 29	33 34 37 35 38 36 39 40	57 7 61 6 64 2 60 3	33 34 38 36 37 35 39 40	57 7 62 5 64 2 59 4	41 42 45 43 46 44 47 48	16 50 12 51 9 55 13 54	41 42 46 44 45 43 47 48	16 50 11 52 9 55 14 53	49 50 53 51 54 52 55 56	41 23 45 22 48 18 44 19	49 50 54 52 53 51 55 56	41 23 46 21 48 18 43 20	57 58 61 59 62 60 63 64	32 34 28 35 25 39 29 38	57 58 62 60 61 59 63 64	32 34 27 36 25 39 30 37
1169/P /CC								1409/P /CC																							
1 2 9 3 10 4 11 12	1 63 9 62 12 54 4 55	1 2 10 4 9 3 11 12	1 63 10 61 12 54 3 56	5 6 13 7 14 8 15 16	60 6 52 7 49 15 57 14	5 6 14 8 13 7 15 16	60 6 51 8 49 15 58 13	17 18 25 19 26 20 27 28	17 47 25 46 28 38 20 39	17 18 26 20 25 19 27 28	17 47 26 45 28 38 19 40	21 22 29 23 30 24 31 32	44 22 36 23 33 31 41 30	21 22 30 24 29 23 31 32	44 22 35 24 33 31 42 29	33 34 41 35 42 36 43 44	53 11 61 10 64 2 56 3	33 34 42 36 41 35 43 44	53 11 62 9 64 2 55 4	37 38 45 39 46 40 47 48	16 50 8 51 5 59 13 58	37 38 46 40 45 39 47 48	16 50 7 52 5 59 14 57	49 50 57 51 58 52 59 60	37 27 45 26 48 18 40 19	49 50 58 52 57 51 59 60	37 27 46 25 48 18 39 20	53 54 61 55 62 56 63 64	32 34 24 35 21 43 29 42	53 54 62 56 61 55 63 64	32 34 23 36 21 43 30 41
1649/P /CC								1833/P /CC																							
1 2 17 3 18 4 19 20	1 63 17 62 20 46 4 47	1 2 18 4 17 3 19 20	1 63 18 61 20 46 3 48	5 6 21 7 22 8 23 24	60 6 44 7 41 23 57 22	5 6 22 8 21 7 23 24	60 6 43 8 41 23 58 21	9 10 25 11 26 12 27 28	9 55 25 54 28 38 12 39	9 10 26 12 25 11 27 28	9 55 26 53 28 38 11 40	13 14 29 15 30 16 31 32	52 14 36 15 33 31 49 30	13 14 30 16 29 15 31 32	52 14 35 16 33 31 50 29	33 34 49 35 50 36 51 52	45 19 61 18 64 2 48 3	33 34 50 36 49 35 51 52	45 19 62 17 64 2 47 4	37 38 53 39 54 40 55 56	24 42 8 43 5 59 21 58	37 38 54 40 53 39 55 56	24 42 7 44 5 59 22 57	41 42 57 43 58 44 59 60	37 27 53 26 56 10 40 11	41 42 58 44 57 43 59 60	37 27 54 25 56 10 39 12	45 46 61 47 62 48 63 64	32 34 16 35 13 51 29 50	45 46 62 48 61 47 63 64	32 34 15 36 13 51 30 49
2017/P /CC								2129/P /CC																							
1 2 33 34 3 4 35 36	1 63 33 31 36 30 4 62	1 2 34 33 4 3 35 36	1 63 34 32 36 30 3 61	5 6 37 38 7 8 39 40	60 6 28 38 25 39 57 7	5 6 38 37 8 7 39 40	60 6 27 37 25 39 58 8	9 10 41 42 11 12 43 44	9 55 41 23 44 22 12 54	9 10 42 41 12 11 43 44	9 55 42 24 44 22 11 53	13 14 45 46 15 16 47 48	52 14 20 46 17 47 49 15	13 14 46 45 16 15 47 48	52 14 19 45 17 47 50 16	17 18 49 50 19 20 51 52	29 35 61 3 64 2 32 34	17 18 50 49 20 19 51 52	29 35 62 4 64 2 31 33	21 22 53 54 23 24 55 56	40 26 8 58 5 59 37 27	21 22 54 53 24 23 55 56	40 26 7 57 5 59 38 28	25 26 57 58 27 28 59 60	21 43 53 11 56 10 24 42	25 26 58 57 28 27 59 60	21 43 54 12 56 10 23 41	29 30 61 62 31 32 63 64	48 18 16 50 13 51 45 19	29 30 62 61 32 31 63 64	48 18 15 49 13 51 46 20
2241/P /CC								2545/P /CC																							
1 3 2 4 5 7 6 8	1 62 2 61 8 59 7 60	1 3 4 2 7 5 6 8	1 62 4 63 8 59 5 58	9 11 10 12 13 15 14 16	56 11 55 12 49 14 50 13	9 11 12 10 15 13 14 16	56 11 53 10 49 14 52 15	17 19 18 20 21 23 22 24	17 46 18 45 24 43 23 44	17 19 20 18 23 21 22 24	17 46 20 47 24 43 21 42	25 27 26 28 29 31 30 32	40 27 39 28 33 30 34 29	25 27 28 26 31 29 30 32	40 27 37 26 33 30 36 31	33 35 34 36 37 39 38 40	57 6 58 5 64 3 63 4	33 35 36 34 39 37 38 40	57 6 60 7 64 3 61 2	41 43 42 44 45 47 46 48	16 51 15 52 9 54 10 53	41 43 44 42 47 45 46 48	16 51 13 50 9 54 12 55	49 51 50 52 53 55 54 56	41 22 42 21 48 19 47 20	49 51 52 50 55 53 54 56	41 22 44 23 48 19 45 18	57 59 58 60 61 63 62 64	32 35 31 36 25 38 26 37	57 59 60 58 63 61 62 64	32 35 29 34 25 38 28 39
2849/P /CC								3129/P /CC																							
1 3 5 2 7 4 6 8	1 62 5 63 8 59 4 58	1 3 7 4 5 2 6 8	1 62 7 61 8 59 2 60	9 11 13 10 15 12 14 16	56 11 52 10 49 14 53 15	9 11 15 12 13 10 14 16	56 11 50 12 49 14 55 13	17 19 21 18 23 20 22 24	17 46 21 47 24 43 20 42	17 19 23 20 21 18 22 24	17 46 23 45 24 43 18 44	25 27 29 26 31 28 30 32	40 27 36 26 33 30 37 31	25 27 31 28 29 26 30 32	40 27 34 28 33 30 39 29	33 35 37 34 39 36 38 40	57 6 61 7 64 3 60 2	33 35 39 36 37 34 38 40	57 6 63 5 64 3 58 4	41 43 45 42 47 44 46 48	16 51 12 50 9 54 13 55	41 43 47 44 45 42 46 48	16 51 10 52 9 54 15 53	49 51 53 50 55 52 54 56	41 22 45 23 48 19 44 18	49 51 55 52 53 50 54 56	41 22 47 21 48 19 42 20	57 59 61 58 63 60 62 64	32 35 28 34 25 38 29 39	57 59 63 60 61 58 62 64	32 35 26 36 25 38 31 37

3409/P /CC
1 3 9 2 11 4 10 12
5 7 13 6 15 8 14 16
17 19 25 18 27 20 26 28
21 23 29 22 31 24 30 32
33 35 41 34 43 36 42 44
37 39 45 38 47 40 46 48
49 51 57 50 59 52 58 60
53 55 61 54 63 56 62 64

3889/P /CC
1 3 17 2 19 4 18 20
5 7 21 6 23 8 22 24
9 11 25 10 27 12 26 28
13 15 29 14 31 16 30 32
33 35 49 34 51 36 50 52
37 39 53 38 55 40 54 56
41 43 57 42 59 44 58 60
45 47 61 46 63 48 62 64

4257/P /CC
1 3 33 35 2 4 34 36
5 7 37 39 6 8 38 40
9 11 41 43 10 12 42 44
13 15 45 47 14 16 46 48
17 19 49 51 18 20 50 52
21 23 53 55 22 24 54 56
25 27 57 59 26 28 58 60
29 31 61 63 30 32 62 64

4481/P /CC
1 4 2 3 6 7 5 8
9 12 10 11 14 15 13 16
17 20 18 19 22 23 21 24
25 28 26 27 30 31 29 32
33 36 34 35 38 39 37 40
41 44 42 43 46 47 45 48
49 52 50 51 54 55 53 56
57 60 58 59 62 63 61 64

7889/P /CC
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57 62 58 60 61 63 59 64

10177/P /CC
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13281/P /CC
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53 63 55 56 61 62 54 64

15233/P /CC
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3649/P /CC
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53 55 63 56 61 54 62 64

4073/P /CC
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45 47 63 48 61 46 62 64

4369/P /CC
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5697/P /CC
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9057/P /CC
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12209/P /CC
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53 62 54 56 61 63 55 64

14305/P /CC
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16929/P /CC
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17825/P /CC
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19425/P /CC
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21121/P /CC
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22289/P /CC
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23041/P /CC
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26497/P /CC
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29905/P /CC
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33217/P /CC
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18673/P /CC
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20001/P /CC
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21729/P /CC
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22753/P /CC
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25281/P /CC
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28737/P /CC
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32097/P /CC
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34289/P /CC
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36321/P /CC
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38273/P /CC
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40865/P /CC
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42465/P /CC
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43649/P /CC
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45329/P /CC
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46081/P /CC
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91393/P /CC
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37345/P /CC
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39169/P /CC
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41713/P /CC
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43041/P /CC
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44769/P /CC
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45793/P /CC
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68737/P /CC
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113089/P /CC
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134785/P

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177409/P

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213889/P

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249601/P

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283393/P

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316417/P

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329473/P

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341761/P

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156097/P

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195649/P

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231745/P

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266497/P

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299905/P

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322945/P

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335617/P

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346945/P

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#5. Comment

I say the concept of 'prototype squares' and the application 'Do-it-After-the-Model Transformation' are not my original inventions. I must confess I borrowed them from the basic ideas of English mathematicians, Drs. Ollerenshaw and Brae.

They call the prototype ones "Reversible Squares" in their page and applied their inventions only to the 'most-perfect' magic type (equivalent to our 'C&C' magic one) of order 4, 8, 12, 16,

I wanted to extend their ideas, and examined various cases by applying them to any kind of magic squares of any order, almost everything.

I must have extended their 'Reversible Squares' to our 'Prototype Squares' at last in order to make them so general that they could be anything, even be un-reversible.

And then I wanted to make the application 'DAMT' stand explicitly upright for us, and liberate it from any theoretical dogmatism. For I thought the object model and the 'DAMT' are essentially independent from the Prototype Squares in a sense of existence. The world of prototype and the one of object are 'parallel', and the 'DAMT

could build the 'magic bridge' between them.

It is Drs. Ollerenshaw and Brae that found the possibility of such a wonderful bridge for the first time, and discovered the beautiful correspondence between those 'parallel worlds'. Their contributions are really praiseworthy, I should say.

They mentioned in their page about Ten "Principal" Reversible Squares of order 8.

But what are the 'most-perfect' magic squares of order 8 corresponding to them?

How could we really find those most-fundamental ten solutions and discover any distinguished properties with them?

#6. What does our Study of 6-Dimensional Magic Objects of Order 2 tell us?

Now I must mention a little about my recent study of 6-dimensional extra-cubic magic objects of order 2. It tells us something interesting.

I invented the way how to compose such objects and how to decompose them into lower dimensional magic squares of higher order.

As a result I could find there are the most fundamental solutions of 'Composite and Complete' magic squares of order 8. How many? Ten, yes, 10.

The solution list below shows them in all.

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

[Count = 10] OK!

The combination of new object Model and the set of 'Principal' prototype solutions could certainly recompose the most fundamental ten solutions of 'C&C' MS88.

Can we recompose all 368640 standard solutions of 'C&C' MS88 by the same model and the same 'DAMT', then? The next list shows a part of the result.

** 'Prototype Squares' of Order 8 and 'Composite and Complete'																**													
** Magic Squares 8x8 Recomposed: List of Standard Solutions:																**													
1/P								/CC								49/P				/CC									
1 2 3 4 5 6 7 8	1 63 4 62 8 58 5 59	1 2 3 4 9 10 11 12	1 63 4 62 12 54 9 55	9 10 11 12 13 14 15 16	56 10 53 11 49 15 52 14	5 6 7 8 13 14 15 16	60 6 57 7 49 15 52 14	17 18 19 20 21 22 23 24	25 39 28 38 32 34 29 35	17 18 19 20 25 26 27 28	21 43 24 42 32 34 29 35	25 26 27 28 29 30 31 32	48 18 45 19 37 27 40 26	33 34 35 36 37 38 39 40	57 7 60 6 64 2 61 3	33 34 35 36 41 42 43 44	53 11 56 10 64 2 61 3	41 42 43 44 45 46 47 48	16 50 13 51 9 55 12 54	37 38 39 40 45 46 47 48	16 50 13 51 5 59 8 58	49 50 51 52 53 54 55 56	33 31 36 30 40 26 37 27	49 50 51 52 57 58 59 60	33 31 36 30 44 22 41 23	57 58 59 60 61 62 63 64	24 42 21 43 17 47 20 46	53 54 55 56 61 62 63 64	28 38 25 39 17 47 20 46
97/P								/CC								145/P				/CC									
1 2 3 4 17 18 19 20	1 63 4 62 20 46 17 47	1 2 3 4 33 34 35 36	1 63 4 62 36 30 33 31	5 6 7 8 21 22 23 24	60 6 57 7 41 23 44 22	5 6 7 8 37 38 39 40	60 6 57 7 25 39 28 38	9 10 11 12 25 26 27 28	13 51 16 50 32 34 29 35	9 10 11 12 41 42 43 44	13 51 16 50 48 18 45 19	13 14 15 16 29 30 31 32	56 10 53 11 37 27 40 26	33 34 35 36 49 50 51 52	45 19 48 18 64 2 61 3	17 18 19 20 49 50 51 52	29 35 32 34 64 2 61 3	37 38 39 40 53 54 55 56	24 42 21 43 5 59 8 58	21 22 23 24 53 54 55 56	40 26 37 27 5 59 8 58	41 42 43 44 57 58 59 60	33 31 36 30 52 14 49 15	25 26 27 28 57 58 59 60	17 47 20 46 52 14 49 15	45 46 47 48 61 62 63 64	28 38 25 39 9 55 12 54	29 30 31 32 61 62 63 64	44 22 41 23 9 55 12 54
193/P								/CC								241/P				/CC									
1 2 3 5 4 6 7 8	1 63 5 62 8 58 4 59	1 2 3 9 4 10 11 12	1 63 9 62 12 54 4 55	9 10 11 13 12 14 15 16	56 10 52 11 49 15 53 14	5 6 7 13 8 14 15 16	60 6 52 7 49 15 57 14	17 18 19 21 20 22 23 24	25 39 29 38 32 34 28 35	17 18 19 25 20 26 27 28	21 43 29 42 32 34 24 35	25 26 27 29 28 30 31 32	48 18 44 19 41 23 45 22	33 34 35 37 36 38 39 40	57 7 61 6 64 2 60 3	33 34 35 41 36 42 43 44	53 11 61 10 64 2 56 3	41 42 43 45 44 46 47 48	16 50 12 51 9 55 13 54	37 38 39 45 40 46 47 48	16 50 8 51 5 59 13 58	49 50 51 53 52 54 55 56	33 31 37 30 40 26 36 27	49 50 51 57 52 58 59 60	33 31 41 30 44 22 36 23	57 58 59 61 60 62 63 64	24 42 20 43 17 47 21 46	53 54 55 61 56 62 63 64	28 38 20 39 17 47 25 46
289/P								/CC								337/P				/CC									
1 2 3 17 4 18 19 20	1 63 17 62 20 46 4 47	1 2 3 33 4 34 35 36	1 63 33 62 36 30 4 31	5 6 7 21 8 22 23 24	60 6 44 7 41 23 57 22	5 6 7 37 8 38 39 40	60 6 28 7 25 39 57 38	9 10 11 25 12 26 27 28	13 51 29 50 32 34 16 35	9 10 11 41 12 42 43 44	13 51 45 50 48 18 16 19	13 14 15 29 16 30 31 32	56 10 40 11 37 27 53 26	33 34 35 49 36 50 51 52	45 19 61 18 64 2 48 3	17 18 19 49 20 50 51 52	29 35 61 34 64 2 32 3	37 38 39 53 40 54 55 56	24 42 8 43 5 59 21 58	21 22 23 53 24 54 55 56	40 26 8 27 5 59 37 58	41 42 43 57 44 58 59 60	33 31 49 30 52 14 36 15	25 26 27 57 28 58 59 60	17 47 49 46 52 14 20 15	45 46 47 61 48 62 63 64	28 38 12 39 9 55 25 54	29 30 31 61 32 62 63 64	44 22 12 23 9 55 41 54
385/P								/CC								433/P				/CC									
1 2 4 3 6 5 7 8	1 63 3 61 8 58 6 60	1 2 4 3 10 9 11 12	1 63 3 61 12 54 10 56	9 10 12 11 14 13 15 16	56 10 54 12 49 15 51 13	5 6 8 7 14 13 15 16	60 6 58 8 49 15 51 13	17 18 20 19 22 21 23 24	25 39 27 37 32 34 30 36	17 18 20 19 26 25 27 28	21 43 23 41 32 34 30 36	25 26 28 27 30 29 31 32	48 18 46 20 41 23 43 21	33 34 36 35 38 37 39 40	57 7 59 5 64 2 62 4	33 34 36 35 42 41 43 44	53 11 55 9 64 2 62 4	41 42 44 43 46 45 47 48	16 50 14 52 9 55 11 53	37 38 40 39 46 45 47 48	16 50 14 52 5 59 7 57	49 50 52 51 54 53 55 56	33 31 35 29 40 26 38 28	49 50 52 51 58 57 59 60	33 31 35 29 44 22 42 24	57 58 60 59 62 61 63 64	24 42 22 44 17 47 19 45	53 54 56 55 62 61 63 64	28 38 26 40 17 47 19 45
481/P								/CC								529/P				/CC									
1 2 4 3 18 17 19 20	1 63 3 61 20 46 18 48	1 2 4 3 34 33 35 36	1 63 3 61 36 30 34 32	5 6 8 7 22 21 23 24	60 6 58 8 41 23 43 21	5 6 8 7 38 37 39 40	60 6 58 8 25 39 27 37	9 10 12 11 26 25 27 28	13 51 15 49 32 34 30 36	9 10 12 11 42 41 43 44	13 51 15 49 48 18 46 20	13 14 16 15 30 29 31 32	56 10 54 12 37 27 39 25	33 34 36 35 50 49 51 52	45 19 47 17 64 2 62 4	17 18 20 19 50 49 51 52	29 35 31 33 64 2 62 4	37 38 40 39 54 53 55 56	24 42 22 44 5 59 7 57	21 22 24 23 54 53 55 56	40 26 38 28 5 59 7 57	41 42 44 43 58 57 59 60	33 31 35 29 52 14 50 16	25 26 28 27 58 57 59 60	17 47 19 45 52 14 50 16	45 46 48 47 62 61 63 64	28 38 26 40 9 55 11 53	29 30 32 31 62 61 63 64	44 22 42 24 9 55 11 53
577/P								/CC								625/P				/CC									
1 2 4 6 3 5 7 8	1 63 6 61 8 58 3 60	1 2 4 10 3 9 11 12	1 63 10 61 12 54 3 56	9 10 12 14 11 13 15 16	56 10 51 12 49 15 54 13	5 6 8 14 7 13 15 16	60 6 51 8 49 15 58 13	17 18 20 22 19 21 23 24	25 39 30 37 32 34 27 36	17 18 20 26 19 25 27 28	21 43 30 41 32 34 23 36	25 26 28 30 27 29 31 32	48 18 43 20 41 23 46 21	33 34 36 38 35 37 39 40	57 7 62 5 64 2 59 4	33 34 36 42 35 41 43 44	53 11 62 9 64 2 55 4	41 42 44 46 43 45 47 48	16 50 11 52 9 55 14 53	37 38 40 46 39 45 47 48	16 50 7 52 5 59 14 57	49 50 52 54 51 53 55 56	33 31 38 29 40 26 35 28	49 50 52 58 51 57 59 60	33 31 42 29 44 22 35 24	57 58 60 62 59 61 63 64	24 42 19 44 17 47 22 45	53 54 56 62 55 61 63 64	28 38 19 40 17 47 26 45

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

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

1537/P /CC
1 2 9 3 10 4 11 12 1 63 3 56 12 54 10 61
5 6 13 7 14 8 15 16 60 6 58 13 49 15 51 8
17 18 25 19 26 20 27 28 21 43 23 36 32 34 30 41
21 22 29 23 30 24 31 32 48 18 46 25 37 27 39 20
33 34 41 35 42 36 43 44 53 11 55 4 64 2 62 9
37 38 45 39 46 40 47 48 16 50 14 57 5 59 7 52
49 50 57 51 58 52 59 60 33 31 35 24 44 22 42 29
53 54 61 55 62 56 63 64 28 38 26 45 17 47 19 40

2305/P /CC
1 2 17 3 18 4 19 20 1 63 3 48 20 46 18 61
5 6 21 7 22 8 23 24 60 6 58 21 41 23 43 8
9 10 25 11 26 12 27 28 13 51 15 36 32 34 30 49
13 14 29 15 30 16 31 32 56 10 54 25 37 27 39 12
33 34 49 35 50 36 51 52 45 19 47 4 64 2 62 17
37 38 53 39 54 40 55 56 24 42 22 57 5 59 7 44
41 42 57 43 58 44 59 60 33 31 35 16 52 14 50 29
45 46 61 47 62 48 63 64 28 38 26 53 9 55 11 40

3073/P /CC
1 2 33 3 34 4 35 36 1 63 3 32 36 30 34 61
5 6 37 7 38 8 39 40 60 6 58 37 25 39 27 8
9 10 41 11 42 12 43 44 13 51 15 20 48 18 46 49
13 14 45 15 46 16 47 48 56 10 54 41 21 43 23 12
17 18 49 19 50 20 51 52 29 35 31 4 64 2 62 33
21 22 53 23 54 24 55 56 40 26 38 57 5 59 7 28
25 26 57 27 58 28 59 60 17 47 19 16 52 14 50 45
29 30 61 31 62 32 63 64 44 22 42 53 9 55 11 24

3841/P /CC
1 3 2 4 5 7 6 8 1 62 4 63 8 59 5 58
9 11 10 12 13 15 14 16 56 11 53 10 49 14 52 15
17 19 18 20 21 23 22 24 25 38 28 39 32 35 29 34
25 27 26 28 29 31 30 32 48 19 45 18 41 22 44 23
33 35 34 36 37 39 38 40 57 6 60 7 64 3 61 2
41 43 42 44 45 47 46 48 16 51 13 50 9 54 12 55
49 51 50 52 53 55 54 56 33 30 36 31 40 27 37 26
57 59 58 60 61 63 62 64 24 43 21 42 17 46 20 47

4609/P /CC
1 3 5 2 7 4 6 8 1 62 2 60 8 59 7 61
9 11 13 10 15 12 14 16 56 11 55 13 49 14 50 12
17 19 21 18 23 20 22 24 25 38 26 36 32 35 31 37
25 27 29 26 31 28 30 32 48 19 47 21 41 22 42 20
33 35 37 34 39 36 38 40 57 6 58 4 64 3 63 5
41 43 45 42 47 44 46 48 16 51 15 53 9 54 10 52
49 51 53 50 55 52 54 56 33 30 34 28 40 27 39 29
57 59 61 58 63 60 62 64 24 43 23 45 17 46 18 44

5281/P /CC
1 3 9 2 11 4 10 12 1 62 2 56 12 55 11 61
5 7 13 6 15 8 14 16 60 7 59 13 49 14 50 8
17 19 25 18 27 20 26 28 21 42 22 36 32 35 31 41
21 23 29 22 31 24 30 32 48 19 47 25 37 26 38 20
33 35 41 34 43 36 42 44 53 10 54 4 64 3 63 9
37 39 45 38 47 40 46 48 16 51 15 57 5 58 6 52
49 51 57 50 59 52 58 60 33 30 34 24 44 23 43 29
53 55 61 54 63 56 62 64 28 39 27 45 17 46 18 40

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

1153/P /CC
1 2 6 4 5 3 7 8 1 63 4 59 8 58 5 62
9 10 14 12 13 11 15 16 56 10 53 14 49 15 52 11
17 18 22 20 21 19 23 24 25 39 28 35 32 34 29 38
25 26 30 28 29 27 31 32 48 18 45 22 41 23 44 19
33 34 38 36 37 35 39 40 57 7 60 3 64 2 61 6
41 42 46 44 45 43 47 48 16 50 13 54 9 55 12 51
49 50 54 52 53 51 55 56 33 31 36 27 40 26 37 30
57 58 62 60 61 59 63 64 24 42 21 46 17 47 20 43

1921/P /CC
1 2 10 4 9 3 11 12 1 63 4 55 12 54 9 62
5 6 14 8 13 7 15 16 60 6 57 14 49 15 52 7
17 18 26 20 25 19 27 28 21 43 24 35 32 34 29 42
21 22 30 24 29 23 31 32 48 18 45 26 37 27 40 19
33 34 42 36 41 35 43 44 53 11 56 3 64 2 61 10
37 38 46 40 45 39 47 48 16 50 13 58 5 59 8 51
49 50 58 52 57 51 59 60 33 31 36 23 44 22 41 30
53 54 62 56 61 55 63 64 28 38 25 46 17 47 20 39

2689/P /CC
1 2 18 4 17 3 19 20 1 63 4 47 20 46 17 62
5 6 22 8 21 7 23 24 60 6 57 22 41 23 44 7
9 10 26 12 25 11 27 28 13 51 16 35 32 34 29 50
13 14 30 16 29 15 31 32 56 10 53 26 37 27 40 11
33 34 50 36 49 35 51 52 45 19 48 3 64 2 61 18
37 38 54 40 53 39 55 56 24 42 21 58 5 59 8 43
41 42 58 44 57 43 59 60 33 31 36 15 52 14 49 30
45 46 62 48 61 47 63 64 28 38 25 54 9 55 12 39

3457/P /CC
1 2 34 4 33 3 35 36 1 63 4 31 36 30 33 62
5 6 38 8 37 7 39 40 60 6 57 38 25 39 28 7
9 10 42 12 41 11 43 44 13 51 16 19 48 18 45 50
13 14 46 16 45 15 47 48 56 10 53 42 21 43 24 11
17 18 50 20 49 19 51 52 29 35 32 3 64 2 61 34
21 22 54 24 53 23 55 56 40 26 37 58 5 59 8 27
25 26 58 28 57 27 59 60 17 47 20 15 52 14 49 46
29 30 62 32 61 31 63 64 44 22 41 54 9 55 12 23

4225/P /CC
1 3 4 2 7 5 6 8 1 62 2 61 8 59 7 60
9 11 12 10 15 13 14 16 56 11 55 12 49 14 50 13
17 19 20 18 23 21 22 24 25 38 26 37 32 35 31 36
25 27 28 26 31 29 30 32 48 19 47 20 41 22 42 21
33 35 36 34 39 37 38 40 57 6 58 5 64 3 63 4
41 43 44 42 47 45 46 48 16 51 15 52 9 54 10 53
49 51 52 50 55 53 54 56 33 30 34 29 40 27 39 28
57 59 60 58 63 61 62 64 24 43 23 44 17 46 18 45

4945/P /CC
1 3 7 4 5 2 6 8 1 62 4 58 8 59 5 63
9 11 15 12 13 10 14 16 56 11 53 15 49 14 52 10
17 19 23 20 21 18 22 24 25 38 28 34 32 35 29 39
25 27 31 28 29 26 30 32 48 19 45 23 41 22 44 18
33 35 39 36 37 34 38 40 57 6 60 2 64 3 61 7
41 43 47 44 45 42 46 48 16 51 13 55 9 54 12 50
49 51 55 52 53 50 54 56 33 30 36 26 40 27 37 31
57 59 63 60 61 58 62 64 24 43 21 47 17 46 20 42

5617/P /CC
1 3 11 4 9 2 10 12 1 62 4 54 12 55 9 63
5 7 15 8 13 6 14 16 60 7 57 15 49 14 52 6
17 19 27 20 25 18 26 28 21 42 24 34 32 35 29 43
21 23 31 24 29 22 30 32 48 19 45 27 37 26 40 18
33 35 43 36 41 34 42 44 53 10 56 2 64 3 61 11
37 39 47 40 45 38 46 48 16 51 13 59 5 58 8 50
49 51 59 52 57 50 58 60 33 30 36 22 44 23 41 31
53 55 63 56 61 54 62 64 28 39 25 47 17 46 20 38

5953/P /CC
1 3 17 2 19 4 18 20
5 7 21 6 23 8 22 24
9 11 25 10 27 12 26 28
13 15 29 14 31 16 30 32
33 35 49 34 51 36 50 52
37 39 53 38 55 40 54 56
41 43 57 42 59 44 58 60
45 47 61 46 63 48 62 64

6625/P /CC
1 3 33 2 35 4 34 36
5 7 37 6 39 8 38 40
9 11 41 10 43 12 42 44
13 15 45 14 47 16 46 48
17 19 49 18 51 20 50 52
21 23 53 22 55 24 54 56
25 27 57 26 59 28 58 60
29 31 61 30 63 32 62 64

7297/P /CC
1 4 2 3 6 7 5 8
9 12 10 11 14 15 13 16
17 20 18 19 22 23 21 24
25 28 26 27 30 31 29 32
33 36 34 35 38 39 37 40
41 44 42 43 46 47 45 48
49 52 50 51 54 55 53 56
57 60 58 59 62 63 61 64

11713/P /CC
1 6 2 4 5 7 3 8
9 14 10 12 13 15 11 16
17 22 18 20 21 23 19 24
25 30 26 28 29 31 27 32
33 38 34 36 37 39 35 40
41 46 42 44 45 47 43 48
49 54 50 52 53 55 51 56
57 62 58 60 61 63 59 64

14401/P /CC
1 9 2 3 10 11 4 12
17 25 18 19 26 27 20 28
5 13 6 7 14 15 8 16
21 29 22 23 30 31 24 32
33 41 34 35 42 43 36 44
49 57 50 51 58 59 52 60
37 45 38 39 46 47 40 48
53 61 54 55 62 63 56 64

17537/P /CC
1 11 3 4 9 10 2 12
17 27 19 20 25 26 18 28
5 15 7 8 13 14 6 16
21 31 23 24 29 30 22 32
33 43 35 36 41 42 34 44
49 59 51 52 57 58 50 60
37 47 39 40 45 46 38 48
53 63 55 56 61 62 54 64

19585/P /CC
1 17 2 3 18 19 4 20
33 49 34 35 50 51 36 52
5 21 6 7 22 23 8 24
9 25 10 11 26 27 12 28
37 53 38 39 54 55 40 56
41 57 42 43 58 59 44 60
13 29 14 15 30 31 16 32
45 61 46 47 62 63 48 64

21313/P /CC
1 19 3 4 17 18 2 20
33 51 35 36 49 50 34 52
5 23 7 8 21 22 6 24
9 27 11 12 25 26 10 28
37 55 39 40 53 54 38 56
41 59 43 44 57 58 42 60
13 31 15 16 29 30 14 32
45 63 47 48 61 62 46 64

6289/P /CC
1 3 19 4 17 2 18 20
5 7 23 8 21 6 22 24
9 11 27 12 25 10 26 28
13 15 31 16 29 14 30 32
33 35 51 36 49 34 50 52
37 39 55 40 53 38 54 56
41 43 59 44 57 42 58 60
45 47 63 48 61 46 62 64

6961/P /CC
1 3 35 4 33 2 34 36
5 7 39 8 37 6 38 40
9 11 43 12 41 10 42 44
13 15 47 16 45 14 46 48
17 19 51 20 49 18 50 52
21 23 55 24 53 22 54 56
25 27 59 28 57 26 58 60
29 31 63 32 61 30 62 64

8833/P /CC
1 5 2 3 6 7 4 8
9 13 10 11 14 15 12 16
17 21 18 19 22 23 20 24
25 29 26 27 30 31 28 32
33 37 34 35 38 39 36 40
41 45 42 43 46 47 44 48
49 53 50 51 54 55 52 56
57 61 58 59 62 63 60 64

13057/P /CC
1 7 3 4 5 6 2 8
9 15 11 12 13 14 10 16
17 23 19 20 21 22 18 24
25 31 27 28 29 30 26 32
33 39 35 36 37 38 34 40
41 47 43 44 45 46 42 48
49 55 51 52 53 54 50 56
57 63 59 60 61 62 58 64

16513/P /CC
1 10 2 4 9 11 3 12
17 26 18 20 25 27 19 28
5 14 6 8 13 15 7 16
21 30 22 24 29 31 23 32
33 42 34 36 41 43 35 44
49 58 50 52 57 59 51 60
37 46 38 40 45 47 39 48
53 62 54 56 61 63 55 64

18561/P /CC
1 13 5 6 9 10 2 14
17 29 21 22 25 26 18 30
3 15 7 8 11 12 4 16
19 31 23 24 27 28 20 32
33 45 37 38 41 42 34 46
49 61 53 54 57 58 50 62
35 47 39 40 43 44 36 48
51 63 55 56 59 60 52 64

20737/P /CC
1 18 2 4 17 19 3 20
33 50 34 36 49 51 35 52
5 22 6 8 21 23 7 24
9 26 10 12 25 27 11 28
37 54 38 40 53 55 39 56
41 58 42 44 57 59 43 60
13 30 14 16 29 31 15 32
45 62 46 48 61 63 47 64

21889/P /CC
1 21 5 6 17 18 2 22
33 53 37 38 49 50 34 54
3 23 7 8 19 20 4 24
9 29 13 14 25 26 10 30
35 55 39 40 51 52 36 56
41 61 45 46 57 58 42 62
11 31 15 16 27 28 12 32
43 63 47 48 59 60 44 64

22465/P /CC

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

46081/P /CC

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

91393/P /CC

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

134785/P /CC

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

177409/P /CC

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

213889/P /CC

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

249601/P /CC

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

283393/P /CC

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

23041/P /CC

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

68737/P /CC

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

113089/P /CC

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

156097/P /CC

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

195649/P /CC

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

231745/P /CC

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

266497/P /CC

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

299905/P /CC

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

17 1 2 3 18 19 20 4	316417/P /CC	17 64 3 63 4 45 18 46	322945/P /CC	18 1 2 4 17 19 20 3	18 64 4 63 3 45 17 46
21 5 6 7 22 23 24 8		44 5 58 6 57 24 43 23		22 5 6 8 21 23 24 7	43 5 57 6 58 24 44 23
49 33 34 35 50 51 52 36		25 56 11 55 12 37 26 38		50 33 34 36 49 51 52 35	26 56 12 55 11 37 25 38
25 9 10 11 26 27 28 12		16 33 30 34 29 52 15 51		26 9 10 12 25 27 28 11	15 33 29 34 30 52 16 51
53 37 38 39 54 55 56 40		61 20 47 19 48 1 62 2		54 37 38 40 53 55 56 39	62 20 48 19 47 1 61 2
29 13 14 15 30 31 32 16		8 41 22 42 21 60 7 59		30 13 14 16 29 31 32 15	7 41 21 42 22 60 8 59
57 41 42 43 58 59 60 44		53 28 39 27 40 9 54 10		58 41 42 44 57 59 60 43	54 28 40 27 39 9 53 10
61 45 46 47 62 63 64 48		36 13 50 14 49 32 35 31		62 45 46 48 61 63 64 47	35 13 49 14 50 32 36 31
19 1 3 4 17 18 20 2	329473/P /CC	19 64 4 62 2 45 17 47	335617/P /CC	20 2 3 4 17 18 19 1	20 63 4 62 1 46 17 47
23 5 7 8 21 22 24 6		42 5 57 7 59 24 44 22		24 6 7 8 21 22 23 5	41 6 57 7 60 23 44 22
51 33 35 36 49 50 52 34		27 56 12 54 10 37 25 39		52 34 35 36 49 50 51 33	28 55 12 54 9 38 25 39
27 9 11 12 25 26 28 10		14 33 29 35 31 52 16 50		28 10 11 12 25 26 27 9	13 34 29 35 32 51 16 50
55 37 39 40 53 54 56 38		63 20 48 18 46 1 61 3		56 38 39 40 53 54 55 37	64 19 48 18 45 2 61 3
31 13 15 16 29 30 32 14		6 41 21 43 23 60 8 58		32 14 15 16 29 30 31 13	5 42 21 43 24 59 8 58
59 41 43 44 57 58 60 42		55 28 40 26 38 9 53 11		60 42 43 44 57 58 59 41	56 27 40 26 37 10 53 11
63 45 47 48 61 62 64 46		34 13 49 15 51 32 36 30		64 46 47 48 61 62 63 45	33 14 49 15 52 31 36 30
21 1 5 6 17 18 22 2	341761/P /CC	21 64 6 60 2 43 17 47	346945/P /CC	22 2 5 6 17 18 21 1	22 63 6 60 1 44 17 47
23 3 7 8 19 20 24 4		42 3 57 7 61 24 46 20		24 4 7 8 19 20 23 3	41 4 57 7 62 23 46 20
53 33 37 38 49 50 54 34		29 56 14 52 10 35 25 39		54 34 37 38 49 50 53 33	30 55 14 52 9 36 25 39
29 9 13 14 25 26 30 10		12 33 27 37 31 54 16 50		30 10 13 14 25 26 29 9	11 34 27 37 32 53 16 50
55 35 39 40 51 52 56 36		63 22 48 18 44 1 59 5		56 36 39 40 51 52 55 35	64 21 48 18 43 2 59 5
31 11 15 16 27 28 32 12		4 41 19 45 23 62 8 58		32 12 15 16 27 28 31 11	3 42 19 45 24 61 8 58
61 41 45 46 57 58 62 42		55 30 40 26 36 9 51 13		62 42 45 46 57 58 61 41	56 29 40 26 35 10 51 13
63 43 47 48 59 60 64 44		34 11 49 15 53 32 38 28		64 44 47 48 59 60 63 43	33 12 49 15 54 31 38 28
23 3 5 7 17 19 21 1	352129/P /CC	23 62 7 60 1 44 17 46	356929/P /CC	24 4 6 8 18 20 22 2	24 61 8 59 2 43 18 45
24 4 6 8 18 20 22 2		41 4 57 6 63 22 47 20		23 3 5 7 17 19 21 1	42 3 58 5 64 21 48 19
55 35 37 39 49 51 53 33		31 54 15 52 9 36 25 38		55 35 37 39 49 51 53 33	31 54 15 52 9 36 25 38
31 11 13 15 25 27 29 9		10 35 26 37 32 53 16 51		31 11 13 15 25 27 29 9	10 35 26 37 32 53 16 51
56 36 38 40 50 52 54 34		64 21 48 19 42 3 58 5		56 36 38 40 50 52 54 34	63 22 47 20 41 4 57 6
32 12 14 16 26 28 30 10		2 43 18 45 24 61 8 59		32 12 14 16 26 28 30 10	1 44 17 46 23 62 7 60
63 43 45 47 57 59 61 41		56 29 40 27 34 11 50 13		64 44 46 48 58 60 62 42	56 29 40 27 34 11 50 13
64 44 46 48 58 60 62 42		33 12 49 14 55 30 39 28		63 43 45 47 57 59 61 41	33 12 49 14 55 30 39 28
25 9 1 10 17 26 18 2	361729/P /CC	25 56 10 64 2 47 17 39	363457/P /CC	26 9 2 10 17 25 18 1	26 56 10 63 1 47 17 40
27 11 3 12 19 28 20 4		38 11 53 3 61 20 46 28		28 11 4 12 19 27 20 3	37 11 53 4 62 20 46 27
57 41 33 42 49 58 50 34		29 52 14 60 6 43 21 35		58 41 34 42 49 57 50 33	30 52 14 59 5 43 21 36
29 13 5 14 21 30 22 6		8 41 23 33 31 50 16 58		30 13 6 14 21 29 22 5	7 41 23 34 32 50 16 57
59 43 35 44 51 60 52 36		63 18 48 26 40 9 55 1		60 43 36 44 51 59 52 35	64 18 48 25 39 9 55 2
31 15 7 16 23 32 24 8		4 45 19 37 27 54 12 62		32 15 8 16 23 31 24 7	3 45 19 38 28 54 12 61
61 45 37 46 53 62 54 38		59 22 44 30 36 13 51 5		62 45 38 46 53 61 54 37	60 22 44 29 35 13 51 6
63 47 39 48 55 64 56 40		34 15 49 7 57 24 42 32		64 47 40 48 55 63 56 39	33 15 49 8 58 24 42 31
27 9 3 11 17 25 19 1	365185/P /CC	27 56 11 62 1 46 17 40	366529/P /CC	28 10 4 12 18 26 20 2	28 55 12 61 2 45 18 39
28 10 4 12 18 26 20 2		37 10 53 4 63 20 47 26		27 9 3 11 17 25 19 1	38 9 54 3 64 19 48 25
59 41 35 43 49 57 51 33		31 52 15 58 5 42 21 36		59 41 35 43 49 57 51 33	31 52 15 58 5 42 21 36
31 13 7 15 21 29 23 5		6 41 22 35 32 51 16 57		31 13 7 15 21 29 23 5	6 41 22 35 32 51 16 57
60 42 36 44 50 58 52 34		64 19 48 25 38 9 54 3		60 42 36 44 50 58 52 34	63 20 47 26 37 10 53 4
32 14 8 16 22 30 24 6		2 45 18 39 28 55 12 61		32 14 8 16 22 30 24 6	1 46 17 40 27 56 11 62
63 45 39 47 53 61 55 37		60 23 44 29 34 13 50 7		64 46 40 48 54 62 56 38	60 23 44 29 34 13 50 7
64 46 40 48 54 62 56 38		33 14 49 8 59 24 43 30		63 45 39 47 53 61 55 37	33 14 49 8 59 24 43 30
29 13 5 14 21 30 22 6	367873/P /CC	29 52 14 60 6 43 21 35	368257/P /CC	30 13 6 14 21 29 22 5	30 52 14 59 5 43 21 36
25 9 1 10 17 26 18 2		40 9 55 1 63 18 48 26		26 9 2 10 17 25 18 1	39 9 55 2 64 18 48 25
57 41 33 42 49 58 50 34		27 54 12 62 4 45 19 37		58 41 34 42 49 57 50 33	28 54 12 61 3 45 19 38
27 11 3 12 19 28 20 4		8 41 23 33 31 50 16 58		28 11 4 12 19 27 20 3	7 41 23 34 32 50 16 57
61 45 37 46 53 62 54 38		59 22 44 30 36 13 51 5		62 45 38 46 53 61 54 37	60 22 44 29 35 13 51 6
31 15 7 16 23 32 24 8		2 47 17 39 25 56 10 64		32 15 8 16 23 31 24 7	1 47 17 40 26 56 10 63
63 47 39 48 55 64 56 40		61 20 46 28 38 11 53 3		64 47 40 48 55 63 56 39	62 20 46 27 37 11 53 4
59 43 35 44 51 60 52 36		34 15 49 7 57 24 42 32		60 43 36 44 51 59 52 35	33 15 49 8 58 24 42 31

[Count = 368640] OK!

It surely shows that the new Model and the 'DAMT' could make all the 368640 standard solutions of 'C&C' magic squares of order 8.

If you want to know about how I really wrote the program list, please go and see the core part of it presented at the end of this file.

I once tried to explain about the reason why there are most-fundamental ten solutions of 'C&C' magic squares of order 8 in the article of 6-dimensional extra-cubic objects of order 2. It is because there are only 6 entries that could come to the next positions to the origin (64 is not counted for it is always on the pan-diagonal). The six entries appear on the two axes of 2-dimensional object by 2 x 3. The permutation of such appearances could be calculated as ${}_6C_3 / {}_2P_2$.

The result 10 is derived from the structural necessity of object. Many conditions of composite squares need many complementary pairs of each value.

There are only 7 groups of complementary pairs that you can make as many as 16+16. Only {32, 48, 56, 60, 62, 63, (64)} are possible to come next to the Origin1.

(Originally Written in English on July 12, 2001;
Revised on June 13, 2006 with MacOSX & Xcode 2.2.1)

Kanji Setsuda: E-Mail Address: jag12001@ni fty. ne. j p

```

/** 'Prototype Squares' of Order 8 and 'Composite **/
/** & Complete' Magic Squares 8x8 Recomposed **/
/** 'ProtoT8CC2.c' built by Kanji Setsuda on **/
/** Jul. 10, '01; Sep. 30, '05; Jun. 10, '06 **/
/** Working with MacOSX and Xcode 2.2 **/
**/
#include <stdio.h>
**/
/* Global Variables */
long int cnt, cnt2;
long cntr[3];
short cnt3;
short LSM, SSM, CC;
short nm[65], uflg[65];
short anm[5][65];
**/
/* Main Program */
int main(){
short n;
printf("\n** 'Prototype Squares' of Order 8 and 'Composite and Complete' **\n");
printf("** Magic Squares 8x8 Recomposed: List of Standard Solutions: **\n");
for(n=0; n<65; n++){nm[n]=0; uflg[n]=0; n1c[n]=0; }
LSM=260; SSM=130; CC=65; cnt=0; cnt3=0;
stp00(); /* Begin the Calculations */
if(cnt3>0){pr2ans(cnt3); }
printf("[Count = %d] OK!\n", cnt);
return 0;
}
**/
/* Begin the Calculations */
/* Set n1 & n64 */
void stp00(){
short a, b;
for(a=1; a<33; a++){b=CC-a;
if((uflg[a]==0)&&(uflg[b]==0)){
nm[1]=a; nm[64]=b;
uflg[a]=1; uflg[b]=1;
stp01();
uflg[b]=0; uflg[a]=0; }
}
}

```

```

    }
}
/* Set n2 & n63 */
void stp01(){
    short a,b;
    for(a=1;a<65;a++){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[2]=a; nm[63]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp02();
            ufl g[b]=0; ufl g[a]=0; }
    }
}
/* Set n3 & n62 */
void stp02(){
    short a,b;
    for(a=1;a<65;a++){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[3]=a; nm[62]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp03();
            ufl g[b]=0; ufl g[a]=0; }
    }
}
/* Set n4 & n61 */
void stp03(){
    short a,b;
    for(a=1;a<65;a++){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[4]=a; nm[61]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp04();
            ufl g[b]=0; ufl g[a]=0; }
    }
}
/* Set n5 & n60 */
void stp04(){
    short a,b;
    for(a=1;a<65;a++){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[5]=a; nm[60]=b;
            ufl g[a]=1; ufl g[b]=1; cnt2=0;
            stp05();
            ufl g[b]=0; ufl g[a]=0; }
    }
}
/* Set n6=n5+n62-n61 & n59(>n1) */
void stp05(){
    short a,b;
    a=nm[5]+nm[62]-nm[61];
    b=nm[3]+nm[60]-nm[4];
    if((0<a)&&(a<65)&&(a+b==CC)){
        if((ufl g[a]==0)&&(ufl g[b]==0)&&(b>nm[1])){
            nm[6]=a; nm[59]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp06();
            ufl g[b]=0; ufl g[a]=0; }}
}
/* Set n7=n6+n63-n62 & n58 */
void stp06(){

```

```

short a, b;
a=nm[6]+nm[63]-nm[62];
b=nm[2]+nm[59]-nm[3];
if((0<a)&&(a<65)&&(a+b==CC)){
    if((ufl g[a]==0)&&(ufl g[b]==0)){
        nm[7]=a; nm[58]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp07();
        ufl g[b]=0; ufl g[a]=0; }}
}
/* Set n8=n7+n64-n63 & n57 */
void stp07(){
short a, b, c, d;
a=nm[7]+nm[64]-nm[63];
b=nm[1]+nm[58]-nm[2];
c=LSM-nm[1]-nm[63]-nm[4]-nm[62]-nm[58]-nm[5]-nm[59];
d=LSM-nm[7]-nm[60]-nm[6]-nm[64]-nm[2]-nm[61]-nm[3];
if((0<a)&&(a<65)){
    if((a==c)&&(b==d)&&(a+b==CC)){
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[8]=a; nm[57]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp08();
            ufl g[b]=0; ufl g[a]=0; }}}
}
/**/
/* Search Level 2: */
/* Set n9 & n56 & n56<n63 */
void stp08(){
short a, b;
for(a=1; a<65; a++){b=CC-a;
    if((ufl g[a]==0)&&(ufl g[b]==0)&&(b<nm[63])){
        nm[9]=a; nm[56]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp09();
        ufl g[b]=0; ufl g[a]=0; }
}
}
/* Set n10=n2+n9-n1 & n55 */
void stp09(){
short a, b, c, d;
a=nm[2]+nm[9]-nm[1];
b=nm[56]+nm[63]-nm[64];
c=SSM-nm[1]-nm[63]-nm[56];
d=SSM-nm[64]-nm[2]-nm[9];
if((0<a)&&(a<65)){
    if((a==c)&&(b==d)&&(a+b==CC)){
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[10]=a; nm[55]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp10();
            ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n11=n3+n10-n2 & n54 */
void stp10(){
short a, b, c, d;
a=nm[3]+nm[10]-nm[2];
b=nm[55]+nm[62]-nm[63];
c=nm[63]+nm[10]-nm[62];
d=nm[2]+nm[55]-nm[3];

```

```

    if((0<a)&&(a<65)){
        if((a==c)&&(b==d)&&(a+b==CC)){
            if((ufl g[a]==0)&&(ufl g[b]==0)){
                nm[11]=a; nm[54]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp11();
                ufl g[b]=0; ufl g[a]=0; }}}
    }
/* Set n12=n4+n11-n3 & n53 */
void stp11(){
    short a, b, c, d;
    a=nm[4]+nm[11]-nm[3];
    b=nm[54]+nm[61]-nm[62];
    c=SSM-nm[3]-nm[61]-nm[54];
    d=SSM-nm[63]-nm[4]-nm[10];
    if((0<a)&&(a<65)){
        if((a==c)&&(b==d)&&(a+b==CC)){
            if((ufl g[a]==0)&&(ufl g[b]==0)){
                nm[12]=a; nm[53]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp12();
                ufl g[b]=0; ufl g[a]=0; }}}
    }
/* Set n13=n5+n12-n4 & n52 */
void stp12(){
    short a, b, c, d;
    a=nm[5]+nm[12]-nm[4];
    b=nm[53]+nm[60]-nm[61];
    c=nm[9]+nm[64]-nm[60];
    d=nm[1]+nm[56]-nm[5];
    if((0<a)&&(a<65)){
        if((a==c)&&(b==d)&&(a+b==CC)){
            if((ufl g[a]==0)&&(ufl g[b]==0)){
                nm[13]=a; nm[52]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp13();
                ufl g[b]=0; ufl g[a]=0; }}}
    }
/* Set n14=n6+n13-n5 & n51 */
void stp13(){
    short a, b, c, d;
    a=nm[6]+nm[13]-nm[5];
    b=nm[52]+nm[59]-nm[60];
    c=SSM-nm[5]-nm[59]-nm[52];
    d=SSM-nm[6]-nm[64]-nm[9];
    if((0<a)&&(a<65)){
        if((a==c)&&(b==d)&&(a+b==CC)){
            if((ufl g[a]==0)&&(ufl g[b]==0)){
                nm[14]=a; nm[51]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp14();
                ufl g[b]=0; ufl g[a]=0; }}}
    }
/* Set n15=n7+n14-n6 & n50 */
void stp14(){
    short a, b, c, d;
    a=nm[7]+nm[14]-nm[6];
    b=nm[51]+nm[58]-nm[59];
    c=SSM-nm[5]-nm[58]-nm[52];
    d=SSM-nm[60]-nm[7]-nm[13];

```

```

if((0<a)&&(a<65)){
  if((a==c)&&(b==d)&&(a+b==CC)){
    if((ufl g[a]==0)&&(ufl g[b]==0)){
      nm[15]=a; nm[50]=b;
      ufl g[a]=1; ufl g[b]=1;
      stp15();
      ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n16=n8+n15-n7 & n49 */
void stp15(){
  short a, b, c, d;
  a=nm[8]+nm[15]-nm[7];
  b=nm[50]+nm[57]-nm[58];
  c=SSM-nm[7]-nm[57]-nm[50];
  d=SSM-nm[62]-nm[8]-nm[11];
  if((0<a)&&(a<65)){
    if((a==c)&&(b==d)&&(a+b==CC)){
      if((ufl g[a]==0)&&(ufl g[b]==0)){
        nm[16]=a; nm[49]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp16();
        ufl g[b]=0; ufl g[a]=0; }}}
}
/* Check Some Equations */
void stp16(){
  short sm1, sm2;
  sm1=nm[8]+nm[9]-nm[1]-nm[16];
  sm2=nm[49]+nm[64]-nm[56]-nm[57];
  if((sm1==0)&&(sm2==0)){stp17();}
}
/**/
/* . . . (Skip) . . . */
/**/
/* Search Level 4: */
/* Set n25 & n40 */
void stp26(){
  short a, b;
  for(a=1; a<65; a++){b=CC-a;
  if((nm[4]+nm[11]+nm[18]+a+b+nm[47]+nm[54]+nm[61]==LSM)){
    if((ufl g[a]==0)&&(ufl g[b]==0)){
      nm[25]=a; nm[40]=b;
      ufl g[a]=1; ufl g[b]=1;
      stp27();
      ufl g[b]=0; ufl g[a]=0; }}}
}
}
/* Set n33=260-n1-n56-n17-n40-n57-n16-n41 & n32 */
void stp27(){
  short a, b;
  a=LSM-nm[1]-nm[56]-nm[25]-nm[48]-nm[57]-nm[16]-nm[24];
  b=LSM-nm[64]-nm[9]-nm[40]-nm[17]-nm[8]-nm[49]-nm[41];
  if((0<a)&&(a<65)&&(a+b==CC)){
    if((ufl g[a]==0)&&(ufl g[b]==0)){
      nm[33]=a; nm[32]=b;
      ufl g[a]=1; ufl g[b]=1;
      stp28();
      ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n26=n18+n25-n17 & n39 */

```

```

void stp28(){
short a, b, c, d;
a=nm[18]+nm[25]-nm[17];
b=nm[47]+nm[40]-nm[48];
c=SSM-nm[17]-nm[47]-nm[40];
d=SSM-nm[48]-nm[18]-nm[25];
if((0<a)&&(a<65)){
if((a==c)&&(b==d)&&(a+b==CC)){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[26]=a; nm[39]=b;
ufl g[a]=1; ufl g[b]=1;
stp29();
ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n27=n19+n26-n18 & n38 */
void stp29(){
short a, b, c, d;
a=nm[19]+nm[26]-nm[18];
b=nm[46]+nm[39]-nm[47];
c=nm[26]+nm[47]-nm[46];
d=nm[39]+nm[18]-nm[19];
if((0<a)&&(a<65)){
if((a==c)&&(b==d)&&(a+b==CC)){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[27]=a; nm[38]=b;
ufl g[a]=1; ufl g[b]=1;
stp30();
ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n28=n20+n27-n19 & n37 */
void stp30(){
short a, b, c, d;
a=nm[20]+nm[27]-nm[19];
b=nm[45]+nm[38]-nm[46];
c=SSM-nm[19]-nm[45]-nm[38];
d=SSM-nm[47]-nm[20]-nm[26];
if((0<a)&&(a<65)){
if((a==c)&&(b==d)&&(a+b==CC)){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[28]=a; nm[37]=b;
ufl g[a]=1; ufl g[b]=1;
stp31();
ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n29=n21+n28-n20 & n36 */
void stp31(){
short a, b, c, d;
a=nm[21]+nm[28]-nm[20];
b=nm[44]+nm[37]-nm[45];
c=nm[32]+nm[41]-nm[44];
d=nm[16]+nm[33]-nm[13];
if((0<a)&&(a<65)){
if((a==c)&&(b==d)&&(a+b==CC)){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[29]=a; nm[36]=b;
ufl g[a]=1; ufl g[b]=1;
stp32();
ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n30=n22+n29-n21 & n35 */

```

```

void stp32(){
  short a, b, c, d;
  a=nm[22]+nm[29]-nm[21];
  b=nm[43]+nm[36]-nm[44];
  c=SSM-nm[21]-nm[43]-nm[36];
  d=SSM-nm[44]-nm[22]-nm[29];
  if((0<a)&&(a<65)){
    if((a==c)&&(b==d)&&(a+b==CC)){
      if((uflg[a]==0)&&(uflg[b]==0)){
        nm[30]=a; nm[35]=b;
        uflg[a]=1; uflg[b]=1;
        stp33();
        uflg[b]=0; uflg[a]=0; }}}
}
/* Set n31=n23+n30-n22 & n34 */
void stp33(){
  short a, b, c, d;
  a=nm[23]+nm[30]-nm[22];
  b=nm[42]+nm[35]-nm[43];
  c=SSM-nm[24]-nm[42]-nm[33];
  d=SSM-nm[44]-nm[23]-nm[29];
  if((0<a)&&(a<65)){
    if((a==c)&&(b==d)&&(a+b==CC)){
      if((uflg[a]==0)&&(uflg[b]==0)){
        nm[31]=a; nm[34]=b;
        uflg[a]=1; uflg[b]=1;
        stp34();
        uflg[b]=0; uflg[a]=0; }}}
}
/* Check Some Equations */
void stp34(){
  short sm1, sm2, sm3;
  sm1=nm[23]+nm[32]-nm[24]-nm[31];
  sm2=nm[26]+nm[33]-nm[25]-nm[34];
  sm3=nm[33]+nm[42]-nm[34]-nm[41];
  if((sm1==0)&&(sm2==0)&&(sm3==0)){stp35();}
}
/* Check Line-Sums */
void stp35(){
  short sm1;
  sm1=nm[1]+nm[10]+nm[19]+nm[28]+nm[64]+nm[55]+nm[46]+nm[37];
  if(sm1==LSM){ansprnt();}
}
/**/
/* Print the Prototype & the 'C&C' MS88 Transformed */
void ansprnt(){
  short n;
  cnt++; cnt2++;
  if(cnt2==1){
    cntr[cnt3]=cnt; cntr[cnt3+1]=0;
    for(n=1; n<65; n++){anm[cnt3*2][n]=nm[n];}
    damt8();
    cnt3++;
    if(cnt3==2){pr2ans(cnt3); cnt3=0;}
  }
}
/**/
void pr2ans(short x){
  short l, l8, n;
  if(x>1){printf("%22d/P   /CC%45d/P   /CC\n", cntr[0], cntr[1]);}
}

```



```

else{printf("%22d/P   /CC\n", cntr[0]);}
for(l=0; l<8; l++){l8=l*8;
for(n=1; n<9; n++){printf("%3d", anm[0][l8+n]);}
printf("  ");
for(n=1; n<9; n++){printf("%3d", anm[1][l8+n]);}
if(x>1){printf("  ");
for(n=1; n<9; n++){printf("%3d", anm[2][l8+n]);}
printf("  ");
for(n=1; n<9; n++){printf("%3d", anm[3][l8+n]);}}
printf("\n");
}
}
/**/
/* The Rules of 'DAM Transformation' */
/**/
void damt8(){
short n;
short c[65], d[65];
for(n=1; n<65; n++){c[n]=nm[n];}
d[1]=c[1]; d[2]=c[63]; d[3]=c[4]; d[4]=c[62];
d[5]=c[8]; d[6]=c[58]; d[7]=c[5]; d[8]=c[59];
d[9]=c[56]; d[10]=c[10]; d[11]=c[53]; d[12]=c[11];
d[13]=c[49]; d[14]=c[15]; d[15]=c[52]; d[16]=c[14];
d[17]=c[25]; d[18]=c[39]; d[19]=c[28]; d[20]=c[38];
d[21]=c[32]; d[22]=c[34]; d[23]=c[29]; d[24]=c[35];
d[25]=c[48]; d[26]=c[18]; d[27]=c[45]; d[28]=c[19];
d[29]=c[41]; d[30]=c[23]; d[31]=c[44]; d[32]=c[22];
d[33]=c[57]; d[34]=c[7]; d[35]=c[60]; d[36]=c[6];
d[37]=c[64]; d[38]=c[2]; d[39]=c[61]; d[40]=c[3];
d[41]=c[16]; d[42]=c[50]; d[43]=c[13]; d[44]=c[51];
d[45]=c[9]; d[46]=c[55]; d[47]=c[12]; d[48]=c[54];
d[49]=c[33]; d[50]=c[31]; d[51]=c[36]; d[52]=c[30];
d[53]=c[40]; d[54]=c[26]; d[55]=c[37]; d[56]=c[27];
d[57]=c[24]; d[58]=c[42]; d[59]=c[21]; d[60]=c[43];
d[61]=c[17]; d[62]=c[47]; d[63]=c[20]; d[64]=c[46];
for(n=1; n<65; n++){anm[cnt3*2+1][n]=d[n];}
}
/**/
/* The Concept of 'DAM Transformation' */
/*
1/Prt
1/C&C
1 2 3 4 5 6 7 8 1 1 63 4 62 8 58 5 59 1
9 10 11 12 13 14 15 16 9 56 10 53 11 49 15 52 14 56
17 18 19 20 21 22 23 24 17 25 39 28 38 32 34 29 35 25
25 26 27 28 29 30 31 32 25 48 18 45 19 41 23 44 22 48
33 34 35 36 37 38 39 40 33 57 7 60 6 64 2 61 3 57
41 42 43 44 45 46 47 48 41 16 50 13 51 9 55 12 54 16
49 50 51 52 53 54 55 56 49 33 31 36 30 40 26 37 27 33
57 58 59 60 61 62 63 64 57 24 42 21 43 17 47 20 46 24
1 2 3 4 5 6 7 8 1 1 63 4 62 8 58 5 59 1
*/
/**/

```