

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

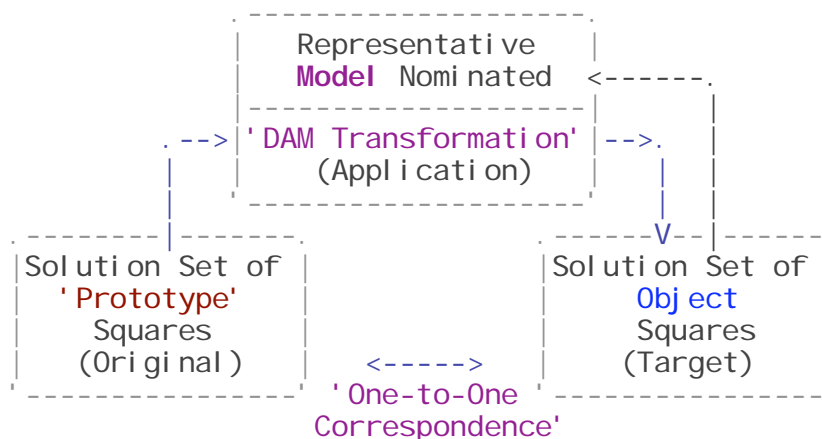
Section 8: New Study of 'Prototype Squares' of Order 8 and 'Do-it-After-the-Model Transformation'

While I was studying further about various 'Prototype Squares' and their 'Do-it-After-the-Model Transformations', I found something new and I felt I had to make a little change about the concept and method of 'Prototype Squares'. Although I don't mean I was wrong, I would like to write a new article here and report of my newest idea and some recent experiments of mine, instead of replacing the old article of order 8 by a new one. I would like you to compare the new article to the old one carefully.

Let's concentrate ourselves only to study the case of 'Composite and Complete' pan-magic squares of order 8 in this section.

#0. Let me explain a little about 'Prototype Squares' and 'DAM Transformation' again right here. Remember we are now studying about the two 'parallel worlds' of magic squares and the beautiful 'bridge' between them.

**** 'Prototype' and 'Do-it-After-the-Model Transformation' ****



#1. What do they look like?

The next list shows the primary representative form of Prototype Squares and the Model solution of our object: 'Composite & Complete' magic squares of order 8.

**** The First Sample of Prototype and Object Model ****

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

We want to make such an object as on the right hand side by transforming the Prototype on the left by some appropriate rules like these below.

- (1) Put the value of n1 of Prototype into n1 of Object.
- (2) Put the value of n63 of Prototype into n2 of Object.

- (3) Put the value of n4 of Prototype into n3 of Object.
- (4) Put the value of n62 of Prototype into n4 of Object.
- (5) Put the value of n8 of Prototype into n5 of Object.
- (6) Put the value of n58 of Prototype into n5 of Object.
-
- (62) Put the value of n47 of Prototype into n63 of Object.
- (63) Put the value of n20 of Prototype into n63 of Object.
- (64) Put the value of n46 of Prototype into n64 of Object.

As you see these rules are dictated literally after the Model above. I want to call them the rules of "Do-it-After-the-Model Transformation", or shortly "DAMT".

Pick up each Prototype solution and apply the very 'DAMT' to it, and you will surely make each corresponding object solution C&C MS88 one after another.

Let me show you some examples of my composition.

**** Some examples of Prototype and Object Solutions ****

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

We want to do that kind of job here and make all the 368640 object solutions.

But can we really do that only by the single method of DAM Transformation? How can we make and prepare the solution set of 368640 Prototype Squares for them?

#2. How can we make the Prototype Solutions?

The set of Prototype solutions is absolutely needed in order to make the set of object solutions. Both of the solution counts must be the same, since we must have the complete one-to-one correspondences realized between them. If you want to have the 368640 solutions of C&C MS88 in all, you must also have the Prototype ones as many as 368640. Of course, each solution must be different from the others.

What do you think of the Prototype Squares watching those examples above? Yes, indeed. The first basic form is made after copying the regular array 8 x 8. The others seem to indicate which blocks we can exchange with each other.

They may be considered as the set of 'basic form and the conceptual diagrams of any transformation system'.

But how can we actually make the complete set of Prototype solutions?

We have to dictate our effective computer program to make them all, but how can we design it before all, dictate the codes for and finally compose Prototype solutions?

#3. What conditions could we put to the Prototype?

Definition of Prototype Squares is always a very difficult job for us to do.

I once defined them almost in the same way as Drs. Ollerenshaw and Brae, British researchers, recommended to use such unique properties as the equality of Cross-sums or equal sums of inner pairs to outer ones in a line.

But this style of definition is not always effective in every case, especially not for order 7. We want to have the universal method applicable in every case.

I found something new about the definition style. I would like to report of it here.

The idea came up to me when I thought of any possible reversible method of transformation: How can we imagine and make the Prototype Squares transformed into the object solutions: Composite & Complete pan-magic squares of order 8?

I thought, we could learn that way from the Model solution itself.

How about taking the value of each variable of the Model and assuming it as the location-name of new variable? And how about defining such equations as listed below among the new set of variables?

** Basic Conditions for Prototype Squares: **

n1+n63+n4+n62+n8+n58+n5+n59=C ... rw1;		n1+n56+n25+n48+n57+n16+n33+n24=C ... cl 1;
n56+n10+n53+n11+n49+n15+n52+n14=C ... rw2;		n63+n10+n39+n18+n7+n50+n31+n42=C ... cl 2;
n25+n39+n28+n38+n32+n34+n29+n35=C ... rw3;		n4+n53+n28+n45+n60+n13+n36+n21=C ... cl 3;
n48+n18+n45+n19+n41+n23+n44+n22=C ... rw4;		n62+n11+n38+n19+n6+n51+n30+n43=C ... cl 4;
n57+n7+n60+n6+n64+n2+n61+n3=C ... rw5;		n8+n49+n32+n41+n64+n9+n40+n17=C ... cl 5;
n16+n50+n13+n51+n9+n55+n12+n54=C ... rw6;		n58+n15+n34+n23+n2+n55+n26+n47=C ... cl 6;
n33+n31+n36+n30+n40+n26+n37+n27=C ... rw7;		n5+n52+n29+n44+n61+n12+n37+n20=C ... cl 7;
n24+n42+n21+n43+n17+n47+n20+n46=C ... rw8;		n59+n14+n35+n22+n3+n54+n27+n46=C ... cl 8;

** Basic Diagrams for Prototype and Model in Extended Space **

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

** 'Pandiagonal Equations' for Prototype Squares: **

n1+n10+n28+n19+n64+n55+n37+n46=C ... pd1;		n1+n14+n29+n23+n64+n51+n36+n42=C ... pb1;
n63+n53+n38+n41+n2+n12+n27+n24=C ... pd2;		n63+n56+n35+n44+n2+n9+n30+n21=C ... pb2;
n4+n11+n32+n23+n61+n54+n33+n42=C ... pd3;		n4+n10+n25+n22+n61+n55+n40+n43=C ... pb3;
n62+n49+n34+n44+n3+n16+n31+n21=C ... pd4;		n62+n53+n39+n48+n3+n12+n26+n17=C ... pb4;
n8+n15+n29+n22+n57+n50+n36+n43=C ... pd5;		n8+n11+n28+n18+n57+n54+n37+n47=C ... pb5;
n58+n52+n35+n48+n7+n13+n30+n17=C ... pd6;		n58+n49+n38+n45+n7+n16+n27+n20=C ... pb6;
n5+n14+n25+n18+n60+n51+n40+n47=C ... pd7;		n5+n15+n32+n19+n60+n50+n33+n46=C ... pb7;
n59+n56+n39+n45+n6+n9+n26+n20=C ... pd8;		n59+n52+n34+n41+n6+n13+n31+n24=C ... pb8;

** 'Composite Conditions' for Prototype Squares: **

n1+n63+n56+n10=S ... c1; | n34+n29+n23+n44=S ... c22; | n13+n51+n36+n30=S ... c43;

$n63+n4+n10+n53=S \dots c2;$	$n29+n35+n44+n22=S \dots c23;$	$n51+n9+n30+n40=S \dots c44;$
$n4+n62+n53+n11=S \dots c3;$	$n35+n25+n22+n48=S \dots c24;$	$n9+n55+n40+n26=S \dots c45;$
$n62+n8+n11+n49=S \dots c4;$	$n48+n18+n57+n7=S \dots c25;$	$n55+n12+n26+n37=S \dots c46;$
$n8+n58+n49+n15=S \dots c5;$	$n18+n45+n7+n60=S \dots c26;$	$n12+n54+n37+n27=S \dots c47;$
$n58+n5+n15+n52=S \dots c6;$	$n45+n19+n60+n6=S \dots c27;$	$n54+n16+n27+n33=S \dots c48;$
$n5+n59+n52+n14=S \dots c7;$	$n19+n41+n6+n64=S \dots c28;$	$n33+n31+n24+n42=S \dots c49;$
$n59+n1+n14+n56=S \dots c8;$	$n41+n23+n64+n2=S \dots c29;$	$n31+n36+n42+n21=S \dots c50;$
$n56+n10+n25+n39=S \dots c9;$	$n23+n44+n2+n61=S \dots c30;$	$n36+n30+n21+n43=S \dots c51;$
$n10+n53+n39+n28=S \dots c10;$	$n44+n22+n61+n3=S \dots c31;$	$n30+n40+n43+n17=S \dots c52;$
$n53+n11+n28+n38=S \dots c11;$	$n22+n48+n3+n57=S \dots c32;$	$n40+n26+n17+n47=S \dots c53;$
$n11+n49+n38+n32=S \dots c12;$	$n57+n7+n16+n50=S \dots c33;$	$n26+n37+n47+n20=S \dots c54;$
$n49+n15+n32+n34=S \dots c13;$	$n7+n60+n50+n13=S \dots c34;$	$n37+n27+n20+n46=S \dots c55;$
$n15+n52+n34+n29=S \dots c14;$	$n60+n6+n13+n51=S \dots c35;$	$n27+n33+n46+n24=S \dots c56;$
$n52+n14+n29+n35=S \dots c15;$	$n6+n64+n51+n9=S \dots c36;$	$n24+n42+n1+n63=S \dots c57;$
$n14+n56+n35+n25=S \dots c16;$	$n64+n2+n9+n55=S \dots c37;$	$n42+n21+n63+n4=S \dots c58;$
$n25+n39+n48+n18=S \dots c17;$	$n2+n61+n55+n12=S \dots c38;$	$n21+n43+n4+n62=S \dots c59;$
$n39+n28+n18+n45=S \dots c18;$	$n61+n3+n12+n54=S \dots c39;$	$n43+n17+n62+n8=S \dots c60;$
$n28+n38+n45+n19=S \dots c19;$	$n3+n57+n54+n16=S \dots c40;$	$n17+n47+n8+n58=S \dots c61;$
$n38+n32+n19+n41=S \dots c20;$	$n16+n50+n33+n31=S \dots c41;$	$n47+n20+n58+n5=S \dots c62;$
$n32+n34+n41+n23=S \dots c21;$	$n50+n13+n31+n36=S \dots c42;$	$n20+n46+n5+n59=S \dots c63;$

and $n46+n24+n59+n1=S \dots c64;$

**** 'Complete Conditions' for Prototype Squares: ****

$n1+n64=n63+n2=n4+n61=n62+n3=n8+n57=n58+n7=n5+n60=n59+n6=n56+n9=$
 $n10+n55=n53+n12=n11+n54=n49+n16=n15+n50=n52+n13=n14+n51=n25+n40=n39+n26=$
 $n28+n37=n38+n27=n32+n33=n34+n31=n29+n36=n35+n30=n48+n17=n18+n47=n45+n20=$
 $n19+n46=n41+n24=n23+n42=n44+n21=n22+n43=CC$

**** List-forming Inequality Conditions for Standard Solutions ****

$n1 < n59, n1 < n24, n1 < 46$ and $n56 < n63$

If you solve all the simultaneous equations above defining our Prototype Squares, you would surely have the complete set of Prototype solutions, I thought.

Here you can no longer find any Cross-Sum Equality conditions, nor find any Equal-sum definitions between inner pairs and outer ones. I made up my mind we would not use them at all for the first definitions.

But you can get the latter property by such algebraic calculations as demonstrated below, just under the basic definitions above we assumed at first.

**** Samples of Interesting Properties found by some Calculations: ****

$n1+n63+n56+n10=SS \dots (c1);$
 $n56+n10+n25+n39=SS \dots (c9); \rightarrow n1+n63=n25+n39=P;$
 $n25+n39+n48+n18=SS \dots (c17); \rightarrow n56+n10=n48+n18=Q;$
 $n48+n18+n57+n7=SS \dots (c25); \rightarrow n25+n39=n57+n7=P;$
 $n57+n7+n16+n50=SS \dots (c33); \rightarrow n48+n18=n16+n50=Q;$
 $n16+n50+n33+n31=SS \dots (c41); \rightarrow n57+n7=n33+n31=P;$
 $n33+n31+n24+n42=SS \dots (c49); \rightarrow n16+n50=n24+n42=Q;$
 $n24+n42+n1+n63=SS \dots (c57); \rightarrow n33+n31=n1+n63=P; (P+Q=SS)$
Therefore $n1+n63=n25+n39=n57+n7=n33+n31=P;$ $n56+n10=n48+n18=n16+n50=n24+n42=Q;$
On the other hand $n8+n57=n58+n7=CC; \rightarrow n8+n57+n58+n7=(n8+n58)+(n57+n7)=CC+CC=SS$
 $(n57+n7)$ is replaceable by $(n1+n63)$, since they are equal to P .
You can now say $(n1+n63)+(n8+n58)=SS;$
 $n8+n58=n32+n34=n64+n2=n40+n26=Q; n49+n15=n41+n23=n9+n55=n17+n47=P;$
In the same way $(n63+n4)+(n58+n5)=SS; (n4+n62)+(n5+n59)=SS; (n62+n8)+(n59+n1)=SS;$
You can say $n1+n8=n4+n5; n63+n58=n62+n59; n2+n7=n3+n6; n64+n57=n61+n60;$
And you can even say $n1+n8=n4+n5=n2+n7=n3+n6=R; n63+n58=n62+n59=n64+n57=n61+n60=T;$
.

It means you can now add those new equations above to your first definitions in this case as you like. If you add and use some, you may possibly make your program run very fast, while you don't have to be afraid of spoiling the result by this addition.

#4. When you define our object 'Composite and Complete' pan-magic squares, if you use all of those 'Composite Conditions' and 'Complete Conditions' above, you don't always have to define all the 'Basic Conditions' and 'Pan-diagonal Conditions'. You only have to define the next two equations at least. You can even get all you want.

It is also true when you define your Prototype Squares for 'C&C MS88'.

```
** The Most Basic Conditions for Prototype Squares 8x8: **
n1+n63+n4+n62+n8+n58+n5+n59=C ... rw1;
n1+n56+n25+n48+n57+n16+n33+n24=C ... cl 1;
```

Let me show you here the whole program I recently dictated.

I don't use any Cross-Sum Equality conditions here, and no Equal-sum definitions between inner pairs and outer ones in any line, either.

```
/** 'Prototype Squares' of Order 8 and 'Composite & Complete' **/
/** Pan-magic Squares 8x8 Recomposed by 'DAM Transformation' **/
/** 'ProtoT8CC.c' built by Kanji Setsuda on **/
/** Jul. 10, '01; Sep. 30, '05; Oct. 20, '06 **/
/** Working on MacOSX and Xcode 2.2.1 **/
/**/
#include <stdio.h>
/* Global Variables */
long int cnt, cnt2;
long cnt3, n1c[65];
short cnt3;
short LSM, SSM, CC;
short nm[65], uflg[65];
short c[65], d[65];
short nt05[58], nt09[50], nt17[34], nt25[18];
short anm[5][65];
/* Sub-Routines */
void stp00(void);
void stp01(void), stp02(void), stp03(void), stp04(void);
void stp05(void), stp06(void), stp07(void), stp08(void);
void stp09(void), stp10(void), stp11(void), stp12(void);
void stp13(void), stp14(void), stp15(void), stp16(void);
void stp17(void), stp18(void), stp19(void), stp20(void);
void stp21(void), stp22(void), stp23(void), stp24(void);
void stp25(void), stp26(void), stp27(void), stp28(void);
void stp29(void), stp30(void), stp31(void), stp32(void);
void stp33(void);
void ansprint(void), pr2ans(void);
void prn1c(void), damt8(void);
/**/
/* Main Program */
int main(){
short n;
printf("\n** 'Prototype Squares' of Order 8 and 'Composite & Complete' **\n");
printf("** Pan-magic Squares 8x8 Recomposed by 'DAM Transformation' **\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;
stp01(); /* Begin the Calculations */
if(cnt3>0){pr2ans();}
printf("[Count = %d]\n", cnt);
prn1c();
printf("[OK!]\n");
return 0;
}
/* Begin the Calculations */
/* Define Level 1: */
/* Set N1 & n64 */
void stp01(){
```

```

short a, b;
for(a=1; a<33; a++){b=CC-a;
    if((ufl g[a]==0)&&(ufl g[b]==0)){
        nm[1]=a; nm[64]=b;
        ufl g[a]=1; ufl g[b]=1; cnt2=0;
        stp02();
        ufl g[b]=0; ufl g[a]=0; }
    }
}
/* Set N63 & n2 */
void stp02(){
    short a, b;
    for(a=64; a>0; a--){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[63]=a; nm[2]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp03();
            ufl g[b]=0; ufl g[a]=0; }
        }
}
/* Set N62 & n3 */
void stp03(){
    short a, b;
    for(a=64; a>0; a--){b=CC-a;
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[62]=a; nm[3]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp04();
            ufl g[b]=0; ufl g[a]=0; }
        }
}
/* Set N4 & n61 */
void stp04(){
    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;
            stp05();
            ufl g[b]=0; ufl g[a]=0; }
        }
}
/* Set N5 & n60 */
void stp05(){
    short a, b, n, m;
    m=1;
    for(n=1; n<65; n++){if(ufl g[n]==0){nt05[m]=n; m++; }}
    nt05[m]=0;
    for(n=1; n<m; n++){
        a=nt05[n]; b=CC-a;
        nm[5]=a; nm[60]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp06();
        ufl g[b]=0; ufl g[a]=0;
    }
}
/* Set n59=n61+n3-n5 & n1<n59 & n6 */
void stp06(){
    short a, b;
    a=nm[61]+nm[3]-nm[5];
    if((nm[1]<a)&&(a<65)){
        b=nm[4]+nm[62]-nm[60];
        if(a+b==CC){
            if((ufl g[a]==0)&&(ufl g[b]==0)){

```

```

        nm[59]=a; nm[6]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp07();
        ufl g[b]=0; ufl g[a]=0; }}
}
/* Set n58=n2+n61-n5 & n7 */
void stp07(){
short a, b;
a=nm[2]+nm[61]-nm[5];
if((0<a)&&(a<65)){
    b=nm[63]+nm[4]-nm[60];
    if(a+b==CC){
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[58]=a; nm[7]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp08();
            ufl g[b]=0; ufl g[a]=0; }}}
}
/* Set n8=LSM-n1-n63-n4-n62-n58-n5-n59 & n57 */
void stp08(){
short a, b;
a=LSM-nm[1]-nm[63]-nm[4]-nm[62]-nm[58]-nm[5]-nm[59];
if((0<a)&&(a<65)){
    b=nm[1]+nm[63]-nm[7];
    if(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;
            stp09();
            ufl g[b]=0; ufl g[a]=0; }
        }}
}
/* Define Level 2: */
/* Set N56(<n63) & n9 */
void stp09(){
short a, b, n, m;
m=1;
for(n=1; n<65; n++){if(ufl g[n]==0){nt09[m]=n; m++; }}
nt09[m]=0;
for(n=m-1; n>0; n--){
    a=nt09[n];
    if(a<nm[63]){b=CC-a;
        nm[56]=a; nm[9]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp10();
        ufl g[b]=0; ufl g[a]=0; }
}
}
/* Set n10=SSM-n1-n63-n56 & n55 */
void stp10(){
short a, b;
a=SSM-nm[1]-nm[63]-nm[56];
if((0<a)&&(a<65)){
    b=SSM-nm[64]-nm[2]-nm[9];
    if(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;
            stp11();
            ufl g[b]=0; ufl g[a]=0; }
        }}
}
/* Set n53=SSM-n63-n4-n10 & n12 */
void stp11(){

```

```

short a, b;
a=SSM-nm[63]-nm[4]-nm[10];
if((0<a)&&(a<65)){
    b=SSM-nm[2]-nm[61]-nm[55];
    if(a+b==CC){
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[53]=a; nm[12]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp12();
            ufl g[b]=0; ufl g[a]=0; }
        }
    }
}
/* Set n11=SSM-n4-n62-n53 & n54 */
void stp12(){
short a, b;
a=SSM-nm[4]-nm[62]-nm[53];
if((0<a)&&(a<65)){
    b=SSM-nm[61]-nm[3]-nm[12];
    if(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;
            stp13();
            ufl g[b]=0; ufl g[a]=0; }
        }
    }
}
/* Set n49=SSM-n62-n8-n11 & n16 */
void stp13(){
short a, b;
a=SSM-nm[62]-nm[8]-nm[11];
if((0<a)&&(a<65)){
    b=SSM-nm[3]-nm[57]-nm[54];
    if(a+b==CC){
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[49]=a; nm[16]=b;
            ufl g[a]=1; ufl g[b]=1;
            stp14();
            ufl g[b]=0; ufl g[a]=0; }
        }
    }
}
/* Set n15=SSM-n8-n58-n49 & n50 */
void stp14(){
short a, b;
a=SSM-nm[8]-nm[58]-nm[49];
if((0<a)&&(a<65)){
    b=SSM-nm[57]-nm[7]-nm[16];
    if(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 n52=SSM-n58-n5-n15 & n13 */
void stp15(){
short a, b;
a=SSM-nm[58]-nm[5]-nm[15];
if((0<a)&&(a<65)){
    b=SSM-nm[7]-nm[60]-nm[50];
    if(a+b==CC){
        if((ufl g[a]==0)&&(ufl g[b]==0)){
            nm[52]=a; nm[13]=b;
            ufl g[a]=1; ufl g[b]=1;

```



```

        stp16();
        ufl g[b]=0; ufl g[a]=0; }
    }}
}
/* Set n14=SSM-n5-n59-n52 & n51 */
void stp16(){
    short a, b, c, d;
    a=SSM-nm[5]-nm[59]-nm[52];
    if((0<a)&&(a<65)){
        b=SSM-nm[60]-nm[6]-nm[13];
        if(a+b==CC){
            c=SSM-nm[59]-nm[1]-nm[56];
            d=SSM-nm[6]-nm[64]-nm[9];
            if((a==c)&&(b==d)){
                if((ufl g[a]==0)&&(ufl g[b]==0)){
                    nm[14]=a; nm[51]=b;
                    ufl g[a]=1; ufl g[b]=1;
                    stp17();
                    ufl g[b]=0; ufl g[a]=0; }}}
    }
}
/* Define Level 3: */
/* Set N48 & n17 */
void stp17(){
    short a, b, n, m;
    m=1;
    for(n=1; n<65; n++){ if(ufl g[n]==0){nt17[m]=n; m++; }}
    nt17[m]=0;
    for(n=m-1; n>0; n--){
        a=nt17[n]; b=CC-a;
        nm[48]=a; nm[17]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp18();
        ufl g[b]=0; ufl g[a]=0;
    }
}
/* Set n18=SSM-n48-n57-n7 & n47 */
void stp18(){
    short a, b;
    a=SSM-nm[48]-nm[57]-nm[7];
    if((0<a)&&(a<65)){
        b=SSM-nm[17]-nm[8]-nm[58];
        if(a+b==CC){
            if((ufl g[a]==0)&&(ufl g[b]==0)){
                nm[18]=a; nm[47]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp19();
                ufl g[b]=0; ufl g[a]=0; }
            }}
    }
}
/* Set n45=SSM-n18-n7-n60 & n20 */
void stp19(){
    short a, b;
    a=SSM-nm[18]-nm[7]-nm[60];
    if((0<a)&&(a<65)){
        b=SSM-nm[47]-nm[58]-nm[5];
        if(a+b==CC){
            if((ufl g[a]==0)&&(ufl g[b]==0)){
                nm[45]=a; nm[20]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp20();
                ufl g[b]=0; ufl g[a]=0; }
            }}
    }
}
/* Set n19=SSM-n45-n60-n6 & n46(>n1) */

```

```

void stp20(){
short a, b;
a=SSM-nm[45]-nm[60]-nm[6];
if((0<a)&&(a<65)){
b=SSM-nm[20]-nm[5]-nm[59];
if((a+b==CC)&&(b>nm[1])){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[19]=a; nm[46]=b;
uflg[a]=1; uflg[b]=1;
stp21();
uflg[b]=0; uflg[a]=0; }
}}
}
/* Set n41=SSM-n19-n6-n64 & n24(>n1) */
void stp21(){
short a, b;
a=SSM-nm[19]-nm[6]-nm[64];
if((0<a)&&(a<65)){
b=SSM-nm[46]-nm[59]-nm[1];
if((a+b==CC)&&(b>nm[1])){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[41]=a; nm[24]=b;
uflg[a]=1; uflg[b]=1;
stp22();
uflg[b]=0; uflg[a]=0; }
}}
}
/* Set n23=SSM-n41-n64-n2 & n42 */
void stp22(){
short a, b;
a=SSM-nm[41]-nm[64]-nm[2];
if((0<a)&&(a<65)){
b=SSM-nm[24]-nm[1]-nm[63];
if(a+b==CC){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[23]=a; nm[42]=b;
uflg[a]=1; uflg[b]=1;
stp23();
uflg[b]=0; uflg[a]=0; }
}}
}
/* Set n44=SSM-n23-n2-n61 & n21 */
void stp23(){
short a, b;
a=SSM-nm[23]-nm[2]-nm[61];
if((0<a)&&(a<65)){
b=SSM-nm[42]-nm[63]-nm[4];
if(a+b==CC){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[44]=a; nm[21]=b;
uflg[a]=1; uflg[b]=1;
stp24();
uflg[b]=0; uflg[a]=0; }
}}
}
/* Set n22=SSM-n44-n61-n3 & n43 */
void stp24(){
short a, b, c, d;
a=SSM-nm[44]-nm[61]-nm[3];
if((0<a)&&(a<65)){
b=SSM-nm[21]-nm[4]-nm[62];
if(a+b==CC){
c=SSM-nm[48]-nm[3]-nm[57];
d=SSM-nm[17]-nm[62]-nm[8];

```

```

        i f((a==c)&&(b==d)) {
            i f((ufl g[a]==0)&&(ufl g[b]==0)) {
                nm[22]=a; nm[43]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp25();
                ufl g[b]=0; ufl g[a]=0; }}}
    }
/* Defi ne Level 4: */
/* Set N25 & n40 */
void stp25() {
    short a, b, n, m;
    m=1;
    for(n=1; n<65; n++){ i f(ufl g[n]==0) {nt25[m]=n; m++; }}
    nt25[m]=0;
    for(n=1; n<m; n++){
        a=nt25[n]; b=CC-a;
        nm[25]=a; nm[40]=b;
        ufl g[a]=1; ufl g[b]=1;
        stp26();
        ufl g[b]=0; ufl g[a]=0;
    }
}
/* Set n33=LSM-n1-n56-n25-n48-n57-n16-n24 & n32 */
void stp26() {
    short a, b;
    a=LSM-nm[1]-nm[56]-nm[25]-nm[48]-nm[57]-nm[16]-nm[24];
    i f((0<a)&&(a<65)) {
        b=nm[56]+nm[25]-nm[49];
        i f(a+b==CC) {
            i f((ufl g[a]==0)&&(ufl g[b]==0)) {
                nm[33]=a; nm[32]=b;
                ufl g[a]=1; ufl g[b]=1;
                stp27();
                ufl g[b]=0; ufl g[a]=0; }}}
    }
/* Set n39=SSM-n56-n10-n25 & n26 */
void stp27() {
    short a, b, c, d;
    a=SSM-nm[56]-nm[10]-nm[25];
    i f((0<a)&&(a<65)) {
        b=SSM-nm[9]-nm[55]-nm[40];
        i f(a+b==CC) {
            c=SSM-nm[25]-nm[48]-nm[18];
            d=SSM-nm[40]-nm[17]-nm[47];
            i f((a==c)&&(b==d)) {
                i f((ufl g[a]==0)&&(ufl g[b]==0)) {
                    nm[39]=a; nm[26]=b;
                    ufl g[a]=1; ufl g[b]=1;
                    stp28();
                    ufl g[b]=0; ufl g[a]=0; }}}}}
    }
/* Set n28=SSM-n10-n53-n39 & n37 */
void stp28() {
    short a, b, c, d;
    a=SSM-nm[10]-nm[53]-nm[39];
    i f((0<a)&&(a<65)) {
        b=SSM-nm[55]-nm[12]-nm[26];
        i f(a+b==CC) {
            c=SSM-nm[39]-nm[18]-nm[45];
            d=SSM-nm[26]-nm[47]-nm[20];
            i f((a==c)&&(b==d)) {
                i f((ufl g[a]==0)&&(ufl g[b]==0)) {
                    nm[28]=a; nm[37]=b;
                    ufl g[a]=1; ufl g[b]=1;

```

```

        stp29();
        ufl g[b]=0; ufl g[a]=0; }}}}
}
/* Set n38=SSM-n53-n11-n28 & n27 */
void stp29(){
short a, b, c, d, e, f;
a=SSM-nm[53]-nm[11]-nm[28];
if((0<a)&&(a<65)){
b=SSM-nm[12]-nm[54]-nm[37];
if(a+b==CC){
c=SSM-nm[11]-nm[49]-nm[32];
d=SSM-nm[54]-nm[16]-nm[33];
e=SSM-nm[28]-nm[45]-nm[19];
f=SSM-nm[32]-nm[19]-nm[41];
if((a==c)&&(b==d)&&(a==e)&&(a==f)){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[38]=a; nm[27]=b;
ufl g[a]=1; ufl g[b]=1;
stp30();
ufl g[b]=0; ufl g[a]=0; }}}}
}
/* Set n34=SSM-n49-n15-n32 & n31 */
void stp30(){
short a, b, c, d;
a=SSM-nm[49]-nm[15]-nm[32];
if((0<a)&&(a<65)){
b=SSM-nm[16]-nm[50]-nm[33];
if(a+b==CC){
c=SSM-nm[32]-nm[41]-nm[23];
d=SSM-nm[33]-nm[24]-nm[42];
if((a==c)&&(b==d)){
if((ufl g[a]==0)&&(ufl g[b]==0)){
nm[34]=a; nm[31]=b;
ufl g[a]=1; ufl g[b]=1;
stp31();
ufl g[b]=0; ufl g[a]=0; }}}}
}
/* Set n29=SSM-n15-n52-n34 & n36 */
void stp31(){
short a, b, c, d;
a=SSM-nm[15]-nm[52]-nm[34];
if((0<a)&&(a<65)){
b=SSM-nm[50]-nm[13]-nm[31];
if(a+b==CC){
c=SSM-nm[34]-nm[23]-nm[44];
d=SSM-nm[31]-nm[42]-nm[21];
if((a==c)&&(b==d)){
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 n35=SSM-n52-n14-n29 & n30 */
void stp32(){
short a, b, c, d, e, f;
a=SSM-nm[52]-nm[14]-nm[29];
if((0<a)&&(a<65)){
b=SSM-nm[13]-nm[51]-nm[36];
if(a+b==CC){
c=SSM-nm[14]-nm[56]-nm[25];
d=SSM-nm[51]-nm[9]-nm[40];
e=SSM-nm[36]-nm[21]-nm[43];
f=SSM-nm[40]-nm[43]-nm[17];

```

```

        if((a==c)&&(b==d)&&(b==e)&&(b==f)){
            if((uflg[a]==0)&&(uflg[b]==0)){
                nm[35]=a; nm[30]=b;
                uflg[a]=1; uflg[b]=1;
                stp33();
                uflg[b]=0; uflg[a]=0; }}}
    }
/**/
/* Check Line-Sums */
void stp33(){
    short sm1, sm2;
    sm1=nm[1]+nm[10]+nm[19]+nm[28]+nm[37]+nm[46]+nm[55]+nm[64];
    sm2=nm[8]+nm[15]+nm[22]+nm[29]+nm[36]+nm[43]+nm[50]+nm[57];
    if((sm1==LSM)&&(sm2==LSM)){ansprint();}
}
/**/
/* Print the Prototypt & the 'C&C' MS88 Transformed */
void ansprint(){
    short n;
    cnt++; cnt2++;
    n1c[nm[1]]++;
    if(cnt2==1){
        cntr[cnt3]=cnt;
        for(n=1; n<65; n++){anm[cnt3*2][n]=nm[n];}
        damt8();
        for(n=1; n<65; n++){anm[cnt3*2+1][n]=d[n];}
        cnt3++;
        if(cnt3==2){
            pr2ans(); cnt3=0;
            cntr[1]=0; for(n=0; n<65; n++){anm[2][n]=0; anm[3][n]=0;}
        }
    }
}
/**/
void pr2ans(){
    short l, l8, n;
    printf("%22d/P /CC%45d/P /CC\n", cntr[0], cntr[1]);
    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]);}
        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 Transformation */
/**/
void damt8(){
    short n;
    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];
}
/**/
void prn1c(){
short n;
printf("\n* Counts according to the Value of n1 *\n");
for(n=1;n<33;n++){
printf(" [%2d: %5d], ", n, n1c[n]);
if(n%8==0){printf("\n");}
}
printf(" . . . . .\n");
}
/**/

```

This list may give you a very similar impression to the old programs I have often presented. Yes, indeed. It is written in the same style as I composed such an ordinary program for C&C MS88. It is because our final goal is making the same object.

As we want the Model itself to have all the same properties of object solutions and intend to make all the Prototype solutions transformed into C&C MS88, we declare so as to design and compose the Prototype by giving all the necessary conditions.

You may understand this process better, if I say that making Prototype Squares is a kind of 'Inverse Function' of the function DAM Transformation.

#5. The next list shows the result of my recent computations, but only a part of long body. It contains the pairs of Prototype and object solutions.

```

** 'Prototype Squares' of Order 8 and 'Composite & Complete' **
** Pan-magic Squares 8x8 Recomposed by 'DAM Transformation' **

      1/P   /CC                                2/P   /CC
1  2  3  4  5  6  7  8   1 63  4 62  8 58  5 59   1  2  3  4  5  6  7  8   1  63  4 62  8 58  5 59
9 10 11 12 13 14 15 16 56 10 53 11 49 15 52 14   9 10 11 12 13 14 15 16 56 10 53 11 49 15 52 14
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33 34 35 36 37 38 39 40 57  7 60  6 64  2 61  3   25 26 27 28 29 30 31 32 57  7 60  6 64  2 61  3
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      3/P   /CC                                4/P   /CC
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      5/P   /CC                                6/P   /CC
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7/P /CC
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9/P /CC
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13/P /CC
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17/P /CC
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33/P /CC
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49/P /CC
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65/P /CC
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8/P /CC
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11/P /CC
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15/P /CC
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25/P /CC
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41/P /CC
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57/P /CC
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73/P /CC
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81/P /CC
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97/P /CC
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193/P /CC
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289/P /CC
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385/P /CC
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481/P /CC
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577/P /CC
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89/P /CC
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145/P /CC
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241/P /CC
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337/P /CC
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433/P /CC
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529/P /CC
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625/P /CC
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673/P /CC
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769/P /CC
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1537/P /CC
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2305/P /CC
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3073/P /CC
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3841/P /CC
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4609/P /CC
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721/P /CC
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1153/P /CC
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1921/P /CC
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2689/P /CC
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3457/P /CC
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4225/P /CC
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4945/P /CC
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5281/P	/CC	5617/P	/CC
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21313/P /CC
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22465/P /CC
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177409/P /CC
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23041/P /CC
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68737/P /CC
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113089/P /CC
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 38 33 34 36 37 39 40 35 62 8 60 7 59 1 61 2
 46 41 42 44 45 47 48 43 11 49 13 50 14 56 12 55
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 62 57 58 60 61 63 64 59 19 41 21 42 22 48 20 47

156097/P /CC
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195649/P /CC
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47 35 37 39 41 43 45 33	47 35 37 39 41 43 45 33
48 36 38 40 42 44 46 34	48 36 38 40 42 44 46 34
63 51 53 55 57 59 61 49	64 52 54 56 58 60 62 50
64 52 54 56 58 60 62 50	63 51 53 55 57 59 61 49
316417/P /CC	322945/P /CC
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49 33 34 35 50 51 52 36	50 33 34 36 49 51 52 35
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61 45 46 47 62 63 64 48	62 45 46 48 61 63 64 47
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55 37 39 40 53 54 56 38	56 38 39 40 53 54 55 37
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59 41 43 44 57 58 60 42	60 42 43 44 57 58 59 41
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341761/P /CC	346945/P /CC
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29 9 13 14 25 26 30 10	30 10 13 14 25 26 29 9
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64 44 46 48 58 60 62 42	63 43 45 47 57 59 61 41

<p style="text-align: center; color: cyan;">361729/P /CC</p> <p>25 9 1 10 17 26 18 2 27 11 3 12 19 28 20 4 57 41 33 42 49 58 50 34 29 13 5 14 21 30 22 6 59 43 35 44 51 60 52 36 31 15 7 16 23 32 24 8 61 45 37 46 53 62 54 38 63 47 39 48 55 64 56 40</p> <p style="text-align: center; color: cyan;">365185/P /CC</p> <p>27 9 3 11 17 25 19 1 28 10 4 12 18 26 20 2 59 41 35 43 49 57 51 33 31 13 7 15 21 29 23 5 60 42 36 44 50 58 52 34 32 14 8 16 22 30 24 6 63 45 39 47 53 61 55 37 64 46 40 48 54 62 56 38</p> <p style="text-align: center; color: cyan;">367873/P /CC</p> <p>29 13 5 14 21 30 22 6 25 9 1 10 17 26 18 2 57 41 33 42 49 58 50 34 27 11 3 12 19 28 20 4 61 45 37 46 53 62 54 38 31 15 7 16 23 32 24 8 63 47 39 48 55 64 56 40 59 43 35 44 51 60 52 36</p>	<p style="text-align: center; color: cyan;">363457/P /CC</p> <p>25 56 10 64 2 47 17 39 38 11 53 3 61 20 46 28 29 52 14 60 6 43 21 35 8 41 23 33 31 50 16 58 63 18 48 26 40 9 55 1 4 45 19 37 27 54 12 62 59 22 44 30 36 13 51 5 34 15 49 7 57 24 42 32</p> <p style="text-align: center; color: cyan;">366529/P /CC</p> <p>27 56 11 62 1 46 17 40 37 10 53 4 63 20 47 26 31 52 15 58 5 42 21 36 6 41 22 35 32 51 16 57 64 19 48 25 38 9 54 3 2 45 18 39 28 55 12 61 60 23 44 29 34 13 50 7 33 14 49 8 59 24 43 30</p> <p style="text-align: center; color: cyan;">368257/P /CC</p> <p>30 13 6 14 21 29 22 5 26 9 2 10 17 25 18 1 58 41 34 42 49 57 50 33 28 11 4 12 19 27 20 3 62 45 38 46 53 61 54 37 32 15 8 16 23 31 24 7 64 47 40 48 55 63 56 39 60 43 36 44 51 59 52 35</p>	<p style="text-align: center; color: cyan;">363457/P /CC</p> <p>26 56 10 63 1 47 17 40 37 11 53 4 62 20 46 27 30 52 14 59 5 43 21 36 7 41 23 34 32 50 16 57 64 18 48 25 39 9 55 2 3 45 19 38 28 54 12 61 60 22 44 29 35 13 51 6 33 15 49 8 58 24 42 31</p> <p style="text-align: center; color: cyan;">366529/P /CC</p> <p>28 55 12 61 2 45 18 39 38 9 54 3 64 19 48 25 31 52 15 58 5 42 21 36 6 41 22 35 32 51 16 57 63 20 47 26 37 10 53 4 1 46 17 40 27 56 11 62 60 23 44 29 34 13 50 7 33 14 49 8 59 24 43 30</p> <p style="text-align: center; color: cyan;">368257/P /CC</p> <p>30 52 14 59 5 43 21 36 39 9 55 2 64 18 48 25 28 54 12 61 3 45 19 38 7 41 23 34 32 50 16 57 60 22 44 29 35 13 51 6 1 47 17 40 26 56 10 63 62 20 46 27 37 11 53 4 33 15 49 8 58 24 42 31</p>
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* Solution Counts according to the Value of n1 *

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 [25: 1728], [26: 1728], [27: 1344], [28: 1344], [29: 384], [30: 384], [31: 0], [32: 0],

We could certainly get the 368640 Prototype solutions, and could transform them into 368640 object solutions completely after the single Model and by the rules of DAM Transformation.

I compared this result with the old list I once got for the solutions of C&C MS88.

Both solution lists appear to have a very similar content in common, say, they do surely have the same set of object solutions.

We could not only succeed in reconstructing the solution set of C&C MS88 well by the combination of Prototype Squares and DAM Transformation, but could also find the beautiful 'one-to-one correspondence' between the two worlds.

It is amazing that a single Model could make so many object solutions as 368640, isn't it? Don't you think so?

But what makes it possible? What do the Prototype Squares mean?

Our success makes me very happy, but it makes me puzzled as much.

#6. The Most Fundamental Ten Solutions of 'C&C' MS88

Let's compose the most fundamental ten solutions of Composite & Complete magic squares of order 8 by the Prototype Squares and DAM Transformation.

Drs. Ollerenshaw and Brae mentioned in their page about ten 'Principal Squares' of 'Reversible' type of order 8. One of the most distinguished properties of it is that all of them have the beautiful structure in common such as:

$n_1 < n_2 < n_3 < n_4 < n_5 < n_6 < n_7 < n_8$; $n_1 < n_9 < n_{17} < n_{25} < n_{33} < n_{41} < n_{49} < n_{57}$;

(n9<n10<n11<n12<n13<n14<n15<n16; n2<n10<n18<n26<n34<n42<n50<n58;
n17<n18<n19<n20<n21<n22<n23<n24; n3<n11<n19<n27<n35<n43<n51<n59;
n25<n26<n27<n28<n29<n30<n31<n32; n4<n12<n20<n28<n36<n44<n52<n60;
.
n57<n58<n59<n60<n61<n62<n63<n64; n8<n16<n24<n32<n40<n48<n56<n64;)

Let's compose our Prototype Squares under these conditions added to the basic definitions, and try to transform the results into objects by DAM Transformation.

Can we really find the same composed objects with the old ones we once got and know very well? Let's examine our compositions carefully.

Let me show you the next list demonstrating the result of my recent experiment.

**** 'Principal Squares' of Order 8 and the Most Fundamental 10 Solutions of 'Composite & Complete' Pan-magic Squares 8x8 Recomposed by 'DAMT' ****

<p>[1] 1/P /CC</p> <p>1 2 3 4 5 6 7 8 1 63 4 62 8 58 5 59 9 10 11 12 13 14 15 16 56 10 53 11 49 15 52 14 17 18 19 20 21 22 23 24 25 39 28 38 32 34 29 35 25 26 27 28 29 30 31 32 48 18 45 19 41 23 44 22 33 34 35 36 37 38 39 40 57 7 60 6 64 2 61 3 41 42 43 44 45 46 47 48 16 50 13 51 9 55 12 54 49 50 51 52 53 54 55 56 33 31 36 30 40 26 37 27 57 58 59 60 61 62 63 64 24 42 21 43 17 47 20 46</p> <p>[3] 97/P /CC</p> <p>1 2 3 4 17 18 19 20 1 63 4 62 20 46 17 47 5 6 7 8 21 22 23 24 60 6 57 7 41 23 44 22 9 10 11 12 25 26 27 28 13 51 16 50 32 34 29 35 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 37 38 39 40 53 54 55 56 24 42 21 43 5 59 8 58 41 42 43 44 57 58 59 60 33 31 36 30 52 14 49 15 45 46 47 48 61 62 63 64 28 38 25 39 9 55 12 54</p> <p>[5] 865/P /CC</p> <p>1 2 5 6 9 10 13 14 1 63 6 60 14 52 9 55 3 4 7 8 11 12 15 16 62 4 57 7 49 15 54 12 17 18 21 22 25 26 29 30 19 45 24 42 32 34 27 37 19 20 23 24 27 28 31 32 48 18 43 21 35 29 40 26 33 34 37 38 41 42 45 46 51 13 56 10 64 2 59 5 35 36 39 40 43 44 47 48 16 50 11 53 3 61 8 58 49 50 53 54 57 58 61 62 33 31 38 28 46 20 41 23 51 52 55 56 59 60 63 64 30 36 25 39 17 47 22 44</p> <p>[7] 961/P /CC</p> <p>1 2 5 6 33 34 37 38 1 63 6 60 38 28 33 31 3 4 7 8 35 36 39 40 62 4 57 7 25 39 30 36 9 10 13 14 41 42 45 46 11 53 16 50 48 18 43 21 11 12 15 16 43 44 47 48 56 10 51 13 19 45 24 42 17 18 21 22 49 50 53 54 27 37 32 34 64 2 59 5 19 20 23 24 51 52 55 56 40 26 35 29 3 61 8 58 25 26 29 30 57 58 61 62 17 47 22 44 54 12 49 15 27 28 31 32 59 60 63 64 46 20 41 23 9 55 14 52</p> <p>[9] 1777/P /CC</p> <p>1 2 9 10 33 34 41 42 1 63 10 56 42 24 33 31 3 4 11 12 35 36 43 44 62 4 53 11 21 43 30 36 5 6 13 14 37 38 45 46 7 57 16 50 48 18 39 25 7 8 15 16 39 40 47 48 60 6 51 13 19 45 28 38 17 18 25 26 49 50 57 58 23 41 32 34 64 2 55 9 19 20 27 28 51 52 59 60 44 22 35 29 3 61 12 54 21 22 29 30 53 54 61 62 17 47 26 40 58 8 49 15 23 24 31 32 55 56 63 64 46 20 37 27 5 59 14 52</p>	<p>[2] 49/P /CC</p> <p>1 2 3 4 9 10 11 12 1 63 4 62 12 54 9 55 5 6 7 8 13 14 15 16 60 6 57 7 49 15 52 14 17 18 19 20 25 26 27 28 21 43 24 42 32 34 29 35 21 22 23 24 29 30 31 32 48 18 45 19 37 27 40 26 33 34 35 36 41 42 43 44 53 11 56 10 64 2 61 3 37 38 39 40 45 46 47 48 16 50 13 51 5 59 8 58 49 50 51 52 57 58 59 60 33 31 36 30 44 22 41 23 53 54 55 56 61 62 63 64 28 38 25 39 17 47 20 46</p> <p>[4] 145/P /CC</p> <p>1 2 3 4 33 34 35 36 1 63 4 62 36 30 33 31 5 6 7 8 37 38 39 40 60 6 57 7 25 39 28 38 9 10 11 12 41 42 43 44 13 51 16 50 48 18 45 19 13 14 15 16 45 46 47 48 56 10 53 11 21 43 24 42 17 18 19 20 49 50 51 52 29 35 32 34 64 2 61 3 21 22 23 24 53 54 55 56 40 26 37 27 5 59 8 58 25 26 27 28 57 58 59 60 17 47 20 46 52 14 49 15 29 30 31 32 61 62 63 64 44 22 41 23 9 55 12 54</p> <p>[6] 913/P /CC</p> <p>1 2 5 6 17 18 21 22 1 63 6 60 22 44 17 47 3 4 7 8 19 20 23 24 62 4 57 7 41 23 46 20 9 10 13 14 25 26 29 30 11 53 16 50 32 34 27 37 11 12 15 16 27 28 31 32 56 10 51 13 35 29 40 26 33 34 37 38 49 50 53 54 43 21 48 18 64 2 59 5 35 36 39 40 51 52 55 56 24 42 19 45 3 61 8 58 41 42 45 46 57 58 61 62 33 31 38 28 54 12 49 15 43 44 47 48 59 60 63 64 30 36 25 39 9 55 14 52</p> <p>[8] 1729/P /CC</p> <p>1 2 9 10 17 18 25 26 1 63 10 56 26 40 17 47 3 4 11 12 19 20 27 28 62 4 53 11 37 27 46 20 5 6 13 14 21 22 29 30 7 57 16 50 32 34 23 41 7 8 15 16 23 24 31 32 60 6 51 13 35 29 44 22 33 34 41 42 49 50 57 58 39 25 48 18 64 2 55 9 35 36 43 44 51 52 59 60 28 38 19 45 3 61 12 54 37 38 45 46 53 54 61 62 33 31 42 24 58 8 49 15 39 40 47 48 55 56 63 64 30 36 21 43 5 59 14 52</p> <p>[10] 2593/P /CC</p> <p>1 2 17 18 33 34 49 50 1 63 18 48 50 16 33 31 3 4 19 20 35 36 51 52 62 4 45 19 13 51 30 36 5 6 21 22 37 38 53 54 7 57 24 42 56 10 39 25 7 8 23 24 39 40 55 56 60 6 43 21 11 53 28 38 9 10 25 26 41 42 57 58 15 49 32 34 64 2 47 17 11 12 27 28 43 44 59 60 52 14 35 29 3 61 20 46 13 14 29 30 45 46 61 62 9 55 26 40 58 8 41 23 15 16 31 32 47 48 63 64 54 12 37 27 5 59 22 44</p>
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[Count = 10/23040] OK!

Compare each solution of the two lists one after another, and you will know they are all the same. There certainly are 'one-to-one' correspondences between the two sets of solutions: ten 'Principal Squares' and the Most Fundamental Ten of C&C MS88. How amazing it is!

#7. Prototype Squares of Order 8 for Multiple type of 'C&C' MS88

Let's study about the multiple type of 'C&C' pan-magic squares of order 8 next.

Let's compose the Prototype Squares at first and then re-compose object squares from them by our DAM Transformation.

But, what is our new object, multiple type of 'C&C' MS88?

Let me show you the Basic Form and the basic conditions below, instead of explaining it in some long words. That would be easier for you to understand.

**** Multiple Type: Including Four Little Squares 4x4 within ****

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

**** Basic Conditions for 'Multiple' Type: 2*SC=C ****

n1+n2+n3+n4=SC	... rw11;	n5+n6+n7+n8=SC	... rw12;
n9+n10+n11+n12=SC	... rw21;	n13+n14+n15+n16=SC	... rw22;
n17+n18+n19+n20=SC	... rw31;	n21+n22+n23+n24=SC	... rw32;
n25+n26+n27+n28=SC	... rw41;	n29+n30+n31+n32=SC	... rw42;

n33+n34+n35+n36=SC	... rw51;	n37+n38+n39+n40=SC	... rw52;
n41+n42+n43+n44=SC	... rw61;	n45+n46+n47+n48=SC	... rw62;
n49+n50+n51+n52=SC	... rw71;	n53+n54+n55+n56=SC	... rw72;
n57+n58+n59+n60=SC	... rw81;	n61+n62+n63+n64=SC	... rw82;

n1+n9+n17+n25=SC	... cl 11;	n33+n41+n49+n57=SC	... cl 12;
n2+n10+n18+n26=SC	... cl 21;	n34+n42+n50+n58=SC	... cl 22;
n3+n11+n19+n27=SC	... cl 31;	n35+n43+n51+n59=SC	... cl 32;
n4+n12+n20+n28=SC	... cl 41;	n36+n44+n52+n60=SC	... cl 42;

n5+n13+n21+n29=SC	... cl 51;	n37+n45+n53+n61=SC	... cl 52;
n6+n14+n22+n30=SC	... cl 61;	n38+n46+n54+n62=SC	... cl 62;
n7+n15+n23+n31=SC	... cl 71;	n39+n47+n55+n63=SC	... cl 72;
n8+n16+n24+n32=SC	... cl 81;	n40+n48+n56+n64=SC	... cl 82;

We assume both the 'Composite Conditions' and 'Complete Conditions' above all. We also assume the same things for our Prototype Squares like these:

**** The most Basic Conditions for our Prototype Squares: ****

n1+n63+n4+n62=S	... rw1;	n36+n30+n33+n31S	... rw2;
n1+n60+n13+n56=S	... cl 1;	n29+n40+n17+n44=S	... cl 2;
n1+n6+n16+n11+n64+n59+n49+n54=C	... pd1;		
n31+n28+n18+n21+n34+n37+n47+n44=C	... pb8;		

**** Basic Diagrams for Prototype and the Model Solution in Extended Space ****

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

**** 'Composite Conditions' for Prototype Squares: ****

```

n1+n63+n60+n6=S ... c01; | n18+n45+n43+n24=S ... c22; | n37+n27+n20+n46=S ... c43;
n63+n4+n6+n57=S ... c02; | n45+n19+n24+n42=S ... c23; | n27+n5+n46+n52=S ... c44;
n4+n62+n57+n7=S ... c03; | n19+n13+n42+n56=S ... c24; | n5+n59+n52+n14=S ... c45;
n62+n36+n7+n25=S ... c04; | n56+n10+n29+n35=S ... c25; | n59+n8+n14+n49=S ... c46;
n36+n30+n25+n39=S ... c05; | n10+n53+n35+n32=S ... c26; | n8+n58+n49+n15=S ... c47;
n30+n33+n39+n28=S ... c06; | n53+n11+n32+n34=S ... c27; | n58+n40+n15+n17=S ... c48;
n33+n31+n28+n38=S ... c07; | n11+n21+n34+n64=S ... c28; | n17+n47+n44+n22=S ... c49;
n31+n1+n38+n60=S ... c08; | n21+n43+n64+n2=S ... c29; | n47+n20+n22+n41=S ... c50;
n60+n6+n13+n51=S ... c09; | n43+n24+n2+n61=S ... c30; | n20+n46+n41+n23=S ... c51;
n6+n57+n51+n16=S ... c10; | n24+n42+n61+n3=S ... c31; | n46+n52+n23+n9=S ... c52;
n57+n7+n16+n50=S ... c11; | n42+n56+n3+n29=S ... c32; | n52+n14+n9+n55=S ... c53;
n7+n25+n50+n48=S ... c12; | n29+n35+n40+n26=S ... c33; | n14+n49+n55+n12=S ... c54;
n25+n39+n48+n18=S ... c13; | n35+n32+n26+n37=S ... c34; | n49+n15+n12+n54=S ... c55;
n39+n28+n18+n45=S ... c14; | n32+n34+n37+n27=S ... c35; | n15+n17+n54+n44=S ... c56;
n28+n38+n45+n19=S ... c15; | n34+n64+n27+n5=S ... c36; | n44+n22+n1+n63=S ... c57;
n38+n60+n19+n13=S ... c16; | n64+n2+n5+n59=S ... c37; | n22+n41+n63+n4=S ... c58;
n13+n51+n56+n10=S ... c17; | n2+n61+n59+n8=S ... c38; | n41+n23+n4+n62=S ... c59;
n51+n16+n10+n53=S ... c18; | n61+n3+n8+n58=S ... c39; | n23+n9+n62+n36=S ... c60;
n16+n50+n53+n11=S ... c19; | n3+n29+n58+n40=S ... c40; | n9+n55+n36+n30=S ... c61;
n50+n48+n11+n21=S ... c20; | n40+n26+n17+n47=S ... c41; | n55+n12+n30+n33=S ... c62;
n48+n18+n21+n43=S ... c21; | n26+n37+n47+n20=S ... c42; | n12+n54+n33+n31=S ... c63;
and n54+n44+n31+n1=S ... c64;

```

**** 'Complete Conditions' for Prototype Squares: ****

```

n1+n64=n63+n2+n4+n61=n62+n3+n36+n29=n30+n35=n33+n32=n31+n34=n60+n5=
n6+n59=n57+n8=n7+n58=n25+n40=n39+n26=n28+n37=n38+n27=n13+n52=n51+n14=
n16+n49=n50+n15=n48+n17=n18+n47=n45+n20=n19+n46=n56+n9=n10+n55=n53+n12=
n11+n54=n21+n44=n43+n22=n24+n41=n42+n23=CC

```

**** List-forming Inequality Conditions for Prototype Squares: ****

```

n1<n31, n1<n44, n1<54 and n60<n63;

```

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

```

void damt8m(){
d[1]=c[1]; d[2]=c[63]; d[3]=c[4]; d[4]=c[62]; d[5]=c[36]; d[6]=c[30]; d[7]=c[33]; d[8]=c[31];
d[9]=c[60]; d[10]=c[6]; d[11]=c[57]; d[12]=c[7]; d[13]=c[25]; d[14]=c[39]; d[15]=c[28]; d[16]=c[38];
d[17]=c[13]; d[18]=c[51]; d[19]=c[16]; d[20]=c[50]; d[21]=c[48]; d[22]=c[18]; d[23]=c[45]; d[24]=c[19];
d[25]=c[56]; d[26]=c[10]; d[27]=c[53]; d[28]=c[11]; d[29]=c[21]; d[30]=c[43]; d[31]=c[24]; d[32]=c[42];
d[33]=c[29]; d[34]=c[35]; d[35]=c[32]; d[36]=c[34]; d[37]=c[64]; d[38]=c[2]; d[39]=c[61]; d[40]=c[3];
d[41]=c[40]; d[42]=c[26]; d[43]=c[37]; d[44]=c[27]; d[45]=c[5]; d[46]=c[59]; d[47]=c[8]; d[48]=c[58];
d[49]=c[17]; d[50]=c[47]; d[51]=c[20]; d[52]=c[46]; d[53]=c[52]; d[54]=c[14]; d[55]=c[49]; d[56]=c[15];
d[57]=c[44]; d[58]=c[22]; d[59]=c[41]; d[60]=c[23]; d[61]=c[9]; d[62]=c[55]; d[63]=c[12]; d[64]=c[54];
}
/**/

```

The next list tells you the result of my recent computation, while it is only a part.

* 'Prototype Squares' of Order 8 and Multiple Type of 'Composite & Complete' Pan-magic Squares 8x8 Recomposed by our 'Do-it-After-the-Model Transformation' *

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1081/P /CC
 4 2 3 1 8 6 7 5 4 63 1 62 33 30 36 31
 12 10 11 9 16 14 15 13 57 6 60 7 28 39 25 38
 20 18 19 17 24 22 23 21 16 51 13 50 45 18 48 19
 28 26 27 25 32 30 31 29 53 10 56 11 24 43 21 42
 36 34 35 33 40 38 39 37 32 35 29 34 61 2 64 3
 44 42 43 41 48 46 47 45 37 26 40 27 8 59 5 58
 52 50 51 49 56 54 55 53 20 47 17 46 49 14 52 15
 60 58 59 57 64 62 63 61 41 22 44 23 12 55 9 54

1441/P /CC
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 37 33 38 34 39 35 40 36 31 38 28 33 60 1 63 6
 45 41 46 42 47 43 48 44 36 25 39 30 7 62 4 57
 53 49 54 50 55 51 56 52 21 48 18 43 50 11 53 16
 61 57 62 58 63 59 64 60 42 19 45 24 13 56 10 51

2161/P /CC
 7 3 5 1 8 4 6 2 7 62 1 60 33 28 39 30
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 31 27 29 25 32 28 30 26 50 11 56 13 24 45 18 43
 39 35 37 33 40 36 38 34 32 37 26 35 58 3 64 5
 47 43 45 41 48 44 46 42 34 27 40 29 8 61 2 59
 55 51 53 49 56 52 54 50 23 46 17 44 49 12 55 14
 63 59 61 57 64 60 62 58 41 20 47 22 15 54 9 52

2881/P /CC
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 13 5 14 6 15 7 16 8 54 3 61 12 29 44 22 35
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 41 33 42 34 43 35 44 36 31 42 24 33 56 1 63 10
 45 37 46 38 47 39 48 40 36 21 43 30 11 62 4 53
 57 49 58 50 59 51 60 52 25 48 18 39 50 7 57 16
 61 53 62 54 63 55 64 56 38 19 45 28 13 60 6 51

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

4033/P /CC
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 15 7 11 3 16 8 12 4 51 6 63 10 31 42 19 38
 29 21 25 17 30 22 26 18 16 57 4 53 36 21 48 25
 31 23 27 19 32 24 28 20 50 7 62 11 30 43 18 39
 45 37 41 33 46 38 42 34 32 41 20 37 52 5 64 9
 47 39 43 35 48 40 44 36 34 23 46 27 14 59 2 55
 61 53 57 49 62 54 58 50 29 44 17 40 49 8 61 12
 63 55 59 51 64 56 60 52 35 22 47 26 15 58 3 54

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

5185/P /CC
 17 1 18 2 19 3 20 4 17 64 2 47 34 15 49 32
 21 5 22 6 23 7 24 8 46 3 61 20 29 52 14 35
 25 9 26 10 27 11 28 12 23 58 8 41 40 9 55 26
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 49 33 50 34 51 35 52 36 31 50 16 33 48 1 63 18
 53 37 54 38 55 39 56 40 36 13 51 30 19 62 4 45
 57 41 58 42 59 43 60 44 25 56 10 39 42 7 57 24
 61 45 62 46 63 47 64 48 38 11 53 28 21 60 6 43

1801/P /CC
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 14 10 13 9 16 12 15 11 57 4 62 7 30 39 25 36
 22 18 21 17 24 20 23 19 16 53 11 50 43 18 48 21
 30 26 29 25 32 28 31 27 51 10 56 13 24 45 19 42
 38 34 37 33 40 36 39 35 32 37 27 34 59 2 64 5
 46 42 45 41 48 44 47 43 35 26 40 29 8 61 3 58
 54 50 53 49 56 52 55 51 22 47 17 44 49 12 54 15
 62 58 61 57 64 60 63 59 41 20 46 23 14 55 9 52

2521/P /CC
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 16 12 14 10 15 11 13 9 58 3 64 5 32 37 26 35
 24 20 22 18 23 19 21 17 15 54 9 52 41 20 47 22
 32 28 30 26 31 27 29 25 49 12 55 14 23 46 17 44
 40 36 38 34 39 35 37 33 31 38 25 36 57 4 63 6
 48 44 46 42 47 43 45 41 33 28 39 30 7 62 1 60
 56 52 54 50 55 51 53 49 24 45 18 43 50 11 56 13
 64 60 62 58 63 59 61 57 42 19 48 21 16 53 10 51

3169/P /CC
 10 2 9 1 12 4 11 3 10 63 1 56 33 24 42 31
 14 6 13 5 16 8 15 7 53 4 62 11 30 43 21 36
 26 18 25 17 28 20 27 19 16 57 7 50 39 18 48 25
 30 22 29 21 32 24 31 23 51 6 60 13 28 45 19 38
 42 34 41 33 44 36 43 35 32 41 23 34 55 2 64 9
 46 38 45 37 48 40 47 39 35 22 44 29 12 61 3 54
 58 50 57 49 60 52 59 51 26 47 17 40 49 8 58 15
 62 54 61 53 64 56 63 55 37 20 46 27 14 59 5 52

3745/P /CC
 12 4 10 2 11 3 9 1 12 61 2 55 34 23 44 29
 16 8 14 6 15 7 13 5 54 3 64 9 32 41 22 35
 28 20 26 18 27 19 25 17 15 58 5 52 37 20 47 26
 32 24 30 22 31 23 29 21 49 8 59 14 27 46 17 40
 44 36 42 34 43 35 41 33 31 42 21 36 53 4 63 10
 48 40 46 38 47 39 45 37 33 24 43 30 11 62 1 56
 60 52 58 50 59 51 57 49 28 45 18 39 50 7 60 13
 64 56 62 54 63 55 61 53 38 19 48 25 16 57 6 51

4321/P /CC
 14 6 10 2 13 5 9 1 14 59 2 55 34 23 46 27
 16 8 12 4 15 7 11 3 52 5 64 9 32 41 20 37
 30 22 26 18 29 21 25 17 15 58 3 54 35 22 47 26
 32 24 28 20 31 23 27 19 49 8 61 12 29 44 17 40
 46 38 42 34 45 37 41 33 31 42 19 38 51 6 63 10
 48 40 44 36 47 39 43 35 33 24 45 28 13 60 1 56
 62 54 58 50 61 53 57 49 30 43 18 39 50 7 62 11
 64 56 60 52 63 55 59 51 36 21 48 25 16 57 4 53

4897/P /CC
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 15 7 11 3 13 5 9 1 51 6 63 10 31 42 19 38
 32 24 28 20 30 22 26 18 13 60 1 56 33 24 45 28
 31 23 27 19 29 21 25 17 50 7 62 11 30 43 18 39
 48 40 44 36 46 38 42 34 29 44 17 40 49 8 61 12
 47 39 43 35 45 37 41 33 34 23 46 27 14 59 2 55
 64 56 60 52 62 54 58 50 32 41 20 37 52 5 64 9
 63 55 59 51 61 53 57 49 35 22 47 26 15 58 3 54

5257/P /CC
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 22 6 21 5 24 8 23 7 45 4 62 19 30 51 13 36
 26 10 25 9 28 12 27 11 24 57 7 42 39 10 56 25
 30 14 29 13 32 16 31 15 43 6 60 21 28 53 11 38
 50 34 49 33 52 36 51 35 32 49 15 34 47 2 64 17
 54 38 53 37 56 40 55 39 35 14 52 29 20 61 3 46
 58 42 57 41 60 44 59 43 26 55 9 40 41 8 58 23
 62 46 61 45 64 48 63 47 37 12 54 27 22 59 5 44

5329/P /CC								5401/P /CC																							
19 3 17 1 20 4 18 2	19 62 1 48 33 16 51 30	20 4 18 2 19 3 17 1	20 61 2 47 34 15 52 29	23 7 21 5 24 8 22 6	45 4 63 18 31 50 13 36	24 8 22 6 23 7 21 5	46 3 64 17 32 49 14 35	27 11 25 9 28 12 26 10	24 57 6 43 38 11 56 25	28 12 26 10 27 11 25 9	23 58 5 44 37 12 55 26	31 15 29 13 32 16 30 14	42 7 60 21 28 53 10 39	32 16 30 14 31 15 29 13	41 8 59 22 27 54 9 40	51 35 49 33 52 36 50 34	32 49 14 35 46 3 64 17	52 36 50 34 51 35 49 33	31 50 13 36 45 4 63 18	55 39 53 37 56 40 54 38	34 15 52 29 20 61 2 47	56 40 54 38 55 39 53 37	33 16 51 30 19 62 1 48	59 43 57 41 60 44 58 42	27 54 9 40 41 8 59 22	60 44 58 42 59 43 57 41	28 53 10 39 42 7 60 21	63 47 61 45 64 48 62 46	37 12 55 26 23 58 5 44	64 48 62 46 63 47 61 45	38 11 56 25 24 57 6 43
5473/P /CC								5545/P /CC																							
21 5 17 1 22 6 18 2	21 60 1 48 33 16 53 28	22 6 18 2 21 5 17 1	22 59 2 47 34 15 54 27	23 7 19 3 24 8 20 4	43 6 63 18 31 50 11 38	24 8 20 4 23 7 19 3	44 5 64 17 32 49 12 37	29 13 25 9 30 14 26 10	24 57 4 45 36 13 56 25	30 14 26 10 29 13 25 9	23 58 3 46 35 14 55 26	31 15 27 11 32 16 28 12	42 7 62 19 30 51 10 39	32 16 28 12 31 15 27 11	41 8 61 20 29 52 9 40	53 37 49 33 54 38 50 34	32 49 12 37 44 5 64 17	54 38 50 34 53 37 49 33	31 50 11 38 43 6 63 18	55 39 51 35 56 40 52 36	34 15 54 27 22 59 2 47	56 40 52 36 55 39 51 35	33 16 53 28 21 60 1 48	61 45 57 41 62 46 58 42	29 52 9 40 41 8 61 20	62 46 58 42 61 45 57 41	30 51 10 39 42 7 62 19	63 47 59 43 64 48 60 44	35 14 55 26 23 58 3 46	64 48 60 44 63 47 59 43	36 13 56 25 24 57 4 45
5617/P /CC								5689/P /CC																							
23 7 19 3 21 5 17 1	23 58 3 46 35 14 55 26	24 8 20 4 22 6 18 2	24 57 4 45 36 13 56 25	24 8 20 4 22 6 18 2	44 5 64 17 32 49 12 37	23 7 19 3 21 5 17 1	43 6 63 18 31 50 11 38	31 15 27 11 29 13 25 9	22 59 2 47 34 15 54 27	32 16 28 12 30 14 26 10	21 60 1 48 33 16 53 28	32 16 28 12 30 14 26 10	41 8 61 20 29 52 9 40	31 15 27 11 29 13 25 9	42 7 62 19 30 51 10 39	55 39 51 35 53 37 49 33	30 51 10 39 42 7 62 19	56 40 52 36 54 38 50 34	33 16 53 28 21 60 1 48	55 39 51 35 53 37 49 33	31 50 11 38 43 6 63 18	63 47 59 43 61 45 57 41	31 50 11 38 43 6 63 18	64 48 60 44 62 46 58 42	36 13 56 25 24 57 4 45	63 47 59 43 61 45 57 41	35 14 55 26 23 58 3 46				

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* Counts according to the Value of n1 *

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- [9: 288], [10: 288], [11: 288], [12: 288], [13: 288], [14: 288], [15: 288], [16: 288],
- [17: 72], [18: 72], [19: 72], [20: 72], [21: 72], [22: 72], [23: 72], [24: 72],
- [25: 0], [26: 0], [27: 0], [28: 0], [29: 0], [30: 0], [31: 0], [32: 0],

[OK!]

We have succeeded in reconstructing all the object solutions by our DAMT.

What can we find about the most Fundamental solutions of this multiple type?
The next list shows the result of my recent computations with a new Model.

** 'Principal Squares' of Order 8 and the Most Fundamental Twenty Solutions **
** of Multiple, 'Composite and Complete' Pan-magic Squares 8x8 Recomposed **

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

[5]	31/P	/CC	[6]	37/P	/CC
1 2 5 6 9 10 13 14	1 63 6 60 38 28 33 31		1 2 5 6 17 18 21 22	1 63 6 60 38 28 33 31	
3 4 7 8 11 12 15 16	56 10 51 13 19 45 24 42		3 4 7 8 19 20 23 24	48 18 43 21 11 53 16 50	
17 18 21 22 25 26 29 30	11 53 16 50 48 18 43 21		9 10 13 14 25 26 29 30	19 45 24 42 56 10 51 13	
19 20 23 24 27 28 31 32	62 4 57 7 25 39 30 36		11 12 15 16 27 28 31 32	62 4 57 7 25 39 30 36	
33 34 37 38 41 42 45 46	27 37 32 34 64 2 59 5		33 34 37 38 49 50 53 54	27 37 32 34 64 2 59 5	
35 36 39 40 43 44 47 48	46 20 41 23 9 55 14 52		35 36 39 40 51 52 55 56	54 12 49 15 17 47 22 44	
49 50 53 54 57 58 61 62	17 47 22 44 54 12 49 15		41 42 45 46 57 58 61 62	9 55 14 52 46 20 41 23	
51 52 55 56 59 60 63 64	40 26 35 29 3 61 8 58		43 44 47 48 59 60 63 64	40 26 35 29 3 61 8 58	
[7]	43/P	/CC	[8]	61/P	/CC
1 2 5 6 33 34 37 38	1 63 6 60 22 44 17 47		1 2 9 10 17 18 25 26	1 63 10 56 42 24 33 31	
3 4 7 8 35 36 39 40	32 34 27 37 11 53 16 50		3 4 11 12 19 20 27 28	48 18 39 25 7 57 16 50	
9 10 13 14 41 42 45 46	35 29 40 26 56 10 51 13		5 6 13 14 21 22 29 30	19 45 28 38 60 6 51 13	
11 12 15 16 43 44 47 48	62 4 57 7 41 23 46 20		7 8 15 16 23 24 31 32	62 4 53 11 21 43 30 36	
17 18 21 22 49 50 53 54	43 21 48 18 64 2 59 5		33 34 41 42 49 50 57 58	23 41 32 34 64 2 55 9	
19 20 23 24 51 52 55 56	54 12 49 15 33 31 38 28		35 36 43 44 51 52 59 60	58 8 49 15 17 47 26 40	
25 26 29 30 57 58 61 62	9 55 14 52 30 36 25 39		37 38 45 46 53 54 61 62	5 59 14 52 46 20 37 27	
27 28 31 32 59 60 63 64	24 42 19 45 3 61 8 58		39 40 47 48 55 56 63 64	44 22 35 29 3 61 12 54	
[9]	67/P	/CC	[10]	91/P	/CC
1 2 9 10 33 34 41 42	1 63 10 56 26 40 17 47		1 2 17 18 33 34 49 50	1 63 18 48 26 40 9 55	
3 4 11 12 35 36 43 44	32 34 23 41 7 57 16 50		3 4 19 20 35 36 51 52	32 34 15 49 7 57 24 42	
5 6 13 14 37 38 45 46	35 29 44 22 60 6 51 13		5 6 21 22 37 38 53 54	35 29 52 14 60 6 43 21	
7 8 15 16 39 40 47 48	62 4 53 11 37 27 46 20		7 8 23 24 39 40 55 56	62 4 45 19 37 27 54 12	
17 18 25 26 49 50 57 58	39 25 48 18 64 2 55 9		9 10 25 26 41 42 57 58	39 25 56 10 64 2 47 17	
19 20 27 28 51 52 59 60	58 8 49 15 33 31 42 24		11 12 27 28 43 44 59 60	58 8 41 23 33 31 50 16	
21 22 29 30 53 54 61 62	5 59 14 52 30 36 21 43		13 14 29 30 45 46 61 62	5 59 22 44 30 36 13 51	
23 24 31 32 55 56 63 64	28 38 19 45 3 61 12 54		15 16 31 32 47 48 63 64	28 38 11 53 3 61 20 46	
[11]	145/P	/CC	[12]	151/P	/CC
1 3 5 7 9 11 13 15	1 62 7 60 39 28 33 30		1 3 5 7 17 19 21 23	1 62 7 60 39 28 33 30	
2 4 6 8 10 12 14 16	56 11 50 13 18 45 24 43		2 4 6 8 18 20 22 24	48 19 42 21 10 53 16 51	
17 19 21 23 25 27 29 31	10 53 16 51 48 19 42 21		9 11 13 15 25 27 29 31	18 45 24 43 56 11 50 13	
18 20 22 24 26 28 30 32	63 4 57 6 25 38 31 36		10 12 14 16 26 28 30 32	63 4 57 6 25 38 31 36	
33 35 37 39 41 43 45 47	26 37 32 35 64 3 58 5		33 35 37 39 49 51 53 55	26 37 32 35 64 3 58 5	
34 36 38 40 42 44 46 48	47 20 41 22 9 54 15 52		34 36 38 40 50 52 54 56	55 12 49 14 17 46 23 44	
49 51 53 55 57 59 61 63	17 46 23 44 55 12 49 14		41 43 45 47 57 59 61 63	9 54 15 52 47 20 41 22	
50 52 54 56 58 60 62 64	40 27 34 29 2 61 8 59		42 44 46 48 58 60 62 64	40 27 34 29 2 61 8 59	
[13]	157/P	/CC	[14]	169/P	/CC
1 3 5 7 33 35 37 39	1 62 7 60 23 44 17 46		1 3 9 11 17 19 25 27	1 62 11 56 43 24 33 30	
2 4 6 8 34 36 38 40	32 35 26 37 10 53 16 51		2 4 10 12 18 20 26 28	48 19 38 25 6 57 16 51	
9 11 13 15 41 43 45 47	34 29 40 27 56 11 50 13		5 7 13 15 21 23 29 31	18 45 28 39 60 7 50 13	
10 12 14 16 42 44 46 48	63 4 57 6 41 22 47 20		6 8 14 16 22 24 30 32	63 4 53 10 21 42 31 36	
17 19 21 23 49 51 53 55	42 21 48 19 64 3 58 5		33 35 41 43 49 51 57 59	22 41 32 35 64 3 54 9	
18 20 22 24 50 52 54 56	55 12 49 14 33 30 39 28		34 36 42 44 50 52 58 60	59 8 49 14 17 46 27 40	
25 27 29 31 57 59 61 63	9 54 15 52 31 36 25 38		37 39 45 47 53 55 61 63	5 58 15 52 47 20 37 26	
26 28 30 32 58 60 62 64	24 43 18 45 2 61 8 59		38 40 46 48 54 56 62 64	44 23 34 29 2 61 12 55	
[15]	175/P	/CC	[16]	193/P	/CC
1 3 9 11 33 35 41 43	1 62 11 56 27 40 17 46		1 3 17 19 33 35 49 51	1 62 19 48 27 40 9 54	
2 4 10 12 34 36 42 44	32 35 22 41 6 57 16 51		2 4 18 20 34 36 50 52	32 35 14 49 6 57 24 43	
5 7 13 15 37 39 45 47	34 29 44 23 60 7 50 13		5 7 21 23 37 39 53 55	34 29 52 15 60 7 42 21	
6 8 14 16 38 40 46 48	63 4 53 10 37 26 47 20		6 8 22 24 38 40 54 56	63 4 45 18 37 26 55 12	
17 19 25 27 49 51 57 59	38 25 48 19 64 3 54 9		9 11 25 27 41 43 57 59	38 25 56 11 64 3 46 17	
18 20 26 28 50 52 58 60	59 8 49 14 33 30 43 24		10 12 26 28 42 44 58 60	59 8 41 22 33 30 51 16	
21 23 29 31 53 55 61 63	5 58 15 52 31 36 21 42		13 15 29 31 45 47 61 63	5 58 23 44 31 36 13 50	
22 24 30 32 54 56 62 64	28 39 18 45 2 61 12 55		14 16 30 32 46 48 62 64	28 39 10 53 2 61 20 47	
[17]	253/P	/CC	[18]	259/P	/CC
1 5 9 13 17 21 25 29	1 60 13 56 45 24 33 28		1 5 9 13 33 37 41 45	1 60 13 56 29 40 17 44	
2 6 10 14 18 22 26 30	48 21 36 25 4 57 16 53		2 6 10 14 34 38 42 46	32 37 20 41 4 57 16 53	
3 7 11 15 19 23 27 31	18 43 30 39 62 7 50 11		3 7 11 15 35 39 43 47	34 27 46 23 62 7 50 11	
4 8 12 16 20 24 28 32	63 6 51 10 19 42 31 38		4 8 12 16 36 40 44 48	63 6 51 10 35 26 47 22	
33 37 41 45 49 53 57 61	20 41 32 37 64 5 52 9		17 21 25 29 49 53 57 61	36 25 48 21 64 5 52 9	
34 38 42 46 50 54 58 62	61 8 49 12 17 44 29 40		18 22 26 30 50 54 58 62	61 8 49 12 33 28 45 24	
35 39 43 47 51 55 59 63	3 58 15 54 47 22 35 26		19 23 27 31 51 55 59 63	3 58 15 54 31 38 19 42	
36 40 44 48 52 56 60 64	46 23 34 27 2 59 14 55		20 24 28 32 52 56 60 64	30 39 18 43 2 59 14 55	

[19]	271/P	/CC	[20]	325/P	/CC																										
1	5	17	21	33	37	49	53	1	60	21	48	29	40	9	52	1	9	17	25	33	41	49	57	1	56	25	48	29	44	5	52
2	6	18	22	34	38	50	54	32	37	12	49	4	57	24	45	2	10	18	26	34	42	50	58	32	41	8	49	4	53	28	45
3	7	19	23	35	39	51	55	34	27	54	15	62	7	42	19	3	11	19	27	35	43	51	59	34	23	58	15	62	11	38	19
4	8	20	24	36	40	52	56	63	6	43	18	35	26	55	14	4	12	20	28	36	44	52	60	63	10	39	18	35	22	59	14
9	13	25	29	41	45	57	61	36	25	56	13	64	5	44	17	5	13	21	29	37	45	53	61	36	21	60	13	64	9	40	17
10	14	26	30	42	46	58	62	61	8	41	20	33	28	53	16	6	14	22	30	38	46	54	62	61	12	37	20	33	24	57	16
11	15	27	31	43	47	59	63	3	58	23	46	31	38	11	50	7	15	23	31	39	47	55	63	3	54	27	46	31	42	7	50
12	16	28	32	44	48	60	64	30	39	10	51	2	59	22	47	8	16	24	32	40	48	56	64	30	43	6	51	2	55	26	47

[Count = 20/360] OK!

When I used the same Model as in the last experiment for 'C&C' MS88, I could get the same set of 10 'Principal Squares' and the same set of 10 object solutions.

But, when I used a new Model, I had to get a new set of 20 Principal Squares and the different set of object solutions. This result is not just what I expected to have.

The new set of 20 Principal Squares includes 10 reflected patterns of 10 in the first part, while the new set of 20 object solutions includes no reflected patterns at all.

They make the completely different set of solutions.

Why? I must confess I was surprised and confused a lot at this result.

I am now thinking about what it means and how we have to deal with it.

Some types of transformation system would often meet the serious conflict with the list-forming inequality conditions. It may be the reason why you should be careful to handle with some types of fundamental solutions, or even standard solutions.

#8. The Last Comment

The most amazing thing of all, I think, is that each type of magic square and cube of every order has its own set of Prototype Squares and the DAM Transformation. Whenever I tried to find the one-to-one correspondence between every object and Prototype, I always succeeded in getting the beautiful result. I have never failed.

But what makes it possible? What does the set of Prototype Squares mean?

One of the possible reasons may be that every set of Prototype solutions could be essentially identified with the set of 'basic form and the conceptual diagrams of any fundamental transformations'.

(October 23, 2006; Worked on MacOSX and Xcode2.2 by Kanji Setsuda)

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