

Part 3: "New Algebraic Study of Magic Squares"
 Chapter 9: Fundamental Study of Composite Magic Squares:
Kanji Setsuda

Section1: Composite Semi-Panmagic Squares of Order 6

#0. What is the 'Composite' Square?

A 'Composite' square has such a strict condition as "every 4 entries of any 2 x 2 block within must add up to the magic constant." The simultaneous equations below may be easier for you to understand this property. In the case of order 6 there are 36 simultaneous equations required.

The name 'Composite' was once given by Prof. Mutsumi Suzuki with his beautiful picture of Japanese royal flower in his page. I know there are some other names such as "most-perfect" or "compact", but I like this name 'Composite' best of all.

Let's study about this type of square of order 6. For we once failed in constructing any pan-diagonal magic squares or any self-complementary magic ones. This would be the last hope for us to make something like magic square of order 6.

See the basic diagram and the list of Composite Conditions below.

[Figure 1: Basic Form and Composite Conditions]

<pre> 36 31 32 33 34 35 36 31 .----- n6 n1 n2 n3 n4 n5 n6 n1 -----+-----+-----+----- 12 n7 n8 n9 10 11 12 n7 -----+-----+-----+----- 18 13 14 15 16 17 18 13 -----+-----+-----+----- 24 19 20 21 22 23 24 19 -----+-----+-----+----- 30 25 26 27 28 29 30 25 -----+-----+-----+----- 36 31 32 33 34 35 36 31 .----- n6 n1 n2 n3 n4 n5 n6 n1 </pre>	<p>Composite Conditions:</p> $n1+n2+n7+n8 = S \dots (1)$ $n2+n3+n8+n9 = S \dots (2)$ $n3+n4+n9+n10 = S \dots (3)$ $n4+n5+n10+n11 = S \dots (4)$ $n5+n6+n11+n12 = S \dots (5)$ $n6+n1+n12+n7 = S \dots (6)$ $n7+n8+n13+n14 = S \dots (7)$ $n8+n9+n14+n15 = S \dots (8)$ $n9+n10+n15+n16 = S \dots (9)$ $n10+n11+n16+n17 = S \dots (10)$ $n11+n12+n17+n18 = S \dots (11)$ $n12+n7+n18+n13 = S \dots (12)$ $n13+n14+n19+n20 = S \dots (13)$ $n14+n15+n20+n21 = S \dots (14)$ <hr style="border-top: 1px dashed black;"/> $n15+n16+n21+n22 = S \dots (15)$ $n16+n17+n22+n23 = S \dots (16)$ $n17+n18+n23+n24 = S \dots (17)$ $n18+n13+n24+n19 = S \dots (18)$ $n19+n20+n25+n26 = S \dots (19)$ $n20+n21+n26+n27 = S \dots (20)$ $n21+n22+n27+n28 = S \dots (21)$ $n22+n23+n28+n29 = S \dots (22)$ $n23+n24+n29+n30 = S \dots (23)$ $n24+n19+n30+n25 = S \dots (24)$ $n25+n26+n31+n32 = S \dots (25)$ $n26+n27+n32+n33 = S \dots (26)$ $n27+n28+n33+n34 = S \dots (27)$ $n28+n29+n34+n35 = S \dots (28)$ $n29+n30+n35+n36 = S \dots (29)$ $n30+n25+n36+n31 = S \dots (30)$ $n31+n32+n1+n2 = S \dots (31)$ $n32+n33+n2+n3 = S \dots (32)$ $n33+n34+n3+n4 = S \dots (33)$ $n34+n35+n4+n5 = S \dots (34)$ $n35+n36+n5+n6 = S \dots (35)$ $n36+n31+n6+n1 = S \dots (36)$
--	--

#1. What can you find if you take Composite Conditions?

Take these 36 simultaneous equations only at first. What properties can you find for your object, then?

$$(1)+(3)+(5): (n1+n2+n3+n4+n5+n6)+(n7+n8+n9+n10+n11+n12)=L1+L7=3*S$$

$$\begin{aligned}
(7)+(9)+(11): & (n_7+n_8+n_9+n_{10}+n_{11}+n_{12})+(n_{13}+n_{14}+n_{15}+n_{16}+n_{17}+n_{18})=L_7+L_{13}=3*S \\
(13)+(15)+(17): & (n_{13}+n_{14}+n_{15}+n_{16}+n_{17}+n_{18})+(n_{19}+n_{20}+n_{21}+n_{22}+n_{23}+n_{24})=L_{13}+L_{19}=3*S \\
(19)+(21)+(23): & (n_{19}+n_{20}+n_{21}+n_{22}+n_{23}+n_{24})+(n_{25}+n_{26}+n_{27}+n_{28}+n_{29}+n_{30})=L_{19}+L_{25}=3*S \\
(25)+(27)+(29): & (n_{25}+n_{26}+n_{27}+n_{28}+n_{29}+n_{30})+(n_{31}+n_{32}+n_{33}+n_{34}+n_{35}+n_{36})=L_{25}+L_{31}=3*S \\
(31)+(33)+(35): & (n_{31}+n_{32}+n_{33}+n_{34}+n_{35}+n_{36})+(n_1+n_2+n_3+n_4+n_5+n_6)=L_{31}+L_1=3*S
\end{aligned}$$

Therefore, $L_1=L_{13}=L_{25}=L_{31}$; $L_7=L_{19}=L_{31}$; and $L_{31}+L_1=3*S=3 \times 74=222$;

But you cannot yet say $L_{31}=L_1=111$.

In the same way

$$\begin{aligned}
(1)+(13)+(25): & (n_1+n_7+n_{13}+n_{19}+n_{25}+n_{31})+(n_2+n_8+n_{14}+n_{20}+n_{26}+n_{32})=R_1+R_2=3*S \\
(2)+(14)+(26): & (n_2+n_8+n_{14}+n_{20}+n_{26}+n_{32})+(n_3+n_9+n_{15}+n_{21}+n_{27}+n_{33})=R_2+R_3=3*S \\
(3)+(15)+(27): & (n_3+n_9+n_{15}+n_{21}+n_{27}+n_{33})+(n_4+n_{10}+n_{16}+n_{22}+n_{28}+n_{34})=R_3+R_4=3*S \\
(4)+(16)+(28): & (n_4+n_{10}+n_{16}+n_{22}+n_{28}+n_{34})+(n_5+n_{11}+n_{17}+n_{23}+n_{29}+n_{35})=R_4+R_5=3*S
\end{aligned}$$

Therefore, $R_1=R_3=R_5=R_{31}$; $R_2=R_4=R_6=R_{32}$; and $R_{31}+R_{32}=3*S=222$

But you cannot yet say $R_{31}=R_{32}=111$.

If you want every row and every column to have the constant sum 111, you must explicitly define as $L_1=R_1=111$ at first by yourself.

Only $n_1+n_2+n_3+n_4+n_5+n_6=n_1+n_7+n_{13}+n_{19}+n_{25}+n_{31}=111$ are essentially needed.

#2. Some Other Interesting Properties

Before studying about pan-diagonals of object, I like to study about some other interesting properties.

(1) Complementary Pairs

$$\begin{aligned}
n_1+n_2+n_7+n_8=S; & & n_7+n_8+n_{13}+n_{14}=S; & \text{-->} & n_1+n_2=n_{13}+n_{14}=P_1 \\
n_7+n_8+n_{13}+n_{14}=S; & & n_{13}+n_{14}+n_{19}+n_{20}=S; & \text{-->} & n_7+n_8=n_{19}+n_{20}=Q_1 \\
n_{13}+n_{14}+n_{19}+n_{20}=S; & & n_{19}+n_{20}+n_{25}+n_{26}=S; & \text{-->} & n_{13}+n_{14}=n_{25}+n_{26}=P_1 \\
n_{19}+n_{20}+n_{25}+n_{26}=S; & & n_{25}+n_{26}+n_{31}+n_{32}=S; & \text{-->} & n_{19}+n_{20}=n_{31}+n_{32}=Q_1
\end{aligned}$$

Therefore, you will find two groups of complementary pairs such as:

$$n_1+n_2=n_{13}+n_{14}=n_{25}+n_{26}=P_1; \quad n_7+n_8=n_{19}+n_{20}=n_{31}+n_{32}=Q_1; \quad (P_1+Q_1=S=74)$$

$$\begin{aligned}
n_1+n_7+n_2+n_8=S; & & n_2+n_8+n_3+n_9=S; & \text{-->} & n_1+n_7=n_3+n_9=P_2 \\
n_2+n_8+n_3+n_9=S; & & n_3+n_9+n_4+n_{10}=S; & \text{-->} & n_2+n_8=n_4+n_{10}=Q_2 \\
n_3+n_9+n_4+n_{10}=S; & & n_4+n_{10}+n_5+n_{11}=S; & \text{-->} & n_3+n_9=n_5+n_{11}=P_2 \\
n_4+n_{10}+n_5+n_{11}=S; & & n_5+n_{11}+n_6+n_{12}=S; & \text{-->} & n_4+n_{10}=n_6+n_{12}=Q_2
\end{aligned}$$

You will also find another groups of complementary pairs:

$$n_1+n_7=n_3+n_9=n_5+n_{11}=P_2; \quad n_2+n_8=n_4+n_{10}=n_6+n_{12}=Q_2; \quad (P_2+Q_2=S)$$

In the same way you may find many other groups of complementary pairs.

$$\begin{aligned}
n_2+n_3=n_{14}+n_{15}=n_{26}+n_{27}=P_3; & & n_8+n_9=n_{20}+n_{21}=n_{32}+n_{33}=Q_3 \\
n_7+n_{13}=n_9+n_{15}=n_{11}+n_{17}=P_4; & & n_8+n_{14}=n_{10}+n_{16}=n_{12}+n_{18}=Q_4 \\
n_3+n_4=n_{15}+n_{16}=n_{27}+n_{28}=P_5; & & n_9+n_{10}=n_{21}+n_{22}=n_{33}+n_{34}=Q_5 \\
n_{13}+n_{19}=n_{15}+n_{21}=n_{17}+n_{23}=P_6; & & n_{14}+n_{20}=n_{16}+n_{22}=n_{18}+n_{24}=Q_6;
\end{aligned}$$

$$P_3+Q_3=S; \quad P_4+Q_4=S; \quad P_5+Q_5=S; \quad \dots \text{-->} \quad P_n+Q_n=S=74$$

But $P_n=Q_n=37$ is not always true. It appears in a few cases.

(2) What relationship can you find among n_1, n_3, n_{13} and n_{15} ?

$$n_1+n_7=n_3+n_9=P_2; \quad n_7+n_{13}=n_9+n_{15}=P_5; \quad \text{-->} \quad n_1+n_{15}=n_3+n_{13}$$

This is an example of 'Equality of Cross-sums', isn't it?

$$n_8+n_{14}=n_{10}+n_{16}=Q_4; \quad n_{14}+n_{20}=n_{16}+n_{22}=Q_6; \quad \text{-->} \quad n_8+n_{22}=n_{10}+n_{20}$$

What about n_1, n_4, n_{19} and n_{22} ?

$$\begin{aligned}
n_1+n_2=P_1; \quad n_3+n_4=P_5; \quad n_{19}+n_{20}=Q_1; \quad n_{21}+n_{22}=Q_5; \\
n_1+n_2+n_3+n_4=P_1+P_5; \quad n_{19}+n_{20}+n_{21}+n_{22}=Q_1+Q_5; \\
n_1+n_2+n_3+n_4+n_{19}+n_{20}+n_{21}+n_{22}=(P_1+Q_1)+(P_5+Q_5)=S+S=2*S
\end{aligned}$$

But $n_2+n_3=P_3; \quad n_{20}+n_{21}=Q_3; \quad n_2+n_3+n_{20}+n_{21}=P_3+Q_3=S$

Therefore $n_1+n_4+n_{19}+n_{22}=2*S-S=S$

This is an example of 'Composite-sums of Middle-size Block', isn't it?

[Figure 1(Again): Extended Form of Composite Object 6*6]

<pre> 36 31 32 33 34 35 36 31 ----- n6 n1 n2 n3 n4 n5 n6 n1 ---+---+---+---+--- 12 n7 n8 n9 10 11 12 n7 ---+---+---+---+--- 18 13 14 15 16 17 18 13 ---+---+---+---+--- 24 19 20 21 22 23 24 19 ---+---+---+---+--- 30 25 26 27 28 29-30-25 ---+---+---+---+--- 36 31 32 33 34 35 36 31 ----- n6 n1 n2 n3 n4 n5-n6-n1 </pre>	<p>{n1, n5, n25, n29} are 4 tops of 5 x 5 block within. They are also 4 tops of 3 x 3 block at the corner on the right hand bottom. n29+n30=n5+n6 -)n30+n25=n6+n1 ----- n29-n25=n5-n1 Therefore n1+n29=n5+n25 It is an example of 'Equality of Cross-sums,' isn't it? n1+n6+n31+n36=S is the largest 'composite 4 tops' and is also the smallest 'composite 4 tops' at the corner on the right hand bottom at the same time.</p>
--	---

Every 4 tops of any block with 2 x 2, 4 x 4, and 6 x 6 entries must add up to the same constant sum 74.

Every 4 tops of any block with 3 x 3, and 5 x 5 entries must obey the property "the Cross-sums are equal to each other."

#3. Pan-Diagonals of 'Composite' Squares

What can you find about pan-diagonals if you accept those composite conditions?

[Figure 3: Extended Form and the Pan-Diagonals]

<pre> n4 n5 n6 n1 n2 n3 n4 n5 n6 n1 n2 n3 ---+---+---+---+--- 10 11 12 n7 n8 n9 10 11 12 n7 n8 n9 ---+---+---+---+--- 16 17 18 13 14 15 16 17 18 13 14 15 ---+---+---+---+--- 22 23 24 19 20 21 22 23 24 19 20 21 ---+---+---+---+--- 28 29 30 25 26 27 28 29 30 25 26 27 ---+---+---+---+--- 34 35 36 31 32 33 34 35 36 31 32 33 ----- </pre>	<p>n1+ n8+n15+n22+n29+n36 = K11 n1+n12+n17+n22+n27+n32 = K12 n2+ n9+n16+n23+n30+n31 = K21 n2+ n7+n18+n23+n28+n33 = K22 n3+n10+n17+n24+n25+n32 = K31 n3+ n8+n13+n24+n29+n34 = K32 n4+n11+n18+n19+n26+n33 = K41 n4+ n9+n14+n19+n30+n35 = K42 n5+n12+n13+n20+n27+n34 = K51 n5+n10+n15+n20+n25+n36 = K52 n6+ n7+n14+n21+n28+n35 = K61 n6+n11+n16+n21+n26+n31 = K62 </p>
--	--

[1] n1+n15=n3+n13; n22+n36=n24+n34; ('Equality of Cross-sums' of 3x3 blocks.)
Add both sides to each other and add the same (n8+n29) to the both sides.

n1+n8+n15+n22+n29+n36=n3+n8+n13+n24+n29+n34=K11=K32;

[2] n3+n17=n5+n15; n24+n32=n20+n36; (Cross-sums of 3 x 3 blocks)
and add (n10+n25) to the both sides.

n3+n10+n17+n24+n25+n32=n5+n10+n15+n20+n25+n36=K31=K52;

[3] n5+n13=n1+n17; n20+n34=n22+n32; Add (n12+n27) to both sides.

n5+n12+n13+n20+n27+n34=n1+n12+n17+n22+n27+n32=K51=K12;

[4] n1+n27=n3+n25 (Cross-sum of 5 x 5 block);

n12+n22=n10+n24 (Cross-sum of 3 x 3 block); Add (n17+n32) to the both sides.

n1+n12+n17+n22+n27+n32=n3+n10+n17+n24+n25+n32=K12=K31;

[5] n1+n29=n5+n25 (Cross-sum of 5 x 5 block);

n8+n22=n10+n20 (Cross-sum of 3 x 3 block); Add (n15+n36) to the both sides.

$n_1+n_8+n_{15}+n_{22}+n_{29}+n_{36}=n_5+n_{10}+n_{15}+n_{20}+n_{25}+n_{36}=K_{11}=K_{52};$
 [6] $n_8+n_{36}=n_{12}+n_{31}$ (Cross-sum of 5 x 5 block);
 $n_{15}+n_{29}=n_{17}+n_{27}$ (the same of 3 x 3 block); Add (n_1+n_{22}) to the both sides.
 $n_1+n_8+n_{15}+n_{22}+n_{29}+n_{36}=n_1+n_{12}+n_{17}+n_{22}+n_{27}+n_{32}=K_{11}=K_{12};$
 After all $K_{11}=K_{12}=K_{31}=K_{32}=K_{51}=K_{52}=PD_1$
 In the same way $K_{21}=K_{22}=K_{41}=K_{42}=K_{61}=K_{62}=PD_2$

All pan-diagonals are classified into two groups according to their sums: (1) Six pandiagonals with n_1, n_3 or n_5 and (2) six ones with n_2, n_4 or n_6 .

Although this conclusion seems almost the same as the usual pan-diagonal type, you cannot yet say $PD_1=PD_2$. When you want all pandiagonals to be equal, you must explicitly give $K_{11}(=K_{62})=K$ at first by yourself.

$n_1+n_8+n_{15}+n_{22}+n_{29}+n_{36} (=n_6+n_{11}+n_{16}+n_{21}+n_{26}+n_{31}) = K$; is essentially needed to make our object be 'pan-diagonal' or 'complete' magic type.

#4. Is the Composite Pan-Magic Square of Order 6 Impossible?

Suppose you add the next equations to the Composite Conditions defined.

(1) $n_1+n_2+n_3+n_4+n_5+n_6 = K$; (2) $n_1+n_7+n_{13}+n_{19}+n_{25}+n_{31} = K$;

(3) $n_1+n_8+n_{15}+n_{22}+n_{29}+n_{36} = n_6+n_{11}+n_{16}+n_{21}+n_{26}+n_{31} = K$

And then you will necessarily fail in making your object. Your computer must reply, "I found No Answers at all!" after a hard calculation.

You may know that there is neither a 'self-complementary' type nor a 'complete' type of magic square of order 6 in general.

Here you can see a sample of proof for this impossibility.

Proof by Reductio ad Absurdum:

[Figure 4: Four Blocks of Complete Magic Square of Order 6]

<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>n1</td><td>n2</td><td>n3</td></tr> <tr><td>n7</td><td>n8</td><td>n9</td></tr> <tr><td>13</td><td>14</td><td>15</td></tr> </table> <p style="text-align: center; color: green;">Block P</p>	n1	n2	n3	n7	n8	n9	13	14	15	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>n4</td><td>n5</td><td>n6</td></tr> <tr><td>10</td><td>11</td><td>12</td></tr> <tr><td>16</td><td>17</td><td>18</td></tr> </table> <p style="text-align: center; color: green;">Block Q</p>	n4	n5	n6	10	11	12	16	17	18	<p>Any Complete magic type of order 6 has all complementary pairs of 37 only on the pan-diagonals: $n_1+n_{22}=37$; $n_2+n_{23}=37$; $n_3+n_{24}=37$; $n_7+n_{28}=37$; $n_8+n_{29}=37$; $n_9+n_{30}=37$; $n_{13}+n_{34}=37$; $n_{14}+n_{35}=37$; $n_{15}+n_{36}=37$; ...</p> <p>Therefore, Block P + Block S = $37 \times 9 = 333$ But Block P + Block Q = $111 \times 3 = 333$ $(n_1+n_2+n_3+n_4+n_5+n_6=111;$ $n_7+n_8+n_9+n_{10}+n_{11}+n_{12}=111;$ $n_{13}+n_{14}+n_{15}+n_{16}+n_{17}+n_{18}=111)$</p> <p>Also Block Q + Block S = 333 $(n_4+n_{10}+n_{16}+n_{22}+n_{28}+n_{34}=111;$ $n_5+n_{11}+n_{17}+n_{23}+n_{29}+n_{35}=111;$ $n_6+n_{12}+n_{18}+n_{24}+n_{30}+n_{36}=111)$</p> <p>Therefore, Block Q = Block S = $(333 / 2)$ But this quotient isn't an integer at all. Sums of both Q and S must be integers.</p>
n1	n2	n3																		
n7	n8	n9																		
13	14	15																		
n4	n5	n6																		
10	11	12																		
16	17	18																		
<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>19</td><td>20</td><td>21</td></tr> <tr><td>25</td><td>26</td><td>27</td></tr> <tr><td>31</td><td>32</td><td>33</td></tr> </table> <p style="text-align: center; color: green;">Block R</p>	19	20	21	25	26	27	31	32	33	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>22</td><td>23</td><td>24</td></tr> <tr><td>28</td><td>29</td><td>30</td></tr> <tr><td>34</td><td>35</td><td>36</td></tr> </table> <p style="text-align: center; color: green;">Block S</p>	22	23	24	28	29	30	34	35	36	
19	20	21																		
25	26	27																		
31	32	33																		
22	23	24																		
28	29	30																		
34	35	36																		

These conclusions are so contradictory to each other that they should demonstrate that we cannot make any Complete magic squares of order 6. (This proof was worked out by Prof. M. Suzuki and K. Setsuda.)

Is it impossible even in the case of 'composite square'?

Yes, it is impossible. If you take all the conditions mentioned above, you cannot really make any kind of pan-magic square of order 6.

#5. What type of 'Composite' squares can we make, then?

We must remove the next pan-diagonal condition from our first definition list:

(3) $n_1+n_8+n_{15}+n_{22}+n_{29}+n_{36} (=n_6+n_{11}+n_{16}+n_{21}+n_{26}+n_{31}) = 111$

But don't be disappointed. We should get a kind of 'semi-panmagic' square of order 6, even when we remove that. They are almost 'pan-magic.' Composite conditions make it have two groups of pan-diagonals. In each group they are equal to one another, though they are no longer equal to the same constant 111.

```

/** Composite Semi-Panmagic Squares 6x6: */
/** 'CSMS66S.c' built by Kanji Setsuda */
/** on Jul. 29, 2001; Jun. 7, 2006 */
/** Working with MacOSX & Xcode 2.2 */
/**/
#include <stdio.h>
/* Global Variables */
long int cnt, cntr[5];
short int cnt2, cnt3;
short LSM, S4N;
short nm[37], uflg[37];
short mnm[5][37];
/**/
/* Main Program: Research */
int main(){
    short n;
    printf("\n** 'Composite' Semi-Panmagic Squares of Order 6: **\n");
    printf("** List of the Standard Solutions **\n");
    for(n=0;n<37;n++){nm[n]=0; uflg[n]=0;}
    LSM=111; S4N=74; cnt=0; cnt3=0;
    stp01(); /* Begin the Calculations */
    if(cnt3>0){printsol (cnt3);}
    printf(" [Count = %d] OK!\n",cnt);
    return 0;
}
/**/
/* Begin the Calculations */
/* Set n1 */
void stp01(){
    short i;
    for(i=1;i<37;i++){
        if(uflg[i]==0){
            nm[1]=i; uflg[i]=1;
            stp02();
            uflg[i]=0;}
    }
}
/* Set n2 */
void stp02(){
    short i;
    for(i=36;i>0;i--){
        if(uflg[i]==0){
            nm[2]=i; uflg[i]=1; cnt2=0;
            stp03();
            uflg[i]=0;}
    }
}
/* Set n7(<n2) */
void stp03(){
    short i;
    for(i=nm[2]-1;i>0;i--){
        if(uflg[i]==0){
            nm[7]=i; uflg[i]=1;

```

```

        stp04();
        uflg[i]=0; }
    }
}
/* Set n8=74-n1-n2-n7 */
void stp04(){
    short i;
    i=S4N-nm[1]-nm[2]-nm[7];
    if((0<i)&&(i<37)){
        if(uflg[i]==0){
            nm[8]=i; uflg[i]=1;
            stp05();
            uflg[i]=0; }}
}
/* Set n3 */
void stp05(){
    short i;
    for(i=1; i<37; i++){
        if(uflg[i]==0){
            nm[3]=i; uflg[i]=1;
            stp06();
            uflg[i]=0; }
    }
}
/* Set n9=74-n2-n3-n8 */
void stp06(){
    short i;
    i=S4N-nm[2]-nm[3]-nm[8];
    if((0<i)&&(i<37)){
        if(uflg[i]==0){
            nm[9]=i; uflg[i]=1;
            stp07();
            uflg[i]=0; }}
}
/* Set n4 */
void stp07(){
    short i;
    for(i=36; i>0; i--){
        if(uflg[i]==0){
            nm[4]=i; uflg[i]=1;
            stp08();
            uflg[i]=0; }
    }
}
/* Set n10=74-n3-n4-n9 */
void stp08(){
    short i;
    i=S4N-nm[3]-nm[4]-nm[9];
    if((0<i)&&(i<37)){
        if(uflg[i]==0){
            nm[10]=i; uflg[i]=1;
            stp09();
            uflg[i]=0; }}
}
/* Set n5 */
void stp09(){
    short i;
    for(i=1; i<37; i++){
        if(uflg[i]==0){

```

```

        nm[5]=i; ufl g[i]=1;
        stp10();
        ufl g[i]=0; }
    }
}
/* Set n6=111-n1-n2-n3-n4-n5 & n1<n6 */
void stp10(){
    short i;
    i=LSM-nm[1]-nm[2]-nm[3]-nm[4]-nm[5];
    if((nm[1]<i)&&(i<37)){
        if(ufl g[i]==0){
            nm[6]=i; ufl g[i]=1;
            stp11();
            ufl g[i]=0; }}
}
/* Set n11=74-n4-n5-n10 */
void stp11(){
    short i;
    i=S4N-nm[4]-nm[5]-nm[10];
    if((0<i)&&(i<37)){
        if(ufl g[i]==0){
            nm[11]=i; ufl g[i]=1;
            stp12();
            ufl g[i]=0; }}
}
/* Set n12=74-n5-n6-n11 */
void stp12(){
    short i, j;
    i=S4N-nm[5]-nm[6]-nm[11];
    j=S4N-nm[6]-nm[1]-nm[7];
    if((0<i)&&(i<37)&&(i==j)){
        if(ufl g[i]==0){
            nm[12]=i; ufl g[i]=1;
            stp14();
            ufl g[i]=0; }}
}
/**/
/* Search Level 2: */
/* Set n13 */
void stp14(){
    short i;
    for(i=1; i<37; i++){
        if(ufl g[i]==0){
            nm[13]=i; ufl g[i]=1;
            stp15();
            ufl g[i]=0; }
    }
}
/* Set n14=74-n7-n8-n13 */
void stp15(){
    short i;
    i=S4N-nm[7]-nm[8]-nm[13];
    if((0<i)&&(i<37)){
        if(ufl g[i]==0){
            nm[14]=i; ufl g[i]=1;
            stp16();
            ufl g[i]=0; }}
}
/* Set n15=74-n8-n9-n14 */

```

```

void stp16(){
  short i;
  i=S4N-nm[8]-nm[9]-nm[14];
  if((0<i)&&(i<37)){
    if(uflg[i]==0){
      nm[15]=i; uflg[i]=1;
      stp17();
      uflg[i]=0;}}
}
/* Set n16=74-n9-n10-n15 */
void stp17(){
  short i;
  i=S4N-nm[9]-nm[10]-nm[15];
  if((0<i)&&(i<37)){
    if(uflg[i]==0){
      nm[16]=i; uflg[i]=1;
      stp18();
      uflg[i]=0;}}
}
/* Set n17=74-n10-n11-n16 */
void stp18(){
  short i;
  i=S4N-nm[10]-nm[11]-nm[16];
  if((0<i)&&(i<37)){
    if(uflg[i]==0){
      nm[17]=i; uflg[i]=1;
      stp19();
      uflg[i]=0;}}
}
/* Set n18=74-n11-n12-n17 */
void stp19(){
  short i,j;
  i=S4N-nm[11]-nm[12]-nm[17];
  j=S4N-nm[7]-nm[12]-nm[13];
  if((0<i)&&(i<37)&&(i==j)){
    if(uflg[i]==0){
      nm[18]=i; uflg[i]=1;
      stp21();
      uflg[i]=0;}}
}
/**/
/* Search Level 3: */
/* Set n19 */
void stp21(){
  short i;
  for(i=36; i>0; i--){
    if(uflg[i]==0){
      nm[19]=i; uflg[i]=1;
      stp22();
      uflg[i]=0;}}
}
/* Set n20=74-n13-n14-n19 */
void stp22(){
  short i;
  i=S4N-nm[13]-nm[14]-nm[19];
  if((0<i)&&(i<37)){
    if(uflg[i]==0){
      nm[20]=i; uflg[i]=1;

```

```

        stp23();
        uflg[i]=0; }}
}
/* Set n21=74-n14-n15-n20 */
void stp23(){
    short i;
    i=S4N-nm[14]-nm[15]-nm[20];
    if((0<i)&&(i<37)){
        if(uflg[i]==0){
            nm[21]=i; uflg[i]=1;
            stp24();
            uflg[i]=0; }}
}
/**/
/* ... (Skip)... */
/**/
/* Set n34=74-n27-n28-n33 */
void stp42(){
    short i;
    i=S4N-nm[27]-nm[28]-nm[33];
    if((0<i)&&(i<37)){
        if(uflg[i]==0){
            nm[34]=i; uflg[i]=1;
            stp43();
            uflg[i]=0; }}
}
/* Set n35=74-n28-n29-n34 */
void stp43(){
    short i;
    i=S4N-nm[28]-nm[29]-nm[34];
    if((0<i)&&(i<37)){
        if(uflg[i]==0){
            nm[35]=i; uflg[i]=1;
            stp44();
            uflg[i]=0; }}
}
/* Set n36=74-n29-n30-n35 & n1<n36 */
void stp44(){
    short i;
    i=S4N-nm[29]-nm[30]-nm[35];
    if((nm[1]<i)&&(i<37)){
        if(uflg[i]==0){
            nm[36]=i; uflg[i]=1;
            stp45();
            uflg[i]=0; }}
}
/* The Last Checks */
void stp45(){
    short sm1, sm2, sm3;
    sm1=nm[1]+nm[6]+nm[31]+nm[36];
    sm2=nm[6]+nm[12]+nm[18]+nm[24]+nm[30]+nm[36];
    sm3=nm[31]+nm[32]+nm[33]+nm[34]+nm[35]+nm[36];
    if((sm1==S4N)&&(sm2==LSM)&&(sm3==LSM)){anspri nt(); }
}
/**/
/* Print The Answers */
void anspri nt(){
    short n;
    cnt++;

```

```

cnt2++; if(cnt2==1){
  cnt3[cnt3]=cnt;
  for(n=1; n<37; n++){mnm[cnt3][n]=nm[n];}
  cnt3++; if(cnt3==4){printsol (cnt3); cnt3=0;}
}
}
/* Print Solutions */
void printsol (short x){
short l, m, n;
for(m=0; m<x; m++){
  printf("%18d/", cnt3[m]);
  if(m+1<x){printf(" ");}
}
printf("\n");
for(l=0; l<6; l++){
  for(m=0; m<x; m++){
    printf(" ");
    for(n=1; n<7; n++){
      printf("%3d", mnm[m][l*6+n]);
    }
    if(m+1<x){printf(" ");}
  }
  printf("\n");
}
}
/**/

```

I could get the largest set of solutions at first. It contains 53136 standard solutions of 'composite' semi-panmagic squares of order 6 in all.

For the next time I got the 1476 fundamental solutions. ($53136 = 1476 \times 36$)

Prof. M. Suzuki found the most fundamental 41 solutions at last. ($1476 = 41 \times 36$)

** 'Composite' Semi-Panmagic Squares of Order 6: **
 ** List of the Standard Solutions **

1/					25/					29/					53/													
1 36 4 33 7 30	1 36 4 33 8 29	1 36 4 30 7 33	1 36 4 29 8 33		35 2 32 5 29 8	35 2 32 5 28 9	35 2 32 8 29 5	35 2 32 9 28 5		3 34 6 31 9 28	3 34 6 31 10 27	3 34 6 28 9 31	3 34 6 27 10 31		27 10 24 13 21 16	25 12 22 15 18 19	27 10 24 16 21 13	25 12 22 19 18 15		19 18 22 15 25 12	23 14 26 11 30 7	19 18 22 12 25 15	23 14 26 7 30 11		26 11 23 14 20 17	24 13 21 16 17 20	26 11 23 17 20 14	24 13 21 20 17 16
57/					81/					105/					129/													
1 36 5 32 9 28	1 36 5 28 9 32	1 36 7 33 4 30	1 36 7 30 4 33		35 2 31 6 27 10	35 2 31 10 27 6	35 2 29 5 32 8	35 2 29 8 32 5		3 34 7 30 11 26	3 34 7 26 11 30	3 34 9 31 6 28	3 34 9 28 6 31		33 4 29 8 25 12	33 4 29 12 25 8	27 10 21 13 24 16	27 10 21 16 24 13		15 22 19 18 23 14	15 22 19 14 23 18	19 18 25 15 22 12	19 18 25 12 22 15		24 13 20 17 16 21	24 13 20 21 16 17	26 11 20 14 23 17	26 11 20 17 23 14
153/					157/					161/					185/													
1 36 8 33 4 29	1 36 8 29 4 33	1 36 9 32 5 28	1 36 9 28 5 32		35 2 28 5 32 9	35 2 28 9 32 5	35 2 27 6 31 10	35 2 27 10 31 6		3 34 10 31 6 27	3 34 10 27 6 31	3 34 11 30 7 26	3 34 11 26 7 30		25 12 18 15 22 19	25 12 18 19 22 15	33 4 25 8 29 12	33 4 25 12 29 8		23 14 30 11 26 7	23 14 30 7 26 11	15 22 23 18 19 14	15 22 23 14 19 18		24 13 17 16 21 20	24 13 17 20 21 16	24 13 16 17 20 21	24 13 16 21 20 17

209/	233/	257/	281/
1 36 13 24 25 12	1 36 13 12 25 24	1 36 25 24 13 12	1 36 25 12 13 24
35 2 23 14 11 26	35 2 23 26 11 14	35 2 11 14 23 26	35 2 11 26 23 14
3 34 15 22 27 10	3 34 15 10 27 22	3 34 27 22 15 10	3 34 27 10 15 22
33 4 21 16 9 28	33 4 21 28 9 16	33 4 9 16 21 28	33 4 9 28 21 16
7 30 19 18 31 6	7 30 19 6 31 18	7 30 31 18 19 6	7 30 31 6 19 18
32 5 20 17 8 29	32 5 20 29 8 17	32 5 8 17 20 29	32 5 8 29 20 17
305/	329/	353/	377/
1 36 2 35 3 34	1 36 2 34 3 35	1 36 3 35 2 34	1 36 3 34 2 35
33 4 32 5 31 6	33 4 32 6 31 5	33 4 31 5 32 6	33 4 31 6 32 5
7 30 8 29 9 28	7 30 8 28 9 29	7 30 9 29 8 28	7 30 9 28 8 29
27 10 26 11 25 12	27 10 26 12 25 11	27 10 25 11 26 12	27 10 25 12 26 11
19 18 20 17 21 16	19 18 20 16 21 17	19 18 21 17 20 16	19 18 21 16 20 17
24 13 23 14 22 15	24 13 23 15 22 14	24 13 22 14 23 15	24 13 22 15 23 14
401/	425/	449/	473/
1 36 5 32 9 28	1 36 5 28 9 32	1 36 9 32 5 28	1 36 9 28 5 32
33 4 29 8 25 12	33 4 29 12 25 8	33 4 25 8 29 12	33 4 25 12 29 8
3 34 7 30 11 26	3 34 7 26 11 30	3 34 11 30 7 26	3 34 11 26 7 30
35 2 31 6 27 10	35 2 31 10 27 6	35 2 27 6 31 10	35 2 27 10 31 6
15 22 19 18 23 14	15 22 19 14 23 18	15 22 23 18 19 14	15 22 23 14 19 18
24 13 20 17 16 21	24 13 20 21 16 17	24 13 16 17 20 21	24 13 16 21 20 17
497/	521/	545/	569/
1 36 13 24 25 12	1 36 13 12 25 24	1 36 25 24 13 12	1 36 25 12 13 24
33 4 21 16 9 28	33 4 21 28 9 16	33 4 9 16 21 28	33 4 9 28 21 16
3 34 15 22 27 10	3 34 15 10 27 22	3 34 27 22 15 10	3 34 27 10 15 22
35 2 23 14 11 26	35 2 23 26 11 14	35 2 11 14 23 26	35 2 11 26 23 14
7 30 19 18 31 6	7 30 19 6 31 18	7 30 31 18 19 6	7 30 31 6 19 18
32 5 20 17 8 29	32 5 20 29 8 17	32 5 8 17 20 29	32 5 8 29 20 17
593/	617/	641/	665/
1 36 13 24 25 12	1 36 13 12 25 24	1 36 25 24 13 12	1 36 25 12 13 24
32 5 20 17 8 29	32 5 20 29 8 17	32 5 8 17 20 29	32 5 8 29 20 17
3 34 15 22 27 10	3 34 15 10 27 22	3 34 27 22 15 10	3 34 27 10 15 22
35 2 23 14 11 26	35 2 23 26 11 14	35 2 11 14 23 26	35 2 11 26 23 14
7 30 19 18 31 6	7 30 19 6 31 18	7 30 31 18 19 6	7 30 31 6 19 18
33 4 21 16 9 28	33 4 21 28 9 16	33 4 9 16 21 28	33 4 9 28 21 16
689/	713/	737/	761/
1 36 13 24 25 12	1 36 13 12 25 24	1 36 25 24 13 12	1 36 25 12 13 24
31 6 19 18 7 30	31 6 19 30 7 18	31 6 7 18 19 30	31 6 7 30 19 18
3 34 15 22 27 10	3 34 15 10 27 22	3 34 27 22 15 10	3 34 27 10 15 22
35 2 23 14 11 26	35 2 23 26 11 14	35 2 11 14 23 26	35 2 11 26 23 14
8 29 20 17 32 5	8 29 20 5 32 17	8 29 32 17 20 5	8 29 32 5 20 17
33 4 21 16 9 28	33 4 21 28 9 16	33 4 9 16 21 28	33 4 9 28 21 16
785/	1073/	1169/	1281/
1 36 2 35 3 34	1 36 4 33 7 30	1 36 4 33 7 30	1 36 2 35 3 34
27 10 26 11 25 12	26 11 23 14 20 17	25 12 22 15 19 18	24 13 23 14 22 15
7 30 8 29 9 28	3 34 6 31 9 28	3 34 6 31 9 28	7 30 8 29 9 28
33 4 32 5 31 6	35 2 32 5 29 8	35 2 32 5 29 8	33 4 32 5 31 6
19 18 20 17 21 16	19 18 22 15 25 12	20 17 23 14 26 11	19 18 20 17 21 16
24 13 23 14 22 15	27 10 24 13 21 16	27 10 24 13 21 16	27 10 26 11 25 12
1489/	1585/	1681/	1777/
1 36 5 32 9 28	1 36 2 35 3 34	1 36 5 32 9 28	1 36 2 35 3 34
23 14 19 18 15 22	21 16 20 17 19 18	11 26 7 30 3 34	9 28 8 29 7 30
3 34 7 30 11 26	7 30 8 29 9 28	15 22 19 18 23 14	19 18 20 17 21 16
35 2 31 6 27 10	33 4 32 5 31 6	35 2 31 6 27 10	33 4 32 5 31 6
16 21 20 17 24 13	22 15 23 14 24 13	16 21 20 17 24 13	22 15 23 14 24 13
33 4 29 8 25 12	27 10 26 11 25 12	33 4 29 8 25 12	27 10 26 11 25 12

1969/ 1 35 2 36 3 34 33 5 32 4 31 6 7 29 8 30 9 28 27 11 26 10 25 12 19 17 20 18 21 16 24 14 23 13 22 15	2177/ 1 35 3 33 15 24 32 6 30 8 18 17 5 31 7 29 19 20 36 2 34 4 22 13 9 27 11 25 23 16 28 10 26 12 14 21	2273/ 1 35 3 27 19 26 30 8 28 16 12 17 4 32 6 24 22 23 36 2 34 10 18 11 7 29 9 21 25 20 33 5 31 13 15 14	2369/ 1 35 3 25 23 24 29 9 27 19 7 20 4 32 6 22 26 21 36 2 34 12 14 13 8 28 10 18 30 17 33 5 31 15 11 16
2385/ 1 35 3 33 15 24 28 10 26 12 14 21 5 31 7 29 19 20 36 2 34 4 22 13 9 27 11 25 23 16 32 6 30 8 18 17	2481/ 1 35 2 36 3 34 27 11 26 10 25 12 7 29 8 30 9 28 33 5 32 4 31 6 19 17 20 18 21 16 24 14 23 13 22 15	2577/ 1 35 2 36 3 34 24 14 23 13 22 15 7 29 8 30 9 28 33 5 32 4 31 6 19 17 20 18 21 16 27 11 26 10 25 12	2769/ 1 35 2 36 3 34 21 17 20 16 19 18 7 29 8 30 9 28 33 5 32 4 31 6 22 14 23 15 24 13 27 11 26 10 25 12
2865/ 1 35 3 33 7 32 12 26 10 28 6 29 13 23 15 21 19 20 36 2 34 4 30 5 25 11 27 9 31 8 24 14 22 16 18 17	2961/ 1 35 2 36 3 34 9 29 8 28 7 30 19 17 20 18 21 16 33 5 32 4 31 6 22 14 23 15 24 13 27 11 26 10 25 12	3057/ 1 34 2 36 3 35 33 6 32 4 31 5 7 28 8 30 9 29 27 12 26 10 25 11 19 16 20 18 21 17 24 15 23 13 22 14	3153/ 1 34 2 36 3 35 27 12 26 10 25 11 7 28 8 30 9 29 33 6 32 4 31 5 19 16 20 18 21 17 24 15 23 13 22 14
3249/ 1 34 2 36 3 35 24 15 23 13 22 14 7 28 8 30 9 29 33 6 32 4 31 5 19 16 20 18 21 17 27 12 26 10 25 11	3345/ 1 34 2 36 3 35 21 18 20 16 19 17 7 28 8 30 9 29 33 6 32 4 31 5 22 13 23 15 24 14 27 12 26 10 25 11	3441/ 1 34 2 36 3 35 9 30 8 28 7 29 19 16 20 18 21 17 33 6 32 4 31 5 22 13 23 15 24 14 27 12 26 10 25 11	3537/ 1 33 3 35 15 24 32 8 30 6 18 17 5 29 7 31 19 20 36 4 34 2 22 13 9 25 11 27 23 16 28 12 26 10 14 21
4337/ 1 32 3 35 7 33 24 17 22 14 18 16 13 20 15 23 19 21 36 5 34 2 30 4 25 8 27 11 31 9 12 29 10 26 6 28	4817/ 1 31 3 35 8 33 24 18 22 14 17 16 13 19 15 23 20 21 36 6 34 2 29 4 25 7 27 11 32 9 12 30 10 26 5 28	5009/ 1 30 4 36 7 33 27 16 24 10 21 13 3 28 6 34 9 31 35 8 32 2 29 5 19 12 22 18 25 15 26 17 23 11 20 14	5393/ 1 29 4 36 8 33 25 19 22 12 18 15 3 27 6 34 10 31 35 9 32 2 28 5 23 7 26 14 30 11 24 20 21 13 17 16
5425/ 1 28 5 36 9 32 24 21 20 13 16 17 3 26 7 34 11 30 35 10 31 2 27 6 15 14 19 22 23 18 33 12 29 4 25 8	5713/ 1 27 7 35 8 33 24 22 18 14 17 16 13 15 19 23 20 21 36 10 30 2 29 4 25 3 31 11 32 9 12 34 6 26 5 28	5905/ 2 36 4 34 5 30 35 1 33 3 32 7 14 24 16 22 17 18 23 13 21 15 20 19 26 12 28 10 29 6 11 25 9 27 8 31	7297/ 2 35 5 32 8 29 34 3 31 6 28 9 10 27 13 24 16 21 36 1 33 4 30 7 11 26 14 23 17 20 18 19 15 22 12 25
8961/ 2 34 1 36 3 35 32 6 33 4 31 5 8 28 7 30 9 29 26 12 27 10 25 11 20 16 19 18 21 17 23 15 24 13 22 14	9969/ 2 32 5 35 8 29 18 22 15 19 12 25 10 24 13 27 16 21 36 4 33 1 30 7 11 23 14 26 17 20 34 6 31 3 28 9	10233/ 2 31 6 35 10 27 22 19 18 15 14 23 4 29 8 33 12 25 36 5 32 1 28 9 13 20 17 24 21 16 34 7 30 3 26 11	10485/ 2 30 4 36 5 34 23 19 21 13 20 15 14 18 16 24 17 22 35 7 33 1 32 3 26 6 28 12 29 10 11 31 9 25 8 27
10653/ 2 29 4 36 6 34 23 20 21 13 19 15 14 17 16 24 18 22 35 8 33 1 31 3 26 5 28 12 30 10 11 32 9 25 7 27	11073/ 2 28 5 36 6 34 23 21 20 13 19 15 14 16 17 24 18 22 35 9 32 1 31 3 26 4 29 12 30 10 11 33 8 25 7 27	11253/ 2 27 6 35 10 31 22 23 18 15 14 19 4 25 8 33 12 29 36 9 32 1 28 5 13 16 17 24 21 20 34 11 30 3 26 7	11505/ 3 36 1 35 2 34 31 4 33 5 32 6 9 30 7 29 8 28 25 10 27 11 26 12 21 18 19 17 20 16 22 13 24 14 23 15

11985/ 3 35 1 33 7 32 34 2 36 4 30 5 15 23 13 21 19 20 22 14 24 16 18 17 27 11 25 9 31 8 10 26 12 28 6 29	13377/ 3 34 7 30 11 26 33 4 29 8 25 12 1 36 5 32 9 28 35 2 31 6 27 10 15 22 19 18 23 14 24 13 20 17 16 21	15041/ 3 33 1 35 15 24 30 8 32 6 18 17 7 29 5 31 19 20 34 4 36 2 22 13 11 25 9 27 23 16 26 12 28 10 14 21	15377/ 3 32 1 35 7 33 22 17 24 14 18 16 15 20 13 23 19 21 34 5 36 2 30 4 27 8 25 11 31 9 10 29 12 26 6 28
15545/ 3 31 6 34 9 28 27 13 24 10 21 16 1 33 4 36 7 30 35 5 32 2 29 8 19 15 22 18 25 12 26 14 23 11 20 17	16073/ 3 30 7 34 11 26 24 17 20 13 16 21 1 32 5 36 9 28 35 6 31 2 27 10 15 18 19 22 23 14 33 8 29 4 25 12	16325/ 3 28 6 34 9 31 27 16 24 10 21 13 1 30 4 36 7 33 35 8 32 2 29 5 19 12 22 18 25 15 26 17 23 11 20 14	16661/ 3 27 6 34 10 31 25 19 22 12 18 15 1 29 4 36 8 33 35 9 32 2 28 5 23 7 26 14 30 11 24 20 21 13 17 16
16685/ 3 26 7 34 11 30 24 21 20 13 16 17 1 28 5 36 9 32 35 10 31 2 27 6 15 14 19 22 23 18 33 12 29 4 25 8	16937/ 3 25 7 35 8 33 22 24 18 14 17 16 15 13 19 23 20 21 34 12 30 2 29 4 27 1 31 11 32 9 10 36 6 26 5 28	17105/ 4 36 2 34 5 30 33 1 35 3 32 7 16 24 14 22 17 18 21 13 23 15 20 19 28 12 26 10 29 6 9 25 11 27 8 31	18449/ 4 34 2 36 5 30 33 3 35 1 32 7 16 22 14 24 17 18 21 15 23 13 20 19 28 10 26 12 29 6 9 27 11 25 8 31
22225/ 5 36 2 34 4 30 32 1 35 3 33 7 17 24 14 22 16 18 20 13 23 15 21 19 29 12 26 10 28 6 8 25 11 27 9 31	27121/ 6 36 2 34 4 29 31 1 35 3 33 8 18 24 14 22 16 17 19 13 23 15 21 20 30 12 26 10 28 5 7 25 11 27 9 32	31745/ 7 36 1 33 4 30 29 2 35 5 32 8 9 34 3 31 6 28 21 10 27 13 24 16 25 18 19 15 22 12 20 11 26 14 23 17	35249/ 8 36 1 33 4 29 28 2 35 5 32 9 10 34 3 31 6 27 18 12 25 15 22 19 30 14 23 11 26 7 17 13 24 16 21 20
38625/ 9 36 1 32 5 28 27 2 35 6 31 10 11 34 3 30 7 26 25 4 33 8 29 12 23 22 15 18 19 14 16 13 24 17 20 21	41809/ 10 36 2 34 11 18 27 1 35 3 26 19 13 33 5 31 14 15 24 4 32 6 23 22 16 30 8 28 17 12 21 7 29 9 20 25	44305/ 11 36 2 34 10 18 26 1 35 3 27 19 14 33 5 31 13 15 23 4 32 6 24 22 17 30 8 28 16 12 20 7 29 9 21 25	46801/ 12 36 2 34 10 17 25 1 35 3 27 20 15 33 5 31 13 14 22 4 32 6 24 23 18 30 8 28 16 11 19 7 29 9 21 26
49057/ 13 36 2 34 4 22 24 1 35 3 33 15 17 32 6 30 8 18 20 5 31 7 29 19 21 28 10 26 12 14 16 9 27 11 25 23	50737/ 14 36 2 34 4 21 23 1 35 3 33 16 18 32 6 30 8 17 19 5 31 7 29 20 22 28 10 26 12 13 15 9 27 11 25 24	51985/ 15 35 1 33 3 24 22 2 36 4 34 13 19 31 5 29 7 20 14 10 28 12 26 21 23 27 9 25 11 16 18 6 32 8 30 17	52657/ 16 35 1 33 3 23 21 2 36 4 34 14 20 31 5 29 7 19 13 10 28 12 26 22 24 27 9 25 11 15 17 6 32 8 30 18
52945/ 17 32 5 8 29 20 24 1 36 25 12 13 14 35 2 11 26 23 22 3 34 27 10 15 16 33 4 9 28 21 18 7 30 31 6 19			

[Count = 53136] OK!

The next list presents the 41 fundamental solutions I verified for Prof. M. Suzuki.

** 'Composi te' Semi -Panmagi c Squares of Order 6: **
 ** List of the Most Fundamental 41 Sol uti ons **

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

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

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

41/

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

[Count = 41] OK!

(Original Edition Written in English on July 29, 2001;
Revised on July 8, 2006; Working with MacOSX & Xcode 2.2)

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