

# Chapter 2 : Algebraic Study of Magic Squares of Order 4

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### Section 3 : New Study of 'Composite' Squares of Order 4

#### #1. What is the 'Composite' Type?

Suppose you pick up any 2 x 2 adjacent entries in the square, and add them up. When you always get any block-sum equal to the magic constant 34, then you may call 'Composite' for this type.

1 12 6 15	1+12+16+ 5=34;	12+ 6+ 5+11=34;	6+15+11+ 2=34;
16 5 11 2	16+ 5+ 3+10=34;	5+11+10+ 8=34;	11+ 2+ 8+13=34;
3 10 8 13	3+10+ 8+13=34;	10+ 8+ 7+ 9=34;	8+13+ 9+ 4=34;
14 7 9 4	. . . . .		

This name was once given by Prof. Mutsumi Suzuki in his page with his beautiful picture of Japanese royal flower. I know there are other names such as 'Most-perfect' or 'Compact' type, but I like the name 'Composite' best of all.

Let's study this type of magic squares right now. I like to start simply with the next Basic Form and the simultaneous 'Composite Conditions'.

[Figure 1: Definition for the Basic Form and 'Composite' Conditions]

-----	n1+ n2+ n5+ n6=S	....(1)
n1 n2 n3 n4	n2+ n3+ n6+ n7=S	....(2)
---+---+---	n3+ n4+ n7+ n8=S	....(3)
n5 n6 n7 n8	n5+ n6+ n9+n10=S	....(4)
---+---+---	n6+ n7+n10+n11=S	....(5)
n9 10 11 12	n7+ n8+n11+n12=S	....(6)
---+---+---	n9+n10+n13+n14=S	....(7)
13 14 15 16	n10+n11+n14+n15=S	....(8)
-----	n11+n12+n15+n16=S	....(9)

If you want to make any 'magic' squares of order 4 for this case, then you have to add the next three equations to the nine 'Composite' Conditions above:

$$n1+n2+n3+n4=C \quad \dots(10); \quad n1+n5+n9+n13=C \quad \dots(11);$$

$$n1+n6+n11+n16=C \quad \dots(12); \quad [C \text{ means the Magic Constant } 34]$$

First of all, let's make some algebraic study for this type only under those nine 'Composite Conditions'.

#### #2. Important Properties of 'Composite' Squares

What properties can we find only under those 9 Composite Conditions above? Let's compare them and calculate some.

$$(1)+(3)+(7)+(9)$$

$$n1+n2+n5+n6+n3+n4+n7+n8+n9+n10+n13+n14+n11+n12+n15+n16=4*S$$

$$n1+n2+n3+n4+n5+n6+n7+n8+n9+n10+n11+n12+n13+n14+n15+n16=4*S$$

$$(16+1)*16/2 =4*S$$

Therefore  $S=34=C \quad \dots(0)$

$$n1+ n2+ n5+ n6=S \quad \dots(1)$$

$$n2+ n3+ n6+ n7=S \quad \dots(2) \quad \rightarrow n1+ n5=n3+ n7 \quad (=P1)$$

$$n3+ n4+ n7+ n8=S \quad \dots(3) \quad \rightarrow n2+ n6=n4+ n8 \quad (=P2)$$

$$(n1+n5)+(n2+n6)+(n3+n7)+(n4+n8)=P1+P2+P1+P2$$

$$=(n1+n2+n5+n6)+(n3+n4+n7+n8)=2*S$$

Therefore  $P1+P2=S$

As a consequence  $n1+n5+n4+n8=P1+P2=S \dots(13)$

On the other hand,

$$n5+ n6+ n9+n10=S \dots(4)$$

$$n6+ n7+n10+n11=S \dots(5) \rightarrow n5+ n9=n7+n11 (=P3)$$

$$n7+ n8+n11+n12=S \dots(6) \rightarrow n6+n10=n8+n12 (=P4)$$

$$(n5+n9)+(n6+n10)+(n7+n11)+(n8+n12)=P3+P4+P3+P4$$

$$=(n5+n6+n9+n10)+(n7+n8+n11+n12)=2*S$$

Therefore  $P3+P4=S$

Consequently  $n5+n9+n8+n12=P3+P4=S \dots(14)$

On the other hand,

$$n9+n10+n13+n14=S \dots(7)$$

$$n10+n11+n14+n15=S \dots(8) \rightarrow n9+n13=n11+n15 (=P5)$$

$$n11+n12+n15+n16=S \dots(9) \rightarrow n10+n14=n12+n16 (=P6)$$

$$(n9+n13)+(n10+n14)+(n11+n15)+(n12+n16)=P5+P6+P5+P6$$

$$=(n9+n10+n13+n14)+(n11+n12+n15+n16)=2*S$$

Therefore  $P5+P6=S$

Consequently  $n9+n13+n12+n16=P5+P6=S \dots(15)$

<table style="border-collapse: collapse; width: 100%;"> <tr> <td style="border: none;">n4</td> <td style="border: none;"> </td> <td style="border: none;">n1</td> <td style="border: none;"> </td> <td style="border: none;">n2</td> <td style="border: none;"> </td> <td style="border: none;">n3</td> <td style="border: none;"> </td> <td style="border: none;">n4</td> <td style="border: none;"> </td> <td style="border: none;">n1</td> </tr> <tr> <td style="border: none;">n8</td> <td style="border: none;"> </td> <td style="border: none;">n5</td> <td style="border: none;"> </td> <td style="border: none;">n6</td> <td style="border: none;"> </td> <td style="border: none;">n7</td> <td style="border: none;"> </td> <td style="border: none;">n8</td> <td style="border: none;"> </td> <td style="border: none;">n5</td> </tr> <tr> <td style="border: none;">12</td> <td style="border: none;"> </td> <td style="border: none;">n9</td> <td style="border: none;"> </td> <td style="border: none;">10</td> <td style="border: none;"> </td> <td style="border: none;">11</td> <td style="border: none;"> </td> <td style="border: none;">12</td> <td style="border: none;"> </td> <td style="border: none;">n9</td> </tr> <tr> <td style="border: none;">16</td> <td style="border: none;"> </td> <td style="border: none;">13</td> <td style="border: none;"> </td> <td style="border: none;">14</td> <td style="border: none;"> </td> <td style="border: none;">15</td> <td style="border: none;"> </td> <td style="border: none;">16</td> <td style="border: none;"> </td> <td style="border: none;">13</td> </tr> <tr> <td style="border: none;">n4</td> <td style="border: none;"> </td> <td style="border: none;">n1</td> <td style="border: none;"> </td> <td style="border: none;">n2</td> <td style="border: none;"> </td> <td style="border: none;">n3</td> <td style="border: none;"> </td> <td style="border: none;">n4</td> <td style="border: none;"> </td> <td style="border: none;">n1</td> </tr> </table>	n4		n1		n2		n3		n4		n1	n8		n5		n6		n7		n8		n5	12		n9		10		11		12		n9	16		13		14		15		16		13	n4		n1		n2		n3		n4		n1	<p>(13), (14) and (15) tell us we could move the 1st column on the left far to the right end beyond the 4th column. Or you could even move the 4th column on the right far to the left end beyond the 1st column. Because any new 2x2 square accepts 'composite' conditions (13)~(15).</p> <p>This is quite similar to one of the most important properties of pan-diagonal magic square, you know.</p>
n4		n1		n2		n3		n4		n1																																														
n8		n5		n6		n7		n8		n5																																														
12		n9		10		11		12		n9																																														
16		13		14		15		16		13																																														
n4		n1		n2		n3		n4		n1																																														

In the same way,

$$n1+ n2+ n5+ n6=S \dots(1)$$

$$n5+ n6+ n9+n10=S \dots(4) \rightarrow n1+ n2=n9+n10 (=Q1)$$

$$n9+n10+n13+n14=S \dots(7) \rightarrow n5+ n6=n13+n14 (=Q2)$$

$$(n1+n2)+(n5+n6)+(n9+n10)+(n13+n14)=Q1+Q2+Q1+Q2$$

$$=(n1+n2+n5+n6)+(n9+n10+n13+n14)=2*S$$

Therefore  $Q1+Q2=S$

As a consequence  $n1+n2+n13+n14=Q1+Q2=S \dots(16)$

$$n2+n3=n10+n11 (=Q3); n6+n7=n14+n15 (=Q4)$$

$$Q3+Q4=S; n2+n3+n14+n15=S \dots(17)$$

$$n3+n4=n11+n12 (=Q5); n7+n8=n15+n16 (=Q6)$$

$$Q5+Q6=S; n3+n4+n15+n16=S \dots(18)$$

(16), (17) and (18) show us we could move the 1st row far to the bottom below the 4th row.

You could even move the 4th row far to the top above the 1st row.

This property is also similar to the one of pan-diagonal magic squares we know very well.

What relationship can we find among {n1, n4, n13 and n16}?

$$n13+n14=n5+n6=Q2$$

Add (n1+n2) to both sides above.

$$n1+n2+n13+n14=n1+n2+n5+n6=S \dots(R1)$$

$$n14+n15=n6+n7=Q4$$

Add (n2+n3) to both sides above.

$$n2+n3+n14+n15=n2+n3+n6+n7=S \dots(R2)$$

$$n15+n16=n7+n8=Q6$$

Add (n3+n4) to both sides above.  
 $n3+n4+n15+n16=n3+n4+n7+n8=S \quad \dots(R3)$   
 $(R1)+(R3)-(R2)$   
 $n1+n2+n13+n14=S$   
 $+ ) \quad n3+n4+n15+n16=S$   
 $- ) \quad n2+n3+n14+n15=S$   


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 $\therefore n1+n4+n13+n16=S \quad \dots(19)$

### #3. Cross-Sums of 4 Tops of Inner 3 x 3 Little Squares

How about {n1, n3, n9, n11} or {n2, n4, n10, n12}?

$n1+ n5=n3+ n7=P1$ $- ) \quad n5+ n9=n7+n11=P3$ <hr style="border-top: 1px dashed green;"/> $n1-n9=n3-n11$ $n1+n11=n3+n9 \quad \dots(CS1)$	$n2+ n6=n4+ n8=P2$ $- ) \quad n6+n10=n8+n12=P4$ <hr style="border-top: 1px dashed green;"/> $n2-n10=n4-n12$ $n2+n12=n4+n10 \quad \dots(CS2)$
$n5+ n9= n7+n11=P3$ $- ) \quad n9+n13=n11+n15=P5$ <hr style="border-top: 1px dashed green;"/> $n5-n13=n7-n15$ $n5+n15=n7+n13 \quad \dots(CS3)$	$n6+n10=n8+n12=P4$ $- ) \quad n10+n14=n12+n16=P6$ <hr style="border-top: 1px dashed green;"/> $n6-n14=n8-n16$ $n6+n16=n8+n14 \quad \dots(CS4)$

Any cross-sum proves to be equal to each other.

### #4. What about Pan-Diagonals?

What could we find about each sum of pandiagonal only under the nine 'Composite Conditions'?

[Figure 2: Extended Space and Pan-Diagonals]

$15 \ 16 \ 13 \ 14 \ 15 \ 16 \ 13 \ 14 \ 15$ $n3 \ n4 \   \ n1 \   \ n2 \   \ n3 \   \ n4 \   \ n1 \   \ n2 \ n3$ $  \ - \ - \ + \ - \ + \ - \ - \ + \ - \   \ - \  $ $n7 \ n8 \   \ n5 \   \ n6 \   \ n7 \   \ n8 \   \ n5 \   \ n6 \ n7$ $  \ - \ - \ + \ - \ + \ - \ - \ + \ - \   \ - \  $ $11 \ 12 \   \ n9 \   \ 10 \   \ 11 \   \ 12 \   \ n9 \   \ 10 \ 11$ $  \ - \ - \ + \ - \ + \ - \ - \ + \ - \   \ - \  $ $15 \ 16 \   \ 13 \   \ 14 \   \ 15 \   \ 16 \   \ 13 \   \ 14 \ 15$ $  \ - \ - \ + \ - \ + \ - \ - \ + \ - \   \ - \  $ $n3 \ n4 \ n1 \ n2 \ n3 \ n4 \ n1 \ n2 \ n3$	<b>Pan-Diagonals:</b> $n1+ n6+n11+n16 = Pd1$ $n1+ n8+n11+n14 = Pd2$ $n2+ n7+n12+n13 = Pb3$ $n2+ n5+n12+n15 = Pb4$ $n3+ n8+ n9+n14 = Pd5$ $n3+ n6+ n9+n16 = Pd6$ $n4+ n5+n10+n15 = Pb7$ $n4+ n7+n10+n13 = Pb8$
$Pd1=(n1+n11)+(n6+n16)$ $Pd6=(n3+n9)+(n6+n16)$ $\text{But } n1+n11=n3+n9 \quad \dots(CS1)$ $\text{Therefore } Pd1=Pd6$	$Pb3=(n2+n12)+(n7+n13)$ $Pb8=(n4+n10)+(n7+n13)$ $\text{But } n2+n12=n4+n10 \quad \dots(CS2)$ $\text{Therefore } Pb3=Pb8$
$Pd2=(n1+n11)+(n8+n14)$ $Pd5=(n3+n9)+(n8+n14)$ $\text{But } n1+n11=n3+n9 \quad \dots(CS1)$ $\text{Therefore } Pd2=Pd5$	$Pb4=(n2+n12)+(n5+n15)$ $Pb7=(n4+n10)+(n5+n15)$ $\text{But } n2+n12=n4+n10 \quad \dots(CS2)$ $\text{Therefore } Pb4=Pb7$
$Pd1=(n1+n11)+(n6+n16)$ $Pd2=(n1+n11)+(n8+n14)$ $\text{But } n6+n16=n8+n14 \quad \dots(CS4)$ $\text{Therefore } Pd1=Pd2$	$Pb3=(n2+n12)+(n7+n13)$ $Pb4=(n2+n12)+(n5+n15)$ $\text{But } n5+n15=n7+n13 \quad \dots(CS3)$ $\text{Therefore } Pb3=Pb4$

$Pd5=(n3+n9)+(n8+n14)$		$Pb7=(n4+n10)+(n5+n15)$
$Pd6=(n3+n9)+(n6+n16)$		$Pb8=(n4+n10)+(n7+n13)$
But $n6+n16=n8+n14 \dots (CS4)$		But $n5+n15=n7+n13 \dots (CS3)$
Therefore $Pd5=Pd6$		Therefore $Pb7=Pb8$
$Pd1=(n1+n11)+(n6+n16)$		$Pd2=(n1+n11)+(n8+n14)$
$Pd5=(n3+n9)+(n8+n14)$		$Pd6=(n3+n9)+(n6+n16)$
But $n1+n11=n3+n9 \dots (CS1)$		But $n1+n11=n3+n9 \dots (CS1)$
$n6+n16=n8+n14 \dots (CS4)$		$n6+n16=n8+n14 \dots (CS4)$
Therefore $Pd1=Pd5$		Therefore $Pd2=Pd6$
$Pb3=(n2+n12)+(n7+n13)$		$Pb4=(n2+n12)+(n5+n15)$
$Pb7=(n4+n10)+(n5+n15)$		$Pb8=(n4+n10)+(n7+n13)$
But $n2+n12=n4+n10 \dots (CS2)$		But $n2+n12=n4+n10 \dots (CS2)$
$n5+n15=n7+n13 \dots (CS3)$		$n5+n15=n7+n13 \dots (CS3)$
Therefore $Pb3=Pb7$		Therefore $Pb4=Pb8$

As a result  $Pd1=Pd2=Pd5=Pd6=Pd$ ;  $Pb3=Pb4=Pb7=Pb8=Pb$ ; and  $Pd+Pb=2S=2C=68$

All pandiagonals can be classified into two groups according to their sums.

This property is almost the same as 'Pan-Magic', though  $Pd1=Pb8$  is not yet always true only under the 9 Composite Conditions.

If you always want  $Pd1=Pb8$  or all pandiagonals equal to 34, then you must give  $Pd1=Pb8$  or just ' $Pd1=34$ ' to the basic conditions at the first definition stage.

### #5. What about Row-sum or Column-sum?

Does any row or any column add up to the magic constant?

$$\begin{array}{r}
 n1+n2+n5+n6=S \\
 +) \quad n3+n4+n7+n8=S \\
 \hline
 (n1+n2+n3+n4)+(n5+n6+n7+n8)=2*S
 \end{array}$$

$$\begin{array}{r}
 n1+n2+n5+n6=S \\
 +) \quad n9+n10+n13+n14=S \\
 \hline
 (n1+n5+n9+n13)+(n2+n6+n10+n14)=2*S
 \end{array}$$

....

$$\begin{array}{r}
 n1+n2+n3+n4=n9+n10+n11+n12 \\
 n1+n5+n9+n13=n3+n7+n11+n15 \\
 \dots
 \end{array}$$

All rows can be classified into two groups according to their sums. All columns can also be classified into two groups according to their sums. But you cannot yet say they are all equal to 34 only under the nine Composite Conditions, although our 'Composite' type is nearly almost the same as the 'Pandiagonal' magic type.

You may well call 'Semi-Panmagic' type for this 'Composite' one.

If you always want all rows and columns be equal to the magic constant, then you must add both  $n1+n2+n3+n4=34$  and  $n1+n5+n9+n13=34$  to the list of Basic Conditions at the first definition stage.

### #6. Making various types of 'Composite' Squares of Order 4

Let's have the actual solutions of various types of Composite Squares now.

**6-1.** At first we want to have the solution list of 'Simply Composite' Squares of Order 4 only under the 9 Composite Conditions listed below and nothing else:

[Figure 1(Again): Composite Conditions]

n1 n2 n3 n4	n1+ n2+ n5+ n6=S	....(1)
n2+ n3+ n6+ n7=S	....(2)	
n3+ n4+ n7+ n8=S	....(3)	
n5+ n6+ n9+n10=S	....(4)	
n6+ n7+n10+n11=S	....(5)	
n7+ n8+n11+n12=S	....(6)	
n9+n10+n13+n14=S	....(7)	
n10+n11+n14+n15=S	....(8)	
n11+n12+n15+n16=S	....(9)	

Take {n1<n16; n1<n4; n1<n13; and n2>n5;} to prevent you from counting the same solution double just for any simple rotation or reflection of the pattern.

Let me show you a sample list of the result of my recent computation as follows.

**\*\* Simply 'Composite' Squares of Order 4 \*\***

[List of Standard Solutions: Sol.Count/|Check-Sums/]

1/ RW P1\ 1 16 2 15 34 20\ 14 3 13 4 34 48\ 9 8 10 7 34 20\ 12 5 11 6 34 48\ -----+-----  36 32 36 32 C1mSum /20/48/20/48 P2Sums	61/ RW P1\ 1 16 2 14 33 31\ 12 5 11 7 35 37\ 9 8 10 6 33 31\ 4 13 3 15 35 37\ -----+-----  26 42 26 42 C1mSum /31/37/31/37 P2Sums	121/ RW P1\ 1 16 2 12 31 29\ 14 3 13 7 37 39\ 9 8 10 4 31 29\ 6 11 5 15 37 39\ -----+-----  30 38 30 38 C1mSum /29/39/29/39 P2Sums	181/ RW P1\ 1 16 2 8 27 25\ 14 3 13 11 41 43\ 5 12 6 4 27 25\ 10 7 9 15 41 43\ -----+-----  30 38 30 38 C1mSum /25/43/25/43 P2Sums
241/ RW P1\ 1 15 2 16 34 20\ 14 4 13 3 34 48\ 9 7 10 8 34 20\ 12 6 11 5 34 48\ -----+-----  36 32 36 32 C1mSum /20/48/20/48 P2Sums	301/ RW P1\ 1 15 4 14 34 18\ 12 6 9 7 34 50\ 5 11 8 10 34 18\ 16 2 13 3 34 50\ -----+-----  34 34 34 34 C1mSum /18/50/18/50 P2Sums	307/ RW P1\ 1 15 2 13 31 33\ 12 6 11 8 37 35\ 9 7 10 5 31 33\ 4 14 3 16 37 35\ -----+-----  26 42 26 42 C1mSum /33/35/33/35 P2Sums	325/ RW P1\ 1 15 3 12 31 27\ 8 10 6 13 37 41\ 9 7 11 4 31 27\ 16 2 14 5 37 41\ -----+-----  34 34 34 34 C1mSum /27/41/27/41 P2Sums
331/ RW P1\ 1 15 2 11 29 31\ 14 4 13 8 39 37\ 9 7 10 3 29 31\ 6 12 5 16 39 37\ -----+-----  30 38 30 38 C1mSum /31/37/31/37 P2Sums	349/ RW P1\ 1 15 3 8 27 23\ 12 6 10 13 41 45\ 5 11 7 4 27 23\ 16 2 14 9 41 45\ -----+-----  34 34 34 34 C1mSum /23/45/23/45 P2Sums	355/ RW P1\ 1 15 2 7 25 27\ 14 4 13 12 43 41\ 5 11 6 3 25 27\ 10 8 9 16 43 41\ -----+-----  30 38 30 38 C1mSum /27/41/27/41 P2Sums	373/ RW P1\ 1 14 2 16 33 31\ 12 7 11 5 35 37\ 9 6 10 8 33 31\ 4 15 3 13 35 37\ -----+-----  26 42 26 42 C1mSum /31/37/31/37 P2Sums
423/ RW P1\ 1 14 4 15 34 18\ 12 7 9 6 34 50\ 5 10 8 11 34 18\ 16 3 13 2 34 50\ -----+-----  34 34 34 34 C1mSum /18/50/18/50 P2Sums	429/ RW P1\ 1 14 2 13 30 22\ 12 7 11 8 38 46\ 9 6 10 5 30 22\ 16 3 15 4 38 46\ -----+-----  38 30 38 30 C1mSum /22/46/22/46 P2Sums	447/ RW P1\ 1 14 2 12 29 27\ 8 11 7 13 39 41\ 9 6 10 4 29 27\ 16 3 15 5 39 41\ -----+-----  34 34 34 34 C1mSum /27/41/27/41 P2Sums	450/ RW P1\ 1 14 3 10 28 32\ 8 11 6 15 40 36\ 2 13 4 9 28 32\ 7 12 5 16 40 36\ -----+-----  18 50 18 50 C1mSum /32/36/32/36 P2Sums
462/ RW P1\ 1 14 2 8 25 23\ 12 7 11 13 43 45\ 5 10 6 4 25 23\ 16 3 15 9 43 45\ -----+-----  34 34 34 34 C1mSum /23/45/23/45 P2Sums	465/ RW P1\ 1 14 3 6 24 28\ 12 7 10 15 44 40\ 2 13 4 5 24 28\ 11 8 9 16 44 40\ -----+-----  26 42 26 42 C1mSum /28/40/28/40 P2Sums	477/ RW P1\ 1 13 2 15 31 33\ 12 8 11 6 37 35\ 9 5 10 7 31 33\ 4 16 3 14 37 35\ -----+-----  26 42 26 42 C1mSum /33/35/33/35 P2Sums	495/ RW P1\ 1 13 2 14 30 22\ 12 8 11 7 38 46\ 9 5 10 6 30 22\ 16 4 15 3 38 46\ -----+-----  38 30 38 30 C1mSum /22/46/22/46 P2Sums

513/ RW P1\ 1 13 2 11 27 29\ 8 12 7 14 41 39\ 9 5 10 3 27 29\ 16 4 15 6 41 39\ -----+  34 34 34 34 C1mSum /29/39/29/39 P2Sums	515/ RW P1\ 1 13 3 10 27 31\ 8 12 6 15 41 37\ 9 5 11 2 27 31\ 16 4 14 7 41 37\ -----+  34 34 34 34 C1mSum /31/37/31/37 P2Sums	517/ RW P1\ 1 13 2 7 23 25\ 12 8 11 14 45 43\ 5 9 6 3 23 25\ 16 4 15 10 45 43\ -----+  34 34 34 34 C1mSum /25/43/25/43 P2Sums	519/ RW P1\ 1 13 3 6 23 27\ 12 8 10 15 45 41\ 5 9 7 2 23 27\ 16 4 14 11 45 41\ -----+  34 34 34 34 C1mSum /27/41/27/41 P2Sums		
521/ RW P1\ 1 12 2 16 31 29\ 8 13 7 9 37 39\ 3 10 4 14 31 29\ 6 15 5 11 37 39\ -----+  18 50 18 50 C1mSum /29/39/29/39 P2Sums	581/ RW P1\ 1 11 2 15 29 31\ 8 14 7 10 39 37\ 3 9 4 13 29 31\ 6 16 5 12 39 37\ -----+  18 50 18 50 C1mSum /31/37/31/37 P2Sums	609/ RW P1\ 1 10 3 14 28 32\ 8 15 6 11 40 36\ 2 9 4 13 28 32\ 7 16 5 12 40 36\ -----+  18 50 18 50 C1mSum /32/36/32/36 P2Sums	637/ RW P1\ 2 16 1 15 34 20\ 13 3 14 4 34 48\ 10 8 9 7 34 20\ 11 5 12 6 34 48\ -----+  36 32 36 32 C1mSum /20/48/20/48 P2Sums		
799/ RW P1\ 2 15 1 16 34 20\ 13 4 14 3 34 48\ 10 7 9 8 34 20\ 11 6 12 5 34 48\ -----+  36 32 36 32 C1mSum /20/48/20/48 P2Sums	1009/ RW P1\ 2 14 1 16 33 31\ 11 7 12 5 35 37\ 10 6 9 8 33 31\ 3 15 4 13 35 37\ -----+  26 42 26 42 C1mSum /31/37/31/37 P2Sums	1047/ RW P1\ 2 13 3 16 34 34\ 11 8 10 5 34 34\ 14 1 15 4 34 34\ 7 12 6 9 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	1137/ RW P1\ 2 12 1 16 31 29\ 7 13 8 9 37 39\ 4 10 3 14 31 29\ 5 15 6 11 37 39\ -----+  18 50 18 50 C1mSum /29/39/29/39 P2Sums		
1162/ 2 11 5 16 7 14 4 9 12 1 15 6 13 8 10 3	1215/ 2 9 4 14 7 16 5 11 10 1 12 6 15 8 13 3	1243/ 3 16 1 15 2 13 4 14 11 8 9 7 10 5 12 6	1383/ 3 15 1 16 2 14 4 13 11 7 9 8 10 6 12 5	1429/ 3 14 1 16 13 4 15 2 11 6 9 8 10 7 12 5	1579/ 3 13 2 16 10 8 11 5 15 1 14 4 6 12 7 9
1647/ 3 12 1 16 6 13 8 9 4 11 2 15 5 14 7 10	1667/ 3 10 1 14 6 15 8 11 4 9 2 13 5 16 7 12	1714/ 3 9 2 13 6 16 7 12 11 1 10 5 14 8 15 4	1737/ 4 16 2 15 1 13 3 14 12 8 10 7 9 5 11 6	1777/ 4 15 2 16 1 14 3 13 12 7 10 8 9 6 11 5	1903/ 4 14 2 16 13 3 15 1 12 6 10 8 9 7 11 5
2001/ 4 13 2 15 10 7 12 5 16 1 14 3 9 8 11 6	2121/ 4 11 2 15 6 13 8 9 3 12 1 16 5 14 7 10	2141/ 4 10 3 14 7 13 8 9 2 12 1 16 5 15 6 11	2161/ 4 9 2 13 6 15 8 11 3 10 1 14 5 16 7 12	2201/ 5 16 1 12 11 2 15 6 13 8 9 4 10 3 14 7	2269/ 5 15 1 11 12 2 16 6 13 7 9 3 10 4 14 8
2287/ 5 14 1 10 12 3 16 7 13 6 9 2 11 4 15 8	2305/ 5 12 1 11 2 15 6 16 13 4 9 3 10 7 14 8	2325/ 5 11 1 12 2 16 6 15 13 3 9 4 10 8 14 7	2343/ 5 10 1 12 3 16 7 14 13 2 9 4 11 8 15 6	2361/ 5 9 2 11 4 16 7 14 13 1 10 3 12 8 15 6	2373/ 6 16 2 12 11 1 15 5 14 8 10 4 9 3 13 7
2385/ 6 15 1 12 11 2 16 5 8 13 3 10 9 4 14 7	2439/ 6 13 1 10 3 12 8 15 14 5 9 2 11 4 16 7	2457/ 6 12 2 11 1 15 5 16 14 4 10 3 9 7 13 8	2475/ 6 11 2 12 1 16 5 15 14 3 10 4 9 8 13 7	2495/ 6 10 5 12 3 15 4 13 2 14 1 16 7 11 8 9	2504/ 6 9 5 11 3 16 4 14 2 13 1 15 7 12 8 10
2515/ 7 14 3 10 12 1 16 5 15 6 11 2 9 4 13 8	2529/ 7 13 3 9 12 2 16 6 15 5 11 1 10 4 14 8	2535/ 7 12 3 10 1 14 5 16 15 4 11 2 9 6 13 8	2542/ 7 11 4 9 2 14 5 16 15 3 12 1 10 6 13 8		

[Count = 2544]

[Listed by Kanji Setsuda on August 17, 2010 with MacOSX & Xcode 3.1.2]

6-2. Next we want to have the actual list of 'Composite Pan-diagonal' Squares of Order 4 only under those 9 Composite Conditions and the equation:  $n1+n6+n11+n16=34$ ;  
But, we define nothing about the sums of rows and columns.

**\*\* 'Composite' Pan-diagonal Squares of Order 4 \*\***

[List of Standard Solutions: Sol.Count/|Check-Sums/]

1/ RW P1\ 1 16 2 15 34 34\ 10 7 9 8 34 34\ 13 4 14 3 34 34\ 6 11 5 12 34 34\ -----+-----  30 38 30 38 C1mSum /34/34/34/34 P2Sums	7/ RW P1\ 1 16 3 14 34 34\ 11 6 9 8 34 34\ 13 4 15 2 34 34\ 7 10 5 12 34 34\ -----+-----  32 36 32 36 C1mSum /34/34/34/34 P2Sums	13/ RW P1\ 1 16 5 12 34 34\ 13 4 9 8 34 34\ 11 6 15 2 34 34\ 7 10 3 14 34 34\ -----+-----  32 36 32 36 C1mSum /34/34/34/34 P2Sums	19/ RW P1\ 1 16 9 8 34 34\ 13 4 5 12 34 34\ 7 10 15 2 34 34\ 11 6 3 14 34 34\ -----+-----  32 36 32 36 C1mSum /34/34/34/34 P2Sums
25/ RW P1\ 1 15 2 16 34 34\ 10 8 9 7 34 34\ 13 3 14 4 34 34\ 6 12 5 11 34 34\ -----+-----  30 38 30 38 C1mSum /34/34/34/34 P2Sums	31/ RW P1\ 1 15 4 14 34 34\ 12 6 9 7 34 34\ 13 3 16 2 34 34\ 8 10 5 11 34 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	33/ RW P1\ 1 15 3 13 32 34\ 12 6 10 8 36 34\ 9 7 11 5 32 34\ 4 14 2 16 36 34\ -----+-----  26 42 26 42 C1mSum /34/34/34/34 P2Sums	37/ RW P1\ 1 15 6 12 34 34\ 14 4 9 7 34 34\ 11 5 16 2 34 34\ 8 10 3 13 34 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums
39/ RW P1\ 1 15 5 11 32 34\ 14 4 10 8 36 34\ 9 7 13 3 32 34\ 6 12 2 16 36 34\ -----+-----  30 38 30 38 C1mSum /34/34/34/34 P2Sums	43/ RW P1\ 1 15 10 8 34 34\ 14 4 5 11 34 34\ 7 9 16 2 34 34\ 12 6 3 13 34 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	45/ RW P1\ 1 15 9 7 32 34\ 14 4 6 12 36 34\ 5 11 13 3 32 34\ 10 8 2 16 36 34\ -----+-----  30 38 30 38 C1mSum /34/34/34/34 P2Sums	49/ RW P1\ 1 14 3 16 34 34\ 11 8 9 6 34 34\ 13 2 15 4 34 34\ 7 12 5 10 34 34\ -----+-----  32 36 32 36 C1mSum /34/34/34/34 P2Sums
55/ RW P1\ 1 14 4 15 34 34\ 12 7 9 6 34 34\ 13 2 16 3 34 34\ 8 11 5 10 34 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	57/ RW P1\ 1 14 2 13 30 34\ 12 7 11 8 38 34\ 9 6 10 5 30 34\ 4 15 3 16 38 34\ -----+-----  26 42 26 42 C1mSum /34/34/34/34 P2Sums	61/ RW P1\ 1 14 7 12 34 34\ 8 11 2 13 34 34\ 10 5 16 3 34 34\ 15 4 9 6 34 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	62/ RW P1\ 1 14 5 10 30 34\ 8 11 4 15 38 34\ 2 13 6 9 30 34\ 7 12 3 16 38 34\ -----+-----  18 50 18 50 C1mSum /34/34/34/34 P2Sums
65/ RW P1\ 1 14 11 8 34 34\ 12 7 2 13 34 34\ 6 9 16 3 34 34\ 15 4 5 10 34 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	66/ RW P1\ 1 14 9 6 30 34\ 12 7 4 15 38 34\ 2 13 10 5 30 34\ 11 8 3 16 38 34\ -----+-----  26 42 26 42 C1mSum /34/34/34/34 P2Sums	69/ RW P1\ 1 13 3 15 32 34\ 12 8 10 6 36 34\ 9 5 11 7 32 34\ 4 16 2 14 36 34\ -----+-----  26 42 26 42 C1mSum /34/34/34/34 P2Sums	73/ RW P1\ 1 13 2 14 30 34\ 12 8 11 7 38 34\ 9 5 10 6 30 34\ 4 16 3 15 38 34\ -----+-----  26 42 26 42 C1mSum /34/34/34/34 P2Sums
77/ RW P1\ 1 13 7 11 32 34\ 8 12 2 14 36 34\ 9 5 15 3 32 34\ 16 4 10 6 36 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	78/ RW P1\ 1 13 6 10 30 34\ 8 12 3 15 38 34\ 9 5 14 2 30 34\ 16 4 11 7 38 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	79/ RW P1\ 1 13 11 7 32 34\ 12 8 2 14 36 34\ 5 9 15 3 32 34\ 16 4 6 10 36 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	80/ RW P1\ 1 13 10 6 30 34\ 12 8 3 15 38 34\ 5 9 14 2 30 34\ 16 4 7 11 38 34\ -----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums



81/ RW P1\ 1 12 5 16 34 34\ 7 14 3 10 34 34\ 11 2 15 6 34 34\ 13 8 9 4 34 34\ -----+  32 36 32 36 C1mSum /34/34/34/34 P2Sums				85/ RW P1\ 1 12 6 15 34 34\ 8 13 3 10 34 34\ 11 2 16 5 34 34\ 14 7 9 4 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums				86/ RW P1\ 1 12 7 14 34 34\ 8 13 2 11 34 34\ 10 3 16 5 34 34\ 15 6 9 4 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums				87/ RW P1\ 1 12 2 11 26 34\ 8 13 7 14 42 34\ 3 10 4 9 26 34\ 6 15 5 16 42 34\ -----+  18 50 18 50 C1mSum /34/34/34/34 P2Sums			
90/ RW P1\ 1 12 3 10 26 34\ 8 13 6 15 42 34\ 2 11 4 9 26 34\ 7 14 5 16 42 34\ -----+  18 50 18 50 C1mSum /34/34/34/34 P2Sums				93/ RW P1\ 1 11 5 15 32 34\ 8 14 4 10 36 34\ 3 9 7 13 32 34\ 6 16 2 12 36 34\ -----+  18 50 18 50 C1mSum /34/34/34/34 P2Sums				96/ RW P1\ 1 11 7 13 32 34\ 8 14 2 12 36 34\ 9 3 15 5 32 34\ 16 6 10 4 36 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums				97/ RW P1\ 1 11 2 12 26 34\ 8 14 7 13 42 34\ 3 9 4 10 26 34\ 6 16 5 15 42 34\ -----+  18 50 18 50 C1mSum /34/34/34/34 P2Sums			
101/ 1 10 5 14 8 15 4 11 2 9 6 13 7 16 3 12		109/ 2 16 1 15 9 7 10 8 14 4 13 3 5 11 6 12		133/ 2 15 1 16 9 8 10 7 14 3 13 4 5 12 6 11		157/ 2 14 4 16 11 7 9 5 10 6 12 8 3 15 1 13		169/ 2 13 3 16 11 8 10 5 14 1 15 4 7 12 6 9		189/ 2 12 6 16 7 13 3 9 4 10 8 14 5 15 1 11					
197/ 2 11 5 16 7 14 4 9 12 1 15 6 13 8 10 3		209/ 2 9 5 14 7 16 4 11 10 1 13 6 15 8 12 3		217/ 3 16 4 15 2 13 1 14 11 8 12 7 10 5 9 6		237/ 3 15 4 16 2 14 1 13 11 7 12 8 10 6 9 5		249/ 3 14 1 16 9 8 11 6 15 2 13 4 5 12 7 10		265/ 3 13 2 16 10 8 11 5 15 1 14 4 6 12 7 9					
281/ 3 12 7 16 6 13 2 9 4 11 8 15 5 14 1 10		287/ 3 10 7 14 8 13 4 9 2 11 6 15 5 16 1 12		295/ 3 9 7 13 8 14 4 10 1 11 5 15 6 16 2 12		301/ 4 16 3 15 1 13 2 14 12 8 11 7 9 5 10 6		313/ 4 15 3 16 1 14 2 13 12 7 11 8 9 6 10 5		333/ 4 14 2 16 1 15 3 13 12 6 10 8 9 7 11 5					
349/ 4 13 2 15 10 7 12 5 16 1 14 3 6 11 8 9		365/ 4 11 8 15 6 13 2 9 3 12 7 16 5 14 1 10		371/ 4 10 8 14 7 13 3 9 2 12 6 16 5 15 1 11		377/ 4 9 8 13 7 14 3 10 1 12 5 16 6 15 2 11		385/ 5 16 1 12 3 10 7 14 15 6 11 2 9 4 13 8		393/ 5 15 1 11 2 12 6 16 13 7 9 3 10 4 14 8					
397/ 5 14 1 10 3 12 7 16 13 6 9 2 11 4 15 8		401/ 5 12 6 11 2 15 1 16 3 14 4 13 8 9 7 10		403/ 5 11 6 12 2 16 1 15 3 13 4 14 8 10 7 9		405/ 5 10 7 12 3 16 1 14 2 13 4 15 8 11 6 9		407/ 5 9 7 11 4 16 2 14 1 13 3 15 8 12 6 10		409/ 6 16 2 12 1 11 5 15 14 8 10 4 9 3 13 7					
413/ 6 15 1 12 3 10 8 13 16 5 11 2 9 4 14 7		421/ 6 13 1 10 3 12 8 15 14 5 9 2 11 4 16 7		425/ 6 12 5 11 1 15 2 16 4 14 3 13 7 9 8 10		427/ 6 11 5 12 1 16 2 15 4 13 3 14 7 10 8 9		429/ 6 10 8 12 3 15 1 13 2 14 4 16 7 11 5 9		431/ 6 9 8 11 4 15 2 13 1 14 3 16 7 12 5 10					

[Count = 432] OK!

[Listed by Kanji Setsuda on August 17, 2010 with MacOSX & Xcode 3.1.2]

These 432 solutions are originally included in the solution set of 'Simply Composite' Squares of Order 4, making the sub-set of the latter set of those 2544 solutions.

They certainly have all the pan-diagonals equal to the constant sum 34, while they are not always the 'Magic' type, for their rows and columns do not always equally add up to the constant 34.



**6-3.** Next we want to have the actual list of 'Composite Semi-Pandiagonal Magic Squares of Order 4 made under those 9 Composite Conditions and only the following two equations:  $n_1+n_2+n_3+n_4=34$ ; and  $n_1+n_5+n_9+n_{13}=34$  for rows and columns.

But, we define nothing about the sums of pandiagonals.

The next list shows the result of my recent computations.

**\*\* 'Composite' Semi-Pandiagonal Magic Squares of Order 4 \*\***

[List of Standard Solutions: Sol.Count/|Check-Sums/]

1/ RW P1\ 1 16 2 15 34 18\ 14 3 13 4 34 50\ 7 10 8 9 34 18\ 12 5 11 6 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	7/ RW P1\ 1 16 3 14 34 18\ 15 2 13 4 34 50\ 6 11 8 9 34 18\ 12 5 10 7 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	13/ RW P1\ 1 16 5 12 34 18\ 15 2 11 6 34 50\ 4 13 8 9 34 18\ 14 3 10 7 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	19/ RW P1\ 1 16 9 8 34 26\ 15 2 7 10 34 42\ 4 13 12 5 34 26\ 14 3 6 11 34 42 -----+  34 34 34 34 C1mSum /26/42/26/42 P2Sums
25/ RW P1\ 1 15 2 16 34 18\ 14 4 13 3 34 50\ 7 9 8 10 34 18\ 12 6 11 5 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	31/ RW P1\ 1 15 4 14 34 18\ 12 6 9 7 34 50\ 5 11 8 10 34 18\ 16 2 13 3 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	35/ RW P1\ 1 15 6 12 34 18\ 14 4 9 7 34 50\ 3 13 8 10 34 18\ 16 2 11 5 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	39/ RW P1\ 1 15 10 8 34 26\ 14 4 5 11 34 42\ 3 13 12 6 34 26\ 16 2 7 9 34 42 -----+  34 34 34 34 C1mSum /26/42/26/42 P2Sums
43/ RW P1\ 1 14 3 16 34 18\ 12 7 10 5 34 50\ 6 9 8 11 34 18\ 15 4 13 2 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	47/ RW P1\ 1 14 4 15 34 18\ 12 7 9 6 34 50\ 5 10 8 11 34 18\ 16 3 13 2 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	51/ RW P1\ 1 14 7 12 34 32\ 8 11 2 13 34 36\ 9 6 15 4 34 32\ 16 3 10 5 34 36 -----+  34 34 34 34 C1mSum /32/36/32/36 P2Sums	53/ RW P1\ 1 14 11 8 34 32\ 12 7 2 13 34 36\ 5 10 15 4 34 32\ 16 3 6 9 34 36 -----+  34 34 34 34 C1mSum /32/36/32/36 P2Sums
55/ RW P1\ 1 12 5 16 34 30\ 8 13 4 9 34 38\ 10 3 14 7 34 30\ 15 6 11 2 34 38 -----+  34 34 34 34 C1mSum /30/38/30/38 P2Sums	57/ RW P1\ 1 12 6 15 34 30\ 8 13 3 10 34 38\ 9 4 14 7 34 30\ 16 5 11 2 34 38 -----+  34 34 34 34 C1mSum /30/38/30/38 P2Sums	59/ RW P1\ 1 12 7 14 34 32\ 8 13 2 11 34 36\ 9 4 15 6 34 32\ 16 5 10 3 34 36 -----+  34 34 34 34 C1mSum /32/36/32/36 P2Sums	61/ RW P1\ 2 16 1 15 34 18\ 13 3 14 4 34 50\ 8 10 7 9 34 18\ 11 5 12 6 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums
67/ RW P1\ 2 16 3 13 34 18\ 15 1 14 4 34 50\ 6 12 7 9 34 18\ 11 5 10 8 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	73/ RW P1\ 2 16 5 11 34 18\ 15 1 12 6 34 50\ 4 14 7 9 34 18\ 13 3 10 8 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	79/ RW P1\ 2 16 9 7 34 26\ 15 1 8 10 34 42\ 4 14 11 5 34 26\ 13 3 6 12 34 42 -----+  34 34 34 34 C1mSum /26/42/26/42 P2Sums	85/ RW P1\ 2 15 1 16 34 18\ 13 4 14 3 34 50\ 8 9 7 10 34 18\ 11 6 12 5 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums
91/ RW P1\ 2 15 4 13 34 18\ 11 6 9 8 34 50\ 5 12 7 10 34 18\ 16 1 14 3 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	95/ RW P1\ 2 15 6 11 34 18\ 13 4 9 8 34 50\ 3 14 7 10 34 18\ 16 1 12 5 34 50 -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	99/ RW P1\ 2 15 10 7 34 26\ 13 4 5 12 34 42\ 3 14 11 6 34 26\ 16 1 8 9 34 42 -----+  34 34 34 34 C1mSum /26/42/26/42 P2Sums	103/ RW P1\ 2 13 3 16 34 34\ 11 8 10 5 34 34\ 14 1 15 4 34 34\ 7 12 6 9 34 34 -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums

105/ RW P1\ 2 13 4 15 34 36\ 11 8 9 6 34 32\ 14 1 16 3 34 36\ 7 12 5 10 34 32\ -----+  34 34 34 34 C1mSum /36/32/36/32 P2Sums	107/ RW P1\ 2 13 8 11 34 34\ 7 12 1 14 34 34\ 9 6 15 4 34 34\ 16 3 10 5 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	109/ RW P1\ 2 13 12 7 34 34\ 11 8 1 14 34 34\ 5 10 15 4 34 34\ 16 3 6 9 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	111/ RW P1\ 2 11 5 16 34 34\ 7 14 4 9 34 34\ 12 1 15 6 34 34\ 13 8 10 3 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums		
112/ RW P1\ 2 11 6 15 34 36\ 7 14 3 10 34 32\ 12 1 16 5 34 36\ 13 8 9 4 34 32\ -----+  34 34 34 34 C1mSum /36/32/36/32 P2Sums	113/ RW P1\ 2 11 8 13 34 34\ 7 14 1 12 34 34\ 9 4 15 6 34 34\ 16 5 10 3 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	115/ RW P1\ 3 16 1 14 34 18\ 13 2 15 4 34 50\ 8 11 6 9 34 18\ 10 5 12 7 34 50\ -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	121/ RW P1\ 3 16 2 13 34 18\ 14 1 15 4 34 50\ 7 12 6 9 34 18\ 10 5 11 8 34 50\ -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums		
127/ RW P1\ 3 16 5 10 34 18\ 14 1 12 7 34 50\ 4 15 6 9 34 18\ 13 2 11 8 34 50\ -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	133/ RW P1\ 3 16 9 6 34 26\ 14 1 8 11 34 42\ 4 15 10 5 34 26\ 13 2 7 12 34 42\ -----+  34 34 34 34 C1mSum /26/42/26/42 P2Sums	139/ RW P1\ 3 14 1 16 34 18\ 13 4 15 2 34 50\ 8 9 6 11 34 18\ 10 7 12 5 34 50\ -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	143/ RW P1\ 3 14 4 13 34 38\ 10 7 9 8 34 30\ 15 2 16 1 34 38\ 6 11 5 12 34 30\ -----+  34 34 34 34 C1mSum /38/30/38/30 P2Sums		
145/ RW P1\ 3 14 7 10 34 18\ 13 4 9 8 34 50\ 2 15 6 11 34 18\ 16 1 12 5 34 50\ -----+  34 34 34 34 C1mSum /18/50/18/50 P2Sums	149/ RW P1\ 3 14 11 6 34 26\ 13 4 5 12 34 42\ 2 15 10 7 34 26\ 16 1 8 9 34 42\ -----+  34 34 34 34 C1mSum /26/42/26/42 P2Sums	153/ RW P1\ 3 13 2 16 34 34\ 10 8 11 5 34 34\ 15 1 14 4 34 34\ 6 12 7 9 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	155/ RW P1\ 3 13 4 14 34 38\ 10 8 9 7 34 30\ 15 1 16 2 34 38\ 6 12 5 11 34 30\ -----+  34 34 34 34 C1mSum /38/30/38/30 P2Sums		
157/ RW P1\ 3 13 8 10 34 34\ 6 12 1 15 34 34\ 9 7 14 4 34 34\ 16 2 11 5 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	159/ RW P1\ 3 13 12 6 34 34\ 10 8 1 15 34 34\ 5 11 14 4 34 34\ 16 2 7 9 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	161/ RW P1\ 3 10 7 14 34 38\ 6 15 2 11 34 30\ 12 1 16 5 34 38\ 13 8 9 4 34 30\ -----+  34 34 34 34 C1mSum /38/30/38/30 P2Sums	162/ RW P1\ 3 10 8 13 34 38\ 6 15 1 12 34 30\ 11 2 16 5 34 38\ 14 7 9 4 34 30\ -----+  34 34 34 34 C1mSum /38/30/38/30 P2Sums		
163/ 4 15 1 14 13 2 16 3 8 11 5 10 9 6 12 7	183/ 4 14 1 15 13 3 16 2 8 10 5 11 9 7 12 6	197/ 4 13 2 15 9 8 11 6 16 1 14 3 5 12 7 10	205/ 5 16 1 12 11 2 15 6 8 13 4 9 10 3 14 7	217/ 5 12 6 11 4 13 3 14 15 2 16 1 10 7 9 8	219/ 5 11 6 12 4 14 3 13 15 1 16 2 10 8 9 7
221/ 5 10 7 12 4 15 2 13 14 1 16 3 11 8 9 6	223/ 6 15 1 12 11 2 16 5 8 13 3 10 9 4 14 7	231/ 6 12 5 11 3 13 4 14 16 2 15 1 9 7 10 8	233/ 6 11 5 12 3 14 4 13 16 1 15 2 9 8 10 7	235/ 7 14 3 10 12 1 16 5 6 15 2 11 9 4 13 8	239/ 7 12 5 10 2 13 4 15 16 3 14 1 9 6 11 8

[Count = 240] OK!

These 240 solutions are originally included in the solution set of 'Simply Composite' Squares of Order 4, making the sub-set of the latter set of those 2544 solutions.

While they are certainly the Magic type whose rows and columns are all equal to the constant sum 34, they are not always 'Pan-diagonal' type. But each sum of two types

of pandiagonals combined keeps constantly equal to 68. They are 'Semi-Pandiagonal'.

**6-4.** For the last case, let's have the solution list of 'Composite Pan-magic' Squares of Order 4 that takes the 9 Composite Conditions and all the following three equations:

$$n_1+n_2+n_3+n_4=34; \quad n_1+n_5+n_9+n_{13}=34; \quad n_1+n_6+n_{11}+n_{16}=34;$$

**\*\* 'Composite Pan-Magic' Squares of Order 4 \*\***

[List of Standard Solutions: [CPMS44] C&SemiPM/|Check-Sums/]

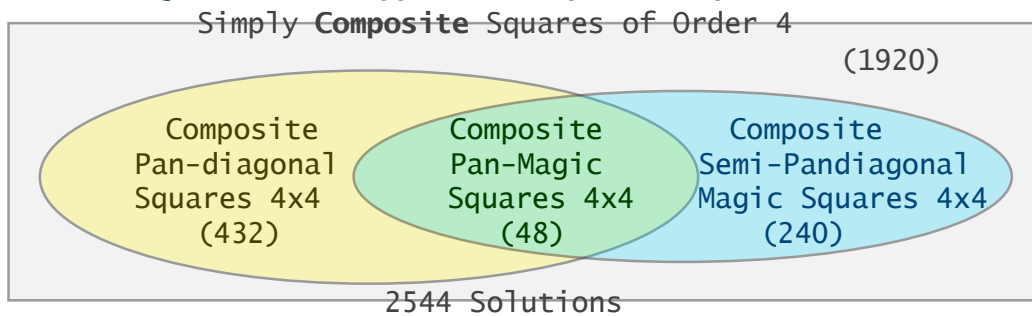
[ 1]    32/ RW P1\ 1 15 4 14 34 34\ 12 6 9 7 34 34\ 13 3 16 2 34 34\ 8 10 5 11 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[ 2]    34/ RW P1\ 1 15 4 14 34 34\ 8 10 5 11 34 34\ 13 3 16 2 34 34\ 12 6 9 7 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[ 3]    36/ RW P1\ 1 15 6 12 34 34\ 14 4 9 7 34 34\ 11 5 16 2 34 34\ 8 10 3 13 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[ 4]    38/ RW P1\ 1 15 6 12 34 34\ 8 10 3 13 34 34\ 11 5 16 2 34 34\ 14 4 9 7 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums
[ 5]    40/ RW P1\ 1 15 10 8 34 34\ 14 4 5 11 34 34\ 7 9 16 2 34 34\ 12 6 3 13 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[ 6]    42/ RW P1\ 1 15 10 8 34 34\ 12 6 3 13 34 34\ 7 9 16 2 34 34\ 14 4 5 11 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[ 7]    48/ RW P1\ 1 14 4 15 34 34\ 12 7 9 6 34 34\ 13 2 16 3 34 34\ 8 11 5 10 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[ 8]    50/ RW P1\ 1 14 4 15 34 34\ 8 11 5 10 34 34\ 13 2 16 3 34 34\ 12 7 9 6 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums
[ 9]    52/ RW P1\ 1 14 7 12 34 34\ 8 11 2 13 34 34\ 10 5 16 3 34 34\ 15 4 9 6 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[10]    54/ RW P1\ 1 14 11 8 34 34\ 12 7 2 13 34 34\ 6 9 16 3 34 34\ 15 4 5 10 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[11]    58/ RW P1\ 1 12 6 15 34 34\ 8 13 3 10 34 34\ 11 2 16 5 34 34\ 14 7 9 4 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[12]    60/ RW P1\ 1 12 7 14 34 34\ 8 13 2 11 34 34\ 10 3 16 5 34 34\ 15 6 9 4 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums
[13]    70/ RW P1\ 2 16 3 13 34 34\ 11 5 10 8 34 34\ 14 4 15 1 34 34\ 7 9 6 12 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[14]    72/ RW P1\ 2 16 3 13 34 34\ 7 9 6 12 34 34\ 14 4 15 1 34 34\ 11 5 10 8 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[15]    76/ RW P1\ 2 16 5 11 34 34\ 13 3 10 8 34 34\ 12 6 15 1 34 34\ 7 9 4 14 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[16]    78/ RW P1\ 2 16 5 11 34 34\ 7 9 4 14 34 34\ 12 6 15 1 34 34\ 13 3 10 8 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums
[17]    82/ RW P1\ 2 16 9 7 34 34\ 13 3 6 12 34 34\ 8 10 15 1 34 34\ 11 5 4 14 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[18]    84/ RW P1\ 2 16 9 7 34 34\ 11 5 4 14 34 34\ 8 10 15 1 34 34\ 13 3 6 12 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[19]    103/ RW P1\ 2 13 3 16 34 34\ 11 8 10 5 34 34\ 14 1 15 4 34 34\ 7 12 6 9 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[20]    104/ RW P1\ 2 13 3 16 34 34\ 7 12 6 9 34 34\ 14 1 15 4 34 34\ 11 8 10 5 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums
[21]    107/ RW P1\ 2 13 8 11 34 34\ 7 12 1 14 34 34\ 9 6 15 4 34 34\ 16 3 10 5 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[22]    109/ RW P1\ 2 13 12 7 34 34\ 11 8 1 14 34 34\ 5 10 15 4 34 34\ 16 3 6 9 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[23]    111/ RW P1\ 2 11 5 16 34 34\ 7 14 4 9 34 34\ 12 1 15 6 34 34\ 13 8 10 3 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[24]    113/ RW P1\ 2 11 8 13 34 34\ 7 14 1 12 34 34\ 9 4 15 6 34 34\ 16 5 10 3 34 34\ -----+  34 34 34 34 C1mSum /34/34/34/34 P2Sums

[25] 124/ 3 16 2 13 10 5 11 8 15 4 14 1 6 9 7 12	[26] 126/ 3 16 2 13 6 9 7 12 15 4 14 1 10 5 11 8	[27] 130/ 3 16 5 10 13 2 11 8 12 7 14 1 6 9 4 15	[28] 132/ 3 16 5 10 6 9 4 15 12 7 14 1 13 2 11 8	[29] 136/ 3 16 9 6 13 2 7 12 8 11 14 1 10 5 4 15	[30] 138/ 3 16 9 6 10 5 4 15 8 11 14 1 13 2 7 12	[31] 153/ 3 13 2 16 10 8 11 5 15 1 14 4 6 12 7 9	[32] 154/ 3 13 2 16 6 12 7 9 15 1 14 4 10 8 11 5	[33] 157/ 3 13 8 10 6 12 1 15 9 7 14 4 16 2 11 5	[34] 159/ 3 13 12 6 10 8 1 15 5 11 14 4 16 2 7 9	[35] 165/ 4 15 1 14 9 6 12 7 16 3 13 2 5 10 8 11	[36] 166/ 4 15 1 14 5 10 8 11 16 3 13 2 9 6 12 7	[37] 172/ 4 15 6 9 14 1 12 7 11 8 13 2 5 10 3 16	[38] 175/ 4 15 6 9 5 10 3 16 11 8 13 2 14 1 12 7	[39] 178/ 4 15 10 5 14 1 8 11 7 12 13 2 9 6 3 16	[40] 181/ 4 15 10 5 9 6 3 16 7 12 13 2 14 1 8 11	[41] 185/ 4 14 1 15 9 7 12 6 16 2 13 3 5 11 8 10	[42] 186/ 4 14 1 15 5 11 8 10 16 2 13 3 9 7 12 6	[43] 191/ 4 14 7 9 5 11 2 16 10 8 13 3 15 1 12 6	[44] 195/ 4 14 11 5 9 7 2 16 6 12 13 3 15 1 8 10	[45] 212/ 5 16 2 11 4 9 7 14 15 6 12 1 10 3 13 8	[46] 216/ 5 16 3 10 4 9 6 15 14 7 12 1 11 2 13 8	[47] 224/ 6 15 1 12 3 10 8 13 16 5 11 2 9 4 14 7	[48] 229/ 6 15 4 9 3 10 5 16 13 8 11 2 12 1 14 7
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

[Count(CPMS44/C&SemiPM) = 48/240] OK!

[Listed by Kanji Setsuda on August 17, 2010 with MacOSX & Xcode 3.1.2]

### Set Diagrams for 4 Types of Composite Squares of Order 4



These 48 standard solutions are completely the same with those ones of 'Pan-diagonal' type of Order 4 we already know very well.

And as you see in the list above, any Complementary Pairs of 17:  $\{(1,16), (2,15), (3,14), (4,13), (5,12), (6,11), (7,10), \text{ and } (8,9)\}$  are placed on their pandiagonals without any exception in all solutions. Yes. They are naturally the 'Complete' type of Magic Squares of order 4, as well as the 'Pan-diagonal' Magic one.

The 3 solution sets of 'Composite Pan-magic', 'Complete' and 'Pandiagonal' Magic Squares of Order 4 are really the same with one another. It is amazing.

Every time when I saw this miraculous coincidence, I used to be moved deep and also puzzled so much that I would make myself try to find any reason for that.

### #7. The 'Composite' Semi-Panmagic Squares of Order 4

Let's get back by one step to the 'Composite Semi-Panmagic' type of Order 4, made only under the nine 'Composite Conditions' and two definitions for the constant sums of rows and columns:  $n_1+n_2+n_3+n_4=34$ ; and  $n_1+n_5+n_9+n_{13}=34$ .

Unless we give  $n_1+n_6+n_{11}+n_{16}=34$  at the definition stage, any pandiagonal does not always add up to the same constant 34.

But any pandiagonal with  $n_1$  or  $n_3$  takes the same sum Pd, and any one with  $n_2$  or

n4 takes the same sum **Pb**. ( $Pd+Pb=2*S=2*C=72$ ); It is almost the same property as of the 'Pan-Magic' type.

**\*\* 'Composite' Semi-Panmagic Squares of Order 4 \*\***

**\*\* List of the Primitive 1920 Solutions \*\***

1/		7/		13/		19/		25/	
1 8 9 16	1 8 9 16	1 8 9 16	1 8 10 15	1 12 5 16					
12 13 4 5	14 11 6 3	15 10 7 2	16 9 7 2	8 13 4 9					
6 3 14 11	4 5 12 13	4 5 12 13	3 6 12 13	10 3 14 7					
15 10 7 2	15 10 7 2	14 11 6 3	14 11 5 4	15 6 11 2					
31/		37/		43/		49/		55/	
1 12 5 16	1 12 5 16	1 12 6 15	1 14 3 16	1 14 3 16					
14 7 10 3	15 6 11 2	16 5 11 2	8 11 6 9	12 7 10 5					
4 9 8 13	4 9 8 13	3 10 8 13	10 5 12 7	6 9 8 11					
15 6 11 2	14 7 10 3	14 7 9 4	15 4 13 2	15 4 13 2					
61/		67/		73/		79/		85/	
1 14 3 16	1 14 4 15	1 15 2 16	1 15 2 16	1 15 2 16					
15 4 13 2	16 3 13 2	8 10 7 9	12 6 11 5	14 4 13 3					
6 9 8 11	5 10 8 11	11 5 12 6	7 9 8 10	7 9 8 10					
12 7 10 5	12 7 9 6	14 4 13 3	14 4 13 3	12 6 11 5					
91/		97/		103/		109/		115/	
1 15 4 14	1 16 2 15	1 16 2 15	1 16 2 15	1 16 3 14					
16 2 13 3	8 9 7 10	12 5 11 6	14 3 13 4	15 2 13 4					
5 11 8 10	11 6 12 5	7 10 8 9	7 10 8 9	6 11 8 9					
12 6 9 7	14 3 13 4	14 3 13 4	12 5 11 6	12 5 10 7					
121/		145/		169/		193/		217/	
2 7 9 16	2 11 5 16	2 13 3 16	2 15 1 16	2 16 1 15					
11 14 4 5	7 14 4 9	7 12 6 9	7 10 8 9	7 9 8 10					
6 3 13 12	10 3 13 8	10 5 11 8	12 5 11 6	12 6 11 5					
15 10 8 1	15 6 12 1	15 4 14 1	13 4 14 3	13 3 14 4					
241/		265/		289/		313/		337/	
3 6 9 16	3 10 5 16	3 13 2 16	3 14 1 16	3 16 1 14					
10 15 4 5	6 15 4 9	6 12 7 9	6 11 8 9	6 9 8 11					
7 2 13 12	11 2 13 8	11 5 10 8	12 5 10 7	12 7 10 5					
14 11 8 1	14 7 12 1	14 4 15 1	13 4 15 2	13 2 15 4					
361/		385/		409/		433/		457/	
4 5 10 15	4 9 6 15	4 13 2 15	4 14 1 15	4 15 1 14					
9 16 3 6	5 16 3 10	5 12 7 10	5 11 8 10	5 10 8 11					
7 2 13 12	11 2 13 8	11 6 9 8	12 6 9 7	12 7 9 6					
14 11 8 1	14 7 12 1	14 3 16 1	13 3 16 2	13 2 16 3					
481/		505/		529/		553/		577/	
5 4 9 16	5 10 3 16	5 11 2 16	5 12 1 16	5 16 1 12					
10 15 6 3	4 15 6 9	4 14 7 9	4 13 8 9	4 9 8 13					
7 2 11 14	13 2 11 8	13 3 10 8	14 3 10 7	14 7 10 3					
12 13 8 1	12 7 14 1	12 6 15 1	11 6 15 2	11 2 15 6					
601/		625/		649/		673/		697/	
6 3 10 15	6 9 4 15	6 11 2 15	6 12 1 15	6 15 1 12					
9 16 5 4	3 16 5 10	3 14 7 10	3 13 8 10	3 10 8 13					
7 2 11 14	13 2 11 8	13 4 9 8	14 4 9 7	14 7 9 4					
12 13 8 1	12 7 14 1	12 5 16 1	11 5 16 2	11 2 16 5					

721/	745/	769/	793/	817/
7 2 11 14	7 9 4 14	7 10 3 14	7 12 1 14	7 14 1 12
9 16 5 4	2 16 5 11	2 15 6 11	2 13 8 11	2 11 8 13
6 3 10 15	13 3 10 8	13 4 9 8	15 4 9 6	15 6 9 4
12 13 8 1	12 6 15 1	12 5 16 1	10 5 16 3	10 3 16 5
841/	865/	889/	913/	937/
8 1 12 13	8 9 4 13	8 10 3 13	8 11 2 13	8 13 2 11
9 16 5 4	1 16 5 12	1 15 6 12	1 14 7 12	1 12 7 14
6 3 10 15	14 3 10 7	14 4 9 7	15 4 9 6	15 6 9 4
11 14 7 2	11 6 15 2	11 5 16 2	10 5 16 3	10 3 16 5
961/	985/	1009/	1033/	1057/
9 4 5 16	9 6 3 16	9 7 2 16	9 8 1 16	9 16 1 8
6 15 10 3	4 15 10 5	4 14 11 5	4 13 12 5	4 5 12 13
11 2 7 14	13 2 7 12	13 3 6 12	14 3 6 11	14 11 6 3
8 13 12 1	8 11 14 1	8 10 15 1	7 10 15 2	7 2 15 10
1081/	1105/	1129/	1153/	1177/
10 3 6 15	10 5 4 15	10 7 2 15	10 8 1 15	10 15 1 8
5 16 9 4	3 16 9 6	3 14 11 6	3 13 12 6	3 6 12 13
11 2 7 14	13 2 7 12	13 4 5 12	14 4 5 11	14 11 5 4
8 13 12 1	8 11 14 1	8 9 16 1	7 9 16 2	7 2 16 9
1201/	1225/	1249/	1273/	1297/
11 2 7 14	11 5 4 14	11 6 3 14	11 8 1 14	11 14 1 8
5 16 9 4	2 16 9 7	2 15 10 7	2 13 12 7	2 7 12 13
10 3 6 15	13 3 6 12	13 4 5 12	15 4 5 10	15 10 5 4
8 13 12 1	8 10 15 1	8 9 16 1	6 9 16 3	6 3 16 9
1321/	1345/	1369/	1393/	1417/
12 1 8 13	12 5 4 13	12 6 3 13	12 7 2 13	12 13 2 7
5 16 9 4	1 16 9 8	1 15 10 8	1 14 11 8	1 8 11 14
10 3 6 15	14 3 6 11	14 4 5 11	15 4 5 10	15 10 5 4
7 14 11 2	7 10 15 2	7 9 16 2	6 9 16 3	6 3 16 9
1441/	1465/	1489/	1513/	1537/
13 2 7 12	13 3 6 12	13 4 5 12	13 8 1 12	13 12 1 8
3 16 9 6	2 16 9 7	2 15 10 7	2 11 14 7	2 7 14 11
10 5 4 15	11 5 4 14	11 6 3 14	15 6 3 10	15 10 3 6
8 11 14 1	8 10 15 1	8 9 16 1	4 9 16 5	4 5 16 9
1561/	1585/	1609/	1633/	1657/
14 1 8 11	14 3 6 11	14 4 5 11	14 7 2 11	14 11 2 7
3 16 9 6	1 16 9 8	1 15 10 8	1 12 13 8	1 8 13 12
10 5 4 15	12 5 4 13	12 6 3 13	15 6 3 10	15 10 3 6
7 12 13 2	7 10 15 2	7 9 16 2	4 9 16 5	4 5 16 9
1681/	1705/	1729/	1753/	1777/
15 1 8 10	15 2 7 10	15 4 5 10	15 6 3 10	15 10 3 6
2 16 9 7	1 16 9 8	1 14 11 8	1 12 13 8	1 8 13 12
11 5 4 14	12 5 4 13	12 7 2 13	14 7 2 11	14 11 2 7
6 12 13 3	6 11 14 3	6 9 16 3	4 9 16 5	4 5 16 9
1801/	1825/	1849/	1873/	1897/
16 1 8 9	16 2 7 9	16 3 6 9	16 5 4 9	16 9 4 5
2 15 10 7	1 15 10 8	1 14 11 8	1 12 13 8	1 8 13 12
11 6 3 14	12 6 3 13	12 7 2 13	14 7 2 11	14 11 2 7
5 12 13 4	5 11 14 4	5 10 15 4	3 10 15 6	3 6 15 10

[Count = 1920]

\* Counts according to the Sum of Diagonals: \*

(14,54):[ 0, 0]; (15,53):[ 0, 0]; (16,52):[ 0, 0];  
 (17,51):[ 0, 0]; (18,50):[192,192]; (19,49):[ 0, 0];  
 (20,48):[ 0, 0]; (21,47):[ 0, 0]; (22,46):[ 0, 0];  
 (23,45):[ 0, 0]; (24,44):[ 0, 0]; (25,43):[ 0, 0];  
 (26,42):[192,192]; (27,41):[ 0, 0]; (28,40):[ 0, 0];  
 (29,39):[ 0, 0]; (30,38):[192,192]; (31,37):[ 0, 0];  
 (32,36):[192,192]; (33,35):[ 0, 0]; (34,34):[384,384];  
 (35,33):[ 0, 0]; (36,32):[192,192]; (37,31):[ 0, 0];  
 (38,30):[192,192]; (39,29):[ 0, 0]; (40,28):[ 0, 0];  
 (41,27):[ 0, 0]; (42,26):[192,192]; (43,25):[ 0, 0];  
 (44,24):[ 0, 0]; (45,23):[ 0, 0]; (46,22):[ 0, 0];  
 (47,21):[ 0, 0]; (48,20):[ 0, 0]; (49,19):[ 0, 0];  
 (50,18):[192,192]; (51,17):[ 0, 0]; (52,16):[ 0, 0];  
 (53,15):[ 0, 0]; (54,14):[ 0, 0]; (55,13):[ 0, 0];

If you take the basic 11 conditions at the first definition stage, you will find the 'primitive' solutions so many as 1920 in all as listed above. This list contains the 384 primitive solutions of 'Composite and Complete' Pan-magic Squares in it.

### #8. Can we assume the Extended Space and any Transformation System?

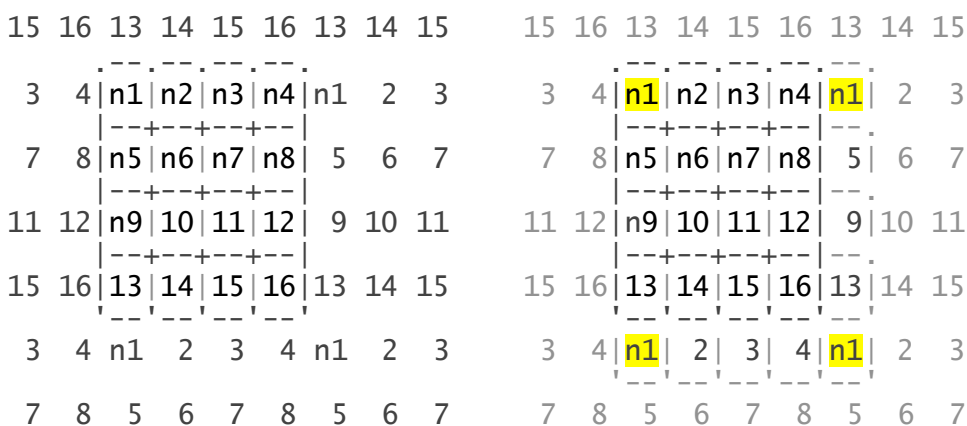
During our study in the previous sub-sections #2~#4, we know we can assume the Extended Space for our Composite type in the same way as the Pandiagonal one.

Since we can move any line in the first place far to the opposite side beyond the last place, we can draw such an Extended Form for our object shown as follows.

You will never lose any important properties of 'Composite Squares' anywhere in the Extended Space. Any 2x2 numbers in a little block add up to the equal sum 34, and any 4 numbers on all pandiagonals add up to the same sum of either Pd or Pb.

[Figure 2: Conceptual Diagrams for the Extended Space]

\* Basic Form in Extended Space and the Moving Frame \*



But, can we really read out any other pieces of solutions from the Extended Space by the moving frame, just in the same way as pandiagonal magic squares?

Yes. We can read them out of the Extended Space just as follows. We can take out four different forms with each n1 on every four corners of the new squares.

\* Read 4 Forms out of the Extended Space \*



T0/	T1/	T2/	T3/																																																																
<table style="width: 100%; border-collapse: collapse;"> <tr><td style="background-color: yellow;">n1</td><td>n2</td><td>n3</td><td>n4</td></tr> <tr><td>n5</td><td>n6</td><td>n7</td><td>n8</td></tr> <tr><td>n9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td>15</td><td>16</td></tr> </table>	n1	n2	n3	n4	n5	n6	n7	n8	n9	10	11	12	13	14	15	16	<table style="width: 100%; border-collapse: collapse;"> <tr><td>2</td><td>3</td><td>4</td><td style="background-color: yellow;">n1</td></tr> <tr><td>6</td><td>7</td><td>8</td><td>5</td></tr> <tr><td>10</td><td>11</td><td>12</td><td>9</td></tr> <tr><td>14</td><td>15</td><td>16</td><td>13</td></tr> </table>	2	3	4	n1	6	7	8	5	10	11	12	9	14	15	16	13	<table style="width: 100%; border-collapse: collapse;"> <tr><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td style="background-color: yellow;">n1</td><td>2</td><td>3</td><td>4</td></tr> </table>	5	6	7	8	9	10	11	12	13	14	15	16	n1	2	3	4	<table style="width: 100%; border-collapse: collapse;"> <tr><td>6</td><td>7</td><td>8</td><td>5</td></tr> <tr><td>10</td><td>11</td><td>12</td><td>9</td></tr> <tr><td>14</td><td>15</td><td>16</td><td>13</td></tr> <tr><td>2</td><td>3</td><td>4</td><td style="background-color: yellow;">n1</td></tr> </table>	6	7	8	5	10	11	12	9	14	15	16	13	2	3	4	n1
n1	n2	n3	n4																																																																
n5	n6	n7	n8																																																																
n9	10	11	12																																																																
13	14	15	16																																																																
2	3	4	n1																																																																
6	7	8	5																																																																
10	11	12	9																																																																
14	15	16	13																																																																
5	6	7	8																																																																
9	10	11	12																																																																
13	14	15	16																																																																
n1	2	3	4																																																																
6	7	8	5																																																																
10	11	12	9																																																																
14	15	16	13																																																																
2	3	4	n1																																																																

\* Make them Smart for n1 always on the left top \*

T0/	T1/	T2/	T3/																																																																
<table style="width: 100%; border-collapse: collapse;"> <tr><td style="background-color: yellow;">n1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td>15</td><td>16</td></tr> </table>	n1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="background-color: yellow;">n1</td><td>4</td><td>3</td><td>2</td></tr> <tr><td>5</td><td>8</td><td>7</td><td>6</td></tr> <tr><td>9</td><td>12</td><td>11</td><td>10</td></tr> <tr><td>13</td><td>16</td><td>15</td><td>14</td></tr> </table>	n1	4	3	2	5	8	7	6	9	12	11	10	13	16	15	14	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="background-color: yellow;">n1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td></tr> </table>	n1	2	3	4	13	14	15	16	9	10	11	12	5	6	7	8	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="background-color: yellow;">n1</td><td>4</td><td>3</td><td>2</td></tr> <tr><td>13</td><td>16</td><td>15</td><td>14</td></tr> <tr><td>9</td><td>12</td><td>11</td><td>10</td></tr> <tr><td>5</td><td>8</td><td>7</td><td>6</td></tr> </table>	n1	4	3	2	13	16	15	14	9	12	11	10	5	8	7	6
n1	2	3	4																																																																
5	6	7	8																																																																
9	10	11	12																																																																
13	14	15	16																																																																
n1	4	3	2																																																																
5	8	7	6																																																																
9	12	11	10																																																																
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n1	2	3	4																																																																
13	14	15	16																																																																
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5	6	7	8																																																																
n1	4	3	2																																																																
13	16	15	14																																																																
9	12	11	10																																																																
5	8	7	6																																																																

Of course, you can make them smart by simple rotation and reflection as shown above so as to meet with  $n1 < n4$ ;  $n1 < n13$ ;  $n1 < n16$ , and  $n2 > n5$ .

Even if you do this job, you will never spoil any constant sum of 'Composite' equations, any rows and columns, and even any pandiagonals (equal to either  $Pd$  or  $Pb$ , but not always equal to 34).

All those diagrams above imply the possibility of some transformation system of solutions. Suppose any solution like #1 is given to us. We can now transform it into 4 different forms automatically by the extended space and the moving frame.

We can also take the concept of 'fundamental' solution for a representative of the 4 solutions transformed.

The next diagrams will demonstrate the actual process of transformation.

* Original #1 in Extended Form *	* Moving Frame *																																																																																																												
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\* Read 4 Forms out of the Extended Space \*

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\* Make them Smart for  $n1 == 1$  always on the left top and  $n2 > n5$  \*

[1T]	T0/	T1/	T2/	T3/
1 12 6 15	1 16 9 8	1 15 6 12	1 16 9 8	
8 13 3 10	12 5 4 13	8 10 3 13	15 2 7 10	
9 4 14 7	6 11 14 3	9 7 14 4	6 11 14 3	
16 5 11 2	15 2 7 10	16 2 11 5	12 5 4 13	

Suppose you have another piece of solution #2 as follows.

\* Original #2 in Extended Form \*      \* Moving Frame \*

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

\* Read 4 Forms out of the Extended Space \*

[2]	T0/	T1/	T2/	T3/
1 12 13 8	12 13 8 1	16 5 4 9	5 4 9 16	
16 5 4 9	5 4 9 16	3 10 15 6	10 15 6 3	
3 10 15 6	10 15 6 3	14 7 2 11	7 2 11 14	
14 7 2 11	7 2 11 14	1 12 13 8	12 13 8 1	

\* Make them Smart for n1==1 and n2>n5 \*

[2T]	T0/	T1/	T2/	T3/
1 16 3 14	1 16 3 14	1 14 3 16	1 14 3 16	
12 5 10 7	8 9 6 11	12 7 10 5	8 11 6 9	
13 4 15 2	13 4 15 2	13 2 15 4	13 2 15 4	
8 9 6 11	12 5 10 7	8 11 6 9	12 7 10 5	

Suppose you have another piece of solution #3 as follows.

\* Original #3 in Extended Form \*      \* Moving Frame \*

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

\* Read 4 Forms out of the Extended Space \*

[3]	T0/	T1/	T2/	T3/
1 8 13 12	8 13 12 1	14 11 2 7	11 2 7 14	
14 11 2 7	11 2 7 14	4 5 16 9	5 16 9 4	
4 5 16 9	5 16 9 4	15 10 3 6	10 3 6 15	
15 10 3 6	10 3 6 15	1 8 13 12	8 13 12 1	

\* Make them Smart for  $n1==1$  and  $n2>n5$  \*

[3T]	T0/	T1/	T2/	T3/
1 14 4 15	1 14 4 15	1 15 4 14	1 15 4 14	
8 11 5 10	12 7 9 6	8 10 5 11	12 6 9 7	
13 2 16 3	13 2 16 3	13 3 16 2	13 3 16 2	
12 7 9 6	8 11 5 10	12 6 9 7	8 10 5 11	

### #9. Which one of the fundamental solutions can you identify your solution with?

This kind of transformation method can tell you how to identify your temporary solution with any piece of fundamental solutions with  $n1==1$ .

The list of fundamental solutions is originally produced under such the inequality conditions as:  $n1==1$ ;  $n2>n4$ ; and  $n2>n5>n13$ ;

You may well find such the transformation that meets these inequality conditions perfectly and try to find the same fundamental solution among the list.

[1T]	T0/	T1/	T2/	T3/
1 12 6 15	1 16 9 8	1 15 6 12	1 16 9 8	
8 13 3 10	12 5 4 13	8 10 3 13	15 2 7 10	
9 4 14 7	6 11 14 3	9 7 14 4	6 11 14 3	
16 5 11 2	15 2 7 10	16 2 11 5	12 5 4 13	

[2T]	T0/	T1/	T2/	T3/
1 16 3 14	1 16 3 14	1 14 3 16	1 14 3 16	
12 5 10 7	8 9 6 11	12 7 10 5	8 11 6 9	
13 4 15 2	13 4 15 2	13 2 15 4	13 2 15 4	
8 9 6 11	12 5 10 7	8 11 6 9	12 7 10 5	

[3T]	T0/	T1/	T2/	T3/
1 14 4 15	1 14 4 15	1 15 4 14	1 15 4 14	
8 11 5 10	12 7 9 6	8 10 5 11	12 6 9 7	
13 2 16 3	13 2 16 3	13 3 16 2	13 3 16 2	
12 7 9 6	8 11 5 10	12 6 9 7	8 10 5 11	

You can select the correct transformations out of those lists above, can't you?

**T3/1**, **T0/2** and **T3/3** meet  $\{n1==1; n2>n4; \text{ and } n2>n5>n13\}$ .

## #10. List of Fundamental Solutions of Composite Semi-Panmagic Squares

The next two lists show the fundamental solutions of 'Composite Semi-Panmagic Squares and those of 'Composite Pan-magic' Squares of Order 4.

**\*\* 'Composite' Semi-Panmagic Squares of Order 4 \*\***

[List of Fundamental Solutions: Sol.Count/|Check-Sums/]

1/ RW P1\ 1 16 2 15 34 18\ 14 3 13 4 34 50\ 7 10 8 9 34 18\ 12 5 11 6 34 50	2/ RW P1\ 1 16 2 15 34 26\ 14 3 13 4 34 42\ 11 6 12 5 34 26\ 8 9 7 10 34 42	3/ RW P1\ 1 16 2 15 34 30\ 12 5 11 6 34 38\ 13 4 14 3 34 30\ 8 9 7 10 34 38	4/ RW P1\ 1 16 3 14 34 18\ 15 2 13 4 34 50\ 6 11 8 9 34 18\ 12 5 10 7 34 50
-----+-----  34 34 34 34 C1mSum /18/50/18/50 P2Sums	-----+-----  34 34 34 34 C1mSum /26/42/26/42 P2Sums	-----+-----  34 34 34 34 C1mSum /30/38/30/38 P2Sums	-----+-----  34 34 34 34 C1mSum /18/50/18/50 P2Sums
5/ RW P1\ 1 16 3 14 34 26\ 15 2 13 4 34 42\ 10 7 12 5 34 26\ 8 9 6 11 34 42	6/ RW P1\ 1 16 3 14 34 32\ 12 5 10 7 34 36\ 13 4 15 2 34 32\ 8 9 6 11 34 36	7/ RW P1\ 1 16 5 12 34 18\ 15 2 11 6 34 50\ 4 13 8 9 34 18\ 14 3 10 7 34 50	8/ RW P1\ 1 16 5 12 34 30\ 15 2 11 6 34 38\ 10 7 14 3 34 30\ 8 9 4 13 34 38
-----+-----  34 34 34 34 C1mSum /26/42/26/42 P2Sums	-----+-----  34 34 34 34 C1mSum /32/36/32/36 P2Sums	-----+-----  34 34 34 34 C1mSum /18/50/18/50 P2Sums	-----+-----  34 34 34 34 C1mSum /30/38/30/38 P2Sums
9/ RW P1\ 1 16 5 12 34 32\ 14 3 10 7 34 36\ 11 6 15 2 34 32\ 8 9 4 13 34 36	10/ RW P1\ 1 16 9 8 34 26\ 15 2 7 10 34 42\ 4 13 12 5 34 26\ 14 3 6 11 34 42	11/ RW P1\ 1 16 9 8 34 30\ 15 2 7 10 34 38\ 6 11 14 3 34 30\ 12 5 4 13 34 38	12/ RW P1\ 1 16 9 8 34 32\ 14 3 6 11 34 36\ 7 10 15 2 34 32\ 12 5 4 13 34 36
-----+-----  34 34 34 34 C1mSum /32/36/32/36 P2Sums	-----+-----  34 34 34 34 C1mSum /26/42/26/42 P2Sums	-----+-----  34 34 34 34 C1mSum /30/38/30/38 P2Sums	-----+-----  34 34 34 34 C1mSum /32/36/32/36 P2Sums
13/ RW P1\ 1 15 4 14 34 34\ 12 6 9 7 34 34\ 13 3 16 2 34 34\ 8 10 5 11 34 34	14/ RW P1\ 1 15 6 12 34 34\ 14 4 9 7 34 34\ 11 5 16 2 34 34\ 8 10 3 13 34 34	15/ RW P1\ 1 15 10 8 34 34\ 14 4 5 11 34 34\ 7 9 16 2 34 34\ 12 6 3 13 34 34	
-----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	-----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	-----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	[Count = 15] OK!

**\*\* 'Composite Pan-Magic' Squares of Order 4 \*\***

[List of Fundamental Solutions: [CPMS44] C&SemiPM/|Check-Sums/]

[ 1 ] 13/ RW P1\ 1 15 4 14 34 34\ 12 6 9 7 34 34\ 13 3 16 2 34 34\ 8 10 5 11 34 34	[ 2 ] 14/ RW P1\ 1 15 6 12 34 34\ 14 4 9 7 34 34\ 11 5 16 2 34 34\ 8 10 3 13 34 34	[ 3 ] 15/ RW P1\ 1 15 10 8 34 34\ 14 4 5 11 34 34\ 7 9 16 2 34 34\ 12 6 3 13 34 34
-----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	-----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums	-----+-----  34 34 34 34 C1mSum /34/34/34/34 P2Sums

[Count(CPMS44/C&SemiPM) = 3/15] OK!

[Listed by Kanji Setsuda on August 18, 2010 with MacOSX & Xcode 3.1.2]

By our method of Extended Space and Moving Frame, we can not only find which fundamental solution any temporary solution of ours should be identified with, by transforming the standard form back into the fundamental, but we can also transform

each fundamental solution into 4 standard solutions.

On top of that we can kill all the inequality conditions  $\{n_1=1; n_2>n_4; n_2>n_5>n_{13}\}$  and make any fundamental solution into the 'primitive' ones with  $n_1=1, 2, 3, 4, 5, \dots, 15, 16$ . We can also make another reflected form for each.

Therefore we can finally make each fundamental into  $4 \times 16 \times 2 = 128$  primitive forms in all. It tells us the reason why our 'Composite' Semi-Panmagic Squares of Order 4 have the 1920 primitive solutions and the 15 fundamental ones:  $1920 = 15 \times 128$

It is the same reason for  $384 = 3 \times 128$  why our 'Composite & Complete' magic squares of Order 4 has the solution sets of 384 primitive ones and 3 fundamental.

At the end of this article I feel I must express my deepest appreciation to Prof. Mutsumi Suzuki. He gave me a lot of suggestion and inspiration in 2000-01.

(Originally written in English on Aug.17, 2001; Revised on Dec.11, 2005  
Newest Revision on Aug.29, 2010 by Kanji Setsuda on MacOSX & Xcode3.1.2)  
E-Mail Address: jag12001@nifty.com

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### [Appendix] Program List for Making the List of Fundamental Solutions

```
/** 'Composite' Semi-Panmagic Squares of Order 4 **/  
/** The 15 Fundamental Solutions with Check-Sums **/  
/** "CmpstSPMS4F.c" dictated by Kanji Setsuda **/  
/** on Dec.18,'04; Aug.24,'06; Aug.24,'10 **/  
/** Working with MacOSX and Xcode 3.1.2 **/  
/**/  
#include <stdio.h>  
/**/  
short cnt, cnt3;  
short LSM;  
short nm[17], uflg[17];  
short d[5][17];  
short lns[5][9], pdsm[5][9];  
/**/  
void stp01(void), stp02(void), stp03(void), stp04(void);  
void stp05(void), stp06(void), stp07(void), stp08(void);  
void stp09(void), stp10(void), stp11(void), stp12(void);  
void stp13(void), stp14(void), stp15(void), stp16(void);  
void ansprint(void);  
void pr4sol(short x);  
void chksum(void);  
/**/  
/* Main Program */  
int main(){  
short n;  
printf("\n** 'Composite' Semi-Panmagic Squares of Order 4 **\n");  
printf(" [List of Fundamental Solutions: Sol.Count/|Check-Sums/]\n");  
for(n=0;n<17;n++){nm[n]=0; uflg[n]=0;}  
LSM=34; cnt=0; cnt3=0;  
nm[1]=1; uflg[1]=1;  
stp02(); //Begin the Calculations  
if(cnt3>0){pr4sol(cnt3);}  
printf(" [Count = %d] OK!\n",cnt);  
printf("[Listed by Kanji Setsuda on August 18, 2010 with MacOSX & Xcode 3.1.2]\n");  
return 0;  
}
```

```

/* Begin the Calculations */
/* Set N1 */
void stp01(){
  short a;
  for(a=1;a<2;a++){
    if(uflg[a]==0){
      nm[1]=a; uflg[a]=1;
      stp02();
      uflg[a]=0;}
  }
}
/* Set N2 */
void stp02(){
  short a;
  for(a=16;a>1;a--){
    if(uflg[a]==0){
      nm[2]=a; uflg[a]=1;
      stp03();
      uflg[a]=0;}
  }
}
/* Set N4(>n2) */
void stp03(){
  short a;
  for(a=nm[2]-1;a>1;a--){
    if(uflg[a]==0){
      nm[4]=a; uflg[a]=1;
      stp04();
      uflg[a]=0;}
  }
}
/* Set n3=LSM-n1-n2-n4 */
void stp04(){
  short a;
  a=LSM-nm[1]-nm[2]-nm[4];
  if((1<a)&&(a<17)){
    if(uflg[a]==0){
      nm[3]=a; uflg[a]=1;
      stp05();
      uflg[a]=0;}}
}
/* Set N5(<n2) */
void stp05(){
  short a;
  for(a=nm[2]-1;a>1;a--){
    if(uflg[a]==0){
      nm[5]=a; uflg[a]=1;
      stp06();
      uflg[a]=0;}
  }
}
/* Set n6=LSM-n1-n2-n5 */
void stp06(){
  short a;
  a=LSM-nm[1]-nm[2]-nm[5];
  if((1<a)&&(a<17)){
    if(uflg[a]==0){
      nm[6]=a; uflg[a]=1;
      stp07();

```

```

        uflg[a]=0;}}
}
/* Set n7=LSM-n2-n3-n6 */
void stp07(){
    short a;
    a=LSM-nm[2]-nm[3]-nm[6];
    if((1<a)&&(a<17)){
        if(uflg[a]==0){
            nm[7]=a; uflg[a]=1;
            stp08();
            uflg[a]=0;}}
}
/* Set n8=LSM-n3-n4-n7 */
void stp08(){
    short a,b;
    a=LSM-nm[3]-nm[4]-nm[7];
    if((1<a)&&(a<17)){
        b=LSM-nm[4]-nm[1]-nm[5];
        if(a==b){
            if(uflg[a]==0){
                nm[8]=a; uflg[a]=1;
                stp09();
                uflg[a]=0;}}}}
}
/* Set N13(>n5) */
void stp09(){
    short a;
    for(a=nm[5]-1;a>1;a--){
        if(uflg[a]==0){
            nm[13]=a; uflg[a]=1;
            stp10();
            uflg[a]=0;}
    }
}
/* Set n9=LSM-n1-n5-n13 */
void stp10(){
    short a;
    a=LSM-nm[1]-nm[5]-nm[13];
    if((1<a)&&(a<17)){
        if(uflg[a]==0){
            nm[9]=a; uflg[a]=1;
            stp11();
            uflg[a]=0;}}
}
/* Set n16=LSM-n1-n4-n13 */
void stp11(){
    short a;
    a=LSM-nm[1]-nm[4]-nm[13];
    if((1<a)&&(a<17)){
        if(uflg[a]==0){
            nm[16]=a; uflg[a]=1;
            stp12();
            uflg[a]=0;}}
}
/* Set n10=LSM-n5-n6-n9 */
void stp12(){
    short a;
    a=LSM-nm[5]-nm[6]-nm[9];
    if((1<a)&&(a<17)){

```



```

        if(uflg[a]==0){
            nm[10]=a; uflg[a]=1;
            stp13();
            uflg[a]=0;}}
    }
    /* Set n11=LSM-n6-n7-n10 */
    void stp13(){
        short a;
        a=LSM-nm[6]-nm[7]-nm[10];
        if((1<a)&&(a<17)){
            if(uflg[a]==0){
                nm[11]=a; uflg[a]=1;
                stp14();
                uflg[a]=0;}}
    }
    /* Set n12=LSM-n7-n8-n11 */
    void stp14(){
        short a,b,c;
        a=LSM-nm[7]-nm[8]-nm[11];
        if((1<a)&&(a<17)){
            b=LSM-nm[8]-nm[5]-nm[9];
            c=LSM-nm[9]-nm[16]-nm[13];
            if((a==b)&&(a==c)){
                if(uflg[a]==0){
                    nm[12]=a; uflg[a]=1;
                    stp15();
                    uflg[a]=0;}}}}
    }
    /* Set n14=LSM-n9-n10-n13 */
    void stp15(){
        short a,b;
        a=LSM-nm[9]-nm[10]-nm[13];
        if((1<a)&&(a<17)){
            b=LSM-nm[13]-nm[1]-nm[2];
            if(a==b){
                if(uflg[a]==0){
                    nm[14]=a; uflg[a]=1;
                    stp16();
                    uflg[a]=0;}}}}
    }
    /* Set n15=LSM-n10-n11-n14 */
    void stp16(){
        short a,b,c,d;
        a=LSM-nm[10]-nm[11]-nm[14];
        if((1<a)&&(a<17)){
            b=LSM-nm[11]-nm[12]-nm[16];
            c=LSM-nm[14]-nm[2]-nm[3];
            d=LSM-nm[16]-nm[3]-nm[4];
            if((a==b)&&(a==c)&&(a==d)){
                if(uflg[a]==0){
                    nm[15]=a; uflg[a]=1;
                    ansprint();
                    uflg[a]=0;}}}}
    }
    /**/
    /* Print the List of Solutions */
    void ansprint(){
        short n;
        cnt++;

```

```

d[cnt3][0]=cnt;
for(n=1;n<17;n++){d[cnt3][n]=nm[n];}
cnt3++; if(cnt3==4){pr4sol(cnt3); cnt3=0;}
}
/**/
/* Print 4 Solutions */
void pr4sol(short x){
short l,l4,m,n;
chksum();
for(m=0;m<x;m++){
printf("%11d/IRWIP1\\",d[m][0]);
if(m<(x-1)){printf(" ");}
}
printf("\n");
for(l=0;l<4;l++){l4=l*4;
for(m=0;m<x;m++){
for(n=1;n<5;n++){printf("%3d",d[m][l4+n]);}
printf("|%2d|%2d\\",
lnsm[m][l],pdsm[m][l+4]);
if(m<(x-1)){printf(" ");}
}
printf("\n");
}
for(m=0;m<x;m++){
printf("-----+-----");
if(m<(x-1)){printf(" ");}
}
printf("\n");
for(m=0;m<x;m++){
for(n=0;n<4;n++){printf("%2d",lnsm[m][n+4]);}
printf("|C|l|n|Sum|");
if(m<(x-1)){printf(" ");}
}
printf("\n");
for(m=0;m<x;m++){
for(n=0;n<4;n++){printf("/%2d",pdsm[m][n]);}
printf("|P2Sums|");
if(m<(x-1)){printf(" ");}
}
printf("\n");
}
/**/
/* Check every sums of rows and columns */
void chksum(){
short l;
for(l=0;l<4;l++){
lnsm[l][0]=d[l][1]+d[l][2]+d[l][3]+d[l][4];
lnsm[l][1]=d[l][5]+d[l][6]+d[l][7]+d[l][8];
lnsm[l][2]=d[l][9]+d[l][10]+d[l][11]+d[l][12];
lnsm[l][3]=d[l][13]+d[l][14]+d[l][15]+d[l][16];
lnsm[l][4]=d[l][1]+d[l][5]+d[l][9]+d[l][13];
lnsm[l][5]=d[l][2]+d[l][6]+d[l][10]+d[l][14];
lnsm[l][6]=d[l][3]+d[l][7]+d[l][11]+d[l][15];
lnsm[l][7]=d[l][4]+d[l][8]+d[l][12]+d[l][16];
/**/
pdsm[l][0]=d[l][1]+d[l][6]+d[l][11]+d[l][16];
pdsm[l][1]=d[l][2]+d[l][7]+d[l][12]+d[l][13];
pdsm[l][2]=d[l][3]+d[l][8]+d[l][9]+d[l][14];
pdsm[l][3]=d[l][4]+d[l][5]+d[l][10]+d[l][15];

```

```
pdsm[l][4]=d[l][1]+d[l][8]+d[l][11]+d[l][14];  
pdsm[l][5]=d[l][2]+d[l][5]+d[l][12]+d[l][15];  
pdsm[l][6]=d[l][3]+d[l][6]+d[l][9]+d[l][16];  
pdsm[l][7]=d[l][4]+d[l][7]+d[l][10]+d[l][13];  
}  
}  
/**/
```