

**Part 4: "New Advanced Study of Magic Squares and Cubes"**

**Chapter 4: Commentary Articles No.2 by Kanji Setsuda**

**"Various Arts and Tools for Studying Magic Squares"**

**Section 9-2: Simultaneous MC444: Both S-C and P-T Made by Binary Number System and "New Euler's Method"**

**0. Let's Go on Building 'Complete Euler Cubes' of Order 4.**

We want to examine and know what a wide range of magic forms we can compose by our "New Euler's Method". Let's go on building another type of Pan-Magic Cubes of order 4 by our new Greco-Latinian Method applied even to every pantriagonal of the object by the Binary Number System.

**1. How about Simultaneous MC444: both Self-complementary and Pan-triagonal?**

I once heard of some European researcher who discovered and reported about the simultaneous magic cube of order 4: both Self-Complementary and Pan-Triagonal.

Let's follow him and try to count the total numbers of them, shall we? I expect we can count them up through, since our new method could always run very fast.

I put some basic conditions and basic form at the first definition stage as follows:

**\* Basic Conditions: \***

$n1+n2+n3+n4=C$ ... d1;	$n1+n17+n33+n49=C$ ... d17;	$n1+n5+n9+n13=C$ ... d33;
$n5+n6+n7+n8=C$ ... d2;	$n2+n18+n34+n50=C$ ... d18;	$n2+n6+n10+n14=C$ ... d34;
$n9+n10+n11+n12=C$ ... d3;	$n3+n19+n35+n51=C$ ... d19;	$n3+n7+n11+n15=C$ ... d35;
$n13+n14+n15+n16=C$ ... d4;	$n4+n20+n36+n52=C$ ... d20;	$n4+n8+n12+n16=C$ ... d36;
$n17+n18+n19+n20=C$ ... d5;	$n5+n21+n37+n53=C$ ... d21;	$n17+n21+n25+n29=C$ ... d37;
$n21+n22+n23+n24=C$ ... d6;	$n6+n22+n38+n54=C$ ... d22;	$n18+n22+n26+n30=C$ ... d38;
$n25+n26+n27+n28=C$ ... d7;	$n7+n23+n39+n55=C$ ... d23;	$n19+n23+n27+n31=C$ ... d39;
$n29+n30+n31+n32=C$ ... d8;	$n8+n24+n40+n56=C$ ... d24;	$n20+n24+n28+n32=C$ ... d40;
$n33+n34+n35+n36=C$ ... d9;	$n9+n25+n41+n57=C$ ... d25;	$n33+n37+n41+n45=C$ ... d41;
$n37+n38+n39+n40=C$ ... d10;	$n10+n26+n42+n58=C$ ... d26;	$n34+n38+n42+n46=C$ ... d42;
$n41+n42+n43+n44=C$ ... d11;	$n11+n27+n43+n59=C$ ... d27;	$n35+n39+n43+n47=C$ ... d43;
$n45+n46+n47+n48=C$ ... d12;	$n12+n28+n44+n60=C$ ... d28;	$n36+n40+n44+n48=C$ ... d44;
$n49+n50+n51+n52=C$ ... d13;	$n13+n29+n45+n61=C$ ... d29;	$n49+n53+n57+n61=C$ ... d45;
$n53+n54+n55+n56=C$ ... d14;	$n14+n30+n46+n62=C$ ... d30;	$n50+n54+n58+n62=C$ ... d46;
$n57+n58+n59+n60=C$ ... d15;	$n15+n31+n47+n63=C$ ... d31;	$n51+n55+n59+n63=C$ ... d47;
$n61+n62+n63+n64=C$ ... d16;	$n16+n32+n48+n64=C$ ... d32;	$n52+n56+n60+n64=C$ ... d48;

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

**\* Complementary Conditions: \***

$n1+n64=n2+n63=n2+n62=n2+n61=$   
 $n5+n60=n5+n59=n5+n58=n5+n57=$   
 $n9+n56=n10+n55=n11+n54=n12+n53=$   
 $n13+n52=n14+n51=n15+n50=n16+n49=$   
 $n17+n48=n18+n47=n19+n46=n20+n45=$   
 $n21+n44=n22+n43=n23+n42=n24+n41=$   
 $n25+n40=n26+n39=n27+n38=n28+n37=$   
 $n29+n36=n30+n35=n31+n34=n32+n33=$   
 $n33+n32=n34+n31=n35+n30=n36+n29=$   
 $n37+n28=n38+n27=n39+n26=n40+n25=$   
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 . . . . . =1 . . . . (cmp1)

**\* Pan-Triagonal Conditions: \***

$n1+n22+n43+n64=C$ ... pd01;	$n1+n24+n43+n62=C$ ... pd02;
$n1+n30+n43+n56=C$ ... pd03;	$n1+n32+n43+n54=C$ ... pd04;
$n2+n23+n44+n61=C$ ... pd05;	$n2+n21+n44+n63=C$ ... pd06;

n2+n31+n44+n53=C ... pd07;		n2+n29+n44+n55=C ... pd08;
n3+n24+n41+n62=C ... pd09;		n3+n22+n41+n64=C ... pd10;
n3+n32+n41+n54=C ... pd11;		n3+n30+n41+n56=C ... pd12;
n4+n21+n42+n63=C ... pd13;		n4+n23+n42+n61=C ... pd14;
n4+n29+n42+n55=C ... pd15;		n4+n31+n42+n53=C ... pd16;
n5+n26+n47+n52=C ... pd17;		n5+n28+n47+n50=C ... pd18;
n5+n18+n47+n60=C ... pd19;		n5+n20+n47+n58=C ... pd20;
n6+n27+n48+n49=C ... pd21;		n6+n25+n48+n51=C ... pd22;
n6+n19+n48+n57=C ... pd23;		n6+n17+n48+n59=C ... pd24;
n7+n28+n45+n50=C ... pd25;		n7+n26+n45+n52=C ... pd26;
n7+n20+n45+n58=C ... pd27;		n7+n18+n45+n60=C ... pd28;
n8+n25+n46+n51=C ... pd29;		n8+n27+n46+n49=C ... pd30;
n8+n17+n46+n59=C ... pd31;		n8+n19+n46+n57=C ... pd32;
n9+n30+n35+n56=C ... pd33;		n9+n32+n35+n54=C ... pd34;
n9+n22+n35+n64=C ... pd35;		n9+n24+n35+n62=C ... pd36;
n10+n31+n36+n53=C ... pd37;		n10+n29+n36+n55=C ... pd38;
n10+n23+n36+n61=C ... pd39;		n10+n21+n36+n63=C ... pd40;
n11+n32+n33+n54=C ... pd41;		n11+n30+n33+n56=C ... pd42;
n11+n24+n33+n62=C ... pd43;		n11+n22+n33+n64=C ... pd44;
n12+n29+n34+n55=C ... pd45;		n12+n31+n34+n53=C ... pd46;
n12+n21+n34+n63=C ... pd47;		n12+n23+n34+n61=C ... pd48;
n13+n18+n39+n60=C ... pd49;		n13+n20+n39+n58=C ... pd50;
n13+n26+n39+n52=C ... pd51;		n13+n28+n39+n50=C ... pd52;
n14+n19+n40+n57=C ... pd53;		n14+n17+n40+n59=C ... pd54;
n14+n27+n40+n49=C ... pd55;		n14+n25+n40+n51=C ... pd56;
n15+n20+n37+n58=C ... pd57;		n15+n18+n37+n60=C ... pd58;
n15+n28+n37+n50=C ... pd59;		n15+n26+n37+n52=C ... pd60;
n16+n17+n38+n59=C ... pd61;		n16+n19+n38+n57=C ... pd62;
n16+n25+n38+n51=C ... pd63;		n16+n27+n38+n49=C ... pd64;

I designed and composed 32 units for the binary decomposed layer of our object.

I picked up various 6 units from them, combined them, calculated and tested them and composed successfully the correct answers as many as 37440.

\*\* 'Complete Euler Cubes': Simultaneous Magic Cubes of \*\*  
 \*\* Order 4: Both Self-Complementary and Pan-Triagonal \*\*  
 \*\* Composed by "New Euler's Method" of Binary System \*\*

[Layer Units]

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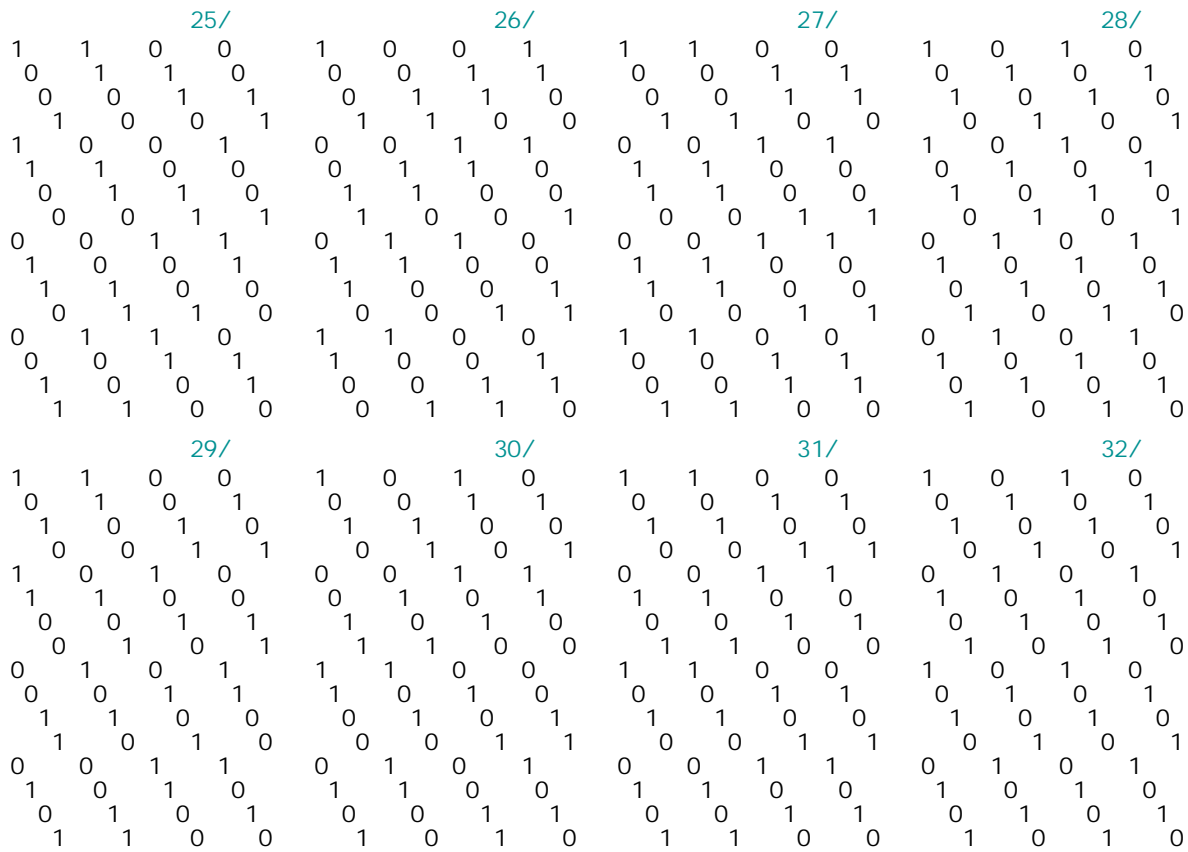
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[Count of Layer Units = 32]

[Reference Table of Matching Digits]

*	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	26	27	28	29	30	31	32
1	64	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	0	
2	32	64	48	48	32	32	32	32	32	48	32	32	32	32	32	16	48	32	32	32	32	16	32	32	32	32	32	32	16	16	0	32
3	32	48	64	32	48	32	40	24	32	32	24	48	32	16	24	32	32	40	48	32	16	40	32	32	40	24	32	16	32	0	16	32
4	32	48	32	64	48	32	24	40	32	32	40	16	32	48	40	32	32	24	16	32	48	24	32	32	24	40	32	16	0	32	16	32
5	32	32	48	48	64	32	32	32	32	16	32	32	32	32	32	48	16	32	32	32	32	32	48	32	32	32	32	0	16	16	32	32
6	32	32	32	32	32	64	48	48	32	32	48	32	32	32	16	32	32	48	32	32	32	16	32	32	16	16	0	32	32	32	32	32
7	32	32	40	24	32	48	64	32	48	24	32	32	48	16	32	24	40	32	48	16	32	32	40	16	32	0	16	32	40	24	32	32
8	32	32	24	40	32	48	32	64	48	40	32	32	16	48	32	40	24	32	16	48	32	32	24	16	0	32	16	32	24	40	32	32
9	32	32	32	32	32	32	48	48	64	32	16	32	32	32	48	32	32	16	32	32	32	48	32	0	16	16	32	32	32	32	32	32
10	32	48	32	32	16	32	24	40	32	64	40	48	32	48	40	32	32	24	16	32	16	24	0	32	24	40	32	48	32	32	16	32
11	32	32	24	40	32	48	32	32	16	40	64	32	48	48	32	40	24	32	16	16	32	0	24	48	32	32	16	32	24	40	32	32
12	32	32	48	16	32	32	32	32	32	48	32	64	32	32	32	48	16	32	32	32	0	32	16	32	32	32	32	32	48	16	32	32
13	32	32	32	32	32	32	48	16	32	32	48	32	64	32	48	32	32	16	32	0	32	16	32	32	48	16	32	32	32	32	32	32
14	32	32	16	48	32	32	16	48	32	48	48	32	32	64	48	48	16	16	0	32	32	16	16	32	16	48	32	32	16	48	32	32
15	32	32	24	40	32	16	32	32	48	40	32	32	48	48	64	40	24	0	16	16	32	32	24	16	32	32	48	32	24	40	32	32
16	32	16	32	32	48	32	24	40	32	32	40	48	32	48	40	64	0	24	16	32	16	24	32	32	24	40	32	16	32	32	48	32
17	32	48	32	32	16	32	40	24	32	32	24	16	32	16	24	0	64	40	48	32	48	40	32	32	40	24	32	48	32	32	16	32
18	32	32	40	24	32	48	32	32	16	24	32	32	16	16	0	24	40	64	48	48	32	32	40	48	32	32	16	32	40	24	32	32
19	32	32	48	16	32	32	48	16	32	16	16	32	32	0	16	16	48	48	64	32	32	48	48	32	48	16	32	32	48	16	32	32
20	32	32	32	32	32	32	16	48	32	32	16	32	0	32	16	32	32	48	32	64	32	48	32	32	16	48	32	32	32	32	32	32
21	32	32	16	48	32	32	32	32	16	32	0	32	32	32	16	48	32	32	32	64	32	48	32	32	32	32	32	32	16	48	32	32
22	32	32	40	24	32	16	32	32	48	24	0	32	16	16	32	24	40	32	48	48	32	64	40	16	32	32	48	32	40	24	32	32
23	32	16	32	32	48	32	40	24	32	0	24	16	32	16	24	32	32	40	48	32	48	40	64	32	40	24	32	16	32	32	48	32
24	32	32	32	32	32	16	16	0	32	48	32	32	16	32	32	48	32	32	32	16	32	64	48	48	32	32	32	32	32	32	32	32
25	32	32	40	24	32	16	32	0	16	24	32	32	48	16	32	24	40	32	48	16	32	32	40	48	64	32	48	32	40	24	32	32
26	32	32	24	40	32	16	0	32	16	40	32	32	16	48	32	40	24	32	16	48	32	24	48	32	64	48	32	24	40	32	32	
27	32	32	32	32	32	0	16	16	32	32	16	32	32	48	32	32	16	32	32	32	48	32	32	48	48	64	32	32	32	32	32	32
28	32	32	16	16	0	32	32	32	48	32	32	32	32	32	16	48	32	32	32	32	32	16	32	32	32	32	32	64	48	48	32	32
29	32	16	32	0	16	32	40	24	32	32	24	48	32	16	24	32	32	40	48	32	16	40	32	32	40	24	32	48	64	32	48	32
30	32	16	0	32	16	32	24	40	32	32	40	16	32	48	40	32	32	24	16	32	48	24	32	32	24	40	32	48	32	64	48	32
31	32	0	16	16	32	32	32	32	16	32	32	32	32	32	32	48	16	32	32	32	32	48	32	32	32	32	32	48	48	64	48	32
32	0	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	64

\*\* Compositions: (Part) \*\*

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

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

1/ 2/ 12/ 5/ 13/ 9/ 71#  
 1-----48-----20-----61  
 |54 27 39 |10  
 59 12 22 37 42 25 7 56  
 |16 63---33---18---29---46---52-- 3  
 8 50 | 41 31 21 35 60 14 |  
 |51 5 30 44 34 24 |15 57  
 62--13-|--19--36---47--32--- 2 49 |  
 9 58 40 23 28 43 53 6  
 55 | 26 38 11 |  
 4-----45-----17-----64

1/ 2/ 13/ 5/ 9/ 6/ 93#  
 1-----47-----28-----54  
 |56 26 45 | 3  
 58 12 24 38 35 17 13 63  
 |15 61---33---19---22---40---60--10  
 16 51 | 34 29 21 42 59 8 |  
 |57 6 23 44 36 31 |14 49  
 55-- 5-|--25--43---46--32--- 4 50 |  
 2 52 48 30 27 41 53 7  
 62 | 20 39 9 |  
 11-----37-----18-----64

1/ 2/ 14/ 5/ 13/ 9/ 189#  
 1-----40-----28-----61  
 |54 19 47 |10  
 51 12 22 45 42 17 15 56  
 | 8 63---33---26---29---38---60-- 3  
 16 58 | 41 31 21 35 52 6 |  
 |59 13 30 44 34 24 | 7 49  
 62-- 5-|--27--36---39--32--- 2 57 |  
 9 50 48 23 20 43 53 14  
 55 | 18 46 11 |  
 4-----37-----25-----64

1/ 2/ 15/ 5/ 7/ 11/ 201#  
 1-----47-----28-----54  
 |55 20 46 | 9  
 52 12 23 38 41 17 14 63  
 |15 62---33---25---22---39---60-- 4  
 16 57 | 34 30 21 36 59 7 |  
 |58 6 29 44 35 31 | 8 49  
 61-- 5-|--26--43---40--32--- 3 50 |  
 2 51 48 24 27 42 53 13  
 56 | 19 45 10 |  
 11-----37-----18-----64

1/ 2/ 19/ 5/ 13/ 9/ 249#  
 9-----48-----20-----53  
 |62 27 39 | 2  
 59 4 30 37 34 25 7 64  
 |16 55---41---18---21---46---52--11  
 8 50 | 33 23 29 43 60 14 |  
 |51 5 22 36 42 32 |15 57  
 54--13-|--19--44---47--24---10 49 |  
 1 58 40 31 28 35 61 6  
 63 | 26 38 3 |  
 12-----45-----17-----56

1/ 2/ 21/ 5/ 13/ 9/ 261#  
 9-----40-----28-----53  
 |62 19 47 | 2  
 51 4 30 45 34 17 15 64  
 | 8 55---41---26---21---38---60--11  
 16 58 | 33 23 29 43 52 6 |  
 |59 13 22 36 42 32 | 7 49  
 54-- 5-|--27--44---39--24---10 57 |  
 1 50 48 31 20 35 61 14  
 63 | 18 46 3 |  
 12-----37-----25-----56

1/ 2/ 28/ 7/ 15/ 11/ 283#  
 9-----39-----32-----50  
 |53 30 36 |11  
 62 16 21 34 43 25 4 55  
 | 7 52---41---27---18--37---64--14  
 8 59 | 42 20 17 46 63 5 |  
 |60 2 19 48 45 23 | 6 57  
 51-- 1-|--28--47---38--24---13 58 |  
 10 61 40 22 31 44 49 3  
 54 | 29 35 12 |  
 15-----33-----26-----56

1/ 3/ 4/ 10/ 13/ 9/ 305#  
 1-----52-----16-----61  
 |58 23 43 | 6  
 55 8 26 41 38 21 11 60  
 |20 63---33---14---29--50---48-- 3  
 12 46 | 37 31 25 35 56 18 |  
 |47 9 30 40 34 28 |19 53  
 62--17-|--15--36---51--32--- 2 45 |  
 5 54 44 27 24 39 57 10  
 59 | 22 42 7 |  
 4-----49-----13-----64

1/ 3/ 10/ 4/ 13/ 9/ 317#  
 1-----52-----16-----61  
 |54           27           39           |10  
 59 12    22 37    42 25    7 56  
 |20 63----33--14----29--50----48-- 3  
 8 46 | 41 31    21 35    60 18 |  
 |47 5    30 44    34 24    |19 57  
 62--17-|--15--36----51--32---- 2 45 |  
 9 58    40 23    28 43    53 6  
 55 |       26           38           11 |  
 4-----49-----13-----64

1/ 3/ 13/ 4/ 9/ 10/ 329#  
 1-----59-----16-----54  
 |55           26           45           | 4  
 58 12    23 37    36 18    13 63  
 |27 62----33-- 8----22--51----48-- 9  
 15 40 | 34 30    21 41    60 19 |  
 |46 5    24 44    35 31    |25 50  
 56--17-|--14--43----57--32---- 3 38 |  
 2 52    47 29    28 42    53 7  
 61 |       20           39           10 |  
 11-----49----- 6-----64

1/ 3/ 16/ 4/ 13/ 9/ 401#  
 1-----60----- 8-----61  
 |54           19           47           |10  
 51 12    22 45    42 17    15 56  
 |28 63----33-- 6----29--58----40-- 3  
 16 38 | 41 31    21 35    52 26 |  
 |39 13    30 44    34 24    |27 49  
 62--25-|-- 7--36----59--32---- 2 37 |  
 9 50    48 23    20 43    53 14  
 55 |       18           46           11 |  
 4-----57----- 5-----64

1/ 3/ 17/ 4/ 13/ 9/ 413#  
 9-----52-----16-----53  
 |62           27           39           | 2  
 59 4    30 37    34 25    7 64  
 |20 55----41--14----21--50----48--11  
 8 46 | 33 23    29 43    60 18 |  
 |47 5    22 36    42 32    |19 57  
 54--17-|--15--44----51--24----10 45 |  
 1 58    40 31    28 35    61 6  
 63 |       26           38           3 |  
 12-----49-----13-----56

1/ 3/ 23/ 4/ 13/ 9/ 425#  
 9-----60----- 8-----53  
 |62           19           47           | 2  
 51 4    30 45    34 17    15 64  
 |28 55----41-- 6----21--58----40--11  
 16 38 | 33 23    29 43    52 26 |  
 |39 13    22 36    42 32    |27 49  
 54--25-|-- 7--44----59--24----10 37 |  
 1 50    48 31    20 35    61 14  
 63 |       18           46           3 |  
 12-----57----- 5-----56

1/ 3/ 29/ 10/ 13/ 9/ 437#  
 9-----60----- 8-----53  
 |50           31           35           |14  
 63 16    18 33    46 29    3 52  
 |28 55----41-- 6----21--58----40--11  
 4 38 | 45 23    17 43    64 26 |  
 |39 1    22 48    42 20    |27 61  
 54--25-|-- 7--44----59--24----10 37 |  
 13 62    36 19    32 47    49 2  
 51 |       30           34           15 |  
 12-----57----- 5-----56

1/ 4/ 3/ 10/ 13/ 9/ 449#  
 1-----44-----24-----61  
 |58           15           51           | 6  
 47 8    26 49    38 13    19 60  
 |12 63----33--22----29--42----56-- 3  
 20 54 | 37 31    25 35    48 10 |  
 |55 17    30 40    34 28    |11 45  
 62-- 9-|--23--36----43--32---- 2 53 |  
 5 46    52 27    16 39    57 18  
 59 |       14           50           7 |  
 4-----41-----21-----64

1/ 5/ 2/ 7/ 15/ 11/ 593#  
 1-----55-----16-----58  
 |61           14           52           | 3  
 46 8    29 50    35 9    20 63  
 |23 60----33--11----26--53----48-- 6  
 24 43 | 34 28    25 38    47 21 |  
 |44 18    27 40    37 31    |22 41  
 59--17-|--12--39----54--32---- 5 42 |  
 2 45    56 30    15 36    57 19  
 62 |       13           51           4 |  
 7-----49-----10-----64

1/ 7/ 2/ 5/ 15/ 11/ 897#  
 1-----55-----28-----46  
 |61           26           40           | 3  
 58 20    29 38    35 9    8 63  
 |23 48----33--11----14--53----60--18  
 24 43 | 34 16    13 50    59 21 |  
 |44 6    15 52    49 31    |22 41  
 47-- 5-|--12--51----54--32----17 42 |  
 2 57    56 30    27 36    45 7  
 62 |       25           39           4 |  
 19-----37-----10-----64

1/ 10/ 3/ 4/ 13/ 9/ 1473#  
 1-----44-----24-----61  
 |46           27           39           |18  
 59 20    14 37    50 25    7 48  
 |12 63----33--22----29--42----56-- 3  
 8 54 | 49 31    13 35    60 10 |  
 |55 5    30 52    34 16    |11 57  
 62-- 9-|--23--36----43--32---- 2 53 |  
 17 58    40 15    28 51    45 6  
 47 |       26           38           19 |  
 4-----41-----21-----64

1/ 12/ 2/ 5/ 13/ 9/ 1617#  
 1-----56-----12-----61  
 |46 27 39 |18  
 59 20 14 37 50 25 7 48  
 |24 63---33--10---29--54---44-- 3  
 8 42 | 49 31 13 35 60 22 |  
 |43 5 30 52 34 16 |23 57  
 62--21-|--11--36---55--32--- 2 41 |  
 17 58 40 15 28 51 45 6  
 47 | 26 38 19 |  
 4-----53-----9-----64

1/ 13/ 2/ 5/ 9/ 6/ 1921#  
 1-----55-----28-----46  
 |48 26 53 | 3  
 58 20 16 38 35 9 21 63  
 |23 61---33--11---14--40---60--18  
 24 43 | 34 29 13 50 59 8 |  
 |57 6 15 52 36 31 |22 41  
 47-- 5-|--25--51---54--32--- 4 42 |  
 2 44 56 30 27 49 45 7  
 62 | 12 39 17 |  
 19-----37-----10-----64

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

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

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

1/ 17/ 3/ 4/ 13/ 9/ 4609#  
 17-----44-----24-----45  
 |62 27 39 | 2  
 59 4 30 37 34 25 7 64  
 |12 47---49--22---13--42---56--19  
 8 54 | 33 15 29 51 60 10 |  
 |55 5 14 36 50 32 |11 57  
 46-- 9-|--23--52---43--16---18 53 |  
 1 58 40 31 28 35 61 6  
 63 | 26 38 3 |  
 20-----41-----21-----48

1/ 19/ 2/ 5/ 13/ 9/ 4753#  
 17-----56-----12-----45  
 |62 27 39 | 2  
 59 4 30 37 34 25 7 64  
 |24 47---49--10---13--54---44--19  
 8 42 | 33 15 29 51 60 22 |  
 |43 5 14 36 50 32 |23 57  
 46--21-|--11--52---55--16---18 41 |  
 1 58 40 31 28 35 61 6  
 63 | 26 38 3 |  
 20-----53-----9-----48

1/ 21/ 2/ 5/ 13/ 9/ 4897#  
 17-----40-----28-----45  
 |62 11 55 | 2  
 43 4 30 53 34 9 23 64  
 | 8 47---49--26---13--38---60--19  
 24 58 | 33 15 29 51 44 6 |  
 |59 21 14 36 50 32 | 7 41  
 46-- 5-|--27--52---39--16---18 57 |  
 1 42 56 31 12 35 61 22  
 63 | 10 54 3 |  
 20-----37-----25-----48

1/ 23/ 3/ 4/ 13/ 9/ 5201#  
 17-----60-----8-----45  
 |62 11 55 | 2  
 43 4 30 53 34 9 23 64  
 |28 47---49-- 6---13--58---40--19  
 24 38 | 33 15 29 51 44 26 |  
 |39 21 14 36 50 32 |27 41  
 46--25-|-- 7--52---59--16---18 37 |  
 1 42 56 31 12 35 61 22  
 63 | 10 54 3 |  
 20-----57-----5-----48

1/ 28/ 2/ 7/ 15/ 11/ 5345#  
 17-----39-----32-----42  
 |45 30 36 |19  
 62 24 13 34 51 25 4 47  
 | 7 44---49--27---10--37---64--22  
 8 59 | 50 12 9 54 63 5 |  
 |60 2 11 56 53 15 | 6 57  
 43-- 1-|--28--55---38--16---21 58 |  
 18 61 40 14 31 52 41 3  
 46 | 29 35 20 |  
 23-----33-----26-----48

1/ 29/ 3/ 10/ 13/ 9/ 5649#  
 17-----60-----8-----45  
 |42 31 35 |22  
 63 24 10 33 54 29 3 44  
 |28 47-----49-- 6-----13--58-----40--19  
 4 38 | 53 15 9 51 64 26 |  
 |39 1 14 56 50 12 |27 61  
 46--25-|-- 7--52-----59--16-----18 37 |  
 21 62 36 11 32 55 41 2  
 43 | 30 34 23 |  
 20-----57-----5-----48

1/ 30/ 4/ 10/ 13/ 9/ 5793#  
 17-----36-----32-----45  
 |42 7 59 |22  
 39 24 10 57 54 5 27 44  
 | 4 47-----49--30-----13--34-----64--19  
 28 62 | 53 15 9 51 40 2 |  
 |63 25 14 56 50 12 | 3 37  
 46-- 1-|--31--52-----35--16-----18 61 |  
 21 38 60 11 8 55 41 26  
 43 | 6 58 23 |  
 20-----33-----29-----48

1/ 31/ 5/ 7/ 15/ 11/ 5937#  
 17-----63-----8-----42  
 |45 6 60 |19  
 38 24 13 58 51 1 28 47  
 |31 44-----49-- 3-----10--61-----40--22  
 32 35 | 50 12 9 54 39 29 |  
 |36 26 11 56 53 15 |30 33  
 43--25-|-- 4--55-----62--16-----21 34 |  
 18 37 64 14 7 52 41 27  
 46 | 5 59 20 |  
 23-----57-----2-----48

2/ 1/ 5/ 7/ 15/ 11/ 6241#  
 1-----31-----40-----58  
 |61 38 28 | 3  
 54 8 45 26 19 33 12 63  
 |15 60-----17--35-----42--29-----56-- 6  
 16 51 | 18 44 41 22 55 13 |  
 |52 10 43 24 21 47 |14 49  
 59-- 9-|--36--23-----30--48----- 5 50 |  
 2 53 32 46 39 20 57 11  
 62 | 37 27 4 |  
 7-----25-----34-----64

3/ 1/ 4/ 10/ 13/ 9/ 9281#  
 1-----52-----16-----61  
 |58 39 27 | 6  
 55 8 42 25 22 37 11 60  
 |36 63-----17--14-----45--50-----32-- 3  
 12 30 | 21 47 41 19 56 34 |  
 |31 9 46 24 18 44 |35 53  
 62--33-|--15--20-----51--48----- 2 29 |  
 5 54 28 43 40 23 57 10  
 59 | 38 26 7 |  
 4-----49-----13-----64

4/ 1/ 3/ 10/ 13/ 9/ 10721#  
 1-----28-----40-----61  
 |58 15 51 | 6  
 31 8 42 49 22 13 35 60  
 |12 63-----17--38-----45--26-----56-- 3  
 36 54 | 21 47 41 19 32 10 |  
 |55 33 46 24 18 44 |11 29  
 62-- 9-|--39--20-----27--48----- 2 53 |  
 5 30 52 43 16 23 57 34  
 59 | 14 50 7 |  
 4-----25-----37-----64

5/ 1/ 2/ 7/ 15/ 11/ 12161#  
 1-----55-----16-----58  
 |61 14 52 | 3  
 30 8 45 50 19 9 36 63  
 |39 60-----17--11-----42--53-----32-- 6  
 40 27 | 18 44 41 22 31 37 |  
 |28 34 43 24 21 47 |38 25  
 59--33-|--12--23-----54--48----- 5 26 |  
 2 29 56 46 15 20 57 35  
 62 | 13 51 4 |  
 7-----49-----10-----64

7/ 1/ 2/ 5/ 15/ 11/ 15201#  
 1-----55-----44-----30  
 |61 42 24 | 3  
 58 36 45 22 19 9 8 63  
 |39 32-----17--11-----14--53-----60--34  
 40 27 | 18 16 13 50 59 37 |  
 |28 6 15 52 49 47 |38 25  
 31-- 5-|--12--51-----54--48-----33 26 |  
 2 57 56 46 43 20 29 7  
 62 | 41 23 4 |  
 35-----21-----10-----64

10/ 1/ 3/ 4/ 13/ 9/ 17505#  
 1-----28-----40-----61  
 |30 43 23 |34  
 59 36 14 21 50 41 7 32  
 |12 63-----17--38-----45--26-----56-- 3  
 8 54 | 49 47 13 19 60 10 |  
 |55 5 46 52 18 16 |11 57  
 62-- 9-|--39--20-----27--48----- 2 53 |  
 33 58 24 15 44 51 29 6  
 31 | 42 22 35 |  
 4-----25-----37-----64

12/ 1/ 2/ 5/ 13/ 9/ 18945#  
 1-----56-----12-----61  
 |30 43 23 |34  
 59 36 14 21 50 41 7 32  
 |40 63-----17--10-----45--54-----28-- 3  
 8 26 | 49 47 13 19 60 38 |  
 |27 5 46 52 18 16 |39 57  
 62--37-|--11--20-----55--48----- 2 25 |  
 33 58 24 15 44 51 29 6  
 31 | 42 22 35 |  
 4-----53----- 9-----64

```

13/ 1/ 2/ 5/ 9/ 6/ 21985#
1-----55-----44-----30
|32      42      53      | 3
58 36   16 22   19 9   37 63
|39 61----17--11----14--24----60--34
40 27 | 18 45   13 50   59 8 |
|57 6   15 52   20 47   |38 25
31-- 5-|--41--51----54--48---- 4 26 |
  2 28   56 46   43 49   29 7
  62 |    12      23      33 |
  35-----21-----10-----64

```

```

14/ 1/ 2/ 5/ 13/ 9/ 31105#
1-----24-----44-----61
|30      11      55      |34
27 36   14 53   50 9   39 32
| 8 63----17--42----45--22----60-- 3
40 58 | 49 47   13 19   28 6 |
|59 37   46 52   18 16   | 7 25
62-- 5-|--43--20----23--48---- 2 57 |
  33 26   56 15   12 51   29 38
  31 |    10      54      35 |
  4-----21-----41-----64

```

```

15/ 1/ 2/ 5/ 7/ 11/ 32545#
1-----55-----44-----30
|31      12      54      |33
28 36   15 22   49 9   38 63
|39 62----17--41----14--23----60-- 4
40 57 | 18 46   13 20   59 7 |
|58 6   45 52   19 47   | 8 25
61-- 5-|--42--51----24--48---- 3 26 |
  2 27   56 16   43 50   29 37
  32 |    11      53      34 |
  35-----21-----10-----64

```

```

16/ 1/ 3/ 4/ 13/ 9/ 36001#
1-----60----- 8-----61
|30      11      55      |34
27 36   14 53   50 9   39 32
|44 63----17-- 6----45--58----24-- 3
40 22 | 49 47   13 19   28 42 |
|23 37   46 52   18 16   |43 25
62--41-|-- 7--20----59--48---- 2 21 |
  33 26   56 15   12 51   29 38
  31 |    10      54      35 |
  4-----57----- 5-----64

```

[Count of Compositions = 37440]

[Counts according to the Value of n1]

1: 4680, 2: 3360, 3: 3216, 4: 2232, 5: 3090, 6: 2106, 7: 1998, 8: 1314,  
9: 2574, 10: 1590, 11: 1482, 12: 798, 13: 1392, 14: 708, 15: 636, 16: 216,  
17: 1512, 18: 828, 19: 756, 20: 336, 21: 702, 22: 282, 23: 246, 24: 54,  
25: 666, 26: 246, 27: 210, 28: 18, 29: 192, 30: ..., 31: ..., 32: ...,  
33: ..., 34: ..., 35: ..., 36: ..., 37: ..., 38: ..., 39: ..., 40: ...

[Counts according to the Value of n43]

1: ..., 2: ..., 3: ..., 4: 48, 5: 6, 6: 54, 7: 66, 8: 174,  
9: 18, 10: 66, 11: 78, 12: 186, 13: 96, 14: 204, 15: 228, 16: 408,  
17: 36, 18: 84, 19: 96, 20: 204, 21: 114, 22: 222, 23: 246, 24: 426,  
25: 138, 26: 246, 27: 270, 28: 450, 29: 300, 30: 480, 31: 516, 32: 780,  
33: 36, 34: 84, 35: 96, 36: 300, 37: 120, 38: 324, 39: 360, 40: 744,  
41: 156, 42: 360, 43: 396, 44: 780, 45: 444, 46: 828, 47: 888, 48: 1476,  
49: 246, 50: 570, 51: 618, 52: 1134, 53: 678, 54: 1194, 55: 1266, 56: 1998,  
57: 954, 58: 1470, 59: 1542, 60: 2274, 61: 1626, 62: 2358, 63: 2454, 64: 3426

OK!

I really certified that there are Simultaneous MC444 as many as 37440.  
But now I recommend you to get the list of 4680 standard solutions with n1=1.  
You can surely find something beautiful, then.

```

/** Simultaneous Type of Magic Cubes 4*4*4 */
/** Both Self-Complementary & Pan-Diagonal */
/** by New Euler's Method of Binary System */
/** (Built by Kanji Setsuda on MacOS Xcode) */
/**/
#include <stdio.h>
/**/
/* Global Var. */
short int cnt;
short cnt2, cnt3;
short lsm, cc;
short u1, u2, u3, u4, u5, u6;
short nm[65], flg[65];

```

```

short anm[72], bnm[72], cnm[72];
short df[49][2], pd[65][2];
short tlu[17][65];
short mtc[17][17];
short cn43[65];
/**/
/* Main Program: Start with n1=1 & n43=64 */
int main(){
short m, n;
printf("\n *** Simul taneous Type of Magic Cubes of Order 4: Both ***\n");
printf(" ** Sel f-Compl ementary & Pan-Diagonal in Standard Form **\n");
printf(" *** wi th n1=1 by New Euler' s Method of Binary System ***\n");
lsm=2; cc=1; cnt=0;
for(n=0; n<65; n++){nm[n]=0; flg[n]=0;}
for(m=0; m<48; m++){for(n=0; n<2; n++){df[m][n]=0;}}
for(m=0; m<64; m++){for(n=0; n<2; n++){pd[m][n]=0;}}
deep01();
printf("\n [Count of Layer Uunits = %d]\n", cnt);
prc4lu();
printf("\n ** Composi ti ons: **\n", cnt);
cnt=0; cnt3=0;
cmbcmp();
if(cnt3>0){pr1ans();}
printf("\n [Count of Composi ti ons = %d]\n", cnt);
printf("\n [Counts according to n43]\n");
prcn43();
printf("\n OK! \n");
return 0;
}
/**/
/* Begin the Search */
/* Set n1=0 & n64=1 */
void deep01(){
short a, b;
for(a=0; a<1; a++){b=cc-a;
if((df[1][a]<2)&&(df[17][a]<2)&&(df[33][a]<2)){
if((pd[1][a]<2)&&(pd[2][a]<2)&&(pd[3][a]<2)&&(pd[4][a]<2)){
if((df[16][b]<2)&&(df[32][b]<2)&&(df[48][b]<2)){
if((pd[1][b]<2)&&(pd[10][b]<2)&&(pd[35][b]<2)&&(pd[44][b]<2)){
nm[1]=a; nm[64]=b;
df[1][a]++; df[17][a]++; df[33][a]++;
pd[1][a]++; pd[2][a]++; pd[3][a]++; pd[4][a]++;
df[16][b]++; df[32][b]++; df[48][b]++;
pd[1][b]++; pd[10][b]++; pd[35][b]++; pd[44][b]++;
deep02();
df[1][a]--; df[17][a]--; df[33][a]--;
pd[1][a]--; pd[2][a]--; pd[3][a]--; pd[4][a]--;
df[16][b]--; df[32][b]--; df[48][b]--;
pd[1][b]--; pd[10][b]--; pd[35][b]--; pd[44][b]--;
}}}}
}
}
/* Set n2 & n63 */
void deep02(){
short a, b;
for(a=1; a>=0; a--){b=cc-a;
if((df[1][a]<2)&&(df[18][a]<2)&&(df[34][a]<2)){
if((pd[5][a]<2)&&(pd[6][a]<2)&&(pd[7][a]<2)&&(pd[8][a]<2)){
if((df[16][b]<2)&&(df[31][b]<2)&&(df[47][b]<2)){
if((pd[6][b]<2)&&(pd[13][b]<2)&&(pd[40][b]<2)&&(pd[47][b]<2)){
nm[2]=a; nm[63]=b;
df[1][a]++; df[18][a]++; df[34][a]++;
pd[5][a]++; pd[6][a]++; pd[7][a]++; pd[8][a]++;
df[16][b]++; df[31][b]++; df[47][b]++;
}
}
}
}
}
}
}

```

```

    pd[6][b]++; pd[13][b]++; pd[40][b]++; pd[47][b]++;
    deep03();
    df[1][a]--; df[18][a]--; df[34][a]--;
    pd[5][a]--; pd[6][a]--; pd[7][a]--; pd[8][a]--;
    df[16][b]--; df[31][b]--; df[47][b]--;
    pd[6][b]--; pd[13][b]--; pd[40][b]--; pd[47][b]--;
    }}}}
}
}
/* Set n3 & n62 */
void deep03(){
    short a, b;
    for(a=0; a<2; a++){b=cc-a;
        if((df[1][a]<2)&&(df[19][a]<2)&&(df[35][a]<2)){
            if((pd[9][a]<2)&&(pd[10][a]<2)&&(pd[11][a]<2)&&(pd[12][a]<2)){
                if((df[16][b]<2)&&(df[30][b]<2)&&(df[46][b]<2)){
                    if((pd[2][b]<2)&&(pd[9][b]<2)&&(pd[36][b]<2)&&(pd[43][b]<2)){
                        nm[3]=a; nm[62]=b;
                        df[1][a]++; df[19][a]++; df[35][a]++;
                        pd[9][a]++; pd[10][a]++; pd[11][a]++; pd[12][a]++;
                        df[16][b]++; df[30][b]++; df[46][b]++;
                        pd[2][b]++; pd[9][b]++; pd[36][b]++; pd[43][b]++;
                        deep04();
                        df[1][a]--; df[19][a]--; df[35][a]--;
                        pd[9][a]--; pd[10][a]--; pd[11][a]--; pd[12][a]--;
                        df[16][b]--; df[30][b]--; df[46][b]--;
                        pd[2][b]--; pd[9][b]--; pd[36][b]--; pd[43][b]--;
                    }}}}
                }
            }
        }
    }
}
/**/
/* Set n4 & n61 */
void deep04(){
    short a, b;
    for(a=1; a>=0; a--){b=cc-a;
        if((df[1][a]<2)&&(df[20][a]<2)&&(df[36][a]<2)){
            if((pd[13][a]<2)&&(pd[14][a]<2)&&(pd[15][a]<2)&&(pd[16][a]<2)){
                if((df[16][b]<2)&&(df[29][b]<2)&&(df[45][b]<2)){
                    if((pd[5][b]<2)&&(pd[14][b]<2)&&(pd[39][b]<2)&&(pd[48][b]<2)){
                        nm[4]=a; nm[61]=b; cnt2=0;
                        df[1][a]++; df[20][a]++; df[36][a]++;
                        pd[13][a]++; pd[14][a]++; pd[15][a]++; pd[16][a]++;
                        df[16][b]++; df[29][b]++; df[45][b]++;
                        pd[5][b]++; pd[14][b]++; pd[39][b]++; pd[48][b]++;
                        deep05();
                        df[1][a]--; df[20][a]--; df[36][a]--;
                        pd[13][a]--; pd[14][a]--; pd[15][a]--; pd[16][a]--;
                        df[16][b]--; df[29][b]--; df[45][b]--;
                        pd[5][b]--; pd[14][b]--; pd[39][b]--; pd[48][b]--;
                    }}}}
                }
            }
        }
    }
}
/**/
/* .... (Ski p).... */
/**/
/* Set n31 & n34 */
void deep31(){
    short a, b;
    for(a=0; a<2; a++){b=cc-a;
        if((df[8][a]<2)&&(df[31][a]<2)&&(df[39][a]<2)){
            if((pd[7][a]<2)&&(pd[16][a]<2)&&(pd[37][a]<2)&&(pd[46][a]<2)){
                if((df[9][b]<2)&&(df[18][b]<2)&&(df[42][b]<2)){
                    if((pd[45][b]<2)&&(pd[46][b]<2)&&(pd[47][b]<2)&&(pd[48][b]<2)){
                        nm[31]=a; nm[34]=b;
                        df[8][a]++; df[31][a]++; df[39][a]++;
                    }
                }
            }
        }
    }
}

```

```

    pd[7][a]++; pd[16][a]++; pd[37][a]++; pd[46][a]++;
    df[9][b]++; df[18][b]++; df[42][b]++;
    pd[45][b]++; pd[46][b]++; pd[47][b]++; pd[48][b]++;
    deep32();
    df[8][a]--; df[31][a]--; df[39][a]--;
    pd[7][a]--; pd[16][a]--; pd[37][a]--; pd[46][a]--;
    df[9][b]--; df[18][b]--; df[42][b]--;
    pd[45][b]--; pd[46][b]--; pd[47][b]--; pd[48][b]--;
    }}}}
}
}
/* Set n32 & n33 */
void deep32(){
    short a, b;
    for(a=1; a>=0; a--){b=cc-a;
        if((df[8][a]<2)&&(df[32][a]<2)&&(df[40][a]<2)){
            if((pd[4][a]<2)&&(pd[11][a]<2)&&(pd[34][a]<2)&&(pd[41][a]<2)){
                if((df[9][b]<2)&&(df[17][b]<2)&&(df[41][b]<2)){
                    if((pd[41][b]<2)&&(pd[42][b]<2)&&(pd[43][b]<2)&&(pd[44][b]<2)){
                        nm[32]=a; nm[33]=b;
                        df[8][a]++; df[32][a]++; df[40][a]++;
                        pd[4][a]++; pd[11][a]++; pd[34][a]++; pd[41][a]++;
                        df[9][b]++; df[17][b]++; df[41][b]++;
                        pd[41][b]++; pd[42][b]++; pd[43][b]++; pd[44][b]++;
                        recordans();
                        df[8][a]--; df[32][a]--; df[40][a]--;
                        pd[4][a]--; pd[11][a]--; pd[34][a]--; pd[41][a]--;
                        df[9][b]--; df[17][b]--; df[41][b]--;
                        pd[41][b]--; pd[42][b]--; pd[43][b]--; pd[44][b]--;
                    }}}}
                }
            }
        }
    }
}
/**/
/* Record the Answer */
void recordans(){
    short n;
    cnt++;
    tlu[cnt-1][0]=cnt;
    for(n=1; n<65; n++){tlu[cnt-1][n]=nm[n]; }
}
/**/
/* Print the Layer Units */
void prc4lu(){
    short m, n, t, l;
    printf("\n [Layer Units]");
    for(m=0; m<cnt; m=m+3){
        anm[0]=m+1; bnm[0]=m+2; cnm[0]=m+3;
        for(n=1; n<65; n++){
            anm[n]=tlu[m][n]; bnm[n]=tlu[m+1][n]; cnm[n]=tlu[m+2][n];
        }
        if(m<15){pr3lu(); }else{pr1lu(); }
    }
    for(m=0; m<cnt; m++){
        for(n=0; n<cnt; n++){
            t=0;
            for(l=1; l<65; l++){if(tlu[m][l]==tlu[n][l]){t++; }}
            mtc[m][n]=t;
        }
    }
    printf("\n [Reference Table of Matching Digits]\n");
    printf("\n *|");
    for(n=0; n<cnt; n++){printf("%3d", n+1); }
    printf("\n ---+-----");
    for(m=0; m<cnt; m++){
        printf("\n%3d|", m+1);
    }
}

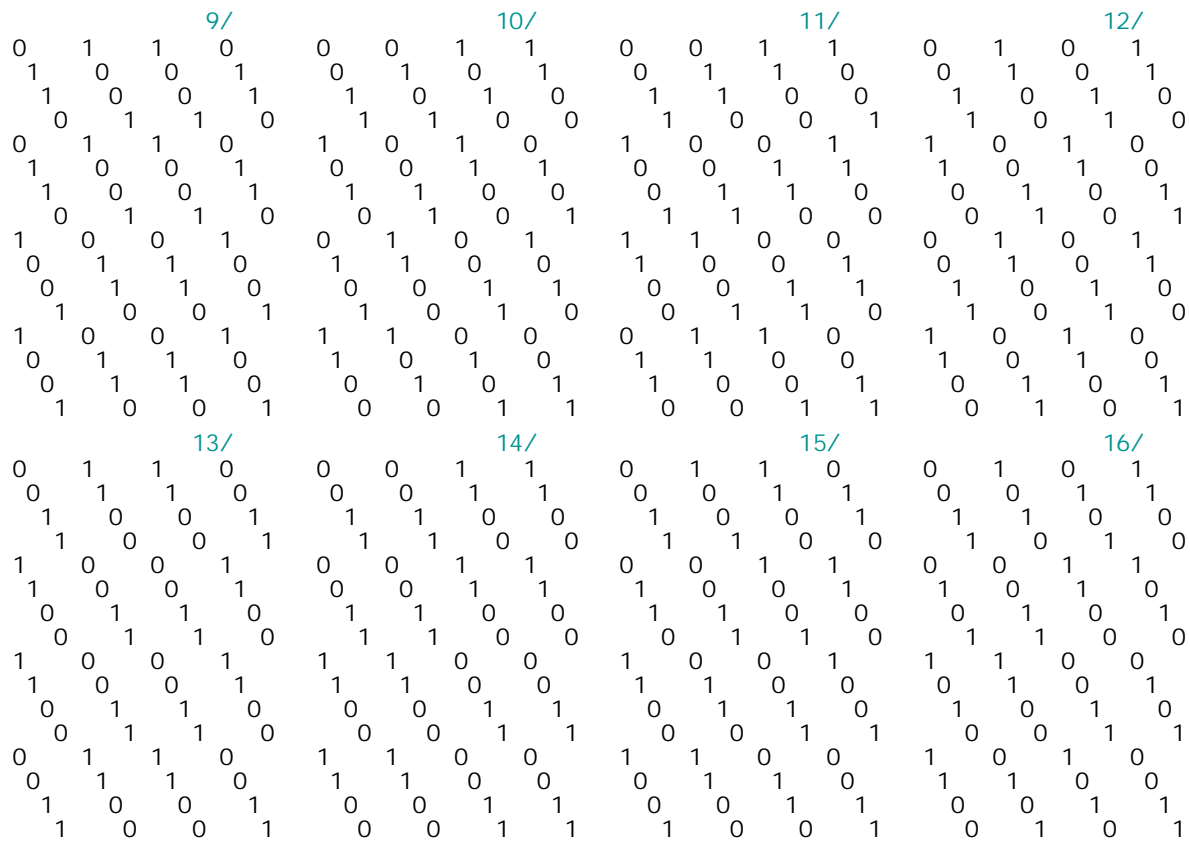
```

```

        for(n=0; n<cnt; n++){
            t=mtc[m][n];
            printf("%3d", t);
        }
    }
    printf("\n");
}
/**/
/* Print 3 Forms */
void pr3l u(){
    short l, m, ms, n, n16, d;
    printf("\n%20d/%24d/%24d/\n", anm[0], bnm[0], cnm[0]);
    for(l=0; l<16; l=l+4){
        for(m=0; m<4; m++){
            for(ms=m; ms>=0; ms--){printf(" ");}
            for(n=0; n<4; n++){n16=n*16;
                printf("%2d", anm[l+m+n16+1]);
            }
            printf(" ");
            for(n=0; n<4; n++){n16=n*16;
                printf("%2d", bnm[l+m+n16+1]);
            }
            printf(" ");
            for(n=0; n<4; n++){n16=n*16; d=cnm[l+m+n16+1];
                if(n<3){printf("%2d", d);}
                else{printf("%2d\n", d);}
            }
        }
    }
}
/**/
/* .... (Skip).... */
/**/
/* Combine abd Compose */
void cmbc mp(){
    short n, d, fc, ul, mc;
    ul=16; mc=32;
    for(u1=0; u1<ul; u1++){
        for(u2=0; u2<ul; u2++){cnt2=0;
            if(mtc[u2][u1]==mc){
                for(u3=0; u3<ul; u3++){
                    if((mtc[u3][u1]==mc)&&(mtc[u3][u2]==mc)){
                        for(u4=0; u4<ul; u4++){
                            if((mtc[u4][u1]==mc)&&(mtc[u4][u2]==mc)){
                                if(mtc[u4][u3]==mc){
                                    for(u5=0; u5<ul; u5++){
                                        if((mtc[u5][u1]==mc)&&(mtc[u5][u2]==mc)){
                                            if((mtc[u5][u3]==mc)&&(mtc[u5][u4]==mc)){
                                                for(u6=0; u6<ul; u6++){
                                                    if((mtc[u6][u1]==mc)&&(mtc[u6][u2]==mc)&&(mtc[u6][u3]==mc)){
                                                        if((mtc[u6][u4]==mc)&&(mtc[u6][u5]==mc)){
                                                            for(n=1; n<65; n++){flg[n]=0;}
                                                            for(n=1; n<65; n++){
                                                                d=tlu[u1][n]*32+tlu[u2][n]*16+tlu[u3][n]*8
                                                                    +tlu[u4][n]*4+tlu[u5][n]*2+tlu[u6][n]+1;
                                                                nm[n]=d; flg[d]++;
                                                            }
                                                            fc=0;
                                                            for(n=1; n<65; n++){
                                                                if(flg[n]==1){fc++;}else{break;}
                                                            }
                                                            if(fc==64){
                                                                if((nm[1]<nm[64])&&(nm[1]<nm[4])
                                                                    &&(nm[1]<nm[13])&&(nm[1]<nm[49])){
                                                                    if((nm[1]<nm[16])&&(nm[1]<nm[52])&&(nm[1]<nm[61])){
                                                                        if((nm[4]<nm[13])&&(nm[13]<nm[49])){pransc4();}
                                                                    }
                                                                }
                                                            }
                                                        }
                                                    }
                                                }
                                            }
                                        }
                                    }
                                }
                            }
                        }
                    }
                }
            }
        }
    }
}

```





[Count of Layer Units = 16]

[Reference Table of Matching Digits]

*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	64	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
2	32	64	48	48	32	32	32	32	32	48	32	32	32	32	32	16
3	32	48	64	32	48	32	40	24	32	32	24	48	32	16	24	32
4	32	48	32	64	48	32	24	40	32	32	40	16	32	48	40	32
5	32	32	48	48	64	32	32	32	32	16	32	32	32	32	32	48
6	32	32	32	32	32	64	48	48	32	32	48	32	32	32	16	32
7	32	32	40	24	32	48	64	32	48	24	32	32	48	16	32	24
8	32	32	24	40	32	48	32	64	48	40	32	32	16	48	32	40
9	32	32	32	32	32	32	48	48	64	32	16	32	32	32	48	32
10	32	48	32	32	16	32	24	40	32	64	40	48	32	48	40	32
11	32	32	24	40	32	48	32	32	16	40	64	32	48	48	32	40
12	32	32	48	16	32	32	32	32	32	48	32	64	32	32	32	48
13	32	32	32	32	32	32	48	16	32	32	48	32	64	32	48	32
14	32	32	16	48	32	32	16	48	32	48	48	32	32	64	48	48
15	32	32	24	40	32	16	32	32	48	40	32	32	48	48	64	40
16	32	16	32	32	48	32	24	40	32	32	40	48	32	48	40	64

\*\* Compositions of Complete Euler Cubes 444: (Part) \*\*

1/	2/	5/	7/	15/	11/	1#	1/	3/	4/	10/	13/	9/	77#															
1	-----	47	-----	24	-----	58	1	-----	52	-----	16	-----	61															
61		22		44		3	58		23		43		6															
54	8	29	42	35	17	12	63	55	8	26	41	38	21	11	60													
15	60	-----	33	-----	19	-----	26	-----	45	-----	56	-----	6															
16	51	34	28	25	38	55	13		20	63	-----	33	-----	14	-----	29	-----	50	-----	48	-----	3						
52	10	27	40	37	31	14	49		12	46	37	31	25	35	56	18		47	9	30	40	34	28	19	53			
59	-----	9	-----	20	-----	39	-----	46	-----	32	-----	5	50		62	-----	17	-----	15	-----	36	-----	51	-----	32	-----	2	45
	2	53	48	30	23	36	57	11	5	54	44	27	24	39	57	10												
	62		21		43		4		59		22		42		7													
	7	-----	41	-----	18	-----	64	4	-----	49	-----	13	-----	64														

1/ 4/ 3/ 10/ 13/ 9/ 113#  
 1-----44-----24-----61  
 |58 15 51 | 6  
 47 8 26 49 38 13 19 60  
 |12 63---33---22---29---42---56-- 3  
 20 54 | 37 31 25 35 48 10 |  
 |55 17 30 40 34 28 |11 45  
 62-- 9-|--23--36---43--32--- 2 53 |  
 5 46 52 27 16 39 57 18  
 59 | 14 50 7 |  
 4-----41-----21-----64

1/ 5/ 2/ 7/ 15/ 11/ 149#  
 1-----55-----16-----58  
 |61 14 52 | 3  
 46 8 29 50 35 9 20 63  
 |23 60---33---11---26---53---48-- 6  
 24 43 | 34 28 25 38 47 21 |  
 |44 18 27 40 37 31 |22 41  
 59--17-|--12--39---54--32--- 5 42 |  
 2 45 56 30 15 36 57 19  
 62 | 13 51 4 |  
 7-----49-----10-----64

1/ 7/ 2/ 5/ 15/ 11/ 225#  
 1-----55-----28-----46  
 |61 26 40 | 3  
 58 20 29 38 35 9 8 63  
 |23 48---33---11---14---53---60--18  
 24 43 | 34 16 13 50 59 21 |  
 |44 6 15 52 49 31 |22 41  
 47-- 5-|--12--51---54--32---17 42 |  
 2 57 56 30 27 36 45 7  
 62 | 25 39 4 |  
 19-----37-----10-----64

1/ 10/ 3/ 4/ 13/ 9/ 261#  
 1-----44-----24-----61  
 |46 27 39 |18  
 59 20 14 37 50 25 7 48  
 |12 63---33---22---29---42---56-- 3  
 8 54 | 49 31 13 35 60 10 |  
 |55 5 30 52 34 16 |11 57  
 62-- 9-|--23--36---43--32--- 2 53 |  
 17 58 40 15 28 51 45 6  
 47 | 26 38 19 |  
 4-----41-----21-----64

1/ 12/ 2/ 5/ 13/ 9/ 297#  
 1-----56-----12-----61  
 |46 27 39 |18  
 59 20 14 37 50 25 7 48  
 |24 63---33---10---29---54---44-- 3  
 8 42 | 49 31 13 35 60 22 |  
 |43 5 30 52 34 16 |23 57  
 62--21-|--11--36---55--32--- 2 41 |  
 17 58 40 15 28 51 45 6  
 47 | 26 38 19 |  
 4-----53-----9-----64

1/ 13/ 2/ 5/ 9/ 6/ 373#  
 1-----55-----28-----46  
 |48 26 53 | 3  
 58 20 16 38 35 9 21 63  
 |23 61---33---11---14---40---60--18  
 24 43 | 34 29 13 50 59 8 |  
 |57 6 15 52 36 31 |22 41  
 47-- 5-|--25--51---54--32--- 4 42 |  
 2 44 56 30 27 49 45 7  
 62 | 12 39 17 |  
 19-----37-----10-----64

1/ 14/ 2/ 5/ 13/ 9/ 601#  
 1-----40-----28-----61  
 |46 11 55 |18  
 43 20 14 53 50 9 23 48  
 | 8 63---33---26---29---38---60-- 3  
 24 58 | 49 31 13 35 44 6 |  
 |59 21 30 52 34 16 | 7 41  
 62-- 5-|--27--36---39--32--- 2 57 |  
 17 42 56 15 12 51 45 22  
 47 | 10 54 19 |  
 4-----37-----25-----64

1/ 15/ 2/ 5/ 7/ 11/ 637#  
 1-----55-----28-----46  
 |47 12 54 |17  
 44 20 15 38 49 9 22 63  
 |23 62---33---25---14---39---60-- 4  
 24 57 | 34 30 13 36 59 7 |  
 |58 6 29 52 35 31 | 8 41  
 61-- 5-|--26--51---40--32--- 3 42 |  
 2 43 56 16 27 50 45 21  
 48 | 11 53 18 |  
 19-----37-----10-----64

1/ 16/ 3/ 4/ 13/ 9/ 745#  
 1-----60----- 8-----61  
 |46 11 55 |18  
 43 20 14 53 50 9 23 48  
 |28 63---33--- 6---29---58---40-- 3  
 24 38 | 49 31 13 35 44 26 |  
 |39 21 30 52 34 16 |27 41  
 62--25-|-- 7--36---59--32--- 2 37 |  
 17 42 56 15 12 51 45 22  
 47 | 10 54 19 |  
 4-----57----- 5-----64

2/ 1/ 5/ 7/ 15/ 11/ 781#  
 1-----31-----40-----58  
 |61 38 28 | 3  
 54 8 45 26 19 33 12 63  
 |15 60---17---35---42---29---56-- 6  
 16 51 | 18 44 41 22 55 13 |  
 |52 10 43 24 21 47 |14 49  
 59-- 9-|--36--23---30--48--- 5 50 |  
 2 53 32 46 39 20 57 11  
 62 | 37 27 4 |  
 7-----25-----34-----64

3/ 1/ 4/ 10/ 13/ 9/ 1161#  
 1-----52-----16-----61  
 |58 39 27 | 6  
 55 8 42 25 22 37 11 60  
 |36 63---17--14---45--50---32-- 3  
 12 30 | 21 47 41 19 56 34 |  
 |31 9 46 24 18 44 |35 53  
 62--33-|--15--20---51--48--- 2 29 |  
 5 54 28 43 40 23 57 10  
 59 | 38 26 7 |  
 4-----49-----13-----64

4/ 1/ 3/ 10/ 13/ 9/ 1341#  
 1-----28-----40-----61  
 |58 15 51 | 6  
 31 8 42 49 22 13 35 60  
 |12 63---17--38---45--26---56-- 3  
 36 54 | 21 47 41 19 32 10 |  
 |55 33 46 24 18 44 |11 29  
 62-- 9-|--39--20---27--48--- 2 53 |  
 5 30 52 43 16 23 57 34  
 59 | 14 50 7 |  
 4-----25-----37-----64

5/ 1/ 2/ 7/ 15/ 11/ 1521#  
 1-----55-----16-----58  
 |61 14 52 | 3  
 30 8 45 50 19 9 36 63  
 |39 60---17--11---42--53---32-- 6  
 40 27 | 18 44 41 22 31 37 |  
 |28 34 43 24 21 47 |38 25  
 59--33-|--12--23---54--48--- 5 26 |  
 2 29 56 46 15 20 57 35  
 62 | 13 51 4 |  
 7-----49-----10-----64

7/ 1/ 2/ 5/ 15/ 11/ 1901#  
 1-----55-----44-----30  
 |61 42 24 | 3  
 58 36 45 22 19 9 8 63  
 |39 32---17--11---14--53---60--34  
 40 27 | 18 16 13 50 59 37 |  
 |28 6 15 52 49 47 |38 25  
 31-- 5-|--12--51---54--48---33 26 |  
 2 57 56 46 43 20 29 7  
 62 | 41 23 4 |  
 35-----21-----10-----64

10/ 1/ 3/ 4/ 13/ 9/ 2081#  
 1-----28-----40-----61  
 |30 43 23 |34  
 59 36 14 21 50 41 7 32  
 |12 63---17--38---45--26---56-- 3  
 8 54 | 49 47 13 19 60 10 |  
 |55 5 46 52 18 16 |11 57  
 62-- 9-|--39--20---27--48--- 2 53 |  
 33 58 24 15 44 51 29 6  
 31 | 42 22 35 |  
 4-----25-----37-----64

12/ 1/ 2/ 5/ 13/ 9/ 2261#  
 1-----56-----12-----61  
 |30 43 23 |34  
 59 36 14 21 50 41 7 32  
 |40 63---17--10---45--54---28-- 3  
 8 26 | 49 47 13 19 60 38 |  
 |27 5 46 52 18 16 |39 57  
 62--37-|--11--20---55--48--- 2 25 |  
 33 58 24 15 44 51 29 6  
 31 | 42 22 35 |  
 4-----53----- 9-----64

13/ 1/ 2/ 5/ 9/ 6/ 2641#  
 1-----55-----44-----30  
 |32 42 53 | 3  
 58 36 16 22 19 9 37 63  
 |39 61---17--11---14--24---60--34  
 40 27 | 18 45 13 50 59 8 |  
 |57 6 15 52 20 47 |38 25  
 31-- 5-|--41--51---54--48--- 4 26 |  
 2 28 56 46 43 49 29 7  
 62 | 12 23 33 |  
 35-----21-----10-----64

14/ 1/ 2/ 5/ 13/ 9/ 3781#  
 1-----24-----44-----61  
 |30 11 55 |34  
 27 36 14 53 50 9 39 32  
 | 8 63---17--42---45--22---60-- 3  
 40 58 | 49 47 13 19 28 6 |  
 |59 37 46 52 18 16 | 7 25  
 62-- 5-|--43--20---23--48--- 2 57 |  
 33 26 56 15 12 51 29 38  
 31 | 10 54 35 |  
 4-----21-----41-----64

15/ 1/ 2/ 5/ 7/ 11/ 3961#  
 1-----55-----44-----30  
 |31 12 54 |33  
 28 36 15 22 49 9 38 63  
 |39 62---17--41---14--23---60-- 4  
 40 57 | 18 46 13 20 59 7 |  
 |58 6 45 52 19 47 | 8 25  
 61-- 5-|--42--51---24--48--- 3 26 |  
 2 27 56 16 43 50 29 37  
 32 | 11 53 34 |  
 35-----21-----10-----64

16/ 1/ 3/ 4/ 13/ 9/ 4501#  
 1-----60----- 8-----61  
 |30 11 55 |34  
 27 36 14 53 50 9 39 32  
 |44 63---17-- 6---45--58---24-- 3  
 40 22 | 49 47 13 19 28 42 |  
 |23 37 46 52 18 16 |43 25  
 62--41-|-- 7--20---59--48--- 2 21 |  
 33 26 56 15 12 51 29 38  
 31 | 10 54 35 |  
 4-----57----- 5-----64

[Count of Compositions = 4680]

[Counts according to the Value of n1]

1: 4680, 2: ..., 3: ..., 4: ..., 5: ..., 6: ..., 7: ..., 8: ...,  
 9: ..., 10: ..., 11: ..., 12: ..., 13: ..., 14: ..., 15: ..., 16: ...,  
 17: ..., 18: ..., 19: ..., 20: ..., 21: ..., 22: ..., 23: ..., 24: ...,  
 25: ..., 26: ..., 27: ..., 28: ..., 29: ..., 30: ..., 31: ..., 32: ...,  
 33: ..., 34: ..., 35: ..., 36: ..., 37: ..., 38: ..., 39: ..., 40: ...

[Counts according to the Value of n43]

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: ..., 26: ..., 27: ..., 28: ..., 29: ..., 30: ..., 31: ..., 32: 780,  
 33: ..., 34: ..., 35: ..., 36: ..., 37: ..., 38: ..., 39: ..., 40: ...,  
 41: ..., 42: ..., 43: ..., 44: ..., 45: ..., 46: ..., 47: ..., 48: 780,  
 49: ..., 50: ..., 51: ..., 52: ..., 53: ..., 54: ..., 55: ..., 56: 780,  
 57: ..., 58: ..., 59: ..., 60: 780, 61: ..., 62: 780, 63: 780, 64: ...

OK!

These are all Complete Euler Cubes of order 4.

When I knew about this verification, I was much surprised. I must confess I had no idea that such a simultaneous magic cubes 444 could really exist. I could not have even imagined about that, for I was interested in the structural relationship between the Self-complementary type and Complete one (with  $n_{43}=64$ ) for a long time and I wanted to know how to transform one into the other.

I am happy I am now enlightened and able to verify the report by our new method. But who discovered this fact for the first time?

**2. How many Simultaneous MC444 are there in all including "Non-Euler Type"?**

Let's compose the same thing in such an ordinary way as usual, without using New Euler's Method by binary number system. We want to know how many solutions exist in all for the Simultaneous MC444 including both Euler type and Non-Euler one.

I have to design and write the program carefully using all our knowledge and skills as hard as I can. I am glad to report here of the next result I could have got at last.

\*\* Simul taneous Magi c Cubes  $4*4*4$ : Pan-Tri agonal and Sel f-Compl ementary \*\*

\*\* Solutions with  $n1=1$  &  $n_{64}=64$  &  $n_{43}=32$  \*\*

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

55/		109/													
1	42	24	63	1	43	24	62								
62	20	43	5	63	20	42	5								
52	8	30	47	37	17	11	58	52	8	31	46	37	17	10	59
10	59	33	21	31	46	56	4	11	58	33	21	30	47	56	4
16	53	39	27	25	36	50	14	16	53	38	26	25	36	51	15
51	15	29	40	38	26	12	49	50	14	29	40	39	27	12	49
61	9	19	34	44	32	6	55	61	9	18	35	44	32	7	54
7	54	48	28	18	35	57	13	6	55	48	28	19	34	57	13
60		22		45		3		60		23		45		2	
	2		41		23		64		3		41		22		64

175/

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

181/

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

199/

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

259/

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

337/

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

421/

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

457/

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

523/

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

601/

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

607/

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

[Count = 804]

\*\* Solutions with n1=1 & n64=64 & n43=48 \*\*

1/

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

49/

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

55/

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

109/

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

175/

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

193/

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

253/

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

325/

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

409/

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

445/

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

511/

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

589/

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

[Count = 780]

\*\* Solutions with n1=1 & n64=64 & n43=56 \*\*

1/

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

49/

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

55/

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

109/

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

175/

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

193/

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

253/

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

325/

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

409/

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

445/

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

511/

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

589/

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

[Count = 780]

\*\* Solutions with n1=1 & n64=64 & n43=60 \*\*

1/

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

49/

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

55/

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

109/

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

175/

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

193/

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

253/

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

325/

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

409/

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

445/

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

511/

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

589/

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

[Count = 780]

\*\* Solutions with n1=1 & n64=64 & n43=62 \*\*

1/

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

49/

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

55/

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

109/

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

175/

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

193/

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

253/

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

325/

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

409/

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

445/

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

511/

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

589/

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

[Count = 780]

\*\* Solutions with n1=1 & n64=64 & n43=63 \*\*

1/

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

49/

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

55/

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

109/

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

175/

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

181/

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

199/

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

259/

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

337/

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

421/

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

457/

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

523/

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

601/

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

607/

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

[Count = 804]

[Counts according to the Value of n43]

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: ..., 26: ..., 27: ..., 28: ..., 29: ..., 30: ..., 31: ..., 32: 804,  
 33: ..., 34: ..., 35: ..., 36: ..., 37: ..., 38: ..., 39: ..., 40: ...,  
 41: ..., 42: ..., 43: ..., 44: ..., 45: ..., 46: ..., 47: ..., 48: 780,  
 49: ..., 50: ..., 51: ..., 52: ..., 53: ..., 54: ..., 55: ..., 56: 780,  
 57: ..., 58: ..., 59: ..., 60: 780, 61: ..., 62: 780, 63: 804, 64: ...

[Total Count = 4728] OK!

Compare this result with that one of Complete Euler Cubes 444, and you will know the difference between the two.

As you guess, there prove to be Non-Euler Cubes as many as  $24 \times 2 = 48$ .

The next 4 sample solutions demonstrate what Non-Euler type looks like.

\*\* Compare and Find the 24 'Non-Euler' Solutions with  $n43=63$  \*\*

[ 1 ]

				/D2i								
1	20	59	50	0	0	1	1	0	1	1	1	1
42	37	34	17	1	1	1	0	0	0	1	0	1
25	22	29	54	0	0	0	1	1	1	1	1	0
62	51	8	9	1	1	1	0	0	1	0	0	0
38	41	18	33	1	1	0	1	1	0	1	0	0
19	2	49	60	0	0	1	1	1	1	1	0	1
52	61	10	7	1	1	0	0	1	0	0	1	0
21	26	53	30	0	0	0	1	0	1	1	0	1
35	12	39	44	1	0	1	1	1	0	0	0	0
58	55	4	13	1	1	0	0	1	0	1	0	0
5	16	63	46	0	0	1	1	1	0	0	1	0
32	47	24	27	0	0	1	0	0	1	0	1	0
56	57	14	3	1	1	0	0	0	1	1	0	0
11	36	43	40	0	1	1	1	1	0	0	0	0
48	31	28	23	1	0	0	0	1	0	1	0	1
15	6	45	64	0	0	1	1	0	0	0	1	1

[ 2 ]

				/D2i								
1	44	35	50	0	1	1	1	0	0	0	1	1
42	13	58	17	1	0	1	0	0	1	0	1	1
25	46	5	54	0	1	0	0	1	1	0	0	1
62	27	32	9	0	1	0	0	0	1	0	1	0
14	41	18	57	0	1	0	1	1	0	0	1	1
43	2	49	36	1	0	1	1	1	0	0	1	0
28	61	10	31	0	1	0	0	0	1	1	0	1
45	26	53	6	1	1	0	1	0	0	1	0	0
59	12	39	20	1	0	0	1	0	1	0	1	0
34	55	4	37	1	1	0	1	1	0	1	0	1
29	16	63	22	0	0	0	1	0	1	0	1	1
8	47	24	51	0	0	1	0	0	1	0	0	1
56	33	38	3	1	1	1	0	0	1	1	0	0
11	60	19	40	0	1	0	1	1	0	1	1	0
48	7	52	23	1	0	0	1	0	0	0	1	1
15	30	21	64	0	0	0	1	0	0	1	1	1

0 1 0 0	0 0 0 0	0 1 1 0	0 1 0 1
1 1 1 0	0 0 1 0	0 0 0 0	0 1 0 1
1 1 1 1	1 1 0 0	0 0 1 0	1 0 1 0
1 1 0 0	1 0 0 0	0 0 0 0	1 0 0 1
1 1 1 1	0 1 0 1	1 0 0 0	0 1 0 1
1 0 1 0	0 0 1 1	1 0 1 0	0 1 0 1
0 1 0 1	1 1 1 1	0 1 1 1	0 1 0 1
0 0 1 0	1 1 0 1	1 1 0 1	1 1 0 1
1 1 0 0	1 0 0 1	1 1 1 1	1 0 0 1
1 1 0 0	1 1 0 0	1 1 1 1	1 0 0 1
1 1 1 0	1 1 1 1	1 0 0 0	0 1 0 1

[ 3]

/D2i

1	20	59	50	0	0	1	1	0	1	1	1	1
32	47	24	27	0	1	0	0	1	0	0	0	0
35	12	39	44	1	1	1	0	1	0	1	0	0
62	51	8	9	1	0	1	0	0	1	0	0	0
48	31	28	23	1	0	0	0	1	0	1	1	0
19	2	49	60	0	1	0	1	0	1	0	1	0
52	61	10	7	0	1	0	1	0	1	0	0	0
11	36	43	40	0	0	1	0	1	1	1	0	0
25	22	29	54	1	0	1	0	0	1	0	1	0
58	55	4	13	1	0	1	0	1	0	1	0	0
5	16	63	46	1	1	1	1	0	1	0	0	1
42	37	34	17	1	1	1	0	1	0	0	0	1
56	57	14	3	1	1	0	0	0	1	1	0	0
21	26	53	30	0	1	0	1	0	0	1	1	0
38	41	18	33	1	0	1	0	0	1	0	1	0
15	6	45	64	0	0	1	1	0	0	0	0	1

0 1 0 0	0 0 0 0	0 1 1 1	0 1 0 1	0 1 1 1	0 1 0 1	0 1 0 1	0 1 0 1
1 0 1 0	1 0 1 0	1 1 1 1	1 0 1 0	1 0 1 1	1 0 1 0	1 0 1 0	1 0 1 0
1 1 0 0	1 1 0 0	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1
1 0 1 0	1 0 1 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0
0 1 0 1	0 1 0 1	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0
1 1 0 0	1 1 0 0	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0
1 0 1 0	1 0 1 0	0 1 1 1	0 1 1 1	0 1 1 1	0 1 1 1	0 1 1 1	0 1 1 1
0 1 1 0	0 1 1 0	1 0 0 1	1 0 0 1	1 0 0 1	1 0 0 1	1 0 0 1	1 0 0 1
0 0 1 1	0 0 1 1	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0
0 1 0 1	0 1 0 1	1 0 0 1	1 0 0 1	1 0 0 1	1 0 0 1	1 0 0 1	1 0 0 1
0 0 1 1	0 0 1 1	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0
1 0 1 1	1 0 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1

[24]

/D2i

1	62	43	24	0	1	1	0	0	1	0	1	1
26	55	32	17	0	1	0	0	0	1	1	1	0
53	6	19	52	1	1	0	0	1	1	0	1	0
50	7	36	37	1	0	0	0	0	1	1	0	0
56	25	18	31	1	0	0	0	1	1	0	1	0
61	2	23	44	1	0	1	1	1	0	1	0	0
8	49	38	35	0	0	1	1	1	0	0	1	1
5	54	51	20	1	0	0	1	1	0	0	1	1
45	14	11	60	1	0	0	0	1	1	0	1	0
30	27	16	57	0	0	1	1	1	0	1	0	0
21	42	63	4	0	1	1	1	1	0	0	0	0
34	47	40	9	0	1	1	1	0	0	1	0	0
28	29	58	15	0	0	1	1	0	0	1	0	0
13	46	59	12	0	1	1	0	0	1	0	0	0
48	33	10	39	1	1	1	0	0	1	0	0	1
41	22	3	64	1	0	0	0	1	0	0	1	0

0 1 1 0	0 1 0 1	0 0 1 1	0 1 0 1	0 0 1 1	0 1 0 1	0 1 0 1	0 1 0 1
1 0 0 0	1 0 1 1	1 0 1 1	1 0 1 1	1 0 1 1	1 0 1 1	1 0 1 1	1 0 1 1
0 0 0 0	0 1 1 1	0 0 1 1	0 0 1 1	0 0 1 1	0 0 1 1	0 0 1 1	0 0 1 1
0 1 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0
0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 1 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0
0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 1 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0
0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 1 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0
0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 1 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0

```

1 0 0 1 1 0 1 0 0 0 1 0 0 1 0 1 0 1 0 1
0 0 0 0 0 1 1 0 0 0 1 1 0 0 0 1 0 1 0 1
0 0 0 0 0 1 1 0 0 0 1 1 0 0 0 1 0 1 0 1
1 1 1 1 1 1 1 0 0 0 0 1 1 1 0 0 1 0 1 0
0 1 1 1 1 1 0 0 0 0 1 1 1 0 0 1 0 1 0 1
0 1 1 1 1 1 0 0 0 0 1 1 1 0 0 1 0 1 0 1
1 1 1 1 1 1 0 1 1 0 1 0 1 0 1 0 1 0 1 0
1 1 0 1 0 1 0 1 0 0 1 0 1 0 1 0 1 0 1 0
1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 0 1 0 1 0

```

Watch the decomposed layers of binary numbers above. You will see various number patterns in any line such as {0, 0, 0, 1}, {0, 1, 1, 1}, or even {1, 1, 1, 1} beside {0, 0, 1, 1}. They are the reasons for these MC444 are classified as Non-Euler Type.

But the count 48 Non-Euler solutions is quite small, about one percent of 4728.

I was really surprised that all of these Simultaneous MC444 were not always Complete Euler Cubes of order 4, and am now wondering why.

(Originally written on September 22, 2003 by Kanji Setsuda;  
 Revised on Feb. 22, 2005 by Kanji Setsuda on MacOSX & Xcode 1.5)

\*\*\* E-Mail Address:<jag12001@nifty.ne.jp>

```

/* Simultaneous Type of Magic Cubes 4*4*4 */
/* 'Pan-Diagonal' and 'Self-Complementary' */
/** (Start with n1=1 & n43=32-63) **/
/** by Kanji Setsuda on MacOS Xcode 1.5 **/
/**/
#include <stdio.h>
/* Global Variables */
short int cnt, cnt1;
short cnt2, cnt3;
short CC, DD, LSM;
short nm[65], flg[65];
short cnm[65], nc[7];
/**/
/* Main Program: */
/* Set n1=1 & n64=64 & n43 & n22=65-n43 */
int main()
short m, n;
printf("\n** Simultaneous Type of Magic Cubes 4*4*4 **\n");
printf("*** 'Pan-Diagonal' and 'Self-Complementary' **\n");
nc[0]=32; nc[1]=48; nc[2]=56; nc[3]=60; nc[4]=62; nc[5]=63;
for(m=0; m<6; m++){
  for(n=0; n<65; n++){nm[n]=0;} /* Reset the Basic Positions */
  nm[1]=1; nm[43]=nc[m]; LSM=130; /* C1: Set n1 & n43 */
  CC=nm[1]+nm[43]; DD=LSM-CC; /* Set C & D */
  /**/
  printf("\n** Solutions with n1=1 & n64=64 & n43=%2d **\n", nm[43]);
  for(n=0; n<65; n++){flg[n]=0;} /* Reset the Flags */
  nm[64]=65-nm[1]; nm[22]=65-nm[43];
  flg[nm[1]]=1; flg[nm[22]]=1; flg[nm[43]]=1; flg[nm[64]]=1;
  cnt=0; cnt3=0; /* Reset the Counter */
  stp01(); /* Begin the Calculation */
  printf("[Count = %d]\n", cnt); /* Final Report */
}
printf(" OK! \n");
return 0;
}
/**/
/* Begin the Calculation */

```

```

/**/
/* Set n4, n42, n61, n23 */
void stp01(){
  short a;
  for(a=63; a>1; a--){
    if(fl g[a]==0){
      fl g[a]=1; nm[4]=a;
      stp011();
      fl g[a]=0; }
  }
}
/* Set n42 */
void stp011(){
  short a;
  a=DD-nm[4];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[42]=a;
    stp012();
    fl g[a]=0; }
}
/* Set n61 */
void stp012(){
  short a;
  a=65-nm[4];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[61]=a;
    stp013();
    fl g[a]=0; }
}
/* Set n23 */
void stp013(){
  short a;
  a=65-nm[42];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[23]=a; cnt2=0;
    stp02();
    fl g[a]=0; }
}
/**/
/* Set n13, n39, n52, n26 */
/* Set n13(>n4) */
void stp02(){
  short a;
  for(a=63; a>nm[4]; a--){
    if(fl g[a]==0){
      fl g[a]=1; nm[13]=a;
      stp021();
      fl g[a]=0; }
  }
}
/* Set n39 */
void stp021(){
  short a;
  a=DD-nm[13];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[39]=a;
    stp022();
    fl g[a]=0; }
}
/* Set n52 */
void stp022(){
  short a;
  a=65-nm[13];
  if((1<a)&&(a<64)&&(fl g[a]==0)){

```

```

    fl g[a]=1; nm[52]=a;
    stp023();
    fl g[a]=0; }
  }
}
/* Set n26 */
void stp023(){
  short a;
  a=65-nm[39];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[26]=a;
    stp03();
    fl g[a]=0; }
  }
}
/**/
/* Set n49, n27, n16, n38 */
/* Set n49(<n13) */
void stp03(){
  short a;
  for(a=63; a>nm[13]; a--){
    if(fl g[a]==0){
      fl g[a]=1; nm[49]=a;
      stp031();
      fl g[a]=0; }
  }
}
/* Set n27 */
void stp031(){
  short a;
  a=DD-nm[49];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[27]=a;
    stp032();
    fl g[a]=0; }
  }
}
/* Set n16 */
void stp032(){
  short a;
  a=65-nm[49];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[16]=a;
    stp033();
    fl g[a]=0; }
  }
}
/* Set n38 */
void stp033(){
  short a;
  a=65-nm[27];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[38]=a;
    stp04();
    fl g[a]=0; }
  }
}
/**/
/* Set n2, n44, n63, n21 */
/* Set n2 */
void stp04(){
  short a;
  for(a=63; a>1; a--){
    if(fl g[a]==0){
      fl g[a]=1; nm[2]=a;
      stp041();
      fl g[a]=0; }
  }
}

```

```

/* Set n44 */
void stp041(){
  short a;
  a=DD-nm[2];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[44]=a;
    stp042();
    fl g[a]=0; }
}
/* Set n63 */
void stp042(){
  short a;
  a=65-nm[2];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[63]=a;
    stp043();
    fl g[a]=0; }
}
/* Set n21 */
void stp043(){
  short a;
  a=65-nm[44];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[21]=a;
    stp05();
    fl g[a]=0; }
}
/**/
/* Set n3, n41, n62, n24 */
/* Set n3=130-n1-n2-n4 */
void stp05(){
  short a;
  a=LSM-nm[1]-nm[2]-nm[4];
  if(fl g[a]==0){
    fl g[a]=1; nm[3]=a;
    stp051();
    fl g[a]=0; }
}
/* Set n41 */
void stp051(){
  short a;
  a=CC-nm[3];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[41]=a;
    stp052();
    fl g[a]=0; }
}
/* Set n62 */
void stp052(){
  short a;
  a=65-nm[3];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[62]=a;
    stp053();
    fl g[a]=0; }
}
/* Set n24 */
void stp053(){
  short a;
  a=65-nm[41];

  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[24]=a;
    stp06();
    fl g[a]=0; }
}
/**/
/* Check (n14+n30+n46+n62=130) */
void stp16(){
  if(nm[14]+nm[30]+nm[46]+nm[62]==LSM){
    stp17(); }
}
/**/
/* Set n15, n37, n50, n28 */
/* Set n15=130-n13-n14-n16 */
/* & n15=130-n3-n7-n11 */
void stp17(){
  short a,b;
  a=LSM-nm[13]-nm[14]-nm[16];
  b=LSM-nm[3]-nm[7]-nm[11];
  if((a==b)&&(fl g[a]==0)){
    fl g[a]=1; nm[15]=a;
    stp171();
    fl g[a]=0; }
}
/* Set n37 */
void stp171(){
  short a;
  a=DD-nm[15];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[37]=a;
    stp172();
    fl g[a]=0; }
}
/* Set n50 */
void stp172(){
  short a;
  a=65-nm[15];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[50]=a;
    stp173();
    fl g[a]=0; }
}
/* Set n28 */
void stp173(){
  short a;
  a=65-nm[37];
  if((1<a)&&(a<64)&&(fl g[a]==0)){
    fl g[a]=1; nm[28]=a;
    stp18();
    fl g[a]=0; }
}
/**/
/* Check (n15+n31+n47+n63=130) */
void stp18(){
  if(nm[15]+nm[31]+nm[47]+nm[63]==LSM){
    stp19(); }
}
/**/
/**/
/* Pandi agonal Checks */
void stp19(){

```

```

short sm1, sm2, sm3;
sm1=nm[1]+nm[24]+nm[43]+nm[62];
sm2=nm[1]+nm[30]+nm[43]+nm[56];
sm3=nm[1]+nm[32]+nm[43]+nm[54];
if((sm1==LSM)&&(sm2==LSM)&&(sm3==LSM)){
    cnt++; cnt2++;
    if(cnt2==1){anspri nt();}
}
}
/**/
/* Print the Result */
void ansprint(){
short n;
cnt3++;
if(cnt3==1){cnt1=cnt;
    for(n=1; n<65; n++){cnm[n]=nm[n];}}
if(cnt3==2){cnt3=0;
    printf("%3d/%41d/\n", cnt1, cnt);
    printf("%4d %9d %9d %9d",
        cnm[1], cnm[17], cnm[33], cnm[49]);
    printf("%12d %9d %9d %9d\n",
        nm[1], nm[17], nm[33], nm[49]);
    printf(" %4d %9d %9d %9d",
        cnm[2], cnm[18], cnm[34], cnm[50]);
    printf("%12d %9d %9d %9d\n",
        nm[2], nm[18], nm[34], nm[50]);
    printf("%4d %3d %5d %3d %5d %3d %5d %3d",
        cnm[5], cnm[3], cnm[21], cnm[19], cnm[37], cnm[35], cnm[53], cnm[51]);
    printf("%8d %3d %5d %3d %5d %3d %5d %3d\n",
        nm[5], nm[3], nm[21], nm[19], nm[37], nm[35], nm[53], nm[51]);
    printf(" %4d %3d %5d %3d %5d %3d %5d %3d",
        cnm[6], cnm[4], cnm[22], cnm[20], cnm[38], cnm[36], cnm[54], cnm[52]);
    printf("%8d %3d %5d %3d %5d %3d %5d %3d\n",
        nm[6], nm[4], nm[22], nm[20], nm[38], nm[36], nm[54], nm[52]);
    printf("%4d %3d %5d %3d %5d %3d %5d %3d",
        cnm[9], cnm[7], cnm[25], cnm[23], cnm[41], cnm[39], cnm[57], cnm[55]);
    printf("%8d %3d %5d %3d %5d %3d %5d %3d\n",
        nm[9], nm[7], nm[25], nm[23], nm[41], nm[39], nm[57], nm[55]);
    printf(" %4d %3d %5d %3d %5d %3d %5d %3d",
        cnm[10], cnm[8], cnm[26], cnm[24], cnm[42], cnm[40], cnm[58], cnm[56]);
    printf("%8d %3d %5d %3d %5d %3d %5d %3d\n",
        nm[10], nm[8], nm[26], nm[24], nm[42], nm[40], nm[58], nm[56]);
    printf("%4d %3d %5d %3d %5d %3d %5d %3d",
        cnm[13], cnm[11], cnm[29], cnm[27], cnm[45], cnm[43], cnm[61], cnm[59]);
    printf("%8d %3d %5d %3d %5d %3d %5d %3d\n",
        nm[13], nm[11], nm[29], nm[27], nm[45], nm[43], nm[61], nm[59]);
    printf(" %4d %3d %5d %3d %5d %3d %5d %3d",
        cnm[14], cnm[12], cnm[30], cnm[28], cnm[46], cnm[44], cnm[62], cnm[60]);
    printf("%8d %3d %5d %3d %5d %3d %5d %3d\n",
        nm[14], nm[12], nm[30], nm[28], nm[46], nm[44], nm[62], nm[60]);
    printf(" %4d %9d %9d %9d",
        cnm[15], cnm[31], cnm[47], cnm[63]);
    printf("%12d %9d %9d %9d\n",
        nm[15], nm[31], nm[47], nm[63]);
    printf(" %4d %9d %9d %9d",
        cnm[16], cnm[32], cnm[48], cnm[64]);
    printf("%12d %9d %9d %9d\n",
        nm[16], nm[32], nm[48], nm[64]);}
}
/**/

```