

Chapter 6: Outlines of Various Magic Squares of Order 8 by Kanji Setsuda

In this chapter I would like to tell you about the outlines of various magic squares of order 8. I want to give you a basic guidebook about this rich and fruitful world. Almost anything you could imagine about magic squares exists in reality here and everything would not stop attracting you, though its scale might be too big for you to go on studying. Don't give it up on your way. I want you to stay long in this world.

Definitions and the solution set of object squares

Everything starts at the same definition stage, and in the end you have to get each correct set of object solutions. I would like to show you each definition and sample solutions for every type of magic squares of order 8 in this chapter.

Section 1: 'Self-complementary' Magic Squares of Order 8

One of the most characteristic properties of this type is the existence of such pairs as (1, 64), (2, 63), (3, 62), (4, 61), (5, 60), (6, 59), (7, 58), ..., (m, n), ..., (30, 35), (31, 34), (32, 33) [m+n=65]

The one of each pair must be located symmetrically to the other with respect to the geometric center of the object square. They are called 'Complementary Pairs'.

'Self-complementary' magic squares of order 8 are defined as shown with the Basic Form below and a lot of simultaneous equations.

* Basic Form and Basic Conditions for Magic Squares of Order 8 *

** #1: Self-Complementary Type: **

* Basic Form *	* Basic Conditions *
n8 | n1 | n2 | n3 | n4 | n5 | n6 | n7 | n8 | n1	n1+n2+n3+n4+n5+n6+n7+n8=C ...rw1;
16 | n9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | n9	n9+n10+n11+n12+n13+n14+n15+n16=C ...rw2;
24 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 17	n17+n18+n19+n20+n21+n22+n23+n24=C ...rw3;
32 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 25	n25+n26+n27+n28+n29+n30+n31+n32=C ...rw4;
40 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 33	n33+n34+n35+n36+n37+n38+n39+n40=C ...rw5;
48 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 41	n41+n42+n43+n44+n45+n46+n47+n48=C ...rw6;
56 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 49	n49+n50+n51+n52+n53+n54+n55+n56=C ...rw7;
64 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 57	n57+n58+n59+n60+n61+n62+n63+n64=C ...rw8;
n1 | n9 | n17 | n25 | n33 | n41 | n49 | n57 =	n1+n9+n17+n25+n33+n41+n49+n57=C ...c11;
n2 | n10 | n18 | n26 | n34 | n42 | n50 | n58 =	n2+n10+n18+n26+n34+n42+n50+n58=C ...c12;
n3 | n11 | n19 | n27 | n35 | n43 | n51 | n59 =	n3+n11+n19+n27+n35+n43+n51+n59=C ...c13;
n4 | n12 | n20 | n28 | n36 | n44 | n52 | n60 =	n4+n12+n20+n28+n36+n44+n52+n60=C ...c14;
n5 | n13 | n21 | n29 | n37 | n45 | n53 | n61 =	n5+n13+n21+n29+n37+n45+n53+n61=C ...c15;
n6 | n14 | n22 | n30 | n38 | n46 | n54 | n62 =	n6+n14+n22+n30+n38+n46+n54+n62=C ...c16;
n7 | n15 | n23 | n31 | n39 | n47 | n55 | n63 =	n7+n15+n23+n31+n39+n47+n55+n63=C ...c17;
n8 | n16 | n24 | n32 | n40 | n48 | n56 | n64 =	n8+n16+n24+n32+n40+n48+n56+n64=C ...c18;

** Self-Complementary Conditions: 4*CC=C=260 **

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

The 'Basic Form' above expresses position names of variables and the 8 by 8 square structure of regular array. 'Basic Conditions' define the constant sum 260 of all rows and columns of the object, while 'Self-Complementary Conditions' define the constant sum 65 of each pair and the symmetrical location of those two numbers.

What do our objects look like? Let me show you some sample solutions here:

** Sample List of Self-complementary Magic Squares of Order 8 **

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

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

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

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

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

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

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The total count of these solutions is still unknown. It is not infinite at all, but it seems almost uncountable. It would take too much time for anyone to count them up to the last. No one knows what scale it has and how it could be calculated either.

When you want to study more about this type, especially about its inner structure and any transformation system, you had better know well about such a new notation of complementary pairs as follows:

**** Basic Forms: Another One made in New Notation ****

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

(New Notation)

Since $n_1+n_{64}=CC$, $n_{64}=CC-n_1$. Let's define $\underline{n_1}$ for n_{64} . It means $\underline{n_1}=CC-n_1=n_{64}$;
 Since $n_2+n_{63}=CC$, $n_{63}=CC-n_2$. Let's define $\underline{n_2}$ for n_{63} . It means $\underline{n_2}=CC-n_2=n_{63}$;
 Since $n_3+n_{62}=CC$, $n_{62}=CC-n_3$. Let's define $\underline{n_3}$ for n_{62} . It means $\underline{n_3}=CC-n_3=n_{62}$;
 Since $n_4+n_{61}=CC$, $n_{61}=CC-n_4$. Let's define $\underline{n_4}$ for n_{61} . It means $\underline{n_4}=CC-n_4=n_{61}$;
 Since $n_5+n_{60}=CC$, $n_{60}=CC-n_5$. Let's define $\underline{n_5}$ for n_{60} . It means $\underline{n_5}=CC-n_5=n_{60}$;

 Since $n_{30}+n_{35}=CC$, $n_{35}=CC-n_{30}$. Let's define $\underline{n_{30}}$ for n_{35} . It means $\underline{n_{30}}=CC-n_{30}=n_{35}$;
 Since $n_{31}+n_{34}=CC$, $n_{34}=CC-n_{31}$. Let's define $\underline{n_{31}}$ for n_{34} . It means $\underline{n_{31}}=CC-n_{31}=n_{34}$;
 Since $n_{32}+n_{33}=CC$, $n_{33}=CC-n_{32}$. Let's define $\underline{n_{32}}$ for n_{33} . It means $\underline{n_{32}}=CC-n_{32}=n_{33}$;

**** Basic Conditions: C=260 ****

$n_1+n_2+n_3+n_4+n_5+n_6+n_7+n_8=C$..rw1;
 $n_9+n_{10}+n_{11}+n_{12}+n_{13}+n_{14}+n_{15}+n_{16}=C$..rw2;
 $n_{17}+n_{18}+n_{19}+n_{20}+n_{21}+n_{22}+n_{23}+n_{24}=C$..rw3;
 $n_{25}+n_{26}+n_{27}+n_{28}+n_{29}+n_{30}+n_{31}+n_{32}=C$..rw4;
 $n_{33}+n_{34}+n_{35}+n_{36}+n_{37}+n_{38}+n_{39}+n_{40}=C$..rw5;
 $n_{41}+n_{42}+n_{43}+n_{44}+n_{45}+n_{46}+n_{47}+n_{48}=C$..rw6;
 $n_{49}+n_{50}+n_{51}+n_{52}+n_{53}+n_{54}+n_{55}+n_{56}=C$..rw7;
 $n_{57}+n_{58}+n_{59}+n_{60}+n_{61}+n_{62}+n_{63}+n_{64}=C$..rw8;

 $n_1+n_9+n_{17}+n_{25}+n_{33}+n_{41}+n_{49}+n_{57}=C$..c11;
 $n_2+n_{10}+n_{18}+n_{26}+n_{34}+n_{42}+n_{50}+n_{58}=C$..c12;
 $n_3+n_{11}+n_{19}+n_{27}+n_{35}+n_{43}+n_{51}+n_{59}=C$..c13;
 $n_4+n_{12}+n_{20}+n_{28}+n_{36}+n_{44}+n_{52}+n_{60}=C$..c14;
 $n_5+n_{13}+n_{21}+n_{29}+n_{37}+n_{45}+n_{53}+n_{61}=C$..c15;
 $n_6+n_{14}+n_{22}+n_{30}+n_{38}+n_{46}+n_{54}+n_{62}=C$..c16;
 $n_7+n_{15}+n_{23}+n_{31}+n_{39}+n_{47}+n_{55}+n_{63}=C$..c17;
 $n_8+n_{16}+n_{24}+n_{32}+n_{40}+n_{48}+n_{56}+n_{64}=C$..c18;

**** Basic Conditions in New Notation: ****

$n_1+n_2+n_3+n_4+n_5+n_6+n_7+n_8=C$..rw1';
 $n_9+n_{10}+n_{11}+n_{12}+n_{13}+n_{14}+n_{15}+n_{16}=C$..rw2';
 $n_{17}+n_{18}+n_{19}+n_{20}+n_{21}+n_{22}+n_{23}+n_{24}=C$..rw3';
 $n_{25}+n_{26}+n_{27}+n_{28}+n_{29}+n_{30}+n_{31}+n_{32}=C$..rw4';
 $n_{32}+n_{31}+n_{30}+n_{29}+n_{28}+n_{27}+n_{26}+n_{25}=C$..rw5';
 $n_{24}+n_{23}+n_{22}+n_{21}+n_{20}+n_{19}+n_{18}+n_{17}=C$..rw6';
 $n_{16}+n_{15}+n_{14}+n_{13}+n_{12}+n_{11}+n_{10}+n_9=C$..rw7';
 $n_8+n_7+n_6+n_5+n_4+n_3+n_2+n_1=C$..rw8';

 $n_1+n_9+n_{17}+n_{25}+n_{32}+n_{24}+n_{16}+n_8=C$..c11';
 $n_2+n_{10}+n_{18}+n_{26}+n_{31}+n_{23}+n_{15}+n_7=C$..c12';
 $n_3+n_{11}+n_{19}+n_{27}+n_{30}+n_{22}+n_{14}+n_6=C$..c13';
 $n_4+n_{12}+n_{20}+n_{28}+n_{29}+n_{21}+n_{13}+n_5=C$..c14';
 $n_5+n_{13}+n_{21}+n_{29}+n_{28}+n_{20}+n_{12}+n_4=C$..c15';
 $n_6+n_{14}+n_{22}+n_{30}+n_{27}+n_{19}+n_{11}+n_3=C$..c16';
 $n_7+n_{15}+n_{23}+n_{31}+n_{26}+n_{18}+n_{10}+n_2=C$..c17';
 $n_8+n_{16}+n_{24}+n_{32}+n_{25}+n_{17}+n_9+n_1=C$..c18';

**** Self-Complementary Conditions: CC=65 ****

$n_1+n_1=n_2+n_2=n_3+n_3=n_4+n_4=n_5+n_5= \dots =n_{30}+n_{30}=n_{31}+n_{31}=n_{32}+n_{32}=CC \dots scc$

You can calculate and prove such an equation with this notation as follows:

$n_1+n_2+n_3+n_4+n_5+n_6+n_7+n_8=(CC-n_1)+(CC-n_2)+(CC-n_3)+(CC-n_4)+(CC-n_5)+(CC-n_6)+(CC-n_7)+(CC-n_8)$
 $=8*CC-(n_1+n_2+n_3+n_4+n_5+n_6+n_7+n_8)=8*65-C=520-260=260=C$
 Therefore, if $n_1+n_2+n_3+n_4+n_5+n_6+n_7+n_8=C$, then $n_{57}+n_{58}+n_{59}+n_{60}+n_{61}+n_{62}+n_{63}+n_{64}=C$

On the other hand $(n1+n9+n17+n25+n33+n41+n49+n57)+(n8+n16+n24+n32+n40+n48+n56+n64)$
 $=(n1+n9+n17+n25+n32+n24+n16+n8)+(n8+n16+n24+n32+n25+n17+n9+n1)$
 $=(n1+n1)+(n9+n9)+(n17+n17)+(n25+n25)+(n8+n8)+(n16+n16)+(n24+n24)+(n32+n32)=8*CC=2*C$
 Therefore, if $n1+n9+n17+n25+n33+n41+n49+n57=C$, then $n8+n16+n24+n32+n40+n48+n56+n64=C$

In the next diagrams you can directly see which rows and which columns you could exchange with each other, keeping all the conditions unspoiled for 'Self-complementary magic squares of order 8. You could easily know all the constant sums here.

** Which rows or which columns can we exchange with each other? **

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

(Original #0) (Exchange #1) (Exchange #2)

Which rows can we exchange with each other?

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

(Original #0) (Exchange #3) (Exchange #4)

Which rows can we exchange with each other at the same time?

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

(Original #0) (Exchange #1 & #2) (Exchange #1,#2 & #3)

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

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

(New Notation)

** Basic Conditions: C=260 **

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

** Basic Conditions in New Notation: **

n1+n2+n3+n4+n5+n6+n7+n8=C ..rw1';
n9+n10+n11+n12+n13+n14+n15+n16=C ..rw2';
n17+n18+n19+n20+n21+n22+n23+n24=C ..rw3';
n25+n26+n27+n28+n29+n30+n31+n32=C ..rw4';
n5+n6+n7+n8+n1+n2+n3+n4=C ..rw5';
n13+n14+n15+n16+n9+n10+n11+n12=C ..rw6';
n21+n22+n23+n24+n17+n18+n19+n20=C ..rw7';
n29+n30+n31+n32+n25+n26+n27+n28=C ..rw8';

n1+n9+n17+n25+n33+n41+n49+n57=C ..c11'; | n1+n9+n17+n25+n5+n13+n21+n29=C ..c11';
n2+n10+n18+n26+n34+n42+n50+n58=C ..c12'; | n2+n10+n18+n26+n6+n14+n22+n30=C ..c12';
n3+n11+n19+n27+n35+n43+n51+n59=C ..c13'; | n3+n11+n19+n27+n7+n15+n23+n31=C ..c13';
n4+n12+n20+n28+n36+n44+n52+n60=C ..c14'; | n4+n12+n20+n28+n8+n16+n24+n32=C ..c14';
n5+n13+n21+n29+n37+n45+n53+n61=C ..c15'; | n5+n13+n21+n29+n1+n9+n17+n25=C ..c15';
n6+n14+n22+n30+n38+n46+n54+n62=C ..c16'; | n6+n14+n22+n30+n2+n10+n18+n26=C ..c16';
n7+n15+n23+n31+n39+n47+n55+n63=C ..c17'; | n7+n15+n23+n31+n3+n11+n19+n27=C ..c17';
n8+n16+n24+n32+n40+n48+n56+n64=C ..c18'; | n8+n16+n24+n32+n4+n12+n20+n28=C ..c18';

** Complete Conditions in New Notation: CC=65 **

n1+n1=n2+n2=n3+n3=n4+n4=n5+n5= ... = n30+n30=n31+n31=n32+n32=CC ... cmlt

You can directly know such the constant sums of each pandiagonal as follows:

pd1: n1+n10+n19+n28+n37+n46+n55+n64=n1+n10+n19+n28+n1+n10+n19+n28
=(n1+n1)+(n10+n10)+(n19+n19)+(n28+n28)=4*CC=C
pb1: n1+n16+n23+n30+n37+n44+n51+n58=n1+n16+n23+n30+n1+n16+n23+n30=4*CC=C
pd2: n2+n11+n20+n29+n38+n47+n56+n65=n2+n11+n20+n29+n2+n11+n20+n29=4*CC=C
pb2: n2+n9+n24+n31+n38+n45+n52+n59=n2+n9+n24+n31+n2+n9+n24+n31=4*CC=C
pd3: n3+n12+n21+n30+n39+n48+n57+n66=n3+n12+n21+n30+n3+n12+n21+n30=4*CC=C
.....
pd7: n7+n16+n17+n26+n35+n44+n53+n62=n7+n16+n17+n26+n7+n16+n17+n26=4*CC=C
pb7: n7+n14+n21+n28+n35+n42+n49+n56=n7+n14+n21+n28+n7+n14+n21+n28=4*CC=C
pd8: n8+n9+n18+n27+n36+n45+n54+n63=n8+n9+n18+n27+n8+n9+n18+n27=4*CC=C
pb8: n8+n15+n22+n29+n36+n43+n50+n57=n8+n15+n22+n29+n8+n15+n22+n29=4*CC=C

** Sample List of Complete Pan-magic Squares of Order 8 **

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

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

You might be possibly impressed with the similarity between the two sample lists of Self-complementary and of Complete pan-magic type. Yes, you are right.

They are so similar that you could easily find the beautiful 'one-to-one correspondence' between them. Each of the self-complementary type could be connected to each of the complete pan-magic type by a certain transformation method.

We are convinced that the total solution count of this object must be necessarily equal to the one of self-complementary, because of this 'one-to-one correspondence' between them, although we know nothing exactly about their total counts at all.

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

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No one knows how many solutions we could make for this type. It seems almost uncountable. I advise you not to try to count them through in vain.

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

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Section 5. 'Composite' Pan-magic Squares of Order 8

I am sure 'Composite' Pan-magic Squares of Order 8 is one of the most attractive types. I myself like this type best of all. I like to define it with the next list below:

**** #5: 'Composite' Pan-magic Type ****

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: C=260 ****

$n1+n2+n3+n4+n5+n6+n7+n8=C$..rw1;

$n1+n9+n17+n25+n33+n41+n49+n57=C$..c11;

$n1+n10+n19+n28+n37+n46+n55+n64=C$..pd1;

$n8+n15+n22+n29+n36+n43+n50+n57=C$..pb8;

[Basic Form in Extended Space]

/ Composite Conditions: SS=130 ****

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

Because you can make no magic squares of order 8 without any 'Basic Conditions' but only with those 'Composite Conditions', you should usually add a few equations like 'Basic Conditions' above.

For instance, if you take the 'Composite Conditions' and only **rw1** and **c11** out of the 'Basic Conditions', you can make 'Composite Semi-panmagic' Magic Squares of order 8, in which all rows and columns should add up to the same constant sum 260.

If you take **rw1**, **c11** and **pd1** at least out of the Basic Conditions beside all the Composite Conditions, you can surely make all 'Composite Pan-magic MS88' as a special kind of 'Pan-diagonal' type, in which every row, every column and every pan-diagonal should add up to the magic constant 260.

Let me show you some sample solutions in the next list.

** Sample List of 'Composite' Pan-magic Squares of Order 8 **

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

.

No one knows the total solution count of this ordinary type yet. I once found the 119439360 solutions for the 'Complete Euler Type' by our "New Euler's Method". But, I don't yet know whether there are any 'Non-Euler Type' of 'C&P' MS88 or not.

Section 6: Simultaneous Types of Magic Squares of Order 8

There are many 'Simultaneous Types' in Magic Squares of order 8. See the next list. It indicates the theoretical possibility of all Simultaneous Types I could imagine.

We have to study carefully about each case, examining one after another to know what it means and how many solutions it should have in all.

** Variety of Possible Types of Simultaneous Magic Squares 8x8 **

	Single	1. Multiple Type	2. Composite Type	3. Multiple and Composite Type
0	Magic type	Multiple Magic	Composite magic	Multiple & Composite
1	Self-complementary type	Multiple & Self-complementary	Composite & Self-complementary *	Multiple, Composite & Self-complementary *
2	Complete Pan-magic type	Multiple & Complete Pan-magic	Composite & Complete Pan-magic	Multiple, Composite & Complete Pan-magic
3	Pan-diagonal Magic type	Multiple & Pan-diagonal Magic	Composite & Pan-diagonal Magic	Multiple, Composite & Pan-diagonal Magic
4	Self-complementary and Pan-diagonal type	Multiple, Self-complementary and Pan-diagonal	Composite, Self-complementary and Pan-diagonal *	Multiple, Composite, Self-complementary & Pan-diagonal *

We know several types have the same solution set in common such as the ones with * in the list above, and we like to identify them with the same concept.

#6-1. Simultaneous MS88: Both Self-Complementary and Pan-diagonal

Let's begin to study about one of the most popular Simultaneous types: Both Self-complementary and Pandiagonal.

I like to define it with the next list below.

** #6: Simultaneous MS88: Both Self-complementary and Pan-diagonal **

** Basic Form in Extended Space **

```

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: C=260 ****

n1+n2+n3+n4+n5+n6+n7+n8=C ..rw1; | n1+n9+n17+n25+n33+n41+n49+n57=C ..c11;
 n9+n10+n11+n12+n13+n14+n15+n16=C ..rw2; | n2+n10+n18+n26+n34+n42+n50+n58=C ..c12;
 n17+n18+n19+n20+n21+n22+n23+n24=C ..rw3; | n3+n11+n19+n27+n35+n43+n51+n59=C ..c13;
 n25+n26+n27+n28+n29+n30+n31+n32=C ..rw4; | n4+n12+n20+n28+n36+n44+n52+n60=C ..c14;
 n33+n34+n35+n36+n37+n38+n39+n40=C ..rw5; | n5+n13+n21+n29+n37+n45+n53+n61=C ..c15;
 n41+n42+n43+n44+n45+n46+n47+n48=C ..rw6; | n6+n14+n22+n30+n38+n46+n54+n62=C ..c16;
 n49+n50+n51+n52+n53+n54+n55+n56=C ..rw7; | n7+n15+n23+n31+n39+n47+n55+n63=C ..c17;
 n57+n58+n59+n60+n61+n62+n63+n64=C ..rw8; | n8+n16+n24+n32+n40+n48+n56+n64=C ..c18;

**** Pandiagonal Conditions: ****

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

**** Self-Complementary Conditions: CC=65 ****

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

We have found many solutions for this type, but we have not yet known how many solutions we could make in all. It took too much time for us to count them through. We often gave it up on our way. It looks like almost uncountable.

Let me show you some sample solutions in the next list.

**** Sample List of Simultaneous Magic Squares of Order 8: ****

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

1/								49/								97/							
1	63	4	62	17	46	20	47	1	63	4	62	17	47	20	46	1	63	4	62	17	47	22	44
60	6	57	7	44	23	41	22	60	6	57	7	44	22	41	23	60	6	57	7	46	20	41	23
15	49	14	52	30	33	31	36	15	49	14	52	31	33	30	36	15	49	14	52	31	33	28	38
54	12	55	9	39	28	38	25	54	12	55	9	38	28	39	25	54	12	55	9	36	30	39	25
40	27	37	26	56	10	53	11	40	26	37	27	56	10	53	11	40	26	35	29	56	10	53	11
29	34	32	35	13	51	16	50	29	35	32	34	13	51	16	50	27	37	32	34	13	51	16	50
43	24	42	21	58	8	59	5	42	24	43	21	58	8	59	5	42	24	45	19	58	8	59	5
18	45	19	48	3	61	2	64	19	45	18	48	3	61	2	64	21	43	18	48	3	61	2	64
145/								193/								241/							
1	63	4	62	17	47	34	32	1	63	4	62	18	45	19	48	1	63	4	62	18	48	19	45
60	6	57	7	46	20	29	35	60	6	57	7	43	24	42	21	60	6	57	7	44	22	41	23
15	49	14	52	43	21	28	38	15	49	14	52	29	34	32	35	15	49	14	52	31	33	30	36
54	12	55	9	24	42	39	25	54	12	55	9	40	27	37	26	54	12	55	9	37	27	40	26
40	26	23	41	56	10	53	11	39	28	38	25	56	10	53	11	39	25	38	28	56	10	53	11
27	37	44	22	13	51	16	50	30	33	31	36	13	51	16	50	29	35	32	34	13	51	16	50
30	36	45	19	58	8	59	5	44	23	41	22	58	8	59	5	42	24	43	21	58	8	59	5
33	31	18	48	3	61	2	64	17	46	20	47	3	61	2	64	20	46	17	47	3	61	2	64
289/								337/								385/							
1	63	4	62	18	48	21	43	1	63	4	62	18	48	33	31	1	63	4	62	19	45	18	48
60	6	57	7	46	20	41	23	60	6	57	7	46	20	29	35	60	6	57	7	42	24	43	21
15	49	14	52	31	33	28	38	15	49	14	52	43	21	28	38	15	49	14	52	29	35	32	34
54	12	55	9	35	29	40	26	54	12	55	9	23	41	40	26	54	12	55	9	40	26	37	27
39	25	36	30	56	10	53	11	39	25	24	42	56	10	53	11	38	28	39	25	56	10	53	11
27	37	32	34	13	51	16	50	27	37	44	22	13	51	16	50	31	33	30	36	13	51	16	50
42	24	45	19	58	8	59	5	30	36	45	19	58	8	59	5	44	22	41	23	58	8	59	5
22	44	17	47	3	61	2	64	34	32	17	47	3	61	2	64	17	47	20	46	3	61	2	64

	433/		481/		529/
1 63 4 62 19 48 18 45	1 63 4 62 19 48 21 42	1 63 4 62 19 48 33 30	60 6 57 7 44 23 41 22	60 6 57 7 47 20 41 22	60 6 57 7 47 20 29 34
15 49 14 52 30 33 31 36	15 49 14 52 30 33 28 39	15 49 14 52 42 21 28 39	54 12 55 9 37 26 40 27	54 12 55 9 34 29 40 27	54 12 55 9 22 41 40 27
38 25 39 28 56 10 53 11	38 25 36 31 56 10 53 11	38 25 24 43 56 10 53 11	29 34 32 35 13 51 16 50	26 37 32 35 13 51 16 50	26 37 44 23 13 51 16 50
43 24 42 21 58 8 59 5	43 24 45 18 58 8 59 5	31 36 45 18 58 8 59 5	20 47 17 46 3 61 2 64	23 44 17 46 3 61 2 64	35 32 17 46 3 61 2 64
	577/		769/		961/
1 63 4 62 20 46 17 47	1 63 4 62 21 43 18 48	1 63 4 62 22 44 17 47	60 6 57 7 42 24 43 21	60 6 57 7 42 24 45 19	60 6 57 7 42 24 45 19
15 49 14 52 29 35 32 34	15 49 14 52 27 37 32 34	15 49 14 52 27 37 32 34	54 12 55 9 39 25 38 28	54 12 55 9 40 26 35 29	54 12 55 9 39 25 36 30
37 27 40 26 56 10 53 11	36 30 39 25 56 10 53 11	35 29 40 26 56 10 53 11	31 33 30 36 13 51 16 50	31 33 28 38 13 51 16 50	31 33 28 38 13 51 16 50
44 22 41 23 58 8 59 5	46 20 41 23 58 8 59 5	46 20 41 23 58 8 59 5	18 48 19 45 3 61 2 64	17 47 22 44 3 61 2 64	18 48 21 43 3 61 2 64
	1153/		1345/		1537/
1 63 4 62 23 44 17 46	1 63 4 62 24 44 17 45	1 63 4 62 33 31 18 48	60 6 57 7 43 24 45 18	60 6 57 7 43 23 46 18	60 6 57 7 30 36 45 19
15 49 14 52 26 37 32 35	15 49 14 52 26 38 31 35	15 49 14 52 27 37 44 22	54 12 55 9 38 25 36 31	54 12 55 9 37 25 36 32	54 12 55 9 40 26 23 41
34 29 40 27 56 10 53 11	33 29 40 28 56 10 53 11	24 42 39 25 56 10 53 11	30 33 28 39 13 51 16 50	30 34 27 39 13 51 16 50	43 21 28 38 13 51 16 50
47 20 41 22 58 8 59 5	47 19 42 22 58 8 59 5	46 20 29 35 58 8 59 5	19 48 21 42 3 61 2 64	20 48 21 41 3 61 2 64	17 47 34 32 3 61 2 64
	1729/		1921/		2113/
1 63 4 62 34 32 17 47	1 63 4 62 35 32 17 46	1 63 4 62 36 32 17 45	60 6 57 7 30 36 45 19	60 6 57 7 31 36 45 18	60 6 57 7 31 35 46 18
15 49 14 52 27 37 44 22	15 49 14 52 26 37 44 23	15 49 14 52 26 38 43 23	54 12 55 9 39 25 24 42	54 12 55 9 38 25 24 43	54 12 55 9 37 25 24 44
23 41 40 26 56 10 53 11	22 41 40 27 56 10 53 11	21 41 40 28 56 10 53 11	43 21 28 38 13 51 16 50	42 21 28 39 13 51 16 50	42 22 27 39 13 51 16 50
46 20 29 35 58 8 59 5	47 20 29 34 58 8 59 5	47 19 30 34 58 8 59 5	18 48 33 31 3 61 2 64	19 48 33 30 3 61 2 64	20 48 33 29 3 61 2 64
	2305/		2497/		2689/
1 63 4 62 37 32 17 44	1 63 4 62 38 32 17 43	1 63 4 62 39 32 17 42	60 6 57 7 31 35 46 18	60 6 57 7 31 36 45 18	60 6 57 7 30 36 45 19
15 49 14 52 26 38 43 23	15 49 14 52 26 37 44 23	15 49 14 52 27 37 44 22	54 12 55 9 36 25 24 45	54 12 55 9 35 25 24 46	54 12 55 9 34 25 24 47
20 41 40 29 56 10 53 11	19 41 40 30 56 10 53 11	18 41 40 31 56 10 53 11	42 22 27 39 13 51 16 50	42 21 28 39 13 51 16 50	43 21 28 38 13 51 16 50
47 19 30 34 58 8 59 5	47 20 29 34 58 8 59 5	46 20 29 35 58 8 59 5	21 48 33 28 3 61 2 64	22 48 33 27 3 61 2 64	23 48 33 26 3 61 2 64
	2737/		2785/		2833/
1 63 4 62 39 44 17 30	1 63 4 62 39 46 17 28	1 63 4 62 39 46 20 25	60 6 57 7 42 24 45 19	60 6 57 7 42 24 43 21	60 6 57 7 44 23 41 22
15 49 14 52 27 37 32 34	15 49 14 52 29 35 32 34	15 49 14 52 30 33 31 36	54 12 55 9 22 25 36 47	54 12 55 9 20 25 38 47	54 12 55 9 17 28 38 47
18 29 40 43 56 10 53 11	18 27 40 45 56 10 53 11	18 27 37 48 56 10 53 11	31 33 28 38 13 51 16 50	31 33 30 36 13 51 16 50	29 34 32 35 13 51 16 50
46 20 41 23 58 8 59 5	44 22 41 23 58 8 59 5	43 24 42 21 58 8 59 5	35 48 21 26 3 61 2 64	37 48 19 26 3 61 2 64	40 45 19 26 3 61 2 64
...					

I advise you to try to count the multiple type of those simultaneous objects.

#6-2. Simultaneous Type: Multiple, Self-complementary and Pandiagonal

Let's go on to the next case of Multiple type of those Simultaneous MS88.

We need to modify the Basic Conditions defining all rows and columns as follows:

**** #6-2: Multiple Type: Including Four Little Squares 4x4 within ****

61 62 63 64 57 58 59 60 61 62 63 64 57 58 59 60	** Basic Conditions: SC=130 **
5 6 7 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 2 3 4	n1+n2+n3+n4=SC; n1+n9+n17+n25=SC;
13 14 15 16 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 9 10 11 12	n9+n10+n11+n12=SC; n2+n10+n18+n26=SC;
21 22 23 24 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 17 18 19 20	n17+n18+n19+n20=SC; n3+n11+n19+n27=SC;
29 30 31 32 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 25 26 27 28	n25+n26+n27+n28=SC; n4+n12+n20+n28=SC;
37 38 39 40 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 33 34 35 36	n5+n6+n7+n8=SC; n5+n13+n21+n29=SC;
45 46 47 48 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 41 42 43 44	n13+n14+n15+n16=SC; n6+n14+n22+n30=SC;
53 54 55 56 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 49 50 51 52	n21+n22+n23+n24=SC; n7+n15+n23+n31=SC;
61 62 63 64 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 57 58 59 60	n29+n30+n31+n32=SC; n8+n16+n24+n32=SC;
5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4	n33+n34+n35+n36=SC; n33+n41+n49+n57=SC;
13 14 15 16 9 10 11 12 13 14 15 16 9 10 11 12	n41+n42+n43+n44=SC; n34+n42+n50+n58=SC;
	n49+n50+n51+n52=SC; n35+n43+n51+n59=SC;
	n57+n58+n59+n60=SC; n36+n44+n52+n60=SC;
	n37+n38+n39+n40=SC; n37+n45+n53+n61=SC;
	n45+n46+n47+n48=SC; n38+n46+n54+n62=SC;
	n53+n54+n55+n56=SC; n39+n47+n55+n63=SC;
	n61+n62+n63+n64=SC; n40+n48+n56+n64=SC;

We don't have to have any change about Pandiagonal Conditions and Self-complementary Conditions.

Let me show you some sample solutions of this type in the next list.

**** Simultaneous MS88: Multiple, Self-complementary and Pan-diagonal ****

	1#	529#	625#
1 63 4 62 17 47 20 46	1 63 4 62 11 53 18 48	1 63 4 62 11 53 20 46	1 63 4 62 11 53 20 46
60 6 57 7 44 22 41 23	60 6 57 7 44 22 37 27	60 6 57 7 50 16 41 23	60 6 57 7 50 16 41 23
13 51 16 50 29 35 32 34	13 51 20 46 33 31 36 30	13 51 22 44 29 35 32 34	13 51 22 44 29 35 32 34
56 10 53 11 40 26 37 27	56 10 49 15 42 24 39 25	56 10 47 17 40 26 37 27	56 10 47 17 40 26 37 27
38 28 39 25 54 12 55 9	40 26 41 23 50 16 55 9	38 28 39 25 48 18 55 9	38 28 39 25 48 18 55 9
31 33 30 36 15 49 14 52	35 29 34 32 19 45 14 52	31 33 30 36 21 43 14 52	31 33 30 36 21 43 14 52
42 24 43 21 58 8 59 5	38 28 43 21 58 8 59 5	42 24 49 15 58 8 59 5	42 24 49 15 58 8 59 5
19 45 18 48 3 61 2 64	17 47 12 54 3 61 2 64	19 45 12 54 3 61 2 64	19 45 12 54 3 61 2 64
	721#	817#	3889#
1 63 4 62 11 53 20 46	1 63 4 62 17 47 20 46	1 63 4 62 9 55 20 46	1 63 4 62 9 55 20 46
60 6 57 7 50 16 41 23	60 6 57 7 44 22 41 23	60 6 57 7 52 14 41 23	60 6 57 7 52 14 41 23
13 51 38 28 29 35 48 18	15 49 14 52 31 33 30 36	15 49 22 44 31 33 30 36	15 49 22 44 31 33 30 36
56 10 31 33 40 26 21 43	54 12 55 9 38 28 39 25	54 12 47 17 38 28 39 25	54 12 47 17 38 28 39 25
22 44 39 25 32 34 55 9	40 26 37 27 56 10 53 11	40 26 37 27 48 18 53 11	40 26 37 27 48 18 53 11
47 17 30 36 37 27 14 52	29 35 32 34 13 51 16 50	29 35 32 34 21 43 16 50	29 35 32 34 21 43 16 50
42 24 49 15 58 8 59 5	42 24 43 21 58 8 59 5	42 24 51 13 58 8 59 5	42 24 51 13 58 8 59 5
19 45 12 54 3 61 2 64	19 45 18 48 3 61 2 64	19 45 10 56 3 61 2 64	19 45 10 56 3 61 2 64
	3985#	4081#	4177#
1 63 4 62 9 55 18 48	1 63 4 62 9 55 18 48	1 63 4 62 9 55 20 46	1 63 4 62 9 55 20 46
60 6 57 7 52 14 43 21	60 6 57 7 52 14 43 21	60 6 57 7 52 14 41 23	60 6 57 7 52 14 41 23
15 49 24 42 29 35 32 34	15 49 38 28 29 35 46 20	15 49 40 26 31 33 48 18	15 49 40 26 31 33 48 18
54 12 45 19 40 26 37 27	54 12 31 33 40 26 23 41	54 12 29 35 38 28 21 43	54 12 29 35 38 28 21 43
38 28 39 25 46 20 53 11	24 42 39 25 32 34 53 11	22 44 37 27 30 36 53 11	22 44 37 27 30 36 53 11
31 33 30 36 23 41 16 50	45 19 30 36 37 27 16 50	47 17 32 34 39 25 16 50	47 17 32 34 39 25 16 50
44 22 51 13 58 8 59 5	44 22 51 13 58 8 59 5	42 24 51 13 58 8 59 5	42 24 51 13 58 8 59 5
17 47 10 56 3 61 2 64	17 47 10 56 3 61 2 64	19 45 10 56 3 61 2 64	19 45 10 56 3 61 2 64

4273#	4369#	4465#
1 63 4 62 17 47 12 54	1 63 4 62 19 45 12 54	1 63 4 62 9 55 12 54
60 6 57 7 38 28 43 21	60 6 57 7 42 24 49 15	60 6 57 7 52 14 49 15
19 45 14 52 33 31 36 30	21 43 14 52 29 35 32 34	21 43 24 42 29 35 32 34
50 16 55 9 42 24 39 25	48 18 55 9 40 26 37 27	48 18 45 19 40 26 37 27
40 26 41 23 56 10 49 15	38 28 39 25 56 10 47 17	38 28 39 25 46 20 47 17
35 29 34 32 13 51 20 46	31 33 30 36 13 51 22 44	31 33 30 36 23 41 22 44
44 22 37 27 58 8 59 5	50 16 41 23 58 8 59 5	50 16 51 13 58 8 59 5
11 53 18 48 3 61 2 64	11 53 20 46 3 61 2 64	11 53 10 56 3 61 2 64
4993#	5089#	5185#
1 63 4 62 9 55 12 54	1 63 4 62 17 47 12 54	1 63 4 62 17 47 10 56
60 6 57 7 52 14 49 15	60 6 57 7 44 22 49 15	60 6 57 7 44 22 51 13
21 43 38 28 29 35 46 20	23 41 14 52 31 33 30 36	23 41 16 50 29 35 32 34
48 18 31 33 40 26 23 41	46 20 55 9 38 28 39 25	46 20 53 11 40 26 37 27
24 42 39 25 32 34 47 17	40 26 37 27 56 10 45 19	38 28 39 25 54 12 45 19
45 19 30 36 37 27 22 44	29 35 32 34 13 51 24 42	31 33 30 36 15 49 24 42
50 16 51 13 58 8 59 5	50 16 43 21 58 8 59 5	52 14 43 21 58 8 59 5
11 53 10 56 3 61 2 64	11 53 18 48 3 61 2 64	9 55 18 48 3 61 2 64
5281#	8353#	8449#
1 63 4 62 9 55 12 54	1 63 4 62 11 53 10 56	1 63 4 62 9 55 12 54
60 6 57 7 52 14 49 15	60 6 57 7 50 16 51 13	60 6 57 7 52 14 49 15
23 41 22 44 31 33 30 36	23 41 38 28 29 35 48 18	23 41 40 26 31 33 48 18
46 20 47 17 38 28 39 25	46 20 31 33 40 26 21 43	46 20 29 35 38 28 21 43
40 26 37 27 48 18 45 19	22 44 39 25 32 34 45 19	22 44 37 27 30 36 45 19
29 35 32 34 21 43 24 42	47 17 30 36 37 27 24 42	47 17 32 34 39 25 24 42
50 16 51 13 58 8 59 5	52 14 49 15 58 8 59 5	50 16 51 13 58 8 59 5
11 53 10 56 3 61 2 64	9 55 12 54 3 61 2 64	11 53 10 56 3 61 2 64
8545#	8593#	8689#
1 63 4 62 9 55 14 52	1 63 4 62 17 47 12 54	1 63 4 62 9 55 12 54
60 6 57 7 48 22 39 21	60 6 57 7 44 22 49 15	60 6 57 7 52 14 49 15
28 36 16 50 42 18 32 38	37 27 14 52 45 19 30 36	37 27 22 44 45 19 30 36
41 25 53 11 31 35 45 19	32 34 55 9 24 42 39 25	32 34 47 17 24 42 39 25
46 20 30 34 54 12 40 24	40 26 23 41 56 10 31 33	40 26 23 41 48 18 31 33
27 33 47 23 15 49 29 37	29 35 46 20 13 51 38 28	29 35 46 20 21 43 38 28
44 26 43 17 58 8 59 5	50 16 43 21 58 8 59 5	50 16 51 13 58 8 59 5
13 51 10 56 3 61 2 64	11 53 18 48 3 61 2 64	11 53 10 56 3 61 2 64
.		

I have not yet known about the total solution counts of them. It seems to be too big, say, hardly countable.

#6-3. Simultaneous Magic Squares 8x8: Composite and Complete

'Composite and Complete' pan-magic squares of order 8 is surely one of the most attractive objects of all. It has a big solution set, but it is not uncountable at all.

We know it is logically equivalent to the "Most-Perfect" magic squares of order 8 well known in Europe, but I prefer to call it "Composite and Complete" type, for it can express the Simultaneous components clearer.

I like to define this type as follows.

You might be afraid that the Basic Conditions are too few to make our objects, but the only two equations are really necessary and adequate for all.

When you take both Composite Conditions and Complete Conditions, if you add those two basic definitions, you can surely make all what we want, the 'Composite and Complete' pandiagonal magic squares of order 8.

**** #6-3: Simultaneous Magic Squares 8x8: Composite and Complete ****

```

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: C=260 ****

```

n1+n2+n3+n4+n5+n6+n7+n8=C      ..rw1;
n1+n9+n17+n25+n33+n41+n49+n57=C ..c11;

```

**** Composite Conditions: SS=130 ****

```

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

```

**** Complete Conditions: CC=65 ****

```

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

```

**** 'Composite and Complete' Pan-magic Squares 8x8: Standard Solutions ****

				1/					3841/					7297/									
1	63	4	62	8	58	5	59	1	62	4	63	8	59	5	58	1	61	3	63	8	60	6	58
56	10	53	11	49	15	52	14	56	11	53	10	49	14	52	15	56	12	54	10	49	13	51	15
25	39	28	38	32	34	29	35	25	38	28	39	32	35	29	34	25	37	27	39	32	36	30	34
48	18	45	19	41	23	44	22	48	19	45	18	41	22	44	23	48	20	46	18	41	21	43	23
57	7	60	6	64	2	61	3	57	6	60	7	64	3	61	2	57	5	59	7	64	4	62	2
16	50	13	51	9	55	12	54	16	51	13	50	9	54	12	55	16	52	14	50	9	53	11	55
33	31	36	30	40	26	37	27	33	30	36	31	40	27	37	26	33	29	35	31	40	28	38	26
24	42	21	43	17	47	20	46	24	43	21	42	17	46	20	47	24	44	22	42	17	45	19	47

8833/	11713/	13057/
1 60 3 63 8 61 6 58	1 59 4 63 8 62 5 58	1 58 4 62 8 63 5 59
56 13 54 10 49 12 51 15	56 14 53 10 49 11 52 15	56 15 53 11 49 10 52 14
25 36 27 39 32 37 30 34	25 35 28 39 32 38 29 34	25 34 28 38 32 39 29 35
48 21 46 18 41 20 43 23	48 22 45 18 41 19 44 23	48 23 45 19 41 18 44 22
57 4 59 7 64 5 62 2	57 3 60 7 64 6 61 2	57 2 60 6 64 7 61 3
16 53 14 50 9 52 11 55	16 54 13 50 9 51 12 55	16 55 13 51 9 50 12 54
33 28 35 31 40 29 38 26	33 27 36 31 40 30 37 26	33 26 36 30 40 31 37 27
24 45 22 42 17 44 19 47	24 46 21 42 17 43 20 47	24 47 21 43 17 42 20 46
14401/	16513/	17537/
1 56 3 63 12 61 10 54	1 55 4 63 12 62 9 54	1 54 4 62 12 63 9 55
48 25 46 18 37 20 39 27	48 26 45 18 37 19 40 27	48 27 45 19 37 18 40 26
21 36 23 43 32 41 30 34	21 35 24 43 32 42 29 34	21 34 24 42 32 43 29 35
60 13 58 6 49 8 51 15	60 14 57 6 49 7 52 15	60 15 57 7 49 6 52 14
53 4 55 11 64 9 62 2	53 3 56 11 64 10 61 2	53 2 56 10 64 11 61 3
28 45 26 38 17 40 19 47	28 46 25 38 17 39 20 47	28 47 25 39 17 38 20 46
33 24 35 31 44 29 42 22	33 23 36 31 44 30 41 22	33 22 36 30 44 31 41 23
16 57 14 50 5 52 7 59	16 58 13 50 5 51 8 59	16 59 13 51 5 50 8 58
18561/	19585/	20737/
1 52 6 60 14 63 9 55	1 48 3 63 20 61 18 46	1 47 4 63 20 62 17 46
48 29 43 21 35 18 40 26	32 49 30 34 13 36 15 51	32 50 29 34 13 35 16 51
19 34 24 42 32 45 27 37	9 40 11 55 28 53 26 38	9 39 12 55 28 54 25 38
62 15 57 7 49 4 54 12	60 21 58 6 41 8 43 23	60 22 57 6 41 7 44 23
51 2 56 10 64 13 59 5	45 4 47 19 64 17 62 2	45 3 48 19 64 18 61 2
30 47 25 39 17 36 22 44	52 29 50 14 33 16 35 31	52 30 49 14 33 15 36 31
33 20 38 28 46 31 41 23	37 12 39 27 56 25 54 10	37 11 40 27 56 26 53 10
16 61 11 53 3 50 8 58	24 57 22 42 5 44 7 59	24 58 21 42 5 43 8 59
21313/	21889/	22465/
1 46 4 62 20 63 17 47	1 44 6 60 22 63 17 47	1 40 10 56 26 63 17 47
32 51 29 35 13 34 16 50	32 53 27 37 11 34 16 50	32 57 23 41 7 34 16 50
9 38 12 54 28 55 25 39	9 36 14 52 30 55 25 39	5 36 14 52 30 59 21 43
60 23 57 7 41 6 44 22	62 23 57 7 41 4 46 20	62 27 53 11 37 4 46 20
45 2 48 18 64 19 61 3	43 2 48 18 64 21 59 5	39 2 48 18 64 25 55 9
52 31 49 15 33 14 36 30	54 31 49 15 33 12 38 28	58 31 49 15 33 8 42 24
37 10 40 26 56 27 53 11	35 10 40 26 56 29 51 13	35 6 44 22 60 29 51 13
24 59 21 43 5 42 8 58	24 61 19 45 3 42 8 58	28 61 19 45 3 38 12 54
23041/	26881/	28417/
2 64 4 62 7 57 5 59	2 62 4 64 7 59 5 57	2 61 3 64 7 60 6 57
55 9 53 11 50 16 52 14	55 11 53 9 50 14 52 16	55 12 54 9 50 13 51 16
26 40 28 38 31 33 29 35	26 38 28 40 31 35 29 33	26 37 27 40 31 36 30 33
47 17 45 19 42 24 44 22	47 19 45 17 42 22 44 24	47 20 46 17 42 21 43 24
58 8 60 6 63 1 61 3	58 6 60 8 63 3 61 1	58 5 59 8 63 4 62 1
15 49 13 51 10 56 12 54	15 51 13 49 10 54 12 56	15 52 14 49 10 53 11 56
34 32 36 30 39 25 37 27	34 30 36 32 39 27 37 25	34 29 35 32 39 28 38 25
23 41 21 43 18 48 20 46	23 43 21 41 18 46 20 48	23 44 22 41 18 45 19 48
31873/	33217/	36097/
2 60 3 64 7 61 6 57	2 59 4 64 7 62 5 57	2 57 4 62 7 64 5 59
55 13 54 9 50 12 51 16	55 14 53 9 50 11 52 16	55 16 53 11 50 9 52 14
26 36 27 40 31 37 30 33	26 35 28 40 31 38 29 33	26 33 28 38 31 40 29 35
47 21 46 17 42 20 43 24	47 22 45 17 42 19 44 24	47 24 45 19 42 17 44 22
58 4 59 8 63 5 62 1	58 3 60 8 63 6 61 1	58 1 60 6 63 8 61 3
15 53 14 49 10 52 11 56	15 54 13 49 10 51 12 56	15 56 13 51 10 49 12 54
34 28 35 32 39 29 38 25	34 27 36 32 39 30 37 25	34 25 36 30 39 32 37 27
23 45 22 41 18 44 19 48	23 46 21 41 18 43 20 48	23 48 21 43 18 41 20 46

37441/						38465/						40577/											
2	56	3	64	11	61	10	53	2	55	4	64	11	62	9	53	2	53	4	62	11	64	9	55
47	25	46	17	38	20	39	28	47	26	45	17	38	19	40	28	47	28	45	19	38	17	40	26
22	36	23	44	31	41	30	33	22	35	24	44	31	42	29	33	22	33	24	42	31	44	29	35
59	13	58	5	50	8	51	16	59	14	57	5	50	7	52	16	59	16	57	7	50	5	52	14
54	4	55	12	63	9	62	1	54	3	56	12	63	10	61	1	54	1	56	10	63	12	61	3
27	45	26	37	18	40	19	48	27	46	25	37	18	39	20	48	27	48	25	39	18	37	20	46
34	24	35	32	43	29	42	21	34	23	36	32	43	30	41	21	34	21	36	30	43	32	41	23
15	57	14	49	6	52	7	60	15	58	13	49	6	51	8	60	15	60	13	51	6	49	8	58
41601/						42625/						43201/											
2	51	6	60	13	64	9	55	2	48	3	64	19	61	18	45	2	47	4	64	19	62	17	45
47	30	43	21	36	17	40	26	31	49	30	33	14	36	15	52	31	50	29	33	14	35	16	52
20	33	24	42	31	46	27	37	10	40	11	56	27	53	26	37	10	39	12	56	27	54	25	37
61	16	57	7	50	3	54	12	59	21	58	5	42	8	43	24	59	22	57	5	42	7	44	24
52	1	56	10	63	14	59	5	46	4	47	20	63	17	62	1	46	3	48	20	63	18	61	1
29	48	25	39	18	35	22	44	51	29	50	13	34	16	35	32	51	30	49	13	34	15	36	32
34	19	38	28	45	32	41	23	38	12	39	28	55	25	54	9	38	11	40	28	55	26	53	9
15	62	11	53	4	49	8	58	23	57	22	41	6	44	7	60	23	58	21	41	6	43	8	60
44353/						44929/						45505/											
2	45	4	62	19	64	17	47	2	43	6	60	21	64	17	47	2	39	10	56	25	64	17	47
31	52	29	35	14	33	16	50	31	54	27	37	12	33	16	50	31	58	23	41	8	33	16	50
10	37	12	54	27	56	25	39	10	35	14	52	29	56	25	39	6	35	14	52	29	60	21	43
59	24	57	7	42	5	44	22	61	24	57	7	42	3	46	20	61	28	53	11	38	3	46	20
46	1	48	18	63	20	61	3	44	1	48	18	63	22	59	5	40	1	48	18	63	26	55	9
51	32	49	15	34	13	36	30	53	32	49	15	34	11	38	28	57	32	49	15	34	7	42	24
38	9	40	26	55	28	53	11	36	9	40	26	55	30	51	13	36	5	44	22	59	30	51	13
23	60	21	43	6	41	8	58	23	62	19	45	4	41	8	58	27	62	19	45	4	37	12	54
46081/						49921/						51457/											
3	64	4	63	6	57	5	58	3	63	4	64	6	58	5	57	3	61	2	64	6	60	7	57
54	9	53	10	51	16	52	15	54	10	53	9	51	15	52	16	54	12	55	9	51	13	50	16
27	40	28	39	30	33	29	34	27	39	28	40	30	34	29	33	27	37	26	40	30	36	31	33
46	17	45	18	43	24	44	23	46	18	45	17	43	23	44	24	46	20	47	17	43	21	42	24
59	8	60	7	62	1	61	2	59	7	60	8	62	2	61	1	59	5	58	8	62	4	63	1
14	49	13	50	11	56	12	55	14	50	13	49	11	55	12	56	14	52	15	49	11	53	10	56
35	32	36	31	38	25	37	26	35	31	36	32	38	26	37	25	35	29	34	32	38	28	39	25
22	41	21	42	19	48	20	47	22	42	21	41	19	47	20	48	22	44	23	41	19	45	18	48
54913/						56209/						58993/											
3	60	2	64	6	61	7	57	3	58	4	64	6	63	5	57	3	57	4	63	6	64	5	58
54	13	55	9	51	12	50	16	54	15	53	9	51	10	52	16	54	16	53	10	51	9	52	15
27	36	26	40	30	37	31	33	27	34	28	40	30	39	29	33	27	33	28	39	30	40	29	34
46	21	47	17	43	20	42	24	46	23	45	17	43	18	44	24	46	24	45	18	43	17	44	23
59	4	58	8	62	5	63	1	59	2	60	8	62	7	61	1	59	1	60	7	62	8	61	2
14	53	15	49	11	52	10	56	14	55	13	49	11	50	12	56	14	56	13	50	11	49	12	55
35	28	34	32	38	29	39	25	35	26	36	32	38	31	37	25	35	25	36	31	38	32	37	26
22	45	23	41	19	44	18	48	22	47	21	41	19	42	20	48	22	48	21	42	19	41	20	47
60289/						61281/						63329/											
3	56	2	64	10	61	11	53	3	54	4	64	10	63	9	53	3	53	4	63	10	64	9	54
46	25	47	17	39	20	38	28	46	27	45	17	39	18	40	28	46	28	45	18	39	17	40	27
23	36	22	44	30	41	31	33	23	34	24	44	30	43	29	33	23	33	24	43	30	44	29	34
58	13	59	5	51	8	50	16	58	15	57	5	51	6	52	16	58	16	57	6	51	5	52	15
55	4	54	12	62	9	63	1	55	2	56	12	62	11	61	1	55	1	56	11	62	12	61	2
26	45	27	37	19	40	18	48	26	47	25	37	19	38	20	48	26	48	25	38	19	37	20	47
35	24	34	32	42	29	43	21	35	22	36	32	42	31	41	21	35	21	36	31	42	32	41	22
14	57	15	49	7	52	6	60	14	59	13	49	7	50	8	60	14	60	13	50	7	49	8	59

64321/					65345/					65905/													
3	50	7	60	13	64	9	54	3	48	2	64	18	61	19	45	3	46	4	64	18	63	17	45
46	31	42	21	36	17	40	27	30	49	31	33	15	36	14	52	30	51	29	33	15	34	16	52
20	33	24	43	30	47	26	37	11	40	10	56	26	53	27	37	11	38	12	56	26	55	25	37
61	16	57	6	51	2	55	12	58	21	59	5	43	8	42	24	58	23	57	5	43	6	44	24
52	1	56	11	62	15	58	5	47	4	46	20	62	17	63	1	47	2	48	20	62	19	61	1
29	48	25	38	19	34	23	44	50	29	51	13	35	16	34	32	50	31	49	13	35	14	36	32
35	18	39	28	45	32	41	22	39	12	38	28	54	25	55	9	39	10	40	28	54	27	53	9
14	63	10	53	4	49	8	59	22	57	23	41	7	44	6	60	22	59	21	41	7	42	8	60
67025/					67585/					68161/													
3	45	4	63	18	64	17	46	3	42	7	60	21	64	17	46	3	38	11	56	25	64	17	46
30	52	29	34	15	33	16	51	30	55	26	37	12	33	16	51	30	59	22	41	8	33	16	51
11	37	12	55	26	56	25	38	11	34	15	52	29	56	25	38	7	34	15	52	29	60	21	42
58	24	57	6	43	5	44	23	61	24	57	6	43	2	47	20	61	28	53	10	39	2	47	20
47	1	48	19	62	20	61	2	44	1	48	19	62	23	58	5	40	1	48	19	62	27	54	9
50	32	49	14	35	13	36	31	53	32	49	14	35	10	39	28	57	32	49	14	35	6	43	24
39	9	40	27	54	28	53	10	36	9	40	27	54	31	50	13	36	5	44	23	58	31	50	13
22	60	21	42	7	41	8	59	22	63	18	45	4	41	8	59	26	63	18	45	4	37	12	55
68737/					91393/					113089/													
4	64	3	63	5	57	6	58	5	64	3	63	4	57	6	58	6	64	4	63	3	57	5	58
53	9	54	10	52	16	51	15	52	9	54	10	53	16	51	15	51	9	53	10	54	16	52	15
28	40	27	39	29	33	30	34	29	40	27	39	28	33	30	34	30	40	28	39	27	33	29	34
45	17	46	18	44	24	43	23	44	17	46	18	45	24	43	23	43	17	45	18	46	24	44	23
60	8	59	7	61	1	62	2	61	8	59	7	60	1	62	2	62	8	60	7	59	1	61	2
13	49	14	50	12	56	11	55	12	49	14	50	13	56	11	55	11	49	13	50	14	56	12	55
36	32	35	31	37	25	38	26	37	32	35	31	36	25	38	26	38	32	36	31	35	25	37	26
21	41	22	42	20	48	19	47	20	41	22	42	21	48	19	47	19	41	21	42	22	48	20	47
134785/					156097/					177409/													
7	64	4	62	2	57	5	59	8	63	4	62	1	58	5	59	9	64	3	63	4	53	10	54
50	9	53	11	55	16	52	14	49	10	53	11	56	15	52	14	52	5	58	6	57	16	51	15
31	40	28	38	26	33	29	35	32	39	28	38	25	34	29	35	29	44	23	43	24	33	30	34
42	17	45	19	47	24	44	22	41	18	45	19	48	23	44	22	40	17	46	18	45	28	39	27
63	8	60	6	58	1	61	3	64	7	60	6	57	2	61	3	61	12	55	11	56	1	62	2
10	49	13	51	15	56	12	54	9	50	13	51	16	55	12	54	8	49	14	50	13	60	7	59
39	32	36	30	34	25	37	27	40	31	36	30	33	26	37	27	41	32	35	31	36	21	42	22
18	41	21	43	23	48	20	46	17	42	21	43	24	47	20	46	20	37	26	38	25	48	19	47
195649/					213889/					231745/													
10	64	4	63	3	53	9	54	11	64	4	62	2	53	9	55	12	63	4	62	1	54	9	55
51	5	57	6	58	16	52	15	50	5	57	7	59	16	52	14	49	6	57	7	60	15	52	14
30	44	24	43	23	33	29	34	31	44	24	42	22	33	29	35	32	43	24	42	21	34	29	35
39	17	45	18	46	28	40	27	38	17	45	19	47	28	40	26	37	18	45	19	48	27	40	26
62	12	56	11	55	1	61	2	63	12	56	10	54	1	61	3	64	11	56	10	53	2	61	3
7	49	13	50	14	60	8	59	6	49	13	51	15	60	8	58	5	50	13	51	16	59	8	58
42	32	36	31	35	21	41	22	43	32	36	30	34	21	41	23	44	31	36	30	33	22	41	23
19	37	25	38	26	48	20	47	18	37	25	39	27	48	20	46	17	38	25	39	28	47	20	46
249601/					266497/					283393/													
13	64	6	60	2	51	9	55	14	63	6	60	1	52	9	55	15	62	7	60	1	52	9	54
50	3	57	7	61	16	54	12	49	4	57	7	62	15	54	12	49	4	57	6	63	14	55	12
31	46	24	42	20	33	27	37	32	45	24	42	19	34	27	37	32	45	24	43	18	35	26	37
36	17	43	21	47	30	40	26	35	18	43	21	48	29	40	26	34	19	42	21	48	29	40	27
63	14	56	10	52	1	59	5	64	13	56	10	51	2	59	5	64	13	56	11	50	3	58	5
4	49	11	53	15	62	8	58	3	50	11	53	16	61	8	58	2	51	10	53	16	61	8	59
45	32	38	28	34	19	41	23	46	31	38	28	33	20	41	23	47	30	39	28	33	20	41	22
18	35	25	39	29	48	22	44	17	36	25	39	30	47	22	44	17	36	25	38	31	46	23	44

299905/								316417/								322945/							
16	61	8	59	2	51	10	53	17	64	3	63	4	45	18	46	18	64	4	63	3	45	17	46
50	3	58	5	64	13	56	11	44	5	58	6	57	24	43	23	43	5	57	6	58	24	44	23
32	45	24	43	18	35	26	37	25	56	11	55	12	37	26	38	26	56	12	55	11	37	25	38
34	19	42	21	48	29	40	27	16	33	30	34	29	52	15	51	15	33	29	34	30	52	16	51
63	14	55	12	49	4	57	6	61	20	47	19	48	1	62	2	62	20	48	19	47	1	61	2
1	52	9	54	15	62	7	60	8	41	22	42	21	60	7	59	7	41	21	42	22	60	8	59
47	30	39	28	33	20	41	22	53	28	39	27	40	9	54	10	54	28	40	27	39	9	53	10
17	36	25	38	31	46	23	44	36	13	50	14	49	32	35	31	35	13	49	14	50	32	36	31
329473/								335617/								341761/							
19	64	4	62	2	45	17	47	20	63	4	62	1	46	17	47	21	64	6	60	2	43	17	47
42	5	57	7	59	24	44	22	41	6	57	7	60	23	44	22	42	3	57	7	61	24	46	20
27	56	12	54	10	37	25	39	28	55	12	54	9	38	25	39	29	56	14	52	10	35	25	39
14	33	29	35	31	52	16	50	13	34	29	35	32	51	16	50	12	33	27	37	31	54	16	50
63	20	48	18	46	1	61	3	64	19	48	18	45	2	61	3	63	22	48	18	44	1	59	5
6	41	21	43	23	60	8	58	5	42	21	43	24	59	8	58	4	41	19	45	23	62	8	58
55	28	40	26	38	9	53	11	56	27	40	26	37	10	53	11	55	30	40	26	36	9	51	13
34	13	49	15	51	32	36	30	33	14	49	15	52	31	36	30	34	11	49	15	53	32	38	28
346945/								352129/								356929/							
22	63	6	60	1	44	17	47	23	62	7	60	1	44	17	46	24	61	8	59	2	43	18	45
41	4	57	7	62	23	46	20	41	4	57	6	63	22	47	20	42	3	58	5	64	21	48	19
30	55	14	52	9	36	25	39	31	54	15	52	9	36	25	38	31	54	15	52	9	36	25	38
11	34	27	37	32	53	16	50	10	35	26	37	32	53	16	51	10	35	26	37	32	53	16	51
64	21	48	18	43	2	59	5	64	21	48	19	42	3	58	5	63	22	47	20	41	4	57	6
3	42	19	45	24	61	8	58	2	43	18	45	24	61	8	59	1	44	17	46	23	62	7	60
56	29	40	26	35	10	51	13	56	29	40	27	34	11	50	13	56	29	40	27	34	11	50	13
33	12	49	15	54	31	38	28	33	12	49	14	55	30	39	28	33	12	49	14	55	30	39	28
361729/								363457/								365185/							
25	56	10	64	2	47	17	39	26	56	10	63	1	47	17	40	27	56	11	62	1	46	17	40
38	11	53	3	61	20	46	28	37	11	53	4	62	20	46	27	37	10	53	4	63	20	47	26
29	52	14	60	6	43	21	35	30	52	14	59	5	43	21	36	31	52	15	58	5	42	21	36
8	41	23	33	31	50	16	58	7	41	23	34	32	50	16	57	6	41	22	35	32	51	16	57
63	18	48	26	40	9	55	1	64	18	48	25	39	9	55	2	64	19	48	25	38	9	54	3
4	45	19	37	27	54	12	62	3	45	19	38	28	54	12	61	2	45	18	39	28	55	12	61
59	22	44	30	36	13	51	5	60	22	44	29	35	13	51	6	60	23	44	29	34	13	50	7
34	15	49	7	57	24	42	32	33	15	49	8	58	24	42	31	33	14	49	8	59	24	43	30
366529/								367873/								368257/							
28	55	12	61	2	45	18	39	29	52	14	60	6	43	21	35	30	52	14	59	5	43	21	36
38	9	54	3	64	19	48	25	40	9	55	1	63	18	48	26	39	9	55	2	64	18	48	25
31	52	15	58	5	42	21	36	27	54	12	62	4	45	19	37	28	54	12	61	3	45	19	38
6	41	22	35	32	51	16	57	8	41	23	33	31	50	16	58	7	41	23	34	32	50	16	57
63	20	47	26	37	10	53	4	59	22	44	30	36	13	51	5	60	22	44	29	35	13	51	6
1	46	17	40	27	56	11	62	2	47	17	39	25	56	10	64	1	47	17	40	26	56	10	63
60	23	44	29	34	13	50	7	61	20	46	28	38	11	53	3	62	20	46	27	37	11	53	4
33	14	49	8	59	24	43	30	34	15	49	7	57	24	42	32	33	15	49	8	58	24	42	31

[Count = 368640] OK!

It is for the first time that we could count up all the standard solutions through of any type of magic squares of order 8, though I took about 20~30 minutes to do that.

When I made the same object by our "New Euler's Method", I could find the same count of 'Complete Euler Squares', 368640 standard solutions of 'C&C' PMS88.

It means 'C&C' PMS88 are all 'Complete Euler Squares' and nothing else.

#6-4. Simultaneous Type of MS88: Multiple, Composite and Complete

The next multiple type of 'Composite and Complete' magic squares of order 8 seem to be more important than anything else. We have found that it makes a noble family with the 'C&C' magic cubes of order 4 and also with the 3-type simultaneous Magic Squares of order 8: Composite, Self-complementary and Pandiagonal.

I advise you to try to study these types as intensively as you can, and you had better know what each of them means and what relations three types really have.

At the definition stage you need to modify the usual Basic Conditions as follows.

**** #6-4: Multiple Type: ****

```

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

```

**** Basic Conditions: SC=130 ****

$n1+n2+n3+n4=SC;$ $n5+n6+n7+n8=SC;$

$n1+n9+n17+n25=SC;$ $n33+n41+n49+n57=SC;$

You don't have to change anything of both Composite Conditions and Complete Conditions above in #6-3.

**** Sample List of Standard Solutions: Multiple Type of ****

**** 'Composite and Complete' Magic Squares of Order 8: ****

				1/					25/					49/									
1	63	4	62	36	30	33	31	1	63	6	60	38	28	33	31	1	63	10	56	42	24	33	31
60	6	57	7	25	39	28	38	62	4	57	7	25	39	30	36	62	4	53	11	21	43	30	36
13	51	16	50	48	18	45	19	11	53	16	50	48	18	43	21	7	57	16	50	48	18	39	25
56	10	53	11	21	43	24	42	56	10	51	13	19	45	24	42	60	6	51	13	19	45	28	38
29	35	32	34	64	2	61	3	27	37	32	34	64	2	59	5	23	41	32	34	64	2	55	9
40	26	37	27	5	59	8	58	40	26	35	29	3	61	8	58	44	22	35	29	3	61	12	54
17	47	20	46	52	14	49	15	17	47	22	44	54	12	49	15	17	47	26	40	58	8	49	15
44	22	41	23	9	55	12	54	46	20	41	23	9	55	14	52	46	20	37	27	5	59	14	52
				73/					97/					121/									
1	63	18	48	50	16	33	31	1	63	34	32	50	16	17	47	1	62	4	63	36	31	33	30
62	4	45	19	13	51	30	36	62	4	29	35	13	51	46	20	60	7	57	6	25	38	28	39
7	57	24	42	56	10	39	25	7	57	40	26	56	10	23	41	13	50	16	51	48	19	45	18
60	6	43	21	11	53	28	38	60	6	27	37	11	53	44	22	56	11	53	10	21	42	24	43
15	49	32	34	64	2	47	17	15	49	48	18	64	2	31	33	29	34	32	35	64	3	61	2
52	14	35	29	3	61	20	46	52	14	19	45	3	61	36	30	40	27	37	26	5	58	8	59
9	55	26	40	58	8	41	23	9	55	42	24	58	8	25	39	17	46	20	47	52	15	49	14
54	12	37	27	5	59	22	44	54	12	21	43	5	59	38	28	44	23	41	22	9	54	12	55
				145/					163/					181/									
1	62	7	60	39	28	33	30	1	62	11	56	43	24	33	30	1	62	19	48	51	16	33	30
56	11	50	13	18	45	24	43	60	7	50	13	18	45	28	39	60	7	42	21	10	53	28	39
10	53	16	51	48	19	42	21	6	57	16	51	48	19	38	25	6	57	24	43	56	11	38	25
63	4	57	6	25	38	31	36	63	4	53	10	21	42	31	36	63	4	45	18	13	50	31	36
26	37	32	35	64	3	58	5	22	41	32	35	64	3	54	9	14	49	32	35	64	3	46	17
47	20	41	22	9	54	15	52	47	20	37	26	5	58	15	52	55	12	37	26	5	58	23	44
17	46	23	44	55	12	49	14	17	46	27	40	59	8	49	14	9	54	27	40	59	8	41	22
40	27	34	29	2	61	8	59	44	23	34	29	2	61	12	55	52	15	34	29	2	61	20	47

	199/		217/		235/
1 62 35 32 51 16 17 46	1 60 6 63 38 31 33 28	1 60 7 62 39 30 33 28	56 13 51 10 19 42 24 45	56 13 50 11 18 43 24 45	10 51 16 53 48 21 42 19
60 7 26 37 10 53 44 23	11 50 16 53 48 21 43 18	63 6 57 4 25 36 31 38	62 7 57 4 25 36 30 39	63 6 57 4 25 36 31 38	26 35 32 37 64 5 58 3
6 57 40 27 56 11 22 41	27 34 32 37 64 5 59 2	47 22 41 20 9 52 15 54	27 34 32 37 64 5 59 2	47 22 41 20 9 52 15 54	17 44 23 46 55 14 49 12
63 4 29 34 13 50 47 20	46 23 41 20 9 52 14 55	17 44 23 46 55 14 49 12	46 23 41 20 9 52 14 55	17 44 23 46 55 14 49 12	40 29 34 27 2 59 8 61
14 49 48 19 64 3 30 33	17 44 22 47 54 15 49 12	40 29 35 26 3 58 8 61	17 44 22 47 54 15 49 12	40 29 35 26 3 58 8 61	
55 12 21 42 5 58 39 28	40 29 35 26 3 58 8 61		40 29 35 26 3 58 8 61		
9 54 43 24 59 8 25 38					
52 15 18 45 2 61 36 31					
	253/		265/		277/
1 60 13 56 45 24 33 28	1 60 21 48 53 16 33 28	1 60 37 32 53 16 17 44	56 13 36 25 4 57 24 45	56 13 20 41 4 57 40 29	10 51 46 23 62 7 26 35
48 21 36 25 4 57 16 53	56 13 36 25 4 57 24 45	10 51 46 23 62 7 26 35	10 51 30 39 62 7 42 19	10 51 46 23 62 7 26 35	63 6 27 34 11 50 47 22
18 43 30 39 62 7 50 11	10 51 30 39 62 7 42 19	63 6 27 34 11 50 47 22	63 6 43 18 11 50 31 38	63 6 27 34 11 50 47 22	12 49 48 21 64 5 28 33
63 6 51 10 19 42 31 38	63 6 43 18 11 50 31 38	12 49 48 21 64 5 28 33	12 49 32 37 64 5 44 17	12 49 48 21 64 5 28 33	61 8 25 36 9 52 45 24
20 41 32 37 64 5 52 9	12 49 32 37 64 5 44 17	61 8 25 36 9 52 45 24	61 8 41 20 9 52 29 40	61 8 25 36 9 52 45 24	3 58 39 30 55 14 19 42
61 8 49 12 17 44 29 40	61 8 41 20 9 52 29 40	3 58 39 30 55 14 19 42	61 8 41 20 9 52 29 40	3 58 39 30 55 14 19 42	54 15 18 43 2 59 38 31
3 58 15 54 47 22 35 26	3 58 23 46 55 14 35 26	54 15 18 43 2 59 38 31	3 58 23 46 55 14 35 26	54 15 18 43 2 59 38 31	
46 23 34 27 2 59 14 55	54 15 34 27 2 59 22 47		54 15 34 27 2 59 22 47		
	289/		337/		361/
1 56 10 63 42 31 33 24	1 48 18 63 26 55 9 40	2 64 3 61 35 29 34 32	32 49 15 34 7 42 24 57	59 5 58 8 26 40 27 37	14 52 15 49 47 17 46 20
48 25 39 18 7 50 16 57	32 49 15 34 7 42 24 57	59 5 58 8 26 40 27 37	35 14 52 29 60 21 43 6	14 52 15 49 47 17 46 20	55 9 54 12 22 44 23 41
19 38 28 45 60 13 51 6	35 14 52 29 60 21 43 6	14 52 15 49 47 17 46 20	62 19 45 4 37 12 54 27	55 9 54 12 22 44 23 41	30 36 31 33 63 1 62 4
62 11 53 4 21 36 30 43	62 19 45 4 37 12 54 27	55 9 54 12 22 44 23 41	39 10 56 25 64 17 47 2	30 36 31 33 63 1 62 4	39 25 38 28 6 60 7 57
23 34 32 41 64 9 55 2	39 10 56 25 64 17 47 2	39 25 38 28 6 60 7 57	58 23 41 8 33 16 50 31	39 25 38 28 6 60 7 57	18 48 19 45 51 13 50 16
58 15 49 8 17 40 26 47	58 23 41 8 33 16 50 31	18 48 19 45 51 13 50 16	58 23 41 8 33 16 50 31	18 48 19 45 51 13 50 16	43 21 42 24 10 56 11 53
5 52 14 59 46 27 37 20	5 44 22 59 30 51 13 36	43 21 42 24 10 56 11 53	5 44 22 59 30 51 13 36	43 21 42 24 10 56 11 53	
44 29 35 22 3 54 12 61	28 53 11 38 3 46 20 61		28 53 11 38 3 46 20 61		
	481/		577/		649/
2 61 3 64 35 32 34 29	2 59 5 64 37 32 34 27	2 55 9 64 41 32 34 23	55 14 52 9 20 41 23 46	47 26 40 17 8 49 15 58	20 37 27 46 59 14 52 5
59 8 58 5 26 37 27 40	55 14 52 9 20 41 23 46	47 26 40 17 8 49 15 58	12 49 15 54 47 22 44 17	20 37 27 46 59 14 52 5	61 12 54 3 22 35 29 44
14 49 15 52 47 20 46 17	12 49 15 54 47 22 44 17	61 12 54 3 22 35 29 44	61 8 58 3 26 35 29 40	61 12 54 3 22 35 29 44	24 33 31 42 63 10 56 1
55 12 54 9 22 41 23 44	61 8 58 3 26 35 29 40	24 33 31 42 63 10 56 1	28 33 31 38 63 6 60 1	24 33 31 42 63 10 56 1	57 16 50 7 18 39 25 48
30 33 31 36 63 4 62 1	28 33 31 38 63 6 60 1	57 16 50 7 18 39 25 48	45 24 42 19 10 51 13 56	57 16 50 7 18 39 25 48	6 51 13 60 45 28 38 19
39 28 38 25 6 57 7 60	45 24 42 19 10 51 13 56	6 51 13 60 45 28 38 19	18 43 21 48 53 16 50 11	6 51 13 60 45 28 38 19	43 30 36 21 4 53 11 62
18 45 19 48 51 16 50 13	18 43 21 48 53 16 50 11	43 30 36 21 4 53 11 62	39 30 36 25 4 57 7 62	43 30 36 21 4 53 11 62	
43 24 42 21 10 53 11 56	39 30 36 25 4 57 7 62				
	697/		721/		841/
2 47 17 64 25 56 10 39	3 64 2 61 34 29 35 32	3 61 2 64 34 32 35 29	58 5 59 8 27 40 26 37	58 8 59 5 27 37 26 40	15 49 14 52 46 20 47 17
31 50 16 33 8 41 23 58	58 5 59 8 27 40 26 37	58 8 59 5 27 37 26 40	15 52 14 49 46 17 47 20	15 49 14 52 46 20 47 17	54 12 55 9 23 41 22 44
36 13 51 30 59 22 44 5	15 52 14 49 46 17 47 20	15 49 14 52 46 20 47 17	54 9 55 12 23 44 22 41	54 12 55 9 23 41 22 44	31 33 30 36 62 4 63 1
61 20 46 3 38 11 53 28	54 9 55 12 23 44 22 41	54 12 55 9 23 41 22 44	31 36 30 33 62 1 63 4	31 33 30 36 62 4 63 1	38 28 39 25 7 57 6 60
40 9 55 26 63 18 48 1	31 36 30 33 62 1 63 4	38 28 39 25 7 57 6 60	38 25 39 28 7 60 6 57	38 28 39 25 7 57 6 60	19 45 18 48 50 16 51 13
57 24 42 7 34 15 49 32	38 25 39 28 7 60 6 57	19 45 18 48 50 16 51 13	19 48 18 45 50 13 51 16	19 45 18 48 50 16 51 13	42 24 43 21 11 53 10 56
6 43 21 60 29 52 14 35	19 48 18 45 50 13 51 16	42 24 43 21 11 53 10 56	42 21 43 24 11 56 10 53	42 24 43 21 11 53 10 56	
27 54 12 37 4 45 19 62	42 21 43 24 11 56 10 53				
	937/		1009/		1057/
3 58 5 64 37 32 35 26	3 54 9 64 41 32 35 22	3 46 17 64 25 56 11 38	46 27 40 17 8 49 14 59	30 51 16 33 8 41 22 59	36 13 50 31 58 23 44 5
54 15 52 9 20 41 22 47	46 27 40 17 8 49 14 59	30 51 16 33 8 41 22 59	20 37 26 47 58 15 52 5	36 13 50 31 58 23 44 5	61 20 47 2 39 10 53 28
12 49 14 55 46 23 44 17	20 37 26 47 58 15 52 5	61 20 47 2 39 10 53 28	61 12 55 2 23 34 29 44	61 20 47 2 39 10 53 28	40 9 54 27 62 19 48 1
61 8 59 2 27 34 29 40	61 12 55 2 23 34 29 44	40 9 54 27 62 19 48 1	24 33 30 43 62 11 56 1	40 9 54 27 62 19 48 1	57 24 43 6 35 14 49 32
28 33 30 39 62 7 60 1	24 33 30 43 62 11 56 1	57 24 43 6 35 14 49 32	57 16 51 6 19 38 25 48	57 24 43 6 35 14 49 32	7 42 21 60 29 52 15 34
45 24 43 18 11 50 13 56	57 16 51 6 19 38 25 48	7 42 21 60 29 52 15 34	7 50 13 60 45 28 39 18	7 42 21 60 29 52 15 34	26 55 12 37 4 45 18 63
19 42 21 48 53 16 51 10	7 50 13 60 45 28 39 18	26 55 12 37 4 45 18 63	42 31 36 21 4 53 10 63	26 55 12 37 4 45 18 63	
38 31 36 25 4 57 6 63	42 31 36 21 4 53 10 63				

	1081/		1441/		1801/
4 63 1 62 33 30 36 31	5 64 2 59 34 27 37 32	6 63 1 60 33 28 38 31	57 4 62 7 30 39 25 36	16 53 11 50 43 18 48 21	51 10 56 13 24 45 19 42
57 6 60 7 28 39 25 38	58 3 61 8 29 40 26 35	57 4 62 7 30 39 25 36	16 53 11 50 43 18 48 21	51 10 56 13 24 45 19 42	32 37 27 34 59 2 64 5
16 51 13 50 45 18 48 19	15 54 12 49 44 17 47 22	16 53 11 50 43 18 48 21	51 10 56 13 24 45 19 42	32 37 27 34 59 2 64 5	35 26 40 29 8 61 3 58
53 10 56 11 24 43 21 42	52 9 55 14 23 46 20 41	51 10 56 13 24 45 19 42	32 37 27 34 59 2 64 5	35 26 40 29 8 61 3 58	22 47 17 44 49 12 54 15
32 35 29 34 61 2 64 3	31 38 28 33 60 1 63 6	32 37 27 34 59 2 64 5	35 26 40 29 8 61 3 58	22 47 17 44 49 12 54 15	41 20 46 23 14 55 9 52
37 26 40 27 8 59 5 58	36 25 39 30 7 62 4 57	22 47 17 44 49 12 54 15	41 20 46 23 14 55 9 52		
20 47 17 46 49 14 52 15	21 48 18 43 50 11 53 16	41 20 46 23 14 55 9 52			
41 22 44 23 12 55 9 54	42 19 45 24 13 56 10 51				
	2161/		2521/		2881/
7 62 1 60 33 28 39 30	8 61 2 59 34 27 40 29	9 64 2 55 34 23 41 32	54 3 61 12 29 44 22 35	15 58 8 49 40 17 47 26	52 5 59 14 27 46 20 37
57 4 63 6 31 38 25 36	58 3 64 5 32 37 26 35	54 3 61 12 29 44 22 35	15 58 8 49 40 17 47 26	52 5 59 14 27 46 20 37	31 42 24 33 56 1 63 10
16 53 10 51 42 19 48 21	15 54 9 52 41 20 47 22	15 58 8 49 40 17 47 26	52 5 59 14 27 46 20 37	31 42 24 33 56 1 63 10	36 21 43 30 11 62 4 53
50 11 56 13 24 45 18 43	49 12 55 14 23 46 17 44	52 5 59 14 27 46 20 37	31 42 24 33 56 1 63 10	36 21 43 30 11 62 4 53	25 48 18 39 50 7 57 16
32 37 26 35 58 3 64 5	31 38 25 36 57 4 63 6	31 42 24 33 56 1 63 10	36 21 43 30 11 62 4 53	25 48 18 39 50 7 57 16	38 19 45 28 13 60 6 51
34 27 40 29 8 61 2 59	33 28 39 30 7 62 1 60	36 21 43 30 11 62 4 53	25 48 18 39 50 7 57 16	38 19 45 28 13 60 6 51	
23 46 17 44 49 12 55 14	24 45 18 43 50 11 56 13	25 48 18 39 50 7 57 16	38 19 45 28 13 60 6 51		
41 20 47 22 15 54 9 52	42 19 48 21 16 53 10 51				
	3169/		3457/		3745/
10 63 1 56 33 24 42 31	11 62 1 56 33 24 43 30	12 61 2 55 34 23 44 29	54 3 64 9 32 41 22 35	15 58 5 52 37 20 47 26	49 8 59 14 27 46 17 40
53 4 62 11 30 43 21 36	53 4 63 10 31 42 21 36	54 3 64 9 32 41 22 35	15 58 5 52 37 20 47 26	49 8 59 14 27 46 17 40	31 42 21 36 53 4 63 10
16 57 7 50 39 18 48 25	16 57 6 51 38 19 48 25	15 58 5 52 37 20 47 26	49 8 59 14 27 46 17 40	31 42 21 36 53 4 63 10	33 24 43 30 11 62 1 56
51 6 60 13 28 45 19 38	50 7 60 13 28 45 18 39	49 8 59 14 27 46 17 40	31 42 21 36 53 4 63 10	33 24 43 30 11 62 1 56	28 45 18 39 50 7 60 13
32 41 23 34 55 2 64 9	32 41 22 35 54 3 64 9	31 42 21 36 53 4 63 10	33 24 43 30 11 62 1 56	28 45 18 39 50 7 60 13	38 19 48 25 16 57 6 51
35 22 44 29 12 61 3 54	34 23 44 29 12 61 2 55	33 24 43 30 11 62 1 56	28 45 18 39 50 7 60 13	38 19 48 25 16 57 6 51	
26 47 17 40 49 8 58 15	27 46 17 40 49 8 59 14	28 45 18 39 50 7 60 13	38 19 48 25 16 57 6 51		
37 20 46 27 14 59 5 52	37 20 47 26 15 58 5 52	38 19 48 25 16 57 6 51			
	4033/		4321/		4609/
13 60 1 56 33 24 45 28	14 59 2 55 34 23 46 27	15 58 3 54 35 22 47 26	52 5 64 9 32 41 20 37	14 59 2 55 34 23 46 27	49 8 61 12 29 44 17 40
51 6 63 10 31 42 19 38	52 5 64 9 32 41 20 37	52 5 64 9 32 41 20 37	14 59 2 55 34 23 46 27	49 8 61 12 29 44 17 40	30 43 18 39 50 7 62 11
16 57 4 53 36 21 48 25	15 58 3 54 35 22 47 26	14 59 2 55 34 23 46 27	49 8 61 12 29 44 17 40	30 43 18 39 50 7 62 11	33 24 45 28 13 60 1 56
50 7 62 11 30 43 18 39	49 8 61 12 29 44 17 40	49 8 61 12 29 44 17 40	30 43 18 39 50 7 62 11	33 24 45 28 13 60 1 56	31 42 19 38 51 6 63 10
32 41 20 37 52 5 64 9	31 42 19 38 51 6 63 10	30 43 18 39 50 7 62 11	36 21 48 25 16 57 4 53	36 21 48 25 16 57 4 53	
34 23 46 27 14 59 2 55	33 24 45 28 13 60 1 56	33 24 45 28 13 60 1 56			
29 44 17 40 49 8 61 12	30 43 18 39 50 7 62 11	31 42 19 38 51 6 63 10			
35 22 47 26 15 58 3 54	36 21 48 25 16 57 4 53	36 21 48 25 16 57 4 53			
	4897/		5185/		5257/
16 57 4 53 36 21 48 25	17 64 2 47 34 15 49 32	18 63 1 48 33 16 50 31	45 4 62 19 30 51 13 36	24 57 7 42 39 10 56 25	43 6 60 21 28 53 11 38
51 6 63 10 31 42 19 38	46 3 61 20 29 52 14 35	45 4 62 19 30 51 13 36	24 57 7 42 39 10 56 25	43 6 60 21 28 53 11 38	32 49 15 34 47 2 64 17
13 60 1 56 33 24 45 28	23 58 8 41 40 9 55 26	24 57 7 42 39 10 56 25	43 6 60 21 28 53 11 38	32 49 15 34 47 2 64 17	35 14 52 29 20 61 3 46
50 7 62 11 30 43 18 39	44 5 59 22 27 54 12 37	43 6 60 21 28 53 11 38	32 49 15 34 47 2 64 17	35 14 52 29 20 61 3 46	26 55 9 40 41 8 58 23
29 44 17 40 49 8 61 12	31 50 16 33 48 1 63 18	32 49 15 34 47 2 64 17	35 14 52 29 20 61 3 46	26 55 9 40 41 8 58 23	37 12 54 27 22 59 5 44
34 23 46 27 14 59 2 55	36 13 51 30 19 62 4 45	35 14 52 29 20 61 3 46	26 55 9 40 41 8 58 23	37 12 54 27 22 59 5 44	
32 41 20 37 52 5 64 9	25 56 10 39 42 7 57 24	26 55 9 40 41 8 58 23	37 12 54 27 22 59 5 44		
35 22 47 26 15 58 3 54	38 11 53 28 21 60 6 43	37 12 54 27 22 59 5 44			
	5329/		5401/		5473/
19 62 1 48 33 16 51 30	20 61 2 47 34 15 52 29	21 60 1 48 33 16 53 28	43 6 63 18 31 50 11 38	24 57 4 45 36 13 56 25	42 7 62 19 30 51 10 39
45 4 63 18 31 50 13 36	46 3 64 17 32 49 14 35	43 6 63 18 31 50 11 38	24 57 4 45 36 13 56 25	42 7 62 19 30 51 10 39	32 49 12 37 44 5 64 17
24 57 6 43 38 11 56 25	23 58 5 44 37 12 55 26	24 57 4 45 36 13 56 25	42 7 62 19 30 51 10 39	32 49 12 37 44 5 64 17	34 15 54 27 22 59 2 47
42 7 60 21 28 53 10 39	41 8 59 22 27 54 9 40	42 7 62 19 30 51 10 39	32 49 12 37 44 5 64 17	34 15 54 27 22 59 2 47	29 52 9 40 41 8 61 20
32 49 14 35 46 3 64 17	31 50 13 36 45 4 63 18	32 49 12 37 44 5 64 17	34 15 54 27 22 59 2 47	29 52 9 40 41 8 61 20	35 14 55 26 23 58 3 46
34 15 52 29 20 61 2 47	33 16 51 30 19 62 1 48	34 15 54 27 22 59 2 47	29 52 9 40 41 8 61 20	35 14 55 26 23 58 3 46	
27 54 9 40 41 8 59 22	28 53 10 39 42 7 60 21	29 52 9 40 41 8 61 20	35 14 55 26 23 58 3 46		
37 12 55 26 23 58 5 44	38 11 56 25 24 57 6 43	35 14 55 26 23 58 3 46			

```

5545/
22 59 2 47 34 15 54 27 23 58 3 46 35 14 55 26 24 57 4 45 36 13 56 25
44 5 64 17 32 49 12 37 44 5 64 17 32 49 12 37 43 6 63 18 31 50 11 38
23 58 3 46 35 14 55 26 22 59 2 47 34 15 54 27 21 60 1 48 33 16 53 28
41 8 61 20 29 52 9 40 41 8 61 20 29 52 9 40 42 7 62 19 30 51 10 39
31 50 11 38 43 6 63 18 30 51 10 39 42 7 62 19 29 52 9 40 41 8 61 20
33 16 53 28 21 60 1 48 33 16 53 28 21 60 1 48 34 15 54 27 22 59 2 47
30 51 10 39 42 7 62 19 31 50 11 38 43 6 63 18 32 49 12 37 44 5 64 17
36 13 56 25 24 57 4 45 36 13 56 25 24 57 4 45 35 14 55 26 23 58 3 46
[Count = 5760] OK!

```

#6-5. Three-Type Simultaneous Magic Squares 8x8: Composite, Self-complementary and Pandiagonal

We know the next four types have the same solution set in common and we have to identify them with the same concept.

	Single	2. Composite Type	3. Multiple and Composite Type
1	Self-complementary type	Composite & Self-complementary	Multiple, Composite & Self-complementary
4	Self-complementary and Pan-diagonal type	Composite, Self-complementary and Pan-diagonal	Multiple, Composite, Self-complementary & Pan-diagonal Magic

We can only make the same solution set, whatever definitions we should start with. Let's define them in such a representative style as in the next list below.

```

** #6-5: 3-T Simultaneous MS88: Composite, Self-complementary and Pandiagonal **
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: C=260 **
n1+n2+n3+n4+n5+n6+n7+n8=C ..rw1;
n1+n9+n17+n25+n33+n41+n49+n57=C ..c11;

** Self-Complementary Conditions **
n1+n64=n2+n63=n3+n62=n4+n61=
n5+n60=n6+n59=n7+n58=n8+n57=
n9+n56=n10+n55=n11+n54=n12+n53=
n13+n52=n14+n51=n15+n50=n16+n49=
n17+n48=n18+n47=n19+n46=n20+n45=
n21+n44=n22+n43=n23+n42=n24+n41=
n25+n40=n26+n39=n27+n38=n28+n37=
n29+n36=n30+n35=n31+n34=n32+n33=CC
... scc [CC=65]

** Composite Conditions: SS=130 **
n1+n2+n9+n10=SS ...c01 | n22+n23+n30+n31=SS ...c22 | n43+n44+n51+n52=SS ...c43
n2+n3+n10+n11=SS ...c02 | n23+n24+n31+n32=SS ...c23 | n44+n45+n52+n53=SS ...c44
n3+n4+n11+n12=SS ...c03 | n24+n17+n32+n25=SS ...c24 | n45+n46+n53+n54=SS ...c45
n4+n5+n12+n13=SS ...c04 | n25+n26+n33+n34=SS ...c25 | n46+n47+n54+n55=SS ...c46
n5+n6+n13+n14=SS ...c05 | n26+n27+n34+n35=SS ...c26 | n47+n48+n55+n56=SS ...c47
n6+n7+n14+n15=SS ...c06 | n27+n28+n35+n36=SS ...c27 | n48+n41+n56+n49=SS ...c48
n7+n8+n15+n16=SS ...c07 | n28+n29+n36+n37=SS ...c28 | n49+n50+n57+n58=SS ...c49
n8+n1+n16+n9=SS ...c08 | n29+n30+n37+n38=SS ...c29 | n50+n51+n58+n59=SS ...c50
n9+n10+n17+n18=SS ...c09 | n30+n31+n38+n39=SS ...c30 | n51+n52+n59+n60=SS ...c51

```

```

n10+n11+n18+n19=SS ...c10 | n31+n32+n39+n40=SS ...c31 | n52+n53+n60+n61=SS ...c52
n11+n12+n19+n20=SS ...c11 | n32+n25+n40+n33=SS ...c32 | n53+n54+n61+n62=SS ...c53
n12+n13+n20+n21=SS ...c12 | n33+n34+n41+n42=SS ...c33 | n54+n55+n62+n63=SS ...c54
n13+n14+n21+n22=SS ...c13 | n34+n35+n42+n43=SS ...c34 | n55+n56+n63+n64=SS ...c55
n14+n15+n22+n23=SS ...c14 | n35+n36+n43+n44=SS ...c35 | n56+n49+n64+n57=SS ...c56
n15+n16+n23+n24=SS ...c15 | n36+n37+n44+n45=SS ...c36 | n57+n58+n1+n2=SS ...c57
n16+n9+n24+n17=SS ...c16 | n37+n38+n45+n46=SS ...c37 | n58+n59+n2+n3=SS ...c58
n17+n18+n25+n26=SS ...c17 | n38+n39+n46+n47=SS ...c38 | n59+n60+n3+n4=SS ...c59
n18+n19+n26+n27=SS ...c18 | n39+n40+n47+n48=SS ...c39 | n60+n61+n4+n5=SS ...c60
n19+n20+n27+n28=SS ...c19 | n40+n33+n48+n41=SS ...c40 | n61+n62+n5+n6=SS ...c61
n20+n21+n28+n29=SS ...c20 | n41+n42+n49+n50=SS ...c41 | n62+n63+n6+n7=SS ...c62
n21+n22+n29+n30=SS ...c21 | n42+n43+n50+n51=SS ...c42 | n63+n64+n7+n8=SS ...c63
and n64+n57+n8+n1=SS ...c64

```

**** Pan-diagonal Conditions: C=260 ****

```

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

```

You don't have to take the Pandiagonal Conditions above, because they could be calculated under the Composite Conditions and Self-complementary Conditions.

```

n1+n10+n19+n28+n37+n46+n55+n64=(n1+n64)+(n10+n55)+(n19+n46)+(n28+n37)=4*CC=C ... pd1;
n8+n15+n22+n29+n36+n43+n50+n57=(n8+n57)+(n15+n50)+(n22+n43)+(n29+n36)=4*CC=C ... pb8;

```

'Multiple conditions' are not always necessary, since they could be calculated under the basic definitions above. Let me show you such an example of simple algebraic calculation as follows.

```

n1+n64=n2+n63=n3+n62=n4+n61=65 ...scc

```

Add all sides of these equations:

```

(n1+n2+n3+n4)+(n61+n62+n63+n64)=65*4=260 ...sm1

```

```

n61+n62+n5+n6=130 ...c61 | n63+n64+n7+n8=130 ...c63

```

```

(n5+n6+n7+n8)+(n61+n62+n63+n64)=130*2=260 ...sm2

```

Since **sm1**, **sm2** and $n1+n2+n3+n4+n5+n6+n7+n8=130$, you can say

```

n1+n2+n3+n4=n5+n6+n7+n8=260/2=130; ... mu1

```

```

n1+n64=n9+n56=n17+n48=n25+n40=65 ...scc

```

Add all sides of these equations:

```

(n1+n9+n17+n25)+(n40+n48+n56+n64)=65*4=260 ...sm3

```

```

n40+n33+n48+n41=SS ...c40 | n56+n49+n64+n57=SS ...c56

```

```

(n33+n41+n49+n57)+(n40+n48+n56+n64)=130*2=260 ...sm4

```

Since **sm3**, **sm4** and $n1+n9+n17+n25+n33+n41+n49+n57=130$, you can say

```

n1+n9+n17+n25=n33+n41+n49+n57=260/2=130; ... mu2

```

Both **mu1** and **mu2** mean just the basic conditions for 'Multiple' types.

**** Standard Solutions of Three-type Simultaneous Magic Squares ****
**** of Order 8: 'Composite', Self-Complementary and Pandiagonal ****

1/								2/								3/							
1	63	4	62	18	48	19	45	1	63	4	62	34	32	35	29	1	63	4	62	10	56	11	53
60	6	57	7	43	21	42	24	60	6	57	7	27	37	26	40	60	6	57	7	51	13	50	16
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28 53 4 45 44 5 52 29	27 54 3 46 43 6 51 30	34 15 58 23 18 63 10 39	37 12 61 20 21 60 13 36	29 52 5 44 45 4 53 28	34 15 58 23 18 63 10 39
38 11 62 19 22 59 14 35	37 12 61 20 21 60 13 36		29 52 5 44 45 4 53 28	32 49 8 41 48 1 56 25	32 49 8 41 48 1 56 25
30 51 6 43 46 3 54 27	29 52 5 44 45 4 53 28		35 14 59 22 19 62 11 38	35 14 59 22 19 62 11 38	35 14 59 22 19 62 11 38
36 13 60 21 20 61 12 37	35 14 59 22 19 62 11 38		32 49 8 41 48 1 56 25		
31 50 7 42 47 2 55 26	32 49 8 41 48 1 56 25		34 15 58 23 18 63 10 39		
33 16 57 24 17 64 9 40	34 15 58 23 18 63 10 39				
	5725/				
28 53 4 45 44 5 52 29					
39 10 63 18 23 58 15 34					
25 56 1 48 41 8 49 32					
38 11 62 19 22 59 14 35					
30 51 6 43 46 3 54 27					
33 16 57 24 17 64 9 40					
31 50 7 42 47 2 55 26					
36 13 60 21 20 61 12 37					

[Count = 5760] OK!

I could find there are 5760 standard solutions for this type.

When I tried to make the Complete Euler Type of solutions for the same object, I could make the same solution set in common with the one in the list above. It means these 3-Type simultaneous magic squares 8x8: Composite, Self-complementary and Pandiagonal are all Complete Euler Type and nothing else.

But why are there 5760 standard solutions for this type?

The total solution count 5760 for this type seems to mean one of the smallest set of solutions of order 8, theoretically speaking.

What do they mean? What makes it possible?

I feel now that we have to study intensively about any structural connections among (1) multiple C&C MS88; (2) 3-T simultaneous MS88: Composite, Self-complementary and Pandiagonal; and (3) C&C magic cubes of order 4.

(Written on Nov. 2, 2006 by Kanji Setsuda; with MacOSX and Xcode 2.2.1)

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