

Chapter 3. New Algebraic Study of Magic Squares 5x5: Kanji Setsuda

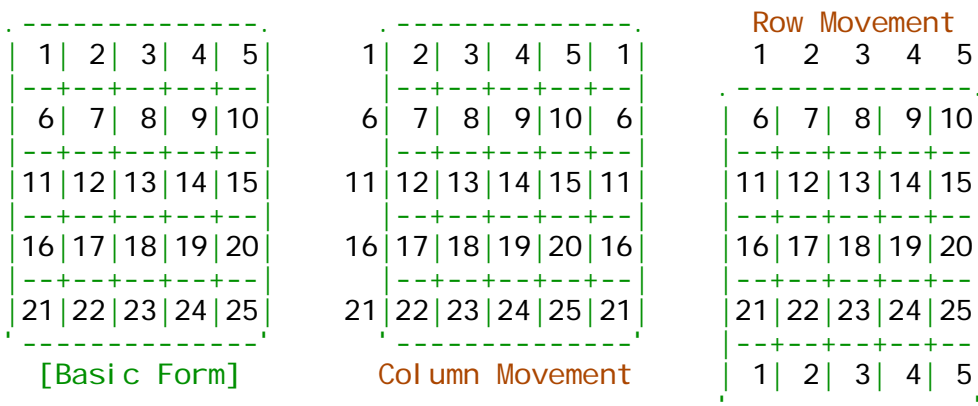
Section 2. New Study of Pandiagonal Magic Squares of Order 5

#1. Basic Conditions for Pan-Diagonal Type

The unique movability of a whole line is one of the important properties of pan-magic squares. You can move the whole row or column on the edge far to the opposite side and put it beyond the other edge. The basic character of pan-magic is not changed at all even after the movement. Each sum of new diagonals is always equal to the magic constant.

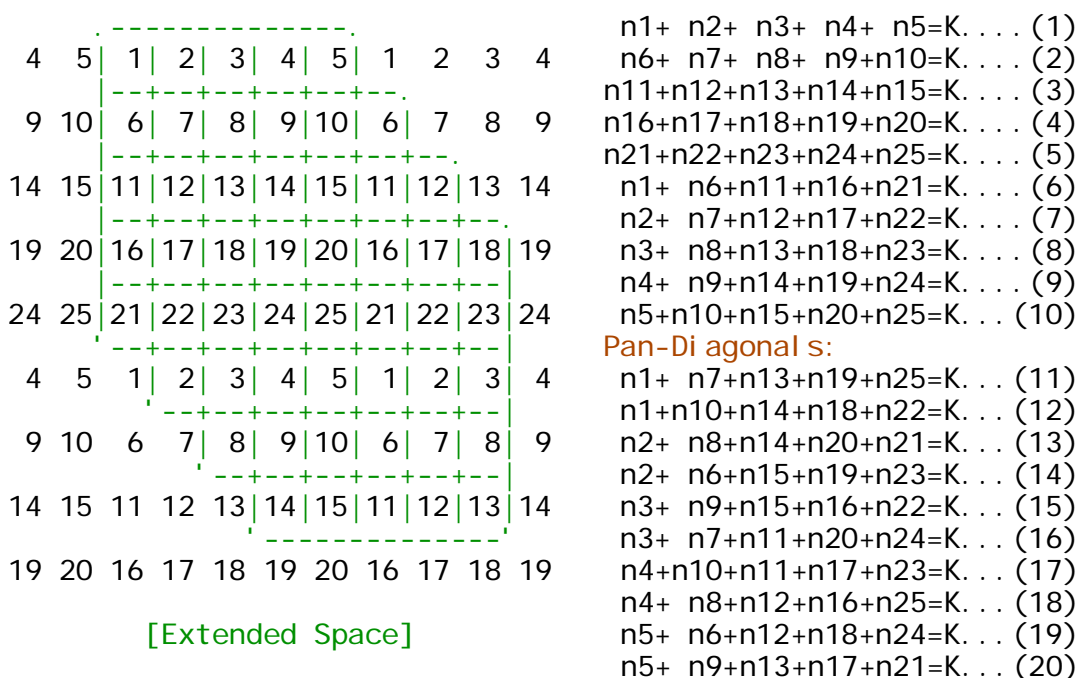
[Figure 1: Pan-Diagonal Magic Square 5x5]

** Unique Movement of the Whole Line **



The 'Pan-Diagonals' are invented for this purpose. There are ten pan-diagonals in the pan-magic square of order 5. Look at the next diagram and basic conditions below.

[Figure 2: Pan-Magic Square 5x5
Basic Form & Basic Conditions]



The 'Extended Space' above is invented so that you could easily find where any pandiagonal is placed. You could see it in a 'straight' line here. Any new square could

also be found by moving the square frame of 5 x 5 in the wide space.

I like to start our discussion simply with this extended space and the basic conditions at the definition stage.

#2. Some Interesting Properties of this Type

[1] $n_1+n_2+n_5+n_6+n_{21}=65$; $n_1+n_7+n_{10}+n_{22}+n_{25}=65$; ...

They seem to be true, but are they really true?

[Figure 3: Pan-Magic Square 5x5
Extended Space & Interesting Properties]

13	14	15	11	12	13	14	(1)+(6)
							$n_1+n_2+n_3+n_4+n_5=K \dots (1)$
18	19	20	16	17	18	19	+ $n_1+n_6+n_{11}+n_{16}+n_{21}=K \dots (6)$
23	24	25	21	22	23	24	$n_1+n_2+n_3+n_4+n_5+n_6+n_{11}+n_{16}+n_{21}=2*K$
							$(n_1+n_2+n_5+n_6+n_{21})+(n_1+n_3+n_4+n_{11}+n_{16})=2K \dots (21)$
3	4	5	1	2	3	4	(11)+(12)
							$n_1+n_7+n_{13}+n_{19}+n_{25}=K \dots (11)$
8	9	10	6	7	8	9	+ $n_1+n_{10}+n_{14}+n_{18}+n_{22}=K \dots (12)$
13	14	15	11	12	13	14	$(n_1+n_7+n_{10}+n_{22}+n_{25})+(n_1+n_{13}+n_{14}+n_{18}+n_{19})=2K$
							$\dots (22)$
18	19	20	16	17	18	19	Find where and how those 5 combined numbers of
							(21) and (22) are placed in the extended space.

[Extended Space]

In our pan-magic squares 5x5 it seems true that $(n_1+n_2+n_5+n_6+n_{21}) = (n_1+n_3+n_4+n_{11}+n_{16}) = (n_1+n_7+n_{10}+n_{22}+n_{25}) = (n_1+n_{13}+n_{14}+n_{18}+n_{19}) = K$

The Proof:

$$(1)+(6)+(13)+(14)+(19)+(20)$$

$$n_1+n_2+n_3+n_4+n_5=K \dots (1)$$

$$n_1+n_6+n_{11}+n_{16}+n_{21}=K \dots (6)$$

$$n_2+n_8+n_{14}+n_{20}+n_{21}=K \dots (13)$$

$$n_2+n_6+n_{15}+n_{19}+n_{23}=K \dots (14)$$

$$n_5+n_6+n_{12}+n_{18}+n_{24}=K \dots (19)$$

$$+n_5+n_9+n_{13}+n_{17}+n_{21}=K \dots (20)$$

$$n_1+n_1+n_2+n_2+n_2+n_3+n_4+n_5+n_5+n_5+n_5+n_6+n_6+n_6+n_6+n_8+n_9+n_{11}+n_{12}+n_{13}+n_{14}+n_{15}+n_{16}+n_{17}+n_{18}+n_{19}+n_{20}+n_{21}+n_{21}+n_{21}+n_{23}+n_{24}=6*K$$

$$(n_1+n_2+n_3+n_4+n_5+n_6+n_8+n_9+n_{11}+n_{12}+n_{13}+n_{14}+n_{15}+n_{16}+n_{17}+n_{18}+n_{19}+n_{20}+n_{21}+n_{23}+n_{24})+(n_1+n_2+n_5+n_6+n_{21})+(n_2+n_5+n_6+n_{21})=6*K$$

Add $(n_1+n_7+n_{10}+n_{22}+n_{25})$ to both sides.

$$(n_1+n_2+n_3+n_4+n_5+\dots+n_{24}+n_{25})+2*(n_1+n_2+n_5+n_6+n_{21})=6*K+(n_1+n_7+n_{10}+n_{22}+n_{25})$$

$$5*K+2*(n_1+n_2+n_5+n_6+n_{21})=6*K+(n_1+n_7+n_{10}+n_{22}+n_{25})$$

$$\text{Therefore } 2*(n_1+n_2+n_5+n_6+n_{21})=K+(n_1+n_7+n_{10}+n_{22}+n_{25}) \dots (23)$$

$$(3)+(4)+(8)+(9)+(11)+(12)$$

$$n_{11}+n_{12}+n_{13}+n_{14}+n_{15}=K \dots (3)$$

$$n_{16}+n_{17}+n_{18}+n_{19}+n_{20}=K \dots (4)$$

$$n_3+n_8+n_{13}+n_{18}+n_{23}=K \dots (8)$$

$$n_4+n_9+n_{14}+n_{19}+n_{24}=K \dots (9)$$

$$n_1+n_7+n_{13}+n_{19}+n_{25}=K \dots (11)$$

$$+n_1+n_{10}+n_{14}+n_{18}+n_{22}=K \dots (12)$$

$$n_1+n_1+n_3+n_4+n_7+n_8+n_9+n_{10}+n_{11}+n_{12}+n_{13}+n_{13}+n_{13}+n_{14}+n_{14}+n_{14}+n_{15}+n_{16}+n_{17}+n_{18}+n_{18}+n_{18}+n_{19}+n_{19}+n_{19}+n_{20}+n_{22}+n_{23}+n_{24}+n_{25}=6*K$$

$$(n_1+n_3+n_4+n_7+n_8+n_9+n_{10}+n_{11}+n_{12}+n_{13}+n_{14}+n_{15}+n_{16}+n_{17}+n_{18}+n_{19}+n_{20}+n_{22}+n_{23}+n_{24}+n_{25})$$

$(n1+n13+n14+n18+n19)+(n13+n14+n18+n19)=6*K$
 Add $(n1+n2+n5+n6+n21)$ to both sides.
 $(n1+n2+n3+n4+n5+...+n24+n25)+2*(n1+n13+n14+n18+n19)=6*K+(n1+n2+n5+n6+n21)$
 $5*K+2*(n1+n13+n14+n18+n19)=6*K+(n1+n2+n5+n6+n21)$
 Therefore $2*(n1+n13+n14+n18+n19)=K+(n1+n2+n5+n6+n21)... (24)$

Compare (22), (23), (24)
 $(n1+n7+n10+n22+n25)+(n1+n13+n14+n18+n19)=2*K... (22)$
 $2*(n1+n2+n5+n6+n21)=K+(n1+n7+n10+n22+n25)... (23)$
 $2*(n1+n13+n14+n18+n19)=K+(n1+n2+n5+n6+n21)... (24)$

Put the name for each:
 $n1+n2+n5+n6+n21=P$; $n1+n7+n10+n22+n25=Q$; $n1+n13+n14+n18+n19=R$
 $Q+R=2K... (22)$
 $2P=K+Q... (23)$
 $2R=K+P... (24)$

$R=2K-Q$; $2(2K-Q)=K+P$; $4K-2Q=K+P$; Therefore $P=3K-2Q$
 $2(3K-2Q)=K+Q$; $6K-4Q=K+Q$; $5K=5Q$; Therefore $Q=K$

As a consequence $P=Q=R=K$; That means

$n1+n2+n5+n6+n21=K$; $n1+n7+n10+n22+n25=K$; $n1+n13+n14+n18+n19=K... (25)$

Bring them back to (21), and you will find $n1+n3+n4+n11+n16=K$

[2] $n1+n2+n6=n20+n24+n25$; $n4+n5+n10=n16+n21+n22$;
 Are they really true?

[Figure 4: Extended Space around n25]

7	8	9	10	6	7	8	
12	13	14	15	11	12	13	
17	18	19	20	16	17	18	
22	23	24	25	21	22	23	
2	3	4	5	1	2	3	
7	8	9	10	6	7	8	
12	13	14	15	11	12	13	

(5)+(10)
 $n21+n22+n23+n24+n25=K... (5)$
 $+n5+n10+n15+n20+n25=K... (10)$

$(n5+n20+n21+n24+n25)$
 $+ (n10+n15+n22+n23+n25)=2K$
 If $(n5+n20+n21+n24+n25)$
 $= (n10+n15+n22+n23+n25)=K$
 then $(n1+n2+n5+n6+n21)$
 $= (n5+n20+n21+n24+n25)=K$
 Subtract $(n5+n21)$ from both sides
 $(n1+n2+n6)=(n20+n24+n25)$

In any pan-magic square whatever is true in one place must also be true in other places in the Extended Space.

If $(n1+n2+n5+n6+n21=65)$ is true, then $(n5+n20+n21+n24+n25=65)$ must be true. Remove the common $(n5+n21)$ from both equations, and you will find $(n1+n2+n6=n20+n24+n25)$ is true.

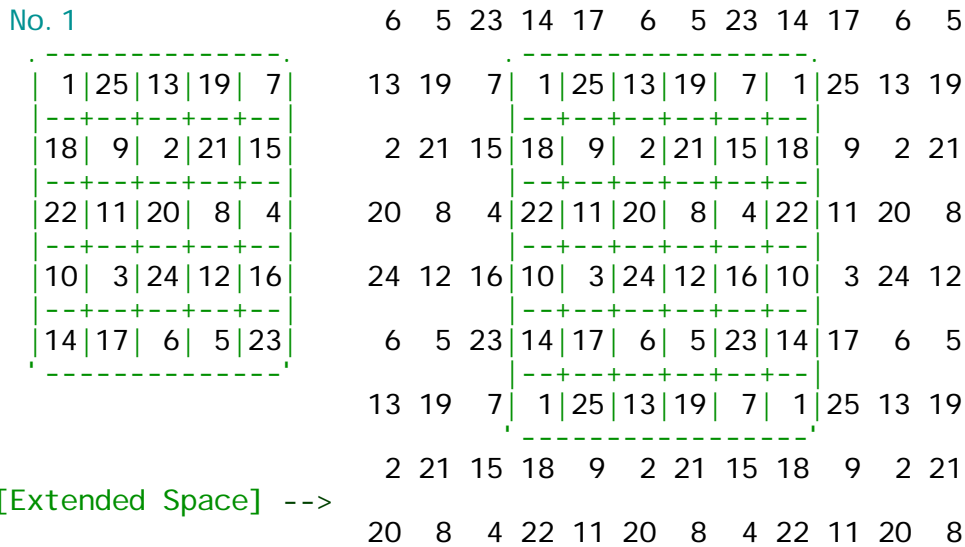
#3. What Patterns must be Unified into a Fundamental?

Take a look at the next figures below. They show how to make the Extended Space and how to read some different patterns out of it.

Suppose you could make the solution No.1. Take every line on the four edges and move it far to the opposite side and put it beyond the other edge. Repeat the same movement as you like, and you will get the 'Extended Space' as shown right.

Move the 5x5 square frame downward, and you will find a new pattern with n1 on the bottom left. Take it out of the space and rewrite it as with n1 on the top left. You may rotate it 90~270 degrees clockwise, or reflect it by the diagonal. You can get the solution T2.

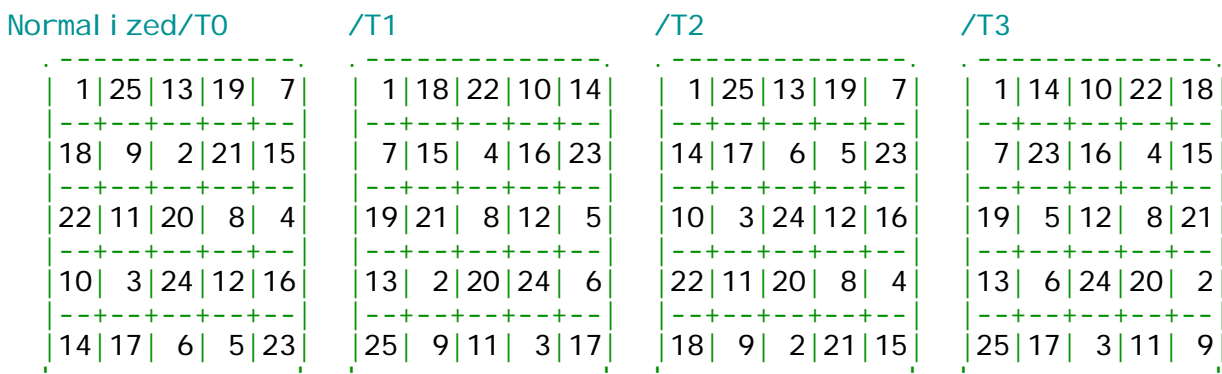
[Figure 5: Various Patterns taken out of the Extended Space]



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 You can find 4 different patterns in all out of the extended space. All of them have the same rows and columns. Although each pan-diagonal is quite different from the others, the sum is always equal to the magic constant. They are really pan-magic squares.



The four above are made into the next four below under $n1 < n5 < n21$, and $n1 < n25$.



I like to consider these 4 patterns as the same one, and assume the solution /T0 as the representative solution. Those patterns that are taken out of the same Extended Space must be unified into a 'fundamental' solution, I think, however different they might look.

#4. How Many Solutions could we Make?

Now let's make this type of magic square of order 5.

If you assume the basic conditions of Figure 2 at the definition stage and add the next list forming inequality conditions $n_1 < n_5 < n_{21}$, $n_1 < n_{25}$, you could make the list of 3600 standard solutions in all.

** Pan-Diagonal Magic Squares of Order 5: Smart List of Standard 3600 Solutions **

	1/ 1 23 20 14 7	37/ 1 23 19 15 7	73/ 1 24 18 15 7	109/ 1 24 17 15 8	145/ 1 18 25 14 7
	15 9 2 21 18	14 10 2 21 18	13 10 2 21 19	12 10 3 21 19	15 9 2 16 23
	22 16 13 10 4	22 16 13 9 5	22 16 14 8 5	23 16 14 7 5	17 21 13 10 4
	8 5 24 17 11	8 4 25 17 11	9 3 25 17 11	9 2 25 18 11	8 5 19 22 11
	19 12 6 3 25	20 12 6 3 24	20 12 6 4 23	20 13 6 4 22	24 12 6 3 20
	181/ 1 18 24 15 7	217/ 1 19 23 15 7	253/ 1 19 22 15 8	289/ 1 13 25 19 7	325/ 1 13 24 20 7
	14 10 2 16 23	13 10 2 16 24	12 10 3 16 24	20 9 2 11 23	19 10 2 11 23
	17 21 13 9 5	17 21 14 8 5	18 21 14 7 5	12 21 18 10 4	12 21 18 9 5
	8 4 20 22 11	9 3 20 22 11	9 2 20 23 11	8 5 14 22 16	8 4 15 22 16
	25 12 6 3 19	25 12 6 4 18	25 13 6 4 17	24 17 6 3 15	25 17 6 3 14
	361/ 1 14 23 20 7	397/ 1 14 22 20 8	433/ 1 8 25 19 12	469/ 1 8 24 20 12	505/ 1 9 23 20 12
	18 10 2 11 24	17 10 3 11 24	20 14 2 6 23	19 15 2 6 23	18 15 2 6 24
	12 21 19 8 5	13 21 19 7 5	7 21 18 15 4	7 21 18 14 5	7 21 19 13 5
	9 3 15 22 16	9 2 15 23 16	13 5 9 22 16	13 4 10 22 16	14 3 10 22 16
	25 17 6 4 13	25 18 6 4 12	24 17 11 3 10	25 17 11 3 9	25 17 11 4 8
	541/ 1 9 22 20 13	577/ 2 23 20 14 6	613/ 2 23 19 15 6	649/ 2 24 18 15 6	685/ 2 24 16 15 8
	17 15 3 6 24	15 9 1 22 18	14 10 1 22 18	13 10 1 22 19	11 10 3 22 19
	8 21 19 12 5	21 17 13 10 4	21 17 13 9 5	21 17 14 8 5	23 17 14 6 5
	14 2 10 23 16	8 5 24 16 12	8 4 25 16 12	9 3 25 16 12	9 1 25 18 12
	25 18 11 4 7	19 11 7 3 25	20 11 7 3 24	20 11 7 4 23	20 13 7 4 21
	721/ 2 18 25 14 6	757/ 2 18 24 15 6	793/ 2 19 23 15 6	829/ 2 19 21 15 8	865/ 2 13 25 19 6
	15 9 1 17 23	14 10 1 17 23	13 10 1 17 24	11 10 3 17 24	20 9 1 12 23
	16 22 13 10 4	16 22 13 9 5	16 22 14 8 5	18 22 14 6 5	11 22 18 10 4
	8 5 19 21 12	8 4 20 21 12	9 3 20 21 12	9 1 20 23 12	8 5 14 21 17
	24 11 7 3 20	25 11 7 3 19	25 11 7 4 18	25 13 7 4 16	24 16 7 3 15
	901/ 2 13 24 20 6	937/ 2 14 23 20 6	973/ 2 14 21 20 8	1009/ 2 8 25 19 11	1045/ 2 8 24 20 11
	19 10 1 12 23	18 10 1 12 24	16 10 3 12 24	20 14 1 7 23	19 15 1 7 23
	11 22 18 9 5	11 22 19 8 5	13 22 19 6 5	6 22 18 15 4	6 22 18 14 5
	8 4 15 21 17	9 3 15 21 17	9 1 15 23 17	13 5 9 21 17	13 4 10 21 17
	25 16 7 3 14	25 16 7 4 13	25 18 7 4 11	24 16 12 3 10	25 16 12 3 9
	1081/ 2 9 23 20 11	1117/ 2 9 21 20 13	1153/ 3 22 20 14 6	1189/ 3 22 19 15 6	1225/ 3 24 17 15 6
	18 15 1 7 24	16 15 3 7 24	15 9 1 23 17	14 10 1 23 17	12 10 1 23 19
	6 22 19 13 5	8 22 19 11 5	21 18 12 10 4	21 18 12 9 5	21 18 14 7 5
	14 3 10 21 17	14 1 10 23 17	7 5 24 16 13	7 4 25 16 13	9 2 25 16 13
	25 16 12 4 8	25 18 12 4 6	19 11 8 2 25	20 11 8 2 24	20 11 8 4 22
	1261/ 3 24 16 15 7	1297/ 3 17 25 14 6	1333/ 3 17 24 15 6	1369/ 3 19 22 15 6	1405/ 3 19 21 15 7
	11 10 2 23 19	15 9 1 18 22	14 10 1 18 22	12 10 1 18 24	11 10 2 18 24
	22 18 14 6 5	16 23 12 10 4	16 23 12 9 5	16 23 14 7 5	17 23 14 6 5
	9 1 25 17 13	7 5 19 21 13	7 4 20 21 13	9 2 20 21 13	9 1 20 22 13
	20 12 8 4 21	24 11 8 2 20	25 11 8 2 19	25 11 8 4 17	25 12 8 4 16
	1441/ 3 12 25 19 6	1477/ 3 12 24 20 6	1513/ 3 14 22 20 6	1549/ 3 14 21 20 7	1585/ 3 7 25 19 11
	20 9 1 13 22	19 10 1 13 22	17 10 1 13 24	16 10 2 13 24	20 14 1 8 22
	11 23 17 10 4	11 23 17 9 5	11 23 19 7 5	12 23 19 6 5	6 23 17 15 4
	7 5 14 21 18	7 4 15 21 18	9 2 15 21 18	9 1 15 22 18	12 5 9 21 18
	24 16 8 2 15	25 16 8 2 14	25 16 8 4 12	25 17 8 4 11	24 16 13 2 10

1621/ 3 7 24 20 11 19 15 1 8 22 6 23 17 14 5 12 4 10 21 18 25 16 13 2 9	1657/ 3 9 22 20 11 17 15 1 8 24 6 23 19 12 5 14 2 10 21 18 25 16 13 4 7	1693/ 3 9 21 20 12 16 15 2 8 24 7 23 19 11 5 14 1 10 22 18 25 17 13 4 6	1729/ 4 22 20 13 6 15 8 1 24 17 21 19 12 10 3 7 5 23 16 14 18 11 9 2 25	1765/ 4 22 18 15 6 13 10 1 24 17 21 19 12 8 5 7 3 25 16 14 20 11 9 2 23
1801/ 4 23 17 15 6 12 10 1 24 18 21 19 13 7 5 8 2 25 16 14 20 11 9 3 22	1837/ 4 23 16 15 7 11 10 2 24 18 22 19 13 6 5 8 1 25 17 14 20 12 9 3 21	1873/ 4 17 25 13 6 15 8 1 19 22 16 24 12 10 3 7 5 18 21 14 23 11 9 2 20	1909/ 4 17 23 15 6 13 10 1 19 22 16 24 12 8 5 7 3 20 21 14 25 11 9 2 18	1945/ 4 18 22 15 6 12 10 1 19 23 16 24 13 7 5 8 2 20 21 14 25 11 9 3 17
1981/ 4 18 21 15 7 11 10 2 19 23 17 24 13 6 5 8 1 20 22 14 25 12 9 3 16	2017/ 4 12 25 18 6 20 8 1 14 22 11 24 17 10 3 7 5 13 21 19 23 16 9 2 15	2053/ 4 12 23 20 6 18 10 1 14 22 11 24 17 8 5 7 3 15 21 19 25 16 9 2 13	2089/ 4 13 22 20 6 17 10 1 14 23 11 24 18 7 5 8 2 15 21 19 25 16 9 3 12	2125/ 4 13 21 20 7 16 10 2 14 23 12 24 18 6 5 8 1 15 22 19 25 17 9 3 11
2161/ 4 7 25 18 11 20 13 1 9 22 6 24 17 15 3 12 5 8 21 19 23 16 14 2 10	2197/ 4 7 23 20 11 18 15 1 9 22 6 24 17 13 5 12 3 10 21 19 25 16 14 2 8	2233/ 4 8 22 20 11 17 15 1 9 23 6 24 18 12 5 13 2 10 21 19 25 16 14 3 7	2269/ 4 8 21 20 12 16 15 2 9 23 7 24 18 11 5 13 1 10 22 19 25 17 14 3 6	2305/ 5 22 19 13 6 14 8 1 25 17 21 20 12 9 3 7 4 23 16 15 18 11 10 2 24
2341/ 5 22 18 14 6 13 9 1 25 17 21 20 12 8 4 7 3 24 16 15 19 11 10 2 23	2377/ 5 23 17 14 6 12 9 1 25 18 21 20 13 7 4 8 2 24 16 15 19 11 10 3 22	2413/ 5 23 16 14 7 11 9 2 25 18 22 20 13 6 4 8 1 24 17 15 19 12 10 3 21	2449/ 5 17 24 13 6 14 8 1 20 22 16 25 12 9 3 7 4 18 21 15 23 11 10 2 19	2485/ 5 17 23 14 6 13 9 1 20 22 16 25 12 8 4 7 3 19 21 15 24 11 10 2 18
2521/ 5 18 22 14 6 12 9 1 20 23 16 25 13 7 4 8 2 19 21 15 24 11 10 3 17	2557/ 5 18 21 14 7 11 9 2 20 23 17 25 13 6 4 8 1 19 22 15 24 12 10 3 16	2593/ 5 12 24 18 6 19 8 1 15 22 11 25 17 9 3 7 4 13 21 20 23 16 10 2 14	2629/ 5 12 23 19 6 18 9 1 15 22 11 25 17 8 4 7 3 14 21 20 24 16 10 2 13	2665/ 5 13 22 19 6 17 9 1 15 23 11 25 18 7 4 8 2 14 21 20 24 16 10 3 12
2701/ 5 13 21 19 7 16 9 2 15 23 12 25 18 6 4 8 1 14 22 20 24 17 10 3 11	2737/ 5 7 24 18 11 19 13 1 10 22 6 25 17 14 3 12 4 8 21 20 23 16 15 2 9	2773/ 5 7 23 19 11 18 14 1 10 22 6 25 17 13 4 12 3 9 21 20 24 16 15 2 8	2809/ 5 8 22 19 11 17 14 1 10 23 6 25 18 12 4 13 2 9 21 20 24 16 15 3 7	2845/ 5 8 21 19 12 16 14 2 10 23 7 25 18 11 4 13 1 9 22 20 24 17 15 3 6
2881/ 6 23 20 4 12 5 14 7 21 18 22 16 3 15 9 13 10 24 17 1 19 2 11 8 25	2893/ 6 23 19 5 12 4 15 7 21 18 22 16 3 14 10 13 9 25 17 1 20 2 11 8 24	2905/ 6 24 18 5 12 3 15 7 21 19 22 16 4 13 10 14 8 25 17 1 20 2 11 9 23	2917/ 6 24 17 5 13 2 15 8 21 19 23 16 4 12 10 14 7 25 18 1 20 3 11 9 22	2929/ 6 18 25 4 12 5 14 7 16 23 17 21 3 15 9 13 10 19 22 1 24 2 11 8 20
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3421/ 9 12 23 5 16 3 20 6 14 22 11 24 2 18 10 17 8 15 21 4 25 1 19 7 13	3433/ 9 13 22 5 16 2 20 6 14 23 11 24 3 17 10 18 7 15 21 4 25 1 19 8 12	3445/ 9 13 21 5 17 1 20 7 14 23 12 24 3 16 10 18 6 15 22 4 25 2 19 8 11	3457/ 10 22 19 3 11 4 13 6 25 17 21 20 2 14 8 12 9 23 16 5 18 1 15 7 24	3469/ 10 22 18 4 11 3 14 6 25 17 21 20 2 13 9 12 8 24 16 5 19 1 15 7 23
3481/ 10 23 17 4 11 2 14 6 25 18 21 20 3 12 9 13 7 24 16 5 19 1 15 8 22	3493/ 10 23 16 4 12 1 14 7 25 18 22 20 3 11 9 13 6 24 17 5 19 2 15 8 21	3505/ 10 17 24 3 11 4 13 6 20 22 16 25 2 14 8 12 9 18 21 5 23 1 15 7 19	3517/ 10 17 23 4 11 3 14 6 20 22 16 25 2 13 9 12 8 19 21 5 24 1 15 7 18	3529/ 10 18 22 4 11 2 14 6 20 23 16 25 3 12 9 13 7 19 21 5 24 1 15 8 17
3541/ 10 18 21 4 12 1 14 7 20 23 17 25 3 11 9 13 6 19 22 5 24 2 15 8 16	3553/ 10 12 24 3 16 4 18 6 15 22 11 25 2 19 8 17 9 13 21 5 23 1 20 7 14	3565/ 10 12 23 4 16 3 19 6 15 22 11 25 2 18 9 17 8 14 21 5 24 1 20 7 13	3577/ 10 13 22 4 16 2 19 6 15 23 11 25 3 17 9 18 7 14 21 5 24 1 20 8 12	3589/ 10 13 21 4 17 1 19 7 15 23 12 25 3 16 9 18 6 14 22 5 24 2 20 8 11

[Count = 3600]

If you assume $n_1=1$ and $n_5 < n_{21}$, $n_2 < n_5$, $n_6 < n_{21}$, you will get the smart list of 144 'Fundamental Solutions'.

It might take a lot of time to calculate and count such a large square as of order 5.

Why don't you use positively such equations as $n_1+n_2+n_5+n_6+n_{21}=65$; and

$n1+n3+n7+n11+n13=65$? That could surely save your time, but it would neither spoil your total survey, nor make you miss any solutions you should have got.

* 'Pan-Diagonal' Magic Squares 5x5: The 144 'Fundamental' Solutions *

1/					2/					3/					4/					5/				
1	10	19	23	12	1	10	18	24	12	1	10	19	22	13	1	10	17	24	13	1	10	18	22	14
18	22	11	5	9	19	22	11	5	8	17	23	11	5	9	19	23	11	5	7	17	24	11	5	8
15	4	8	17	21	15	3	9	17	21	15	4	7	18	21	15	2	9	18	21	15	3	7	19	21
7	16	25	14	3	7	16	25	13	4	8	16	25	14	2	8	16	25	12	4	9	16	25	13	2
24	13	2	6	20	23	14	2	6	20	24	12	3	6	20	22	14	3	6	20	23	12	4	6	20
6/					7/					8/					9/					10/				
1	10	17	23	14	1	9	20	23	12	1	9	18	25	12	1	9	20	22	13	1	9	17	25	13
18	24	11	5	7	18	22	11	4	10	20	22	11	4	8	17	23	11	4	10	20	23	11	4	7
15	2	8	19	21	14	5	8	17	21	14	3	10	17	21	14	5	7	18	21	14	2	10	18	21
9	16	25	12	3	7	16	24	15	3	7	16	24	13	5	8	16	24	15	2	8	16	24	12	5
22	13	4	6	20	25	13	2	6	19	23	15	2	6	19	25	12	3	6	19	22	15	3	6	19
11/					12/					13/					14/					15/				
1	9	18	22	15	1	9	17	23	15	1	8	20	24	12	1	8	19	25	12	1	8	20	22	14
17	25	11	4	8	18	25	11	4	7	19	22	11	3	10	20	22	11	3	9	17	24	11	3	10
14	3	7	20	21	14	2	8	20	21	13	5	9	17	21	13	4	10	17	21	13	5	7	19	21
10	16	24	13	2	10	16	24	12	3	7	16	23	15	4	7	16	23	14	5	9	16	23	15	2
23	12	5	6	19	22	13	5	6	19	25	14	2	6	18	24	15	2	6	18	25	12	4	6	18
16/					17/					18/					19/					20/				
1	8	17	25	14	1	8	19	22	15	1	8	17	24	15	1	7	20	24	13	1	7	19	25	13
20	24	11	3	7	17	25	11	3	9	19	25	11	3	7	19	23	11	2	10	20	23	11	2	9
13	2	10	19	21	13	4	7	20	21	13	2	9	20	21	12	5	9	18	21	12	4	10	18	21
9	16	23	12	5	10	16	23	14	2	10	16	23	12	4	8	16	22	15	4	8	16	22	14	5
22	15	4	6	18	24	12	5	6	18	22	14	5	6	18	25	14	3	6	17	24	15	3	6	17
21/					22/					23/					24/					25/				
1	7	20	23	14	1	7	18	25	14	1	7	19	23	15	1	7	18	24	15	1	13	25	9	17
18	24	11	2	10	20	24	11	2	8	18	25	11	2	9	19	25	11	2	8	10	19	2	11	23
12	5	8	19	21	12	3	10	19	21	12	4	8	20	21	12	3	9	20	21	12	21	8	20	4
9	16	22	15	3	9	16	22	13	5	10	16	22	14	3	10	16	22	13	4	18	5	14	22	6
25	13	4	6	17	23	15	4	6	17	24	13	5	6	17	23	14	5	6	17	24	7	16	3	15
26/					27/					28/					29/					30/				
1	10	14	23	17	1	14	25	8	17	1	10	13	24	17	1	12	25	9	18	1	10	14	22	18
13	22	16	5	9	10	18	2	11	24	14	22	16	5	8	10	19	3	11	22	12	23	16	5	9
20	4	8	12	21	12	21	9	20	3	20	3	9	12	21	13	21	7	20	4	20	4	7	13	21
7	11	25	19	3	19	5	13	22	6	7	11	25	18	4	17	5	14	23	6	8	11	25	19	2
24	18	2	6	15	23	7	16	4	15	23	19	2	6	15	24	8	16	2	15	24	17	3	6	15
31/					32/					33/					34/					35/				
1	14	25	7	18	1	10	12	24	18	1	12	25	8	19	1	10	13	22	19	1	13	25	7	19
10	17	3	11	24	14	23	16	5	7	10	18	4	11	22	12	24	16	5	8	10	17	4	11	23
13	21	9	20	2	20	2	9	13	21	14	21	7	20	3	20	3	7	14	21	14	21	8	20	2
19	5	12	23	6	8	11	25	17	4	17	5	13	24	6	9	11	25	18	2	18	5	12	24	6
22	8	16	4	15	22	19	3	6	15	23	9	16	2	15	23	17	4	6	15	22	9	16	3	15
36/					37/					38/					39/					40/				
1	10	12	23	19	1	13	24	10	17	1	9	15	23	17	1	15	24	8	17	1	9	13	25	17
13	24	16	5	7	9	20	2	11	23	13	22	16	4	10	9	18	2	11	25	15	22	16	4	8
20	2	8	14	21	12	21	8	19	5	19	5	8	12	21	12	21	10	19	3	19	3	10	12	21
9	11	25	17	3	18	4	15	22	6	7	11	24	20	3	20	4	13	22	6	7	11	24	18	5
22	18	4	6	15	25	7	16	3	14	25	18	2	6	14	23	7	16	5	14	23	20	2	6	14
41/					42/					43/					44/					45/				
1	12	24	10	18	1	9	15	22	18	1	15	24	7	18	1	9	12	25	18	1	12	24	8	20
9	20	3	11	22	12	23	16	4	10	9	17	3	11	25	15	23	16	4	7	9	18	5	11	22
13	21	7	19	5	19	5	7	13	21	13	21	10	19	2	19	2	10	13	21	15	21	7	19	3
17	4	15	23	6	8	11	24	20	2	20	4	12	23	6	8	11	24	17	5	17	4	13	25	6
25	8	16	2	14	25	17	3	6	14	22	8	16	5	14	22	20	3	6	14	23	10	16	2	14

46/ 1 9 13 22 20 12 25 16 4 8 19 3 7 15 21 10 11 24 18 2 23 17 5 6 14	47/ 1 13 24 7 20 9 17 5 11 23 15 21 8 19 2 18 4 12 25 6 22 10 16 3 14	48/ 1 9 12 23 20 13 25 16 4 7 19 2 8 15 21 10 11 24 17 3 22 18 5 6 14	49/ 1 14 23 10 17 8 20 2 11 24 12 21 9 18 5 19 3 15 22 6 25 7 16 4 13	50/ 1 8 15 24 17 14 22 16 3 10 18 5 9 12 21 7 11 23 20 4 25 19 2 6 13
51/ 1 15 23 9 17 8 19 2 11 25 12 21 10 18 4 20 3 14 22 6 24 7 16 5 13	52/ 1 8 14 25 17 15 22 16 3 9 18 4 10 12 21 7 11 23 19 5 24 20 2 6 13	53/ 1 12 23 10 19 8 20 4 11 22 14 21 7 18 5 17 3 15 24 6 25 9 16 2 13	54/ 1 8 15 22 19 12 24 16 3 10 18 5 7 14 21 9 11 23 20 2 25 17 4 6 13	55/ 1 15 23 7 19 8 17 4 11 25 14 21 10 18 2 20 3 12 24 6 22 9 16 5 13
56/ 1 8 12 25 19 15 24 16 3 7 18 2 10 14 21 9 11 23 17 5 22 20 4 6 13	57/ 1 12 23 9 20 8 19 5 11 22 15 21 7 18 4 17 3 14 25 6 24 10 16 2 13	58/ 1 8 14 22 20 12 25 16 3 9 18 4 7 15 21 10 11 23 19 2 24 17 5 6 13	59/ 1 14 23 7 20 8 17 5 11 24 15 21 9 18 2 19 3 12 25 6 22 10 16 4 13	60/ 1 8 12 24 20 14 25 16 3 7 18 2 9 15 21 10 11 23 17 4 22 19 5 6 13
61/ 1 14 22 10 18 7 20 3 11 24 13 21 9 17 5 19 2 15 23 6 25 8 16 4 12	62/ 1 7 15 24 18 14 23 16 2 10 17 5 9 13 21 8 11 22 20 4 25 19 3 6 12	63/ 1 15 22 9 18 7 19 3 11 25 13 21 10 17 4 20 2 14 23 6 24 8 16 5 12	64/ 1 7 14 25 18 15 23 16 2 9 17 4 10 13 21 8 11 22 19 5 24 20 3 6 12	65/ 1 13 22 10 19 7 20 4 11 23 14 21 8 17 5 18 2 15 24 6 25 9 16 3 12
66/ 1 7 15 23 19 13 24 16 2 10 17 5 8 14 21 9 11 22 20 3 25 18 4 6 12	67/ 1 15 22 8 19 7 18 4 11 25 14 21 10 17 3 20 2 13 24 6 23 9 16 5 12	68/ 1 7 13 25 19 15 24 16 2 8 17 3 10 14 21 9 11 22 18 5 23 20 4 6 12	69/ 1 13 22 9 20 7 19 5 11 23 15 21 8 17 4 18 2 14 25 6 24 10 16 3 12	70/ 1 7 14 23 20 13 25 16 2 9 17 4 8 15 21 10 11 22 19 3 24 18 5 6 12
71/ 1 14 22 8 20 7 18 5 11 24 15 21 9 17 3 19 2 13 25 6 23 10 16 4 12	72/ 1 7 13 24 20 14 25 16 2 8 17 3 9 15 21 10 11 22 18 4 23 19 5 6 12	73/ 1 8 25 19 12 20 14 2 6 23 7 21 18 15 4 13 5 9 22 16 24 17 11 3 10	74/ 1 9 25 18 12 20 13 2 6 24 7 21 19 15 3 14 5 8 22 16 23 17 11 4 10	75/ 1 7 25 19 13 20 14 3 6 22 8 21 17 15 4 12 5 9 23 16 24 18 11 2 10
76/ 1 9 25 17 13 20 12 3 6 24 8 21 19 15 2 14 5 7 23 16 22 18 11 4 10	77/ 1 7 25 18 14 20 13 4 6 22 9 21 17 15 3 12 5 8 24 16 23 19 11 2 10	78/ 1 8 25 17 14 20 12 4 6 23 9 21 18 15 2 13 5 7 24 16 22 19 11 3 10	79/ 1 8 25 14 17 15 19 2 6 23 7 21 13 20 4 18 5 9 22 11 24 12 16 3 10	80/ 1 15 9 23 17 8 22 16 5 14 20 4 13 7 21 12 6 25 19 3 24 18 2 11 10
81/ 1 9 25 13 17 15 18 2 6 24 7 21 14 20 3 19 5 8 22 11 23 12 16 4 10	82/ 1 15 8 24 17 9 22 16 5 13 20 3 14 7 21 12 6 25 18 4 23 19 2 11 10	83/ 1 7 25 14 18 15 19 3 6 22 8 21 12 20 4 17 5 9 23 11 24 13 16 2 10	84/ 1 15 9 22 18 7 23 16 5 14 20 4 12 8 21 13 6 25 19 2 24 17 3 11 10	85/ 1 9 25 12 18 15 17 3 6 24 8 21 14 20 2 19 5 7 23 11 22 13 16 4 10
86/ 1 15 7 24 18 9 23 16 5 12 20 2 14 8 21 13 6 25 17 4 22 19 3 11 10	87/ 1 7 25 13 19 15 18 4 6 22 9 21 12 20 3 17 5 8 24 11 23 14 16 2 10	88/ 1 15 8 22 19 7 24 16 5 13 20 3 12 9 21 14 6 25 18 2 23 17 4 11 10	89/ 1 8 25 12 19 15 17 4 6 23 9 21 13 20 2 18 5 7 24 11 22 14 16 3 10	90/ 1 15 7 23 19 8 24 16 5 12 20 2 13 9 21 14 6 25 17 3 22 18 4 11 10
91/ 1 8 24 20 12 19 15 2 6 23 7 21 18 14 5 13 4 10 22 16 25 17 11 3 9	92/ 1 10 24 18 12 19 13 2 6 25 7 21 20 14 3 15 4 8 22 16 23 17 11 5 9	93/ 1 7 24 20 13 19 15 3 6 22 8 21 17 14 5 12 4 10 23 16 25 18 11 2 9	94/ 1 10 24 17 13 19 12 3 6 25 8 21 20 14 2 15 4 7 23 16 22 18 11 5 9	95/ 1 7 24 18 15 19 13 5 6 22 10 21 17 14 3 12 4 8 25 16 23 20 11 2 9

1 8 24 17 15	1 8 24 15 17	1 14 10 23 17	1 10 24 13 17	1 14 8 25 17
19 12 5 6 23	14 20 2 6 23	8 22 16 4 15	14 18 2 6 25	10 22 16 4 13
10 21 18 14 2	7 21 13 19 5	19 5 13 7 21	7 21 15 19 3	19 3 15 7 21
13 4 7 25 16	18 4 10 22 11	12 6 24 20 3	20 4 8 22 11	12 6 24 18 5
22 20 11 3 9	25 12 16 3 9	25 18 2 11 9	23 12 16 5 9	23 20 2 11 9
101/	102/	103/	104/	105/
1 7 24 15 18	1 14 10 22 18	1 10 24 12 18	1 14 7 25 18	1 7 24 13 20
14 20 3 6 22	7 23 16 4 15	14 17 3 6 25	10 23 16 4 12	14 18 5 6 22
8 21 12 19 5	19 5 12 8 21	8 21 15 19 2	19 2 15 8 21	10 21 12 19 3
17 4 10 23 11	13 6 24 20 2	20 4 7 23 11	13 6 24 17 5	17 4 8 25 11
25 13 16 2 9	25 17 3 11 9	22 13 16 5 9	22 20 3 11 9	23 15 16 2 9
106/	107/	108/	109/	110/
1 14 8 22 20	1 8 24 12 20	1 14 7 23 20	1 9 23 20 12	1 10 23 19 12
7 25 16 4 13	14 17 5 6 23	8 25 16 4 12	18 15 2 6 24	18 14 2 6 25
19 3 12 10 21	10 21 13 19 2	19 2 13 10 21	7 21 19 13 5	7 21 20 13 4
15 6 24 18 2	18 4 7 25 11	15 6 24 17 3	14 3 10 22 16	15 3 9 22 16
23 17 5 11 9	22 15 16 3 9	22 18 5 11 9	25 17 11 4 8	24 17 11 5 8
111/	112/	113/	114/	115/
1 7 23 20 14	1 10 23 17 14	1 7 23 19 15	1 9 23 17 15	1 9 23 15 17
18 15 4 6 22	18 12 4 6 25	18 14 5 6 22	18 12 5 6 24	13 20 2 6 24
9 21 17 13 5	9 21 20 13 2	10 21 17 13 4	10 21 19 13 2	7 21 14 18 5
12 3 10 24 16	15 3 7 24 16	12 3 9 25 16	14 3 7 25 16	19 3 10 22 11
25 19 11 2 8	22 19 11 5 8	24 20 11 2 8	22 20 11 4 8	25 12 16 4 8
116/	117/	118/	119/	120/
1 13 10 24 17	1 10 23 14 17	1 13 9 25 17	1 7 23 15 19	1 13 10 22 19
9 22 16 3 15	13 19 2 6 25	10 22 16 3 14	13 20 4 6 22	7 24 16 3 15
18 5 14 7 21	7 21 15 18 4	18 4 15 7 21	9 21 12 18 5	18 5 12 9 21
12 6 23 20 4	20 3 9 22 11	12 6 23 19 5	17 3 10 24 11	14 6 23 20 2
25 19 2 11 8	24 12 16 5 8	24 20 2 11 8	25 14 16 2 8	25 17 4 11 8
121/	122/	123/	124/	125/
1 10 23 12 19	1 13 7 25 19	1 7 23 14 20	1 13 9 22 20	1 9 23 12 20
13 17 4 6 25	10 24 16 3 12	13 19 5 6 22	7 25 16 3 14	13 17 5 6 24
9 21 15 18 2	18 2 15 9 21	10 21 12 18 4	18 4 12 10 21	10 21 14 18 2
20 3 7 24 11	14 6 23 17 5	17 3 9 25 11	15 6 23 19 2	19 3 7 25 11
22 14 16 5 8	22 20 4 11 8	24 15 16 2 8	24 17 5 11 8	22 15 16 4 8
126/	127/	128/	129/	130/
1 13 7 24 20	1 9 22 20 13	1 10 22 19 13	1 8 22 20 14	1 10 22 18 14
9 25 16 3 12	17 15 3 6 24	17 14 3 6 25	17 15 4 6 23	17 13 4 6 25
18 2 14 10 21	8 21 19 12 5	8 21 20 12 4	9 21 18 12 5	9 21 20 12 3
15 6 23 17 4	14 2 10 23 16	15 2 9 23 16	13 2 10 24 16	15 2 8 24 16
22 19 5 11 8	25 18 11 4 7	24 18 11 5 7	25 19 11 3 7	23 19 11 5 7
131/	132/	133/	134/	135/
1 8 22 19 15	1 9 22 18 15	1 9 22 15 18	1 12 10 24 18	1 10 22 14 18
17 14 5 6 23	17 13 5 6 24	12 20 3 6 24	9 23 16 2 15	12 19 3 6 25
10 21 18 12 4	10 21 19 12 3	8 21 14 17 5	17 5 14 8 21	8 21 15 17 4
13 2 9 25 16	14 2 8 25 16	19 2 10 23 11	13 6 22 20 4	20 2 9 23 11
24 20 11 3 7	23 20 11 4 7	25 13 16 4 7	25 19 3 11 7	24 13 16 5 7
136/	137/	138/	139/	140/
1 12 9 25 18	1 8 22 15 19	1 12 10 23 19	1 10 22 13 19	1 12 8 25 19
10 23 16 2 14	12 20 4 6 23	8 24 16 2 15	12 18 4 6 25	10 24 16 2 13
17 4 15 8 21	9 21 13 17 5	17 5 13 9 21	9 21 15 17 3	17 3 15 9 21
13 6 22 19 5	18 2 10 24 11	14 6 22 20 3	20 2 8 24 11	14 6 22 18 5
24 20 3 11 7	25 14 16 3 7	25 18 4 11 7	23 14 16 5 7	23 20 4 11 7
141/	142/	143/	144/	
1 8 22 14 20	1 12 9 23 20	1 9 22 13 20	1 12 8 24 20	
12 19 5 6 23	8 25 16 2 14	12 18 5 6 24	9 25 16 2 13	
10 21 13 17 4	17 4 13 10 21	10 21 14 17 3	17 3 14 10 21	
18 2 9 25 11	15 6 22 19 3	19 2 8 25 11	15 6 22 18 4	
24 15 16 3 7	24 18 5 11 7	23 15 16 4 7	23 19 5 11 7	

[Count = 144]

These solutions are essentially the same with the ones Prof. Mutsumi Suzuki discovered before. He presented the perfect list of his own in his page. I just verified it for his great achievement.

But what do these 'Fundamental Solutions' mean?

Could they really make 144 into 3600 pan-diagonal solutions?

I should say "yes". Please look carefully at the same 'Extended Space' shown below again.

** Pan-Magic Squares 5*5 **

4	5	1	2	3	4	5	1	2	3	4
9	10	6	7	8	9	10	6	7	8	9
14	15	11	12	13	14	15	11	12	13	14
19	20	16	17	18	19	20	16	17	18	19
24	25	21	22	23	24	25	21	22	23	24
4	5	1	2	3	4	5	1	2	3	4
9	10	6	7	8	9	10	6	7	8	9
14	15	11	12	13	14	15	11	12	13	14
19	20	16	17	18	19	20	16	17	18	19

[Extended Space]

** Row or Column Rotation-shift makes 25 Transformations **

[Original] 00/	01/	02/	03/	04/
1 2 3 4 5	6 7 8 9 10	11 12 13 14 15	16 17 18 19 20	21 22 23 24 25
6 7 8 9 10	11 12 13 14 15	16 17 18 19 20	21 22 23 24 25	1 2 3 4 5
11 12 13 14 15	16 17 18 19 20	21 22 23 24 25	1 2 3 4 5	6 7 8 9 10
16 17 18 19 20	21 22 23 24 25	1 2 3 4 5	6 7 8 9 10	11 12 13 14 15
21 22 23 24 25	1 2 3 4 5	6 7 8 9 10	11 12 13 14 15	16 17 18 19 20
10/	11/	12/	13/	14/
2 3 4 5 1	7 8 9 10 6	12 13 14 15 11	17 18 19 20 16	22 23 24 25 21
7 8 9 10 6	12 13 14 15 11	17 18 19 20 16	22 23 24 25 21	2 3 4 5 1
12 13 14 15 11	17 18 19 20 16	22 23 24 25 21	2 3 4 5 1	7 8 9 10 6
17 18 19 20 16	22 23 24 25 21	2 3 4 5 1	7 8 9 10 6	12 13 14 15 11
22 23 24 25 21	2 3 4 5 1	7 8 9 10 6	12 13 14 15 11	17 18 19 20 16
20/	21/	22/	23/	24/
3 4 5 1 2	8 9 10 6 7	13 14 15 11 12	18 19 20 16 17	23 24 25 21 22
8 9 10 6 7	13 14 15 11 12	18 19 20 16 17	23 24 25 21 22	3 4 5 1 2
13 14 15 11 12	18 19 20 16 17	23 24 25 21 22	3 4 5 1 2	8 9 10 6 7
18 19 20 16 17	23 24 25 21 22	3 4 5 1 2	8 9 10 6 7	13 14 15 11 12
23 24 25 21 22	3 4 5 1 2	8 9 10 6 7	13 14 15 11 12	18 19 20 16 17
30/	31/	32/	33/	34/
4 5 1 2 3	9 10 6 7 8	14 15 11 12 13	19 20 16 17 18	24 25 21 22 23
9 10 6 7 8	14 15 11 12 13	19 20 16 17 18	24 25 21 22 23	4 5 1 2 3
14 15 11 12 13	19 20 16 17 18	24 25 21 22 23	4 5 1 2 3	9 10 6 7 8
19 20 16 17 18	24 25 21 22 23	4 5 1 2 3	9 10 6 7 8	14 15 11 12 13
24 25 21 22 23	4 5 1 2 3	9 10 6 7 8	14 15 11 12 13	19 20 16 17 18
40/	41/	42/	43/	44/
5 1 2 3 4	10 6 7 8 9	15 11 12 13 14	20 16 17 18 19	25 21 22 23 24
10 6 7 8 9	15 11 12 13 14	20 16 17 18 19	25 21 22 23 24	5 1 2 3 4
15 11 12 13 14	20 16 17 18 19	25 21 22 23 24	5 1 2 3 4	10 6 7 8 9
20 16 17 18 19	25 21 22 23 24	5 1 2 3 4	10 6 7 8 9	15 11 12 13 14
25 21 22 23 24	5 1 2 3 4	10 6 7 8 9	15 11 12 13 14	20 16 17 18 19

Of course, you can find and take out the one with 2~25 on its left top by moving the square frame in the Extended Space as you like.

Let's consider this as a transformation process, and make the original into 25 different objects for each.

Let me show you some results of my experiment. Input one of the standard forms to this transformation process, and get its output of 25 patterns reformed automatically.

**** First Fundamental with 24 Transformations ****

[1]	170/	0/	0/	0/	0/
1 10 19 23 12	18 22 11 5 9	15 4 8 17 21	7 16 25 14 3	24 13 2 6 20	1 10 19 23 12
18 22 11 5 9	15 4 8 17 21	7 16 25 14 3	24 13 2 6 20	1 10 19 23 12	18 22 11 5 9
15 4 8 17 21	7 16 25 14 3	24 13 2 6 20	1 10 19 23 12	18 22 11 5 9	15 4 8 17 21
7 16 25 14 3	24 13 2 6 20	1 10 19 23 12	18 22 11 5 9	15 4 8 17 21	7 16 25 14 3
24 13 2 6 20	1 10 19 23 12	18 22 11 5 9	15 4 8 17 21	7 16 25 14 3	0/
0/	0/	1942/	0/	0/	0/
10 19 23 12 1	22 11 5 9 18	4 8 17 21 15	16 25 14 3 7	13 2 6 20 24	10 19 23 12 1
22 11 5 9 18	4 8 17 21 15	16 25 14 3 7	13 2 6 20 24	10 19 23 12 1	22 11 5 9 18
4 8 17 21 15	16 25 14 3 7	13 2 6 20 24	10 19 23 12 1	22 11 5 9 18	4 8 17 21 15
16 25 14 3 7	13 2 6 20 24	10 19 23 12 1	22 11 5 9 18	4 8 17 21 15	16 25 14 3 7
13 2 6 20 24	10 19 23 12 1	22 11 5 9 18	4 8 17 21 15	16 25 14 3 7	0/
0/	0/	0/	0/	854/	0/
19 23 12 1 10	11 5 9 18 22	8 17 21 15 4	25 14 3 7 16	2 6 20 24 13	19 23 12 1 10
11 5 9 18 22	8 17 21 15 4	25 14 3 7 16	2 6 20 24 13	19 23 12 1 10	11 5 9 18 22
8 17 21 15 4	25 14 3 7 16	2 6 20 24 13	19 23 12 1 10	11 5 9 18 22	8 17 21 15 4
25 14 3 7 16	2 6 20 24 13	19 23 12 1 10	11 5 9 18 22	8 17 21 15 4	25 14 3 7 16
2 6 20 24 13	19 23 12 1 10	11 5 9 18 22	8 17 21 15 4	25 14 3 7 16	0/
0/	2474/	0/	0/	0/	0/
23 12 1 10 19	5 9 18 22 11	17 21 15 4 8	14 3 7 16 25	6 20 24 13 2	23 12 1 10 19
5 9 18 22 11	17 21 15 4 8	14 3 7 16 25	6 20 24 13 2	23 12 1 10 19	5 9 18 22 11
17 21 15 4 8	14 3 7 16 25	6 20 24 13 2	23 12 1 10 19	5 9 18 22 11	17 21 15 4 8
14 3 7 16 25	6 20 24 13 2	23 12 1 10 19	5 9 18 22 11	17 21 15 4 8	14 3 7 16 25
6 20 24 13 2	23 12 1 10 19	5 9 18 22 11	17 21 15 4 8	14 3 7 16 25	0/
0/	0/	0/	1400/	0/	0/
12 1 10 19 23	9 18 22 11 5	21 15 4 8 17	3 7 16 25 14	20 24 13 2 6	12 1 10 19 23
9 18 22 11 5	21 15 4 8 17	3 7 16 25 14	20 24 13 2 6	12 1 10 19 23	9 18 22 11 5
21 15 4 8 17	3 7 16 25 14	20 24 13 2 6	12 1 10 19 23	9 18 22 11 5	21 15 4 8 17
3 7 16 25 14	20 24 13 2 6	12 1 10 19 23	9 18 22 11 5	21 15 4 8 17	20 24 13 2 6
20 24 13 2 6	12 1 10 19 23	9 18 22 11 5	21 15 4 8 17	3 7 16 25 14	12 1 10 19 23

You can remake these results and get them smart under $n_1 < n_{25}$, $n_1 < n_5 < n_{21}$. You can easily find and identify your result with the one in the old 3600 solutions list.

**** Pan-Diagonal Magic Squares of Order 5 ****

**** Transformations: Making 144 into 3600 ****

[1]	170/	475/	3420/	1451/	1198/
1 10 19 23 12	1 10 19 23 12	9 5 11 22 18	3 14 25 16 7	3 14 25 16 7	3 14 25 16 7
18 22 11 5 9	24 13 2 6 20	12 23 19 10 1	20 6 2 13 24	21 17 8 4 15	21 17 8 4 15
15 4 8 17 21	7 16 25 14 3	20 6 2 13 24	12 23 19 10 1	9 5 11 22 18	9 5 11 22 18
7 16 25 14 3	15 4 8 17 21	3 14 25 16 7	9 5 11 22 18	12 23 19 10 1	12 23 19 10 1
24 13 2 6 20	18 22 11 5 9	21 17 8 4 15	21 17 8 4 15	20 6 2 13 24	20 6 2 13 24
377/	128/	1942/	2255/	3148/	3148/
1 12 23 19 10	1 12 23 19 10	4 8 17 21 15	4 8 17 21 15	7 3 14 25 16	7 3 14 25 16
18 9 5 11 22	24 20 6 2 13	16 25 14 3 7	22 11 5 9 18	15 21 17 8 4	15 21 17 8 4
15 21 17 8 4	7 3 14 25 16	13 2 6 20 24	10 19 23 12 1	18 9 5 11 22	18 9 5 11 22
7 3 14 25 16	15 21 17 8 4	10 19 23 12 1	13 2 6 20 24	1 12 23 19 10	1 12 23 19 10
24 20 6 2 13	18 9 5 11 22	22 11 5 9 18	16 25 14 3 7	24 20 6 2 13	24 20 6 2 13

2 6 20 24 13	10 1 12 23 19	4 15 21 17 8	4 15 21 17 8	2 6 20 24 13
25 14 3 7 16	13 24 20 6 2	16 7 3 14 25	22 18 9 5 11	19 23 12 1 10
8 17 21 15 4	16 7 3 14 25	13 24 20 6 2	10 1 12 23 19	11 5 9 18 22
11 5 9 18 22	4 15 21 17 8	10 1 12 23 19	13 24 20 6 2	8 17 21 15 4
19 23 12 1 10	22 18 9 5 11	22 18 9 5 11	16 7 3 14 25	25 14 3 7 16
652/	2474/	2779/	3282/	901/
2 13 24 20 6	5 9 18 22 11	5 9 18 22 11	8 4 15 21 17	2 13 24 20 6
25 16 7 3 14	17 21 15 4 8	23 12 1 10 19	11 22 18 9 5	19 10 1 12 23
8 4 15 21 17	14 3 7 16 25	6 20 24 13 2	19 10 1 12 23	11 22 18 9 5
11 22 18 9 5	6 20 24 13 2	14 3 7 16 25	2 13 24 20 6	8 4 15 21 17
19 10 1 12 23	23 12 1 10 19	17 21 15 4 8	25 16 7 3 14	25 16 7 3 14
3024/	2681/	2432/	1400/	1705/
6 2 13 24 20	5 11 22 18 9	5 11 22 18 9	3 7 16 25 14	3 7 16 25 14
14 25 16 7 3	17 8 4 15 21	23 19 10 1 12	20 24 13 2 6	21 15 4 8 17
17 8 4 15 21	14 25 16 7 3	6 2 13 24 20	12 1 10 19 23	9 18 22 11 5
5 11 22 18 9	6 2 13 24 20	14 25 16 7 3	9 18 22 11 5	12 1 10 19 23
23 19 10 1 12	23 19 10 1 12	17 8 4 15 21	21 15 4 8 17	20 24 13 2 6

[13]

1 8 20 24 12	1 8 20 24 12	10 3 11 22 19	4 15 23 16 7	4 15 23 16 7
19 22 11 3 10	25 14 2 6 18	12 24 20 8 1	18 6 2 14 25	21 17 9 5 13
13 5 9 17 21	7 16 23 15 4	18 6 2 14 25	12 24 20 8 1	10 3 11 22 19
7 16 23 15 4	13 5 9 17 21	4 15 23 16 7	10 3 11 22 19	12 24 20 8 1
25 14 2 6 18	19 22 11 3 10	21 17 9 5 13	21 17 9 5 13	18 6 2 14 25
333/	112/	2482/	2823/	3134/
1 12 24 20 8	1 12 24 20 8	5 9 17 21 13	5 9 17 21 13	7 4 15 23 16
19 10 3 11 22	25 18 6 2 14	16 23 15 4 7	22 11 3 10 19	13 21 17 9 5
13 21 17 9 5	7 4 15 23 16	14 2 6 18 25	8 20 24 12 1	19 10 3 11 22
7 4 15 23 16	13 21 17 9 5	8 20 24 12 1	14 2 6 18 25	1 12 24 20 8
25 18 6 2 14	19 10 3 11 22	22 11 3 10 19	16 23 15 4 7	25 18 6 2 14
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2 6 18 25 14	8 1 12 24 20	5 13 21 17 9	5 13 21 17 9	2 6 18 25 14
23 15 4 7 16	14 25 18 6 2	16 7 4 15 23	22 19 10 3 11	20 24 12 1 8
9 17 21 13 5	16 7 4 15 23	14 25 18 6 2	8 1 12 24 20	11 3 10 19 22
11 3 10 19 22	5 13 21 17 9	8 1 12 24 20	14 25 18 6 2	9 17 21 13 5
20 24 12 1 8	22 19 10 3 11	22 19 10 3 11	16 7 4 15 23	23 15 4 7 16
614/	1322/	1627/	3414/	867/
2 14 25 18 6	3 10 19 22 11	3 10 19 22 11	9 5 13 21 17	2 14 25 18 6
23 16 7 4 15	17 21 13 5 9	24 12 1 8 20	11 22 19 10 3	20 8 1 12 24
9 5 13 21 17	15 4 7 16 23	6 18 25 14 2	20 8 1 12 24	11 22 19 10 3
11 22 19 10 3	6 18 25 14 2	15 4 7 16 23	2 14 25 18 6	9 5 13 21 17
20 8 1 12 24	24 12 1 8 20	17 21 13 5 9	23 16 7 4 15	23 16 7 4 15
3016/	1529/	1280/	1980/	2289/
6 2 14 25 18	3 11 22 19 10	3 11 22 19 10	4 7 16 23 15	4 7 16 23 15
15 23 16 7 4	17 9 5 13 21	24 20 8 1 12	18 25 14 2 6	21 13 5 9 17
17 9 5 13 21	15 23 16 7 4	6 2 14 25 18	12 1 8 20 24	10 19 22 11 3
3 11 22 19 10	6 2 14 25 18	15 23 16 7 4	10 19 22 11 3	12 1 8 20 24
24 20 8 1 12	24 20 8 1 12	17 9 5 13 21	21 13 5 9 17	18 25 14 2 6

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12 21 8 20 4	25 16 14 8 2	15 3 16 7 24	8 2 25 16 14	14 8 2 25 16
18 5 14 22 6	9 3 22 20 11	17 9 25 13 1	21 19 13 7 5	5 21 19 13 7
24 7 16 3 15	17 15 6 4 23	23 11 2 19 10	12 10 1 24 18	18 12 10 1 24
544/	202/	3494/	2695/	2313/
1 17 9 25 13	1 24 18 12 10	10 1 24 18 12	5 14 22 6 18	5 21 19 13 7
10 23 11 2 19	17 15 6 4 23	23 17 15 6 4	7 16 3 15 24	14 8 2 25 16
12 4 20 8 21	9 3 22 20 11	11 9 3 22 20	13 25 9 17 1	22 20 11 9 3
18 6 22 14 5	25 16 14 8 2	2 25 16 14 8	19 2 11 23 10	6 4 23 17 15
24 15 3 16 7	13 7 5 21 19	19 13 7 5 21	21 8 20 4 12	18 12 10 1 24

3032/ 7 5 21 19 13 24 18 12 10 1 15 6 4 23 17 3 22 20 11 9 16 14 8 2 25	965/ 2 11 23 10 19 8 20 4 12 21 14 22 6 18 5 16 3 15 24 7 25 9 17 1 13	687/ 2 25 16 14 8 11 9 3 22 20 23 17 15 6 4 10 1 24 18 12 19 13 7 5 21	2792/ 5 18 6 22 14 7 24 15 3 16 13 1 17 9 25 19 10 23 11 2 21 12 4 20 8	2562/ 5 21 19 13 7 18 12 10 1 24 6 4 23 17 15 22 20 11 9 3 14 8 2 25 16
1171/ 3 22 20 11 9 15 6 4 23 17 24 18 12 10 1 7 5 21 19 13 16 14 8 2 25	1046/ 2 19 10 23 11 8 21 12 4 20 14 5 18 6 22 16 7 24 15 3 25 13 1 17 9	736/ 2 25 16 14 8 19 13 7 5 21 10 1 24 18 12 23 17 15 6 4 11 9 3 22 20	3198/ 8 2 25 16 14 21 19 13 7 5 12 10 1 24 18 4 23 17 15 6 20 11 9 3 22	1503/ 3 15 24 7 16 9 17 1 13 25 11 23 10 19 2 20 4 12 21 8 22 6 18 5 14
1382/ 3 22 20 11 9 16 14 8 2 25 7 5 21 19 13 24 18 12 10 1 15 6 4 23 17	3328/ 9 3 22 20 11 25 16 14 8 2 13 7 5 21 19 1 24 18 12 10 17 15 6 4 23	2157/ 4 12 21 8 20 6 18 5 14 22 15 24 7 16 3 17 1 13 25 9 23 10 19 2 11	1801/ 4 23 17 15 6 12 10 1 24 18 21 19 13 7 5 8 2 25 16 14 20 11 9 3 22	1712/ 3 16 7 24 15 9 25 13 1 17 11 2 19 10 23 20 8 21 12 4 22 14 5 18 6

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349/ 1 13 24 10 17 9 20 2 11 23 12 21 8 19 5 18 4 15 22 6 25 7 16 3 14	83/ 1 25 18 12 9 13 7 4 21 20 24 16 15 8 2 10 3 22 19 11 17 14 6 5 23	2746/ 5 19 8 21 12 6 22 15 4 18 14 3 16 7 25 17 10 24 13 1 23 11 2 20 9	2492/ 5 23 17 14 6 19 11 10 3 22 8 2 24 16 15 21 20 13 7 4 12 9 1 25 18	2890/ 6 5 23 17 14 22 19 11 10 3 15 8 2 24 16 4 21 20 13 7 18 12 9 1 25
542/ 1 17 10 24 13 9 23 11 2 20 12 5 19 8 21 18 6 22 15 4 25 14 3 16 7	166/ 1 25 18 12 9 17 14 6 5 23 10 3 22 19 11 24 16 15 8 2 13 7 4 21 20	3350/ 9 1 25 18 12 23 17 14 6 5 11 10 3 22 19 2 24 16 15 8 20 13 7 4 21	2119/ 4 15 22 6 18 7 16 3 14 25 13 24 10 17 1 20 2 11 23 9 21 8 19 5 12	1737/ 4 21 20 13 7 15 8 2 24 16 22 19 11 10 3 6 5 23 17 14 18 12 9 1 25
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1207/ 3 22 19 11 10 14 6 5 23 17 25 18 12 9 1 7 4 21 20 13 16 15 8 2 24	1010/ 2 20 9 23 11 8 21 12 5 19 15 4 18 6 22 16 7 25 14 3 24 13 1 17 10	772/ 2 24 16 15 8 20 13 7 4 21 9 1 25 18 12 23 17 14 6 5 11 10 3 22 19	3202/ 8 2 24 16 15 21 20 13 7 4 12 9 1 25 18 5 23 17 14 6 19 11 10 3 22	1467/ 3 14 25 7 16 10 17 1 13 24 11 23 9 20 2 19 5 12 21 8 22 6 18 4 15
1390/ 3 22 19 11 10 16 15 8 2 24 7 4 21 20 13 25 18 12 9 1 14 6 5 23 17	3472/ 10 3 22 19 11 24 16 15 8 2 13 7 4 21 20 1 25 18 12 9 17 14 6 5 23	2733/ 5 12 21 8 19 6 18 4 15 22 14 25 7 16 3 17 1 13 24 10 23 9 20 2 11	2377/ 5 23 17 14 6 12 9 1 25 18 21 20 13 7 4 8 2 24 16 15 19 11 10 3 22	1704/ 3 16 7 25 14 10 24 13 1 17 11 2 20 9 23 19 8 21 12 5 22 15 4 18 6

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385/ 1 14 23 10 17 8 20 2 11 24 12 21 9 18 5 19 3 15 22 6 25 7 16 4 13	47/ 1 25 19 12 8 14 7 3 21 20 23 16 15 9 2 10 4 22 18 11 17 13 6 5 24	2782/ 5 18 9 21 12 6 22 15 3 19 13 4 16 7 25 17 10 23 14 1 24 11 2 20 8	2456/ 5 24 17 13 6 18 11 10 4 22 9 2 23 16 15 21 20 14 7 3 12 8 1 25 19	2886/ 6 5 24 17 13 22 18 11 10 4 15 9 2 23 16 3 21 20 14 7 19 12 8 1 25
550/ 1 17 10 23 14 8 24 11 2 20 12 5 18 9 21 19 6 22 15 3 25 13 4 16 7	158/ 1 25 19 12 8 17 13 6 5 24 10 4 22 18 11 23 16 15 9 2 14 7 3 21 20	3206/ 8 1 25 19 12 24 17 13 6 5 11 10 4 22 18 2 23 16 15 9 20 14 7 3 21	1543/ 3 15 22 6 19 7 16 4 13 25 14 23 10 17 1 20 2 11 24 8 21 9 18 5 12	1161/ 3 21 20 14 7 15 9 2 23 16 22 18 11 10 4 6 5 24 17 13 19 12 8 1 25

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421/	39/	2818/	2454/	2882/
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19 2 15 23 6	10 4 23 17 11	18 10 22 14 1	21 20 14 8 2	2 21 20 14 8
25 8 16 4 12	18 12 6 5 24	24 11 3 20 7	13 7 1 25 19	19 13 7 1 25
514/	150/	3062/	967/	585/
1 18 10 22 14	1 25 19 13 7	7 1 25 19 13	2 15 23 6 19	2 21 20 14 8
7 24 11 3 20	18 12 6 5 24	24 18 12 6 5	8 16 4 12 25	15 9 3 22 16
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16 15 9 3 22	22 14 1 18 10	11 10 4 23 17	17 11 10 4 23	23 6 19 2 15
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8 2 21 20 14	14 8 2 21 20	12 25 8 16 4	21 20 14 8 2	11 3 20 7 24
25 19 13 7 1	1 25 19 13 7	18 1 14 22 10	9 3 22 16 15	17 9 21 13 5
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433/	98/	1882/	2067/	3565/
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13 5 9 22 16	7 21 18 15 4	12 19 25 8 1	10 3 11 17 24	17 8 14 21 5
24 17 11 3 10	20 14 2 6 23	23 6 2 14 20	16 22 9 5 13	24 1 20 7 13
256/	337/	3143/	2819/	2338/
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20 23 6 2 14	24 10 3 11 17	4 16 10 12 23	17 11 3 10 24	21 18 15 4 7
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13 16 22 9 5	7 4 15 18 21	18 9 11 25 2	14 2 6 23 20	8 25 19 12 1
24 10 3 11 17	20 23 6 2 14	21 5 17 8 14	21 18 15 4 7	17 11 3 10 24

3301/ 8 14 21 5 17 1 20 7 13 24 12 23 4 16 10 19 6 15 22 3 25 2 18 9 11	1089/ 2 6 23 20 14 18 15 4 7 21 9 22 16 13 5 11 3 10 24 17 25 19 12 1 8	716/ 2 6 23 20 14 25 19 12 1 8 11 3 10 24 17 9 22 16 13 5 18 15 4 7 21	2504/ 5 13 16 22 9 17 24 10 3 11 8 1 12 19 25 14 20 23 6 2 21 7 4 15 18	2723/ 5 13 16 22 9 21 7 4 15 18 14 20 23 6 2 8 1 12 19 25 17 24 10 3 11
1178/ 3 10 24 17 11 22 16 13 5 9 15 4 7 21 18 6 23 20 14 2 19 12 1 8 25	758/ 2 14 20 23 6 18 21 7 4 15 9 5 13 16 22 11 17 24 10 3 25 8 1 12 19	871/ 2 14 20 23 6 25 8 1 12 19 11 17 24 10 3 9 5 13 16 22 18 21 7 4 15	3417/ 9 11 25 2 18 5 17 8 14 21 13 24 1 20 7 16 10 12 23 4 22 3 19 6 15	1623/ 3 10 24 17 11 19 12 1 8 25 6 23 20 14 2 15 4 7 21 18 22 16 13 5 9
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463/ 1 9 25 12 18 15 17 3 6 24 8 21 14 20 2 19 5 7 23 11 22 13 16 4 10	69/ 1 22 19 8 15 9 13 5 21 17 25 16 7 14 3 12 4 23 20 6 18 10 11 2 24	874/ 2 20 14 21 8 11 23 7 5 19 10 4 16 13 22 18 12 25 9 1 24 6 3 17 15	771/ 2 20 14 21 8 24 6 3 17 15 18 12 25 9 1 10 4 16 13 22 11 23 7 5 19	3507/ 10 18 24 2 11 4 12 6 20 23 16 25 3 14 7 13 9 17 21 5 22 1 15 8 19
372/ 1 18 12 25 9 15 24 6 3 17 8 2 20 14 21 19 11 23 7 5 22 10 4 16 13	265/ 1 18 12 25 9 22 10 4 16 13 19 11 23 7 5 8 2 20 14 21 15 24 6 3 17	3251/ 8 19 22 1 15 2 11 10 18 24 20 23 4 12 6 14 7 16 25 3 21 5 13 9 17	2807/ 5 7 23 11 19 13 16 4 10 22 9 25 12 18 1 17 3 6 24 15 21 14 20 2 8	2405/ 5 21 17 9 13 7 14 3 25 16 23 20 6 12 4 11 2 24 18 10 19 8 15 1 22
3401/ 9 17 21 5 13 1 15 8 19 22 18 24 2 11 10 12 6 20 23 4 25 3 14 7 16	1649/ 3 6 24 15 17 14 20 2 8 21 7 23 11 19 5 16 4 10 22 13 25 12 18 1 9	1291/ 3 25 16 7 14 6 12 4 23 20 24 18 10 11 2 15 1 22 19 8 17 9 13 5 21	2604/ 5 19 11 23 7 13 22 10 4 16 9 1 18 12 25 17 15 24 6 3 21 8 2 20 14	2563/ 5 19 11 23 7 21 8 2 20 14 17 15 24 6 3 9 1 18 12 25 13 22 10 4 16
1759/ 4 23 20 6 12 10 11 2 24 18 22 19 8 15 1 13 5 21 17 9 16 7 14 3 25	1514/ 3 17 15 24 6 14 21 8 2 20 7 5 19 11 23 16 13 22 10 4 25 9 1 18 12	1301/ 3 17 15 24 6 25 9 1 18 12 16 13 22 10 4 7 5 19 11 23 14 21 8 2 20	3081/ 7 16 25 3 14 5 13 9 17 21 19 22 1 15 8 11 10 18 24 2 23 4 12 6 20	2259/ 4 10 22 13 16 12 18 1 9 25 6 24 15 17 3 20 2 8 21 14 23 11 19 5 7
1929/ 4 16 13 22 10 23 7 5 19 11 20 14 21 8 2 6 3 17 15 24 12 25 9 1 18	2955/ 6 20 23 4 12 3 14 7 16 25 17 21 5 13 9 15 8 19 22 1 24 2 11 10 18	1149/ 2 8 21 14 20 11 19 5 7 23 10 22 13 16 4 18 1 9 25 12 24 15 17 3 6	673/ 2 24 18 10 11 8 15 1 22 19 21 17 9 13 5 14 3 25 16 7 20 6 12 4 23	2142/ 4 16 13 22 10 12 25 9 1 18 6 3 17 15 24 20 14 21 8 2 23 7 5 19 11

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493/ 1 8 24 15 17 14 20 2 6 23 7 21 13 19 5 18 4 10 22 11 25 12 16 3 9	103/ 1 25 18 7 14 8 12 4 21 20 24 16 10 13 2 15 3 22 19 6 17 9 11 5 23	2602/ 5 19 13 21 7 11 22 10 4 18 9 3 16 12 25 17 15 24 8 1 23 6 2 20 14	2499/ 5 19 13 21 7 23 6 2 20 14 17 15 24 8 1 9 3 16 12 25 11 22 10 4 18	3373/ 9 17 23 5 11 3 15 6 19 22 16 24 2 13 10 12 8 20 21 4 25 1 14 7 18
398/ 1 17 15 24 8 14 23 6 2 20 7 5 19 13 21 18 11 22 10 4 25 9 3 16 12	157/ 1 17 15 24 8 25 9 3 16 12 18 11 22 10 4 7 5 19 13 21 14 23 6 2 20	3083/ 7 18 25 1 14 5 11 9 17 23 19 22 3 15 6 13 10 16 24 2 21 4 12 8 20	2263/ 4 10 22 11 18 12 16 3 9 25 8 24 15 17 1 20 2 6 23 14 21 13 19 5 7	1757/ 4 21 20 8 12 10 13 2 24 16 22 19 6 15 3 11 5 23 17 9 18 7 14 1 25

3255/ 8 20 21 4 12 1 14 7 18 25 17 23 5 11 9 15 6 19 22 3 24 2 13 10 16	1113/ 2 6 23 14 20 13 19 5 7 21 10 22 11 18 4 16 3 9 25 12 24 15 17 1 8	709/ 2 24 16 10 13 6 15 3 22 19 23 17 9 11 5 14 1 25 18 7 20 8 12 4 21	2072/ 4 18 11 22 10 12 25 9 3 16 8 1 17 15 24 20 14 23 6 2 21 7 5 19 13	2003/ 4 18 11 22 10 21 7 5 19 13 20 14 23 6 2 8 1 17 15 24 12 25 9 3 16
1223/ 3 22 19 6 15 9 11 5 23 17 25 18 7 14 1 12 4 21 20 8 16 10 13 2 24	866/ 2 20 14 23 6 13 21 7 5 19 10 4 18 11 22 16 12 25 9 3 24 8 1 17 15	763/ 2 20 14 23 6 24 8 1 17 15 16 12 25 9 3 10 4 18 11 22 13 21 7 5 19	3513/ 10 16 24 2 13 4 12 8 20 21 18 25 1 14 7 11 9 17 23 5 22 3 15 6 19	1611/ 3 9 25 12 16 15 17 1 8 24 6 23 14 20 2 19 5 7 21 13 22 11 18 4 10
1381/ 3 16 12 25 9 22 10 4 18 11 19 13 21 7 5 6 2 20 14 23 15 24 8 1 17	2975/ 6 19 22 3 15 2 13 10 16 24 20 21 4 12 8 14 7 18 25 1 23 5 11 9 17	2877/ 5 7 21 13 19 11 18 4 10 22 9 25 12 16 3 17 1 8 24 15 23 14 20 2 6	2401/ 5 23 17 9 11 7 14 1 25 18 21 20 8 12 4 13 2 24 16 10 19 6 15 3 22	1560/ 3 16 12 25 9 15 24 8 1 17 6 2 20 14 23 19 13 21 7 5 22 10 4 18 11

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505/ 1 9 23 20 12 18 15 2 6 24 7 21 19 13 5 14 3 10 22 16 25 17 11 4 8	64/ 1 9 23 20 12 25 17 11 4 8 14 3 10 22 16 7 21 19 13 5 18 15 2 6 24	2494/ 5 13 19 21 7 16 22 10 3 14 8 4 11 17 25 12 20 23 9 1 24 6 2 15 18	2607/ 5 13 19 21 7 24 6 2 15 18 12 20 23 9 1 8 4 11 17 25 16 22 10 3 14	3277/ 8 12 24 5 16 4 20 6 13 22 11 23 2 19 10 17 9 15 21 3 25 1 18 7 14
262/ 1 12 20 23 9 18 24 6 2 15 7 5 13 19 21 14 16 22 10 3 25 8 4 11 17	309/ 1 12 20 23 9 25 8 4 11 17 14 16 22 10 3 7 5 13 19 21 18 24 6 2 15	3127/ 7 14 25 1 18 5 16 8 12 24 13 22 4 20 6 19 10 11 23 2 21 3 17 9 15	1667/ 3 10 22 16 14 17 11 4 8 25 9 23 20 12 1 15 2 6 24 18 21 19 13 5 7	1186/ 3 10 22 16 14 21 19 13 5 7 15 2 6 24 18 9 23 20 12 1 17 11 4 8 25
3447/ 9 15 21 3 17 1 18 7 14 25 12 24 5 16 8 20 6 13 22 4 23 2 19 10 11	1061/ 2 6 24 18 15 19 13 5 7 21 10 22 16 14 3 11 4 8 25 17 23 20 12 1 9	718/ 2 6 24 18 15 23 20 12 1 9 11 4 8 25 17 10 22 16 14 3 19 13 5 7 21	1352/ 3 14 16 22 10 17 25 8 4 11 9 1 12 20 23 15 18 24 6 2 21 7 5 13 19	1571/ 3 14 16 22 10 21 7 5 13 19 15 18 24 6 2 9 1 12 20 23 17 25 8 4 11
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2101/ 4 11 17 25 8 22 10 3 14 16 13 19 21 7 5 6 2 15 18 24 20 23 9 1 12	3021/ 6 13 22 4 20 2 19 10 11 23 15 21 3 17 9 18 7 14 25 1 24 5 16 8 12	2853/ 5 7 21 19 13 16 14 3 10 22 8 25 17 11 4 12 1 9 23 20 24 18 15 2 6	2408/ 5 7 21 19 13 24 18 15 2 6 12 1 9 23 20 8 25 17 11 4 16 14 3 10 22	1992/ 4 11 17 25 8 20 23 9 1 12 6 2 15 18 24 13 19 21 7 5 22 10 3 14 16

[121]

535/ 1 10 23 12 19 13 17 4 6 25 9 21 15 18 2 20 3 7 24 11 22 14 16 5 8	29/ 1 22 20 9 13 10 14 3 21 17 23 16 7 15 4 12 5 24 18 6 19 8 11 2 25	946/ 2 18 15 21 9 11 24 7 3 20 8 5 16 14 22 19 12 23 10 1 25 6 4 17 13	743/ 2 18 15 21 9 25 6 4 17 13 19 12 23 10 1 8 5 16 14 22 11 24 7 3 20	3219/ 8 19 25 2 11 5 12 6 18 24 16 23 4 15 7 14 10 17 21 3 22 1 13 9 20
344/ 1 19 12 23 10 13 25 6 4 17 9 2 18 15 21 20 11 24 7 3 22 8 5 16 14	275/ 1 19 12 23 10 22 8 5 16 14 20 11 24 7 3 9 2 18 15 21 13 25 6 4 17	3391/ 9 20 22 1 13 2 11 8 19 25 18 24 5 12 6 15 7 16 23 4 21 3 14 10 17	1655/ 3 7 24 11 20 14 16 5 8 22 10 23 12 19 1 17 4 6 25 13 21 15 18 2 9	1253/ 3 21 17 10 14 7 15 4 23 16 24 18 6 12 5 11 2 25 19 8 20 9 13 1 22

#5. How to Identify your Solution with the Fundamental?

Suppose you get an answer below, for instance.

First of all you have to make the individual Extended Space from your answer. Move the 5x5 square frame in the space and find a new square with 1 on the tops. If you want $n_1=1$ on the top left, rotate or reflect it as you like.

[Figure 7:

How to Identify your Answer with the Fundamental]

[Your Answer]	24 17 10 3 11	24 17 10 3 11
5 13 21 19 7	5 13 21 19 7	5 13 21 19 7
16 9 2 15 23	16 9 2 15 23	16 9 2 15 23
12 25 18 6 4	12 25 18 6 4	12 25 18 6 4
8 1 14 22 20	8 1 14 22 20	8 1 14 22 20
24 17 10 3 11	24 17 10 3 11	24 17 10 3 11

Make[Extended Space]/

Take this out/	Reflect left/right
14 22 20 8 1	1 8 20 22 14
10 3 11 24 17	17 24 11 3 10
21 19 7 5 13	13 5 7 19 21
2 15 23 16 9	9 16 23 15 2
18 6 4 12 25	25 12 4 6 18

[Goal: List No. 15]

The list of 144 Fundamental Solutions of mine is made under the conditions: $n_1=1$ on the top left; $n_5 < n_{21}$, $n_2 < n_5$ and $n_6 > n_{21}$.

If you transform your answer into the last pattern shown above, you will find it in the list: No.15

(Written on Aug. 27, Dec. 27, 2001; Revised on May 27, 2005

Worked on Mac OS X(10.3.5) and Xcode 1.5 by Kanji Setsuda)

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