

# Part 1: "Basic Study of Magic Squares and Cubes": Kanji Setsuda

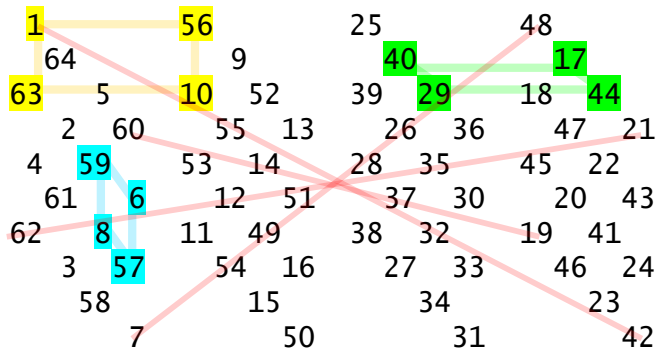
## Chapter 4: "Advanced Algebraic Study of Magic Cubes"

### Section 4: 'Composite' Pan-Magic Cubes of Order 4 : Revised

#### #1. What is the 'Composite' Pan-Magic Cube of Order 4 like?

First of all let me present a sample solution as shown below.

[Figure 1: Example of 'Composite' Pan-magic Cube]



$$1+63+56+10=130; \quad 59+6+8+57=130; \quad 40+17+29+44=130; \dots$$

Every four adjacent numbers making a little square 2 x 2 on any plane of the three dimensional cube add up to the magic constant 130. Of course, the sum of any next four numbers combined into a little square 2 x 2 on any plane is equal to 130.

We call such a cube with a lot of little squares 2 x 2 as the 'Composite' type.

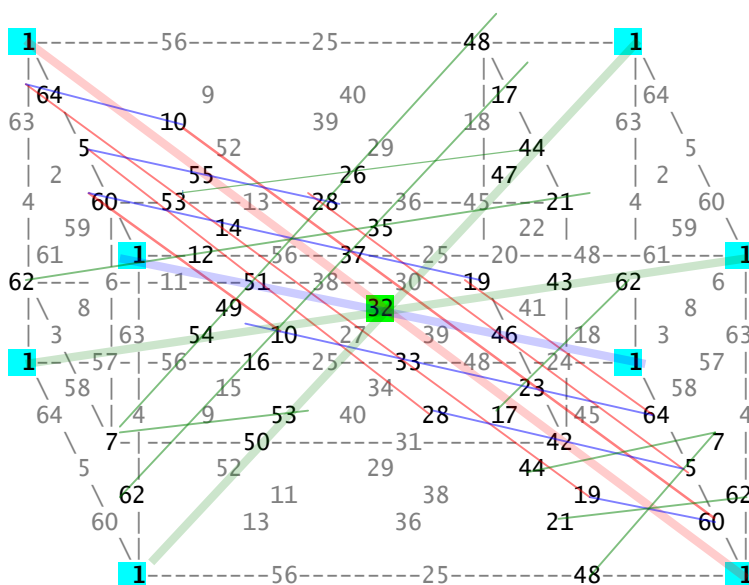
As far as it must be a 'magic' cube, every row, every column and every pillar add up to the same constant 130. And on top of that all the 4 Primary Triagonals also have the same constant sums 130 of the 4 numbers on each.

$$\begin{aligned} 1+64+5+60 &= 130; & 1+63+4+62 &= 130; & 1+56+25+48 &= 130; \\ 1+55+32+42 &= 130; & 60+14+37+19 &= 130; & 62+12+35+21 &= 130; \\ 7+49+26+48 &= 130; & \dots & & & \end{aligned}$$

#### #2. Let's Make the 'Composite' Pan-Magic Cubes

Watch the next cube, and check if every pan-triagonal has the same sum.

$$\begin{aligned} 64+14+33+19 &= 130; & 5+51+28+46 &= 130; & 60+10+37+23 &= 130; & 1+51+32+46 &= 130; \\ 1+54+32+43 &= 130; & 1+50+32+47 &= 130; & 62+16+34+17 &= 130; & 7+53+26+44 &= 130; \dots \end{aligned}$$



[Figure 2: Pan-triagonals in the Extended Space]

[Number 32 is placed on n43, the 'Pan-magic Symmetric Center' to the Number 1 on n1]

Every pan-triagonal seems to have the same structure:  $33+97$ (or  $97+33$ )= $130$ ;

$$\begin{aligned} (1+32)+(55+42) &= 130; & (1+32)+(51+46) &= 130; & (60+37)+(14+19) &= 130; \\ (60+37)+(10+23) &= 130; & (62+35)+(12+21) &= 130; & (62+35)+(16+17) &= 130; \\ (7+26)+(49+48) &= 130; & (7+26)+(53+44) &= 130; & (64+33)+(14+19) &= 130; \\ (63+34)+(12+21) &= 130; & \dots & & & \end{aligned}$$

Yes. It is not only a 'Composite' magic cube, but also a 'Pan-triagonal' magic cube  $4 \times 4 \times 4$  at the same time. It can regularly change itself by 'Pan-magic Plane Shifting'.

Let's make this type of 'Composite & Pan-triagonal' Magic Cubes of Order 4 now.

### #3. Basic Form and Basic Conditions

What conditions should we assume at the first definition stage?

\* Conditions for the Sums of 'Composite' Fours:  $S=130$ ; \*

$n1+n2+n5+n6=S$ ...cc001;	$n1+n2+n17+n18=S$ ...cc002;	$n1+n5+n17+n21=S$ ...cc003;
$n2+n3+n6+n7=S$ ...cc004;	$n2+n3+n18+n19=S$ ...cc005;	$n2+n6+n18+n22=S$ ...cc006;
$n3+n4+n7+n8=S$ ...cc007;	$n3+n4+n19+n20=S$ ...cc008;	$n3+n7+n19+n23=S$ ...cc009;
$n4+n1+n8+n5=S$ ...cc010;	$n4+n1+n20+n17=S$ ...cc011;	$n4+n8+n20+n24=S$ ...cc012;
$n5+n6+n9+n10=S$ ...cc013;	$n5+n6+n21+n22=S$ ...cc014;	$n5+n9+n21+n25=S$ ...cc015;
$n6+n7+n10+n11=S$ ...cc016;	$n6+n7+n22+n23=S$ ...cc017;	$n6+n10+n22+n26=S$ ...cc018;
$n7+n8+n11+n12=S$ ...cc019;	$n7+n8+n23+n24=S$ ...cc020;	$n7+n11+n23+n27=S$ ...cc021;
$n8+n5+n12+n9=S$ ...cc022;	$n8+n5+n24+n21=S$ ...cc023;	$n8+n12+n24+n28=S$ ...cc024;
$n9+n10+n13+n14=S$ ...cc025;	$n9+n10+n25+n26=S$ ...cc026;	$n9+n13+n25+n29=S$ ...cc027;
$n10+n11+n14+n15=S$ ...cc028;	$n10+n11+n26+n27=S$ ...cc029;	$n10+n14+n26+n30=S$ ...cc030;
$n11+n12+n15+n16=S$ ...cc031;	$n11+n12+n27+n28=S$ ...cc032;	$n11+n15+n27+n31=S$ ...cc033;
$n12+n9+n16+n13=S$ ...cc034;	$n12+n9+n28+n25=S$ ...cc035;	$n12+n16+n28+n32=S$ ...cc036;
$n13+n14+n1+n2=S$ ...cc037;	$n13+n14+n29+n30=S$ ...cc038;	$n13+n1+n29+n17=S$ ...cc039;
$n14+n15+n2+n3=S$ ...cc040;	$n14+n15+n30+n31=S$ ...cc041;	$n14+n2+n30+n18=S$ ...cc042;
$n15+n16+n3+n4=S$ ...cc043;	$n15+n16+n31+n32=S$ ...cc044;	$n15+n3+n31+n19=S$ ...cc045;
$n16+n13+n4+n1=S$ ...cc046;	$n16+n13+n32+n29=S$ ...cc047;	$n16+n4+n32+n20=S$ ...cc048;
$n17+n18+n21+n22=S$ ...cc049;	$n17+n18+n33+n34=S$ ...cc050;	$n17+n21+n33+n37=S$ ...cc051;
$n18+n19+n22+n23=S$ ...cc052;	$n18+n19+n34+n35=S$ ...cc053;	$n18+n22+n34+n38=S$ ...cc054;
$n19+n20+n23+n24=S$ ...cc055;	$n19+n20+n35+n36=S$ ...cc056;	$n19+n23+n35+n39=S$ ...cc057;
$n20+n17+n24+n21=S$ ...cc058;	$n20+n17+n36+n33=S$ ...cc059;	$n20+n24+n36+n40=S$ ...cc060;
$n21+n22+n25+n26=S$ ...cc061;	$n21+n22+n37+n38=S$ ...cc062;	$n21+n25+n37+n41=S$ ...cc063;
$n22+n23+n26+n27=S$ ...cc064;	$n22+n23+n38+n39=S$ ...cc065;	$n22+n26+n38+n42=S$ ...cc066;
$n23+n24+n27+n28=S$ ...cc067;	$n23+n24+n39+n40=S$ ...cc068;	$n23+n27+n39+n43=S$ ...cc069;
$n24+n21+n28+n25=S$ ...cc070;	$n24+n21+n40+n37=S$ ...cc071;	$n24+n28+n40+n44=S$ ...cc072;
$n25+n26+n29+n30=S$ ...cc073;	$n25+n26+n41+n42=S$ ...cc074;	$n25+n29+n41+n45=S$ ...cc075;
$n26+n27+n30+n31=S$ ...cc076;	$n26+n27+n42+n43=S$ ...cc077;	$n26+n30+n42+n46=S$ ...cc078;
$n27+n28+n31+n32=S$ ...cc079;	$n27+n28+n43+n44=S$ ...cc080;	$n27+n31+n43+n47=S$ ...cc081;
$n28+n25+n32+n29=S$ ...cc082;	$n28+n25+n44+n41=S$ ...cc083;	$n28+n32+n44+n48=S$ ...cc084;
$n29+n30+n17+n18=S$ ...cc085;	$n29+n30+n45+n46=S$ ...cc086;	$n29+n17+n45+n33=S$ ...cc087;
$n30+n31+n18+n19=S$ ...cc088;	$n30+n31+n46+n47=S$ ...cc089;	$n30+n18+n46+n34=S$ ...cc090;
$n31+n32+n19+n20=S$ ...cc091;	$n31+n32+n47+n48=S$ ...cc092;	$n31+n19+n47+n35=S$ ...cc093;
$n32+n29+n20+n17=S$ ...cc094;	$n32+n29+n48+n45=S$ ...cc095;	$n32+n20+n48+n36=S$ ...cc096;
$n33+n34+n37+n38=S$ ...cc097;	$n33+n34+n49+n50=S$ ...cc098;	$n33+n37+n49+n53=S$ ...cc099;
$n34+n35+n38+n39=S$ ...cc100;	$n34+n35+n50+n51=S$ ...cc101;	$n34+n38+n50+n54=S$ ...cc102;
$n35+n36+n39+n40=S$ ...cc103;	$n35+n36+n51+n52=S$ ...cc104;	$n35+n39+n51+n55=S$ ...cc105;
$n36+n33+n40+n37=S$ ...cc106;	$n36+n33+n52+n49=S$ ...cc107;	$n36+n40+n52+n56=S$ ...cc108;
$n37+n38+n41+n42=S$ ...cc109;	$n37+n38+n53+n54=S$ ...cc110;	$n37+n41+n53+n57=S$ ...cc111;
$n38+n39+n42+n43=S$ ...cc112;	$n38+n39+n54+n55=S$ ...cc113;	$n38+n42+n54+n58=S$ ...cc114;
$n39+n40+n43+n44=S$ ...cc115;	$n39+n40+n55+n56=S$ ...cc116;	$n39+n43+n55+n59=S$ ...cc117;
$n40+n37+n44+n41=S$ ...cc118;	$n40+n37+n56+n53=S$ ...cc119;	$n40+n44+n56+n60=S$ ...cc120;
$n41+n42+n45+n46=S$ ...cc121;	$n41+n42+n57+n58=S$ ...cc122;	$n41+n45+n57+n61=S$ ...cc123;
$n42+n43+n46+n47=S$ ...cc124;	$n42+n43+n58+n59=S$ ...cc125;	$n42+n46+n58+n62=S$ ...cc126;
$n43+n44+n47+n48=S$ ...cc127;	$n43+n44+n59+n60=S$ ...cc128;	$n43+n47+n59+n63=S$ ...cc129;
$n44+n41+n48+n45=S$ ...cc130;	$n44+n41+n60+n57=S$ ...cc131;	$n44+n48+n60+n64=S$ ...cc132;
$n45+n46+n33+n34=S$ ...cc133;	$n45+n46+n61+n62=S$ ...cc134;	$n45+n33+n61+n49=S$ ...cc135;
$n46+n47+n34+n35=S$ ...cc136;	$n46+n47+n62+n63=S$ ...cc137;	$n46+n34+n62+n50=S$ ...cc138;
$n47+n48+n35+n36=S$ ...cc139;	$n47+n48+n63+n64=S$ ...cc140;	$n47+n35+n63+n51=S$ ...cc141;
$n48+n45+n36+n33=S$ ...cc142;	$n48+n45+n64+n61=S$ ...cc143;	$n48+n36+n64+n52=S$ ...cc144;
$n49+n50+n53+n54=S$ ...cc145;	$n49+n50+n1+n2=S$ ...cc146;	$n49+n53+n1+n5=S$ ...cc147;

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n50+n51+n54+n55=S...cc148; | n50+n51+n2+n3=S ...cc149; | n50+n54+n2+n6=S ...cc150;
n51+n52+n55+n56=S...cc151; | n51+n52+n3+n4=S ...cc152; | n51+n55+n3+n7=S ...cc153;
n52+n49+n56+n53=S...cc154; | n52+n49+n4+n1=S ...cc155; | n52+n56+n4+n8=S ...cc156;
n53+n54+n57+n58=S...cc157; | n53+n54+n5+n6=S ...cc158; | n53+n57+n5+n9=S ...cc159;
n54+n55+n58+n59=S...cc160; | n54+n55+n6+n7=S ...cc161; | n54+n58+n6+n10=S ...cc162;
n55+n56+n59+n60=S...cc163; | n55+n56+n7+n8=S ...cc164; | n55+n59+n7+n11=S ...cc165;
n56+n53+n60+n57=S...cc166; | n56+n53+n8+n5=S ...cc167; | n56+n60+n8+n12=S ...cc168;
n57+n58+n61+n62=S...cc169; | n57+n58+n9+n10=S ...cc170; | n57+n61+n9+n13=S ...cc171;
n58+n59+n62+n63=S...cc172; | n58+n59+n10+n11=S ...cc173; | n58+n62+n10+n14=S ...cc174;
n59+n60+n63+n64=S...cc175; | n59+n60+n11+n12=S ...cc176; | n59+n63+n11+n15=S ...cc177;
n60+n57+n64+n61=S...cc178; | n60+n57+n12+n9=S ...cc179; | n60+n64+n12+n16=S ...cc180;
n61+n62+n49+n50=S...cc181; | n61+n62+n13+n14=S ...cc182; | n61+n49+n13+n1=S ...cc183;
n62+n63+n50+n51=S...cc184; | n62+n63+n14+n15=S ...cc185; | n62+n50+n14+n2=S ...cc186;
n63+n64+n51+n52=S...cc187; | n63+n64+n15+n16=S ...cc188; | n63+n51+n15+n3=S ...cc189;
n64+n61+n52+n49=S...cc190; | n64+n61+n16+n13=S ...cc191; | n64+n52+n16+n4=S ...cc192;

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\* Additional Basic Conditions: K=130; \*  
 n1+n2+n3+n4=K; n1+n5+n9+n13=K; n1+n17+n33+n49=K;  
 n1+n22+n43+n64=K

[Figure 3: Basic Form for the 'Composite' Pan-Magic Cube 4x4x4]

```

n1-----17-----33-----49
|n2      |18      |34      |50
n5  n3   21 19   37 35   53 51
|n6  n4---22--20---38--36---54--52
n9  n7 | 25 23 | 41 39 | 57 55 |
|10  n8 |26 24 |42 40 |58 56
13--11-|--29--27-|--45--43-|--61 59 |
 14 12   30 28   46 44   62 60
   15 |   31 |   47 |   63 |
 16-----32-----48-----64

```

\* Normalizing Inequality Conditions for the Standard Solutions \*  
 n1<n49<n4<n13; n1<n16; n1<n52; n1<n61; and n1<n64;

#### #4. The Result List of Composition

Let me skip my explanation here about the reason why so few Additional Basic Conditions are needed. Let's directly come to the result list of solutions of our object 'Composite' Pan-magic Cubes of Order 4. Please watch them now, will you?

\*\*\* 'Composite & Pan-triagonal' Magic Cubes of Order 4 \*\*\*  
 \*\* Compact List of 6720 Standard Solutions Normalized \*\*

```

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

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

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

141/  
 1-----56-----41-----32  
 |63 |10 |23 |34 |  
 64 6 9 51 24 46 33 27  
 | 2 60--+55--13--42--20--+31--37 |  
 3 59 | 54 14 | 43 19 | 30 38 |  
 |61 5 |12 52 |21 45 |36 28 |  
 62-- 8--|11--49--|22--48--|35 25 |  
 4 58 | 53 15 | 44 18 | 29 39 |  
 57 | 16 | 17 | 40 |  
 7-----50-----47-----26

161/  
 1-----56-----41-----32  
 |62 |11 |22 |35 |  
 64 7 9 50 24 47 33 26  
 | 3 60--+54--13--43--20--+30--37 |  
 2 58 | 55 15 | 42 18 | 31 39 |  
 |61 5 |12 52 |21 45 |36 28 |  
 63-- 8--|10--49--|23--48--|34 25 |  
 4 59 | 53 14 | 44 19 | 29 38 |  
 57 | 16 | 17 | 40 |  
 6-----51-----46-----27

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

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

221/  
 1-----60-----13-----56  
 |32 |37 |20 |41 |  
 64 35 5 26 52 47 9 22  
 |33 62--+28-- 7--+45--50--+24--11 |  
 2 30 | 59 39 | 14 18 | 55 43 |  
 |31 3 |38 58 |19 15 |42 54 |  
 63--36--| 6--25--|51--48--|10 21 |  
 34 61 | 27 8 | 46 49 | 23 12 |  
 29 | 40 | 17 | 44 |  
 4-----57-----16-----53

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

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

281/  
 1-----48-----49-----32  
 |62 |19 |14 |35 |  
 64 7 17 42 16 55 33 26  
 | 3 60--+46--21--+51--12--+30--37 |  
 2 58 | 47 23 | 50 10 | 31 39 |  
 |61 5 |20 44 |13 53 |36 28 |  
 63-- 8--|18--41--|15--56--|34 25 |  
 4 59 | 45 22 | 52 11 | 29 38 |  
 57 | 24 | 9 | 40 |  
 6-----43-----54-----27

301/  
 1-----48-----49-----32  
 |60 |21 |12 |37 |  
 64 7 17 42 16 55 33 26  
 | 5 62--+44--19--+53--14--+28--35 |  
 2 58 | 47 23 | 50 10 | 31 39 |  
 |59 3 |22 46 |11 51 |38 30 |  
 63-- 8--|18--41--|15--56--|34 25 |  
 6 61 | 43 20 | 54 13 | 27 36 |  
 57 | 24 | 9 | 40 |  
 4-----45-----52-----29

321/  
 1-----60-----37-----32  
 |48 |21 |12 |49 |  
 64 19 5 42 28 55 33 14  
 |17 62--+44-- 7--+53--26--+16--35 |  
 2 46 | 59 23 | 38 10 | 31 51 |  
 |47 3 |22 58 |11 39 |50 30 |  
 63--20--| 6--41--|27--56--|34 13 |  
 18 61 | 43 8 | 54 25 | 15 36 |  
 45 | 24 | 9 | 52 |  
 4-----57-----40-----29

341/  
 1-----60-----21-----48  
 |32 |37 |12 |49 |  
 64 35 5 26 44 55 17 14  
 |33 62--+28-- 7--+53--42--+16--19 |  
 2 30 | 59 39 | 22 10 | 47 51 |  
 |31 3 |38 58 |11 23 |50 46 |  
 63--36--| 6--25--|43--56--|18 13 |  
 34 61 | 27 8 | 54 41 | 15 20 |  
 29 | 40 | 9 | 52 |  
 4-----57-----24-----45

361/  
 1-----48-----49-----32  
 |64 |17 |16 |33 |  
 63 9 18 40 15 57 34 24  
 | 2 56--+47--25--+50-- 8--+31--41 |  
 4 55 | 45 26 | 52 7 | 29 42 |  
 |61 10 |20 39 |13 58 |36 23 |  
 62--12--|19--37--|14--60--|35 21 |  
 3 53 | 46 28 | 51 5 | 30 44 |  
 54 | 27 | 6 | 43 |  
 11-----38-----59-----22

381/  
 1-----48-----49-----32  
 |63 |18 |15 |34 |  
 64 10 17 39 16 58 33 23  
 | 2 56--+47--25--+50-- 8--+31--41 |  
 3 55 | 46 26 | 51 7 | 30 42 |  
 |61 9 |20 40 |13 57 |36 24 |  
 62--12--|19--37--|14--60--|35 21 |  
 4 54 | 45 27 | 52 6 | 29 43 |  
 53 | 28 | 5 | 44 |  
 11-----38-----59-----22

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

421/  
 1-----48-----49-----32  
 |56 |25 | 8 |41 |  
 64 11 17 38 16 59 33 22  
 | 9 62--+40--19--+57--14--+24--35 |  
 2 54 | 47 27 | 50 6 | 31 43 |  
 |55 3 |26 46 | 7 51 |42 30 |  
 63--12--|18--37--|15--60--|34 21 |  
 10 61 | 39 20 | 58 13 | 23 36 |  
 53 | 28 | 5 | 44 |  
 4-----45-----52-----29

441/  
 1-----56-----41-----32  
 |48 |25 | 8 |49 |  
 64 19 9 38 24 59 33 14  
 |17 62--+40--11--+57--22--+16--35 |  
 2 46 | 55 27 | 42 6 | 31 51 |  
 |47 3 |26 54 | 7 43 |50 30 |  
 63--20--|10--37--|23--60--|34 13 |  
 18 61 | 39 12 | 58 21 | 15 36 |  
 45 | 28 | 5 | 52 |  
 4-----53-----44-----29

461/  
 1-----56-----25-----48  
 |32 |41 | 8 |49 |  
 64 35 9 22 40 59 17 14  
 |33 62--+24--11--+57--38--+16--19 |  
 2 30 | 55 43 | 26 6 | 47 51 |  
 |31 3 |42 54 | 7 27 |50 46 |  
 63--36--|10--21--|39--60--|18 13 |  
 34 61 | 23 12 | 58 37 | 15 20 |  
 29 | 44 | 5 | 52 |  
 4-----53-----28-----45

481/  
 1-----48-----49-----32  
 |64 |17 |16 |33 |  
 63 9 18 40 15 57 34 24  
 | 2 56--+47--25--+50-- 8--+31--41 |  
 6 55 | 43 26 | 54 7 | 27 42 |  
 |59 10 |22 39 |11 58 |38 23 |  
 60--14--|21--35--|12--62--|37 19 |  
 5 51 | 44 30 | 53 3 | 28 46 |  
 52 | 29 | 4 | 45 |  
 13-----36-----61-----20

501/  
 1-----48-----49-----32  
 |63 |18 |15 |34 |  
 64 10 17 39 16 58 33 23  
 | 2 56--+47--25--+50-- 8--+31--41 |  
 5 55 | 44 26 | 53 7 | 28 42 |  
 |59 9 |22 40 |11 57 |38 24 |  
 60--14--|21--35--|12--62--|37 19 |  
 6 52 | 43 29 | 54 4 | 27 45 |  
 51 | 30 | 3 | 46 |  
 13-----36-----61-----20

521/  
 1-----48-----49-----32  
 |60 |21 |12 |37 |  
 64 13 17 36 16 61 33 20  
 | 5 56--+44--25--+53-- 8--+28--41 |  
 2 52 | 47 29 | 50 4 | 31 45 |  
 |59 9 |22 40 |11 57 |38 24 |  
 63--14--|18--35--|15--62--|34 19 |  
 6 55 | 43 26 | 54 7 | 27 42 |  
 51 | 30 | 3 | 46 |  
 10-----39-----58-----23

541/  
 1-----48-----49-----32  
 |56 |25 | 8 |41 |  
 64 13 17 36 16 61 33 20  
 | 9 60--40-21--57-12--24-37 |  
 2 52 | 47 29 | 50 4 | 31 45 |  
 |55 5 |26 44 | 7 53 |42 28 |  
 63--14-|18-35-|15-62-|34 19 |  
 10 59 39 22 58 11 23 38  
 51 | 30 | 3 | 46 |  
 6-----43-----54-----27

561/  
 1-----56-----41-----32  
 |48 |25 | 8 |49 |  
 64 21 9 36 24 61 33 12  
 |17 60--40-13--57-20--16-37 |  
 2 44 | 55 29 | 42 4 | 31 53 |  
 |47 5 |26 52 | 7 45 | 50 28 |  
 63--22-|10-35-|23-62-|34 11 |  
 18 59 39 14 58 19 15 38  
 43 | 30 | 3 | 54 |  
 6-----51-----46-----27

581/  
 1-----56-----25-----48  
 |32 |41 | 8 |49 |  
 64 37 9 20 40 61 17 12  
 |33 60--24-13--57-36--16-21 |  
 2 28 | 55 45 | 26 4 | 47 53 |  
 |31 5 |42 52 | 7 29 |50 44 |  
 63--38-|10-19-|39-62-|18 11 |  
 34 59 23 14 58 35 15 22  
 27 | 46 | 3 | 54 |  
 6-----51-----30-----43

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

621/  
 1-----48-----49-----32  
 |62 |11 |19 38 |14 59 |33 22 |  
 64 11 17 38 16 59 33 22  
 | 3 56--46-25--51- 8--30-41 |  
 5 54 | 44 27 | 53 6 | 28 43 |  
 |58 9 |23 40 |10 57 |39 24 |  
 60--15-|21-34-|12-63-|37 18 |  
 7 52 42 29 55 4 26 45  
 50 | 31 | 2 | 47 |  
 13-----36-----61-----20

641/  
 1-----48-----49-----32  
 |60 |13 |21 36 |12 61 |33 20 |  
 64 13 17 36 16 61 33 20  
 | 5 56--44-25--53- 8--28-41 |  
 3 52 | 46 29 | 51 4 | 30 45 |  
 |58 9 |23 40 |10 57 |39 24 |  
 62--15-|19-34-|14-63-|35 18 |  
 7 54 42 27 55 6 26 43  
 50 | 31 | 2 | 47 |  
 11-----38-----59-----22

661/  
 1-----48-----49-----32  
 |56 |25 | 8 |41 |  
 64 13 17 36 16 61 33 20  
 | 9 60--40-21--57-12--24-37 |  
 3 52 | 46 29 | 51 4 | 30 45 |  
 |54 5 |27 44 | 6 53 |43 28 |  
 62--15-|19-34-|14-63-|35 18 |  
 11 58 38 23 59 10 22 39  
 50 | 31 | 2 | 47 |  
 7-----42-----55-----26

681/  
 1-----56-----41-----32  
 |48 |25 | 8 |49 |  
 64 21 9 36 24 61 33 12  
 |17 60--40-13--57-20--16-37 |  
 3 44 | 54 29 | 43 4 | 30 53 |  
 |46 5 |27 52 | 6 45 |51 28 |  
 62--23-|11-34-|22-63-|35 10 |  
 19 58 38 15 59 18 14 39  
 42 | 31 | 2 | 55 |  
 7-----50-----47-----26

701/  
 1-----56-----25-----48  
 |32 |41 | 8 |49 |  
 64 37 9 20 40 61 17 12  
 |33 60--24-13--57-36--16-21 |  
 3 28 | 54 45 | 27 4 | 46 53 |  
 |30 5 |43 52 | 6 29 |51 44 |  
 62--39-|11-18-|38-63-|19 10 |  
 35 58 22 15 59 34 14 23  
 26 | 47 | 2 | 55 |  
 7-----50-----31-----42

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

741/  
 1-----48-----49-----32  
 |62 |11 |18 38 |14 59 |34 22 |  
 63 11 18 38 15 59 34 22  
 | 4 56--45-25--52- 8--29-41 |  
 6 53 | 43 28 | 54 5 | 27 44 |  
 |57 10 |24 39 | 9 58 |40 23 |  
 60--16-|21-33-|12-64-|37 17 |  
 7 51 42 30 55 3 26 46  
 50 | 31 | 2 | 47 |  
 13-----36-----61-----20

761/  
 1-----48-----49-----32  
 |60 |13 |21 36 |12 61 |34 20 |  
 63 13 18 36 15 61 34 20  
 | 6 56--43-25--54- 8--27-41 |  
 4 51 | 45 30 | 52 3 | 29 46 |  
 |57 10 |24 39 | 9 58 |40 23 |  
 62--16-|19-33-|14-64-|35 17 |  
 7 53 42 28 55 5 26 44  
 50 | 31 | 2 | 47 |  
 11-----38-----59-----22

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

801/  
 1-----56-----41-----32  
 |48 |25 | 8 |49 |  
 63 21 10 36 23 61 34 12  
 |18 60--39-13--58-20--15-37 |  
 4 43 | 53 30 | 44 3 | 29 54 |  
 |45 6 |28 51 | 5 46 |52 27 |  
 62--24-|11-33-|22-64-|35 9 |  
 19 57 38 16 59 17 14 40  
 42 | 31 | 2 | 55 |  
 7-----50-----47-----26

821/  
 1-----56-----25-----48  
 |32 |41 | 8 |49 |  
 63 37 10 20 39 61 18 12  
 |34 60--23-13--58-36--15-21 |  
 4 27 | 53 46 | 28 3 | 45 54 |  
 |29 6 |44 51 | 5 30 |52 43 |  
 62--40-|11-17-|38-64-|19 9 |  
 35 57 22 16 59 33 14 24  
 26 | 47 | 2 | 55 |  
 7-----50-----31-----42

841/  
 2-----55-----26-----47  
 |64 | 5 | 9 |40 |17 |  
 63 5 10 52 39 29 18 44  
 | 1 59--56-14--25-35--48-22 |  
 4 60 | 53 13 | 28 36 | 45 21 |  
 |62 6 |11 51 |38 30 |19 43 |  
 61-- 7-|12-50-|37-31-|20 42 |  
 3 57 54 16 27 33 46 24  
 58 | 15 | 34 | 23 |  
 8-----49-----32-----41

1561/  
 3-----54-----27-----46  
 |64 | 5 | 9 |40 |17 |  
 62 5 11 52 38 29 19 44  
 | 1 58--56-15--25-34--48-23 |  
 4 60 | 53 13 | 28 36 | 45 21 |  
 |63 7 |10 50 |39 31 |18 42 |  
 61-- 6-|12-51-|37-30-|20 43 |  
 2 57 55 16 26 33 47 24  
 59 | 14 | 35 | 22 |  
 8-----49-----32-----41

2185/  
 4-----53-----28-----45  
 |63 | 6 |10 |39 |18 |  
 62 6 11 51 38 30 19 43  
 | 1 57--56-16--25-33--48-24 |  
 3 60 | 54 13 | 27 36 | 46 21 |  
 |64 7 | 9 50 |40 31 |17 42 |  
 61-- 5-|12-52-|37-29-|20 44 |  
 2 58 55 15 26 34 47 23  
 59 | 14 | 35 | 22 |  
 8-----49-----32-----41

2713/  
 5-----52-----29-----44  
 |64 | 3 | 9 |40 |17 |  
 60 3 13 54 36 27 21 46  
 | 1 58--56-15--25-34--48-23 |  
 6 62 | 51 11 | 30 38 | 43 19 |  
 |63 7 |10 50 |39 31 |18 42 |  
 59-- 4-|14-53-|35-28-|22 45 |  
 2 57 55 16 26 33 47 24  
 61 | 12 | 37 | 20 |  
 8-----49-----32-----41

3241/  
 6-----51-----30-----43  
 |63 | 4 |10 |39 |18 |  
 60 4 13 53 36 28 21 45  
 | 1 57--56-16--25-33--48-24 |  
 5 62 | 52 11 | 29 38 | 44 19 |  
 |64 7 | 9 50 |40 31 |17 42 |  
 59-- 3-|14-54-|35-27-|22 46 |  
 2 58 55 15 26 34 47 23  
 61 | 12 | 37 | 20 |  
 8-----49-----32-----41

3673/  
 7-----50-----31-----42  
 |62 | 4 |11 |38 |19 |  
 60 4 13 53 36 28 21 45  
 | 1 57--56-16--25-33--48-24 |  
 5 63 | 52 10 | 29 39 | 44 18 |  
 |64 6 | 9 51 |40 30 |17 43 |  
 58-- 2-|15-55-|34-26-|23 47 |  
 3 59 54 14 27 35 46 22  
 61 | 12 | 37 | 20 |  
 8-----49-----32-----41

4033/  
 8-----57-----24-----41  
 |61 | 4 |45 |20  
 59 12 | 6 53 | 43 28 | 22 37  
 | 2 49--+63--16--+18--33--+47--32  
 5 55 | 60 10 | 21 39 | 44 26 |  
 |64 14 | 1 51 |48 30 |17 35  
 58-- 9--| 7--56--|42--25--|23 40 |  
 3 52 | 62 13 | 19 36 | 46 29  
 54 | 11 | 38 | 27 |  
 15-----50-----31-----34

4321/  
 9-----52-----29-----40  
 |64 | 5 |44 |17  
 56 3 | 13 58 | 36 23 | 25 46  
 | 1 54--+60--15--+21--34--+48--27  
 10 62 | 51 7 | 30 42 | 39 19 |  
 |63 11 | 6 50 |43 31 |18 38  
 55-- 4--|14--57--|35--24--|26 45 |  
 2 53 | 59 16 | 22 33 | 47 28  
 61 | 8 | 41 | 20 |  
 12-----49-----32-----37

4729/  
 10-----51-----30-----39  
 |63 | 6 |43 |18  
 56 4 | 13 57 | 36 24 | 25 45  
 | 1 53--+60--16--+21--33--+48--28  
 9 62 | 52 7 | 29 42 | 40 19 |  
 |64 11 | 5 50 |44 31 |17 38  
 55-- 3--|14--58--|35--23--|26 46 |  
 2 54 | 59 15 | 22 34 | 47 27  
 61 | 8 | 41 | 20 |  
 12-----49-----32-----37

5041/  
 11-----50-----31-----38  
 |62 | 7 |42 |19  
 56 4 | 13 57 | 36 24 | 25 45  
 | 1 53--+60--16--+21--33--+48--28  
 9 63 | 52 6 | 29 43 | 40 18 |  
 |64 10 | 5 51 |44 30 |17 39  
 54-- 2--|15--59--|34--22--|27 47 |  
 3 55 | 58 14 | 23 35 | 46 26  
 61 | 8 | 41 | 20 |  
 12-----49-----32-----37

5281/  
 12-----53-----28-----37  
 |61 | 4 |45 |20  
 55 8 | 10 57 | 39 24 | 26 41  
 | 2 49--+63--16--+18--33--+47--32  
 9 59 | 56 6 | 25 43 | 40 22 |  
 |64 14 | 1 51 |48 30 |17 35  
 54-- 5--|11--60--|38--21--|27 44 |  
 3 52 | 62 13 | 19 36 | 46 29  
 58 | 7 | 42 | 23 |  
 15-----50-----31-----34

5449/  
 13-----50-----31-----36  
 |60 | 7 |42 |21  
 56 6 | 11 57 | 38 24 | 25 43  
 | 1 51--+62--16--+19--33--+48--30  
 9 63 | 54 4 | 27 45 | 40 18 |  
 |64 10 | 3 53 |46 28 |17 39  
 52-- 2--|15--61--|34--20--|29 47 |  
 5 55 | 58 12 | 23 37 | 44 26  
 59 | 8 | 41 | 22 |  
 14-----49-----32-----35

5617/  
 14-----51-----30-----35  
 |59 | 6 |43 |22  
 55 8 | 10 57 | 39 24 | 26 41  
 | 2 49--+63--16--+18--33--+47--32  
 9 61 | 56 4 | 25 45 | 40 20 |  
 |64 12 | 1 53 |48 28 |17 37  
 52-- 3--|13--62--|36--19--|29 46 |  
 5 54 | 60 11 | 21 38 | 44 27  
 58 | 7 | 42 | 23 |  
 15-----50-----31-----34

5713/  
 15-----52-----29-----34  
 |58 | 5 |44 |23  
 54 8 | 9 59 | 40 22 | 27 41  
 | 3 49--+64--14--+17--35--+46--32  
 11 61 | 56 2 | 25 47 | 38 20 |  
 |62 12 | 1 55 |48 26 |19 37  
 50-- 4--|13--63--|36--18--|31 45 |  
 7 53 | 60 10 | 21 39 | 42 28  
 57 | 6 | 43 | 24 |  
 16-----51-----30-----33

5761/  
 17-----44-----29-----40  
 |64 | 5 |52 |9  
 48 3 | 21 58 | 36 15 | 25 54  
 | 1 46--+60--23--+13--34--+56--27  
 18 62 | 43 7 | 30 50 | 39 11 |  
 |63 19 | 6 42 |51 31 |10 38  
 47-- 4--|22--57--|35--16--|26 53 |  
 2 45 | 59 24 | 14 33 | 55 28  
 61 | 8 | 49 | 12 |  
 20-----41-----32-----37

6001/  
 18-----43-----30-----39  
 |63 | 6 |51 |10  
 48 4 | 21 57 | 36 16 | 25 53  
 | 1 45--+60--24--+13--33--+56--28  
 17 62 | 44 7 | 29 50 | 40 11 |  
 |64 19 | 5 42 |52 31 |9 38  
 47-- 3--|22--58--|35--15--|26 54 |  
 2 46 | 59 23 | 14 34 | 55 27  
 61 | 8 | 49 | 12 |  
 20-----41-----32-----37

6169/  
 19-----42-----31-----38  
 |62 | 7 |50 |11  
 48 4 | 21 57 | 36 16 | 25 53  
 | 1 45--+60--24--+13--33--+56--28  
 17 63 | 44 6 | 29 51 | 40 10 |  
 |64 18 | 5 43 |52 30 |9 39  
 46-- 2--|23--59--|34--14--|27 55 |  
 3 47 | 58 22 | 15 35 | 54 26  
 61 | 8 | 49 | 12 |  
 20-----41-----32-----37

6289/  
 20-----45-----28-----37  
 |61 | 4 |53 |12  
 47 8 | 18 57 | 39 16 | 26 49  
 | 2 41--+63--24--+10--33--+55--32  
 17 59 | 48 6 | 25 51 | 40 14 |  
 |64 22 | 1 43 |56 30 |9 35  
 46-- 5--|19--60--|38--13--|27 52 |  
 3 44 | 62 21 | 11 36 | 54 29  
 58 | 7 | 50 | 15 |  
 23-----42-----31-----34

6361/  
 21-----42-----31-----36  
 |60 | 7 |50 |13  
 48 6 | 19 57 | 38 16 | 25 51  
 | 1 43--+62--24--+11--33--+56--30  
 17 63 | 46 4 | 27 53 | 40 10 |  
 |64 18 | 3 45 |54 28 |9 39  
 44-- 2--|23--61--|34--12--|29 55 |  
 5 47 | 58 20 | 15 37 | 52 26  
 59 | 8 | 49 | 14 |  
 22-----41-----32-----35

6457/  
 22-----43-----30-----35  
 |59 | 6 |51 |14  
 47 8 | 18 57 | 39 16 | 26 49  
 | 2 41--+63--24--+10--33--+55--32  
 17 61 | 48 4 | 25 53 | 40 12 |  
 |64 20 | 1 45 |56 28 |9 37  
 44-- 3--|21--62--|36--11--|29 54 |  
 5 46 | 60 19 | 13 38 | 52 27  
 58 | 7 | 50 | 15 |  
 23-----42-----31-----34

6505/  
 23-----44-----29-----34  
 |58 | 5 |52 |15  
 46 8 | 17 59 | 40 14 | 27 49  
 | 3 41--+64--22--+9--35--+54--32  
 19 61 | 48 2 | 25 55 | 38 12 |  
 |62 20 | 1 47 |56 26 |11 37  
 42-- 4--|21--63--|36--10--|31 53 |  
 7 45 | 60 18 | 13 39 | 50 28  
 57 | 6 | 51 | 16 |  
 24-----43-----30-----33

6529/  
 25-----38-----31-----36  
 |56 |11 |50 |13  
 48 10 | 19 53 | 42 16 | 21 51  
 | 1 39--+62--28--+7--33--+60--30  
 17 63 | 46 4 | 23 57 | 44 6 |  
 |64 18 | 3 45 |58 24 |5 43  
 40-- 2--|27--61--|34-- 8--|29 59 |  
 9 47 | 54 20 | 15 41 | 52 22  
 55 | 12 | 49 | 14 |  
 26-----37-----32-----35

6625/  
 26-----39-----30-----35  
 |55 |10 |51 |14  
 47 12 | 18 53 | 43 16 | 22 49  
 | 2 37--+63--28--+6--33--+59--32  
 17 61 | 48 4 | 21 57 | 44 8 |  
 |64 20 | 1 45 |60 24 |5 41  
 40-- 3--|25--62--|36-- 7--|29 58 |  
 9 46 | 56 19 | 13 42 | 52 23  
 54 | 11 | 50 | 15 |  
 27-----38-----31-----34

6673/  
 27-----40-----29-----34  
 |54 | 9 |52 |15  
 46 12 | 17 55 | 44 14 | 23 49  
 | 3 37--+64--26--+5--35--+58--32  
 19 61 | 48 2 | 21 59 | 42 8 |  
 |62 20 | 1 47 |60 22 |7 41  
 38-- 4--|25--63--|36-- 6--|31 57 |  
 11 45 | 56 18 | 13 43 | 50 24  
 53 | 10 | 51 | 16 |  
 28-----39-----30-----33

6697/  
 29-----40-----27-----34  
 |52 | 9 |54 |15  
 44 14 | 17 55 | 46 12 | 23 49  
 | 5 35--+64--26--+3--37--+58--32  
 21 59 | 48 2 | 19 61 | 42 8 |  
 |60 22 | 1 47 |62 20 |7 41  
 36-- 6--|25--63--|38-- 4--|31 57 |  
 13 43 | 56 18 | 11 45 | 50 24  
 51 | 10 | 53 | 16 |  
 30-----39-----28-----33

[Solution Counts = 6720]

\* Solution Counts according to the Values of n43 when n1=1 \*

```

1: 0, 2: 0, 3: 0, 4: 0, 5: 0, 6: 0, 7: 0, 8: 0,
9: 0, 10: 0, 11: 0, 12: 0, 13: 0, 14: 0, 15: 0, 16: 0,
17: 0, 18: 0, 19: 0, 20: 0, 21: 0, 22: 0, 23: 0, 24: 0,
25: 0, 26: 0, 27: 0, 28: 0, 29: 0, 30: 0, 31: 0, 32: 120,
33: 0, 34: 0, 35: 0, 36: 0, 37: 0, 38: 0, 39: 0, 40: 0,
41: 0, 42: 0, 43: 0, 44: 0, 45: 0, 46: 0, 47: 0, 48: 120,
49: 0, 50: 0, 51: 0, 52: 0, 53: 0, 54: 0, 55: 0, 56: 120,
57: 0, 58: 0, 59: 0, 60: 120, 61: 0, 62: 120, 63: 120, 64: 120;

```

[OK!]

\*\* Calculated and Listed by Kanji Setsuda on  
Dec.25, 2014 with MacOSX 10.10.1 & Xcode 6.1.1 \*\*

The next list shows the check results if each of the necessary sums is correct.

\*\*\* 'Composite & Pan-triagonal' Magic Cubes of Order 4: \*\*\*  
\*\* Standard Solutions with precise Check-Sum Errors; \*\*

		1/	CS	Rw,C1,&P1	Pantriagonals	Composite	Fours
1	-----56-----25-----48		0	0	0	0	0
64	9 40  17		0	0	0	0	0
63	5 10 52 39 29 18 44		0	0	0	0	0
2	60--55--13--26--36--47--21		0	0	0	0	0
4	59   53 14 28 35 45 22		0	0	0	0	0
61	6 12 51 37 30  20 43		0	0	0	0	0
62--	8-- 11--49--38--32--19 41		0	0	0	0	0
3	57 54 16 27 33 46 24		0	0	0	0	0
58	15 34 23		0	0	0	0	0
7	-----50-----31-----42		0	0	0	0	0

		121/	CS	Rw,C1,&P1	Pantriagonals	Composite	Fours
1	-----56-----41-----32		0	0	0	0	0
64	9 24  33		0	0	0	0	0
63	5 10 52 23 45 34 28		0	0	0	0	0
2	60--55--13--42--20--31--37		0	0	0	0	0
4	59   53 14 44 19 29 38		0	0	0	0	0
61	6 12 51 21 46  36 27		0	0	0	0	0
62--	8-- 11--49--22--48--35 25		0	0	0	0	0
3	57 54 16 43 17 30 40		0	0	0	0	0
58	15 18 39		0	0	0	0	0
7	-----50-----47-----26		0	0	0	0	0

		241/	CS	Rw,C1,&P1	Pantriagonals	Composite	Fours
1	-----48-----49-----32		0	0	0	0	0
64	17 16  33		0	0	0	0	0
63	5 18 44 15 53 34 28		0	0	0	0	0
2	60--47--21--50--12--31--37		0	0	0	0	0
4	59   45 22 52 11 29 38		0	0	0	0	0
61	6 20 43 13 54  36 27		0	0	0	0	0
62--	8-- 19--41--14--56--35 25		0	0	0	0	0
3	57 46 24 51 9 30 40		0	0	0	0	0
58	23 10 39		0	0	0	0	0
7	-----42-----55-----26		0	0	0	0	0

		361/	CS	Rw,C1,&P1	Pantriagonals	Composite	Fours
1	-----48-----49-----32		0	0	0	0	0
64	17 16  33		0	0	0	0	0
63	9 18 40 15 57 34 24		0	0	0	0	0
2	56--47--25--50--8--31--41		0	0	0	0	0
4	55   45 26 52 7 29 42		0	0	0	0	0
61	10 20 39 13 58  36 23		0	0	0	0	0
62--	12-- 19--37--14--60--35 21		0	0	0	0	0
3	53 46 28 51 5 30 44		0	0	0	0	0
54	27 6 43		0	0	0	0	0
11	-----38-----59-----22		0	0	0	0	0

		481/	CS	Rw,C1,&P1	Pantriagonals	Composite	Fours
1	-----48-----49-----32		0	0	0	0	0
64	17 16  33		0	0	0	0	0
63	9 18 40 15 57 34 24		0	0	0	0	0
2	56--47--25--50--8--31--41		0	0	0	0	0
6	55   43 26 54 7 27 42		0	0	0	0	0
59	10 22 39 11 58  38 23		0	0	0	0	0
60--	14-- 21--35--12--62--37 19		0	0	0	0	0
5	51 44 30 53 3 28 46		0	0	0	0	0
52	29 4 45		0	0	0	0	0
13	-----36-----61-----20		0	0	0	0	0

601/												CS	Rw,Cl,&Pl	Pantriagonals	Composite	Fours										
1	-----	48	-----	49	-----	32		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	64		17		16			33				0	0	0	0	0	0	0	0	0	0	0	0			
62	9	19	40	14	57	35	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	3	56	-----	46	-----	25	-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7	54		42	27	55	6	26	43		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	58	11	23	38	10	59		39	22		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	-----	15	-----	21	-----	34	-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5	50		44	31	53	2	28	47		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
52		29								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13	-----	36	-----	61	-----	20		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

721/												CS	Rw,Cl,&Pl	Pantriagonals	Composite	Fours										
1	-----	48	-----	49	-----	32		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	63		18		15			34				0	0	0	0	0	0	0	0	0	0	0	0			
62	10	19	39	14	58	35	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	4	56	-----	45	-----	25	-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7	53		42	28	55	5	26	44		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	57	11	24	38	9	59		40	22		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	-----	16	-----	21	-----	33	-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
6	50		43	31	54	2	27	47		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
51		30								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13	-----	36	-----	61	-----	20		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

841/												CS	Rw,Cl,&Pl	Pantriagonals	Composite	Fours										
2	-----	55	-----	26	-----	47		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	64		9		40			17				0	0	0	0	0	0	0	0	0	0	0	0			
63	5	10	52	39	29	18	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	1	59	-----	56	-----	14	-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
4	60		53	13	28	36	45	21		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	62	6	11	51	38	30		19	43		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	-----	7	-----	12	-----	50	-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
3	57		54	16	27	33	46	24		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
58		15								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	-----	49	-----	32	-----	41		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

\*\* Calculated and Listed by Kanji Setsuda on  
Dec.25, 2014 with MacOSX 10.10.1 & Xcode 6.1.1 \*\*

Just as you see above, every solutions prove to have no errors. All of them are really what we have wanted, the Composite Pan-magic Cubes of Order 4.

The total count of solutions is very small, smaller than any other type of cubes, and it shows our object is one of the rarest, noblest Magic Things, I would say.

It also has such an interesting characteristics with them as:

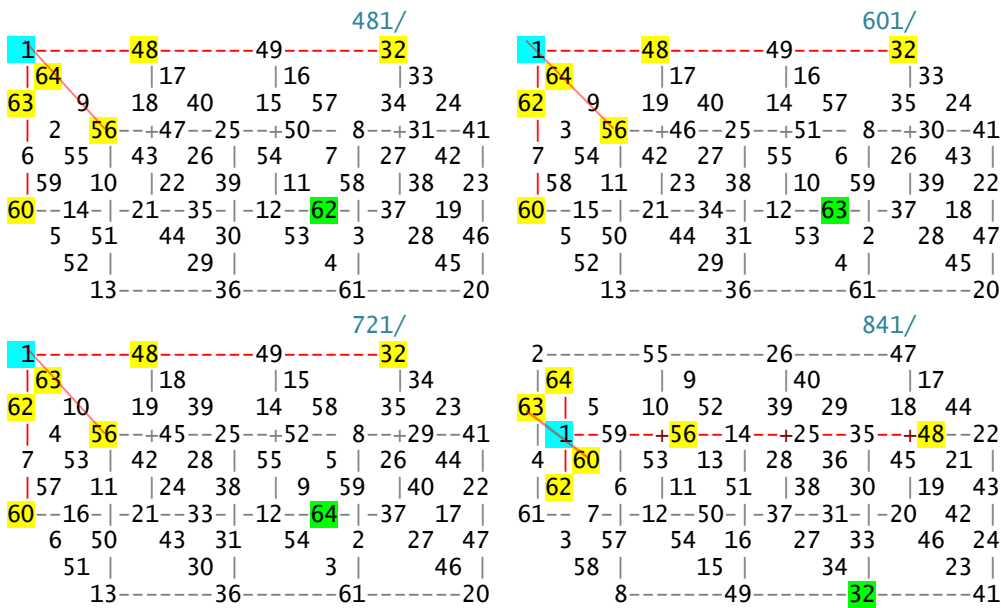
(1) Watch the next list of sample solutions below, please.

Number **1** seems to have its own 7 fixed followers on the fixed positions around it. 6 of them are on the same axes where **1** is situated on, and the rest one on **n43**.

The followers of **1** seems to be {64, 63, 60, 56, 48 and 32}.

1/												121/											
<b>1</b>	-----	<b>56</b>	-----	25	-----	<b>48</b>		<b>1</b>	-----	<b>56</b>	-----	41	-----	<b>32</b>									
	64		9		40			17					64		9			24					33
63	5	10	52	39	29	18	44	63	5	10	52	23	45	34	28								
	2	<b>60</b>	-----	55	-----	13	-----		2	<b>60</b>	-----	55	-----	13	-----								
4	59		53	14	28	35	45	22		4	59		53	14	44	19	29	38					
	61	6	12	51	37	30		20	43			61	6	12	51	21	46	36	27				
<b>62</b>	-----	8	-----	11	-----	49	-----	<b>62</b>	-----	8	-----	11	-----	49	-----								
3	57		54	16	27	33	46	24		3	57		54	16	43	17	30	40					
58		15								58		15			18								
7	-----	50	-----	31	-----	42		7	-----	50	-----	47	-----	26									
241/												361/											
<b>1</b>	-----	<b>48</b>	-----	49	-----	<b>32</b>		<b>1</b>	-----	<b>48</b>	-----	49	-----	<b>32</b>									
	64		17		16			33					64		17			16					33
63	5	18	44	15	53	34	28	63	5	18	40	15	57	34	24								
	2	<b>60</b>	-----	47	-----	21	-----		2	<b>56</b>	-----	47	-----	25	-----								
4	59		45	22	52	11	29	38		4	55		45	26	52	7	29	42					
	61	6	20	43	13	54		36	27			61	10	20	39	13	58		36	23			
<b>62</b>	-----	8	-----	19	-----	41	-----	<b>62</b>	-----	12	-----	19	-----	37	-----								
3	57		46	24	51	9	30	40		3	53		46	28	51	5	30	44					
58		23			10					54		27			6								
7	-----	42	-----	55	-----	26		11	-----	38	-----	59	-----	22									





The 7 followers seems to be sitting freely only among those 7 seats.

- (2) Wherever Number 1 goes out of the Origin n1, the 7 fixed followers seem to go along with 1 regularly at the same time.

Let me explain fully about my study of these points in the following Section 4-2. I will explain about the mysterious role of the 'Complementary Pairs' there. I will also discuss there about what the meaning of solution counts is:

$$6720 = 2^3 \times 2^3 \times 7 \times 5 \times 3;$$

Let me end this introduction of CPMC444 here and come to the next topic.

### #5. Let's make the 'Composite & Complete' type of Magic Cubes of Order 4

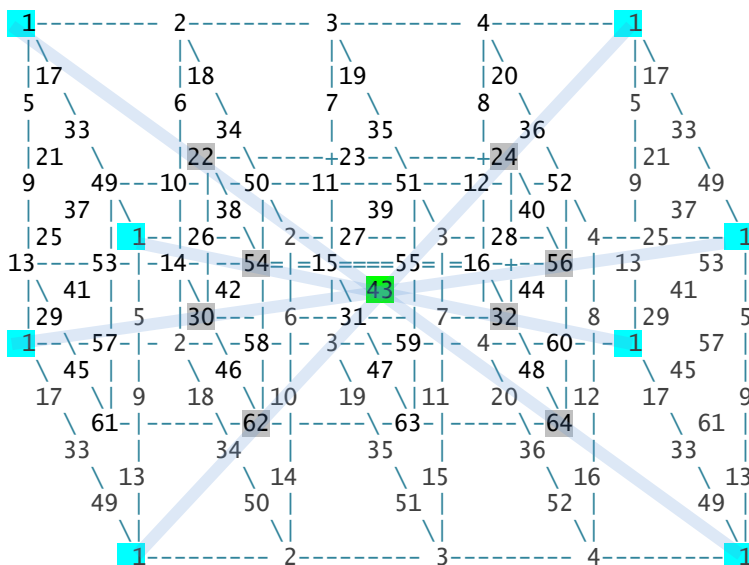
We, Japanese researchers, have known very well about the next 'Complete' type of CPMC444. Let me demonstrate what we have long treasured most, realizing it here.

**\*\* Definitions: \*\***

'Composite Conditions' are just the same as the former type of CPMC444.

\* Additional Basic Conditions:  $C=130$ ; \*

$$n1+n2+n3+n4=C \dots b1; \quad n1+n5+n9+n13=C \dots b2; \quad n1+n17+n33+n49=C \dots b3;$$



(43) is the Pan-magic Symmetric Center toward every n1=1 in the Extended Space.)

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

```
** Normalizing Inequality Conditions for Standard Solutions **
n2>n5>n17; n1<n4; n1<n13; n1<n16; n1<n49; n1<n52; n1<n61; and n1<n64;
```

The 'Complete Conditions' mean that every pan-triagonal could be defined as the sums of those pairs as below:

```
n1+n22+n43+n64=(n1+n43)+(n22+n64)=CC+CC=130; n1+n24+n43+n62=(n1+n43)+(n24+n62)=CC+CC=130;
n1+n30+n43+n56=(n1+n43)+(n30+n56)=CC+CC=130; n1+n32+n43+n54=(n1+n43)+(n32+n54)=CC+CC=130;
n2+n23+n44+n61=(n2+n44)+(n23+n61)=CC+CC=130; n2+n21+n44+n63=(n2+n44)+(n21+n63)=CC+CC=130;
n2+n31+n44+n53=(n2+n44)+(n31+n53)=CC+CC=130; n2+n29+n44+n55=(n2+n44)+(n29+n55)=CC+CC=130;
n3+n24+n41+n62=(n3+n41)+(n24+n62)=CC+CC=130; n3+n22+n41+n64=(n3+n41)+(n22+n64)=CC+CC=130;
n3+n32+n41+n54=(n3+n41)+(n32+n54)=CC+CC=130; n3+n30+n41+n56=(n3+n41)+(n30+n56)=CC+CC=130;
n4+n21+n42+n63=(n4+n42)+(n21+n63)=CC+CC=130; n4+n23+n42+n61=(n4+n42)+(n23+n61)=CC+CC=130;
n4+n29+n42+n55=(n4+n42)+(n29+n55)=CC+CC=130; n4+n31+n42+n53=(n4+n42)+(n31+n53)=CC+CC=130;
. . . .
```

They mean this is really the special type of Pan-triagonal Magic Cubes of Order 4. But, it is different from the former CPMC444 on the point that  $n43=64$  whenever  $n1=1$ .  $n43$  can never take any other value than 64.

Let me present the recent program I dictated for this type at the end of this article. Here you are at the result list of realization of 'Composite & Complete' PMC444.

```
** 'Composite & Complete' Magic Cubes of Order 4: **
* Compact List of the 960 Standard Solutions Normalized *
```

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

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

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

67/  
 1-----62-----4-----63  
 |48-----|19-----|45-----|18-----|  
 60 49 7 14 57 52 6 15  
 |21 32--|42--35--|24--29--|43--34--|  
 13 12 | 50 55 | 16 9 | 51 54 |  
 |36 37 |31 26 |33 40 |30 27 |  
 56-61-|11- 2-|53-64-|10 3 |  
 25 20 38 47 28 17 39 46  
 8 | 59 | 5 | 58 |  
 41-----22-----44-----23

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

79/  
 1-----62-----4-----63  
 |48-----|19-----|45-----|18-----|  
 56 49 11 14 53 52 10 15  
 |25 32--|38--35--|28--29--|39--34--|  
 13 8 | 50 59 | 16 5 | 51 58 |  
 |36 41 |31 22 |33 44 |30 23 |  
 60-61-| 7- 2-|57-64-| 6 3 |  
 21 20 42 47 24 17 43 46  
 12 | 55 | 9 | 54 |  
 37-----26-----40-----27

85/  
 1-----62-----4-----63  
 |32-----|35-----|29-----|34-----|  
 56 49 11 14 53 52 10 15  
 |41 48--|22--19--|44--45--|23--18--|  
 13 8 | 50 59 | 16 5 | 51 58 |  
 |20 25 |47 38 |17 28 |46 39 |  
 60-61-| 7- 2-|57-64-| 6 3 |  
 37 36 26 31 40 33 27 30  
 12 | 55 | 9 | 54 |  
 21-----42-----24-----43

91/  
 1-----62-----4-----63  
 |32-----|35-----|29-----|34-----|  
 48 41 19 22 45 44 18 23  
 |49 56--|14--11--|52--53--|15--10--|  
 21 8 | 42 59 | 24 5 | 43 58 |  
 |12 25 |55 38 | 9 28 |54 39 |  
 60-61-| 7- 2-|57-64-| 6 3 |  
 37 36 26 31 40 33 27 30  
 20 | 47 | 17 | 46 |  
 13-----50-----16-----51

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

103/  
 1-----60-----6-----63  
 |32-----|37-----|27-----|34-----|  
 56 49 13 12 51 54 10 15  
 |41 48--|20--21--|46--43--|23--18--|  
 11 8 | 50 61 | 16 3 | 53 58 |  
 |22 25 |47 36 |17 30 |44 39 |  
 62-59-| 7- 2-|57-64-| 4 5 |  
 35 38 26 31 40 33 29 28  
 14 | 55 | 9 | 52 |  
 19-----42-----24-----45

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

115/  
 1-----56-----10-----63  
 |32-----|41-----|23-----|34-----|  
 48 37 25 20 39 46 18 27  
 |49 60--| 8--13--|58--51--|15-- 6--|  
 19 12 | 38 61 | 28 3 | 45 54 |  
 |14 21 |59 36 | 5 30 |52 43 |  
 62-55-|11- 2-|53-64-| 4 9 |  
 35 42 22 31 44 33 29 24  
 26 | 47 | 17 | 40 |  
 7-----50-----16-----57

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

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

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

433/  
 5-----64-----3-----58  
 |52-----| 9-----|54-----|15-----|  
 59 45 2 24 61 43 8 18  
 |14 28--|55--33--|12--30--|49--39--|  
 22 19 | 47 42 | 20 21 | 41 48 |  
 |35 38 |26 31 |37 36 |32 25 |  
 44-62-|17- 7-|46-60-|23 1 |  
 29 11 40 50 27 13 34 56  
 4 | 57 | 6 | 63 |  
 53-----16-----51-----10

505/  
 6-----63-----4-----57  
 |51-----|10-----|53-----|16-----|  
 60 46 1 23 62 44 7 17  
 |13 27--|56--34--|11--29--|50--40--|  
 21 20 | 48 41 | 19 22 | 42 47 |  
 |36 37 |25 32 |38 35 |31 26 |  
 43-61-|18- 8-|45-59-|24 2 |  
 30 12 39 49 28 14 33 55  
 3 | 58 | 5 | 64 |  
 54-----15-----52----- 9

577/  
 7-----62-----4-----57  
 |50-----|11-----|53-----|16-----|  
 60 47 1 22 63 44 6 17  
 |13 26--|56--35--|10--29--|51--40--|  
 21 20 | 48 41 | 18 23 | 43 46 |  
 |36 37 |25 32 |39 34 |30 27 |  
 42-61-|19- 8-|45-58-|24 3 |  
 31 12 38 49 28 15 33 54  
 2 | 59 | 5 | 64 |  
 55-----14-----52----- 9

631/  
 8-----61-----3-----58  
 |49-----|12-----|54-----|15-----|  
 59 48 2 21 64 43 5 18  
 |14 25--|55--36--| 9--30--|52--39--|  
 22 19 | 47 42 | 17 24 | 44 45 |  
 |35 38 |26 31 |40 33 |29 28 |  
 41-62-|20- 7-|46-57-|23 4 |  
 32 11 37 50 27 16 34 53  
 1 | 60 | 6 | 63 |  
 56-----13-----51-----10

685/  
 9-----64-----3-----54  
 |40-----|17-----|46-----|27-----|  
 55 57 2 16 61 51 12 6  
 |26 24--|47--33--|20--30--|37--43--|  
 14 7 | 59 50 | 8 13 | 49 60 |  
 |35 42 |22 31 |41 36 |32 21 |  
 52-62-| 5-11-|58-56-|15 1 |  
 29 19 44 38 23 25 34 48  
 4 | 53 | 10 | 63 |  
 45-----28-----39-----18

733/  
 10-----63-----4-----53  
 |39-----|18-----|45-----|28-----|  
 56 58 1 15 62 52 11 5  
 |25 23--|48--34--|19--29--|38--44--|  
 13 8 | 60 49 | 7 14 | 50 59 |  
 |36 41 |21 32 |42 35 |31 22 |  
 51-61-| 6-12-|57-55-|16 2 |  
 30 20 43 37 24 26 33 47  
 3 | 54 | 9 | 64 |  
 46-----27-----40-----17

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

<p style="text-align: center;">811/ 12-----61-----3-----54</p> <pre>   37     20     46     27 55 60  2 13  64 51  9  6   26 21--  47--36--  17--30--  40--43 14  7   59 50   5 16   52 57     35 42   22 31   44 33   29 24 49--62--  8--11--  58--53--  15  4    32 19 41 38 23 28 34 45   1     56     10     63    48-----25-----39-----18 </pre>	<p style="text-align: center;">841/ 13-----60-----6-----51</p> <pre>   36     21     43     30 56 61  1 12  63 54 10  3   25 20--  48--37--  18--27--  39--46 11  8   62 49   4 15   53 58     38 41   19 32   45 34   28 23 50--59--  7--14--  57--52--  16  5    31 22 42 35 24 29 33 44   2     55     9      64    47-----26-----40-----17 </pre>	<p style="text-align: center;">853/ 14-----59-----5-----52</p> <pre>   35     22     44     29 55 62  2 11  64 53  9  4   26 19--  47--38--  17--28--  40--45 12  7   61 50   3 16   54 57     37 42   20 31   46 33   27 24 49--60--  8--13--  58--51--  15  6    32 21 41 36 23 30 34 43   1     56     10     63    48-----25-----39-----18 </pre>
<p style="text-align: center;">865/ 17-----64-----3-----46</p> <pre>   16     33     30     51 47 57  2 24  61 43 20  6   50 40--  31--9--  36--54--  13--27 22  7   59 42   8 21   41 60     11 26   38 55   25 12   56 37 44--62--  5--19--  58--48--  23  1    53 35 28 14 39 49 10 32   4     45     18     63    29-----52-----15-----34 </pre>	<p style="text-align: center;">889/ 18-----63-----4-----45</p> <pre>   15     34     29     52 48 58  1 23  62 44 19  5   49 39--  32--10--  35--53--  14--28 21  8   60 41   7 22   42 59     12 25   37 56   26 11   55 38 43--61--  6--20--  57--47--  24  2    54 36 27 13 40 50  9 31   3     46     17     64    30-----51-----16-----33 </pre>	<p style="text-align: center;">913/ 19-----62-----4-----45</p> <pre>   14     35     29     52 48 59  1 22  63 44 18  5   49 38--  32--11--  34--53--  15--28 21  8   60 41   6 23   43 58     12 25   37 56   27 10   54 39 42--61--  7--20--  57--46--  24  3    55 36 26 13 40 51  9 30   2     47     17     64    31-----50-----16-----33 </pre>
<p style="text-align: center;">925/ 20-----61-----3-----46</p> <pre>   13     36     30     51 47 60  2 21  64 43 17  6   50 37--  31--12--  33--54--  16--27 22  7   59 42   5 24   44 57     11 26   38 55   28  9   53 40 41--62--  8--19--  58--45--  23  4    56 35 25 14 39 52 10 29   1     48     18     63    32-----49-----15-----34 </pre>	<p style="text-align: center;">937/ 21-----60-----6-----43</p> <pre>   12     37     27     54 48 61  1 20  63 46 18  3   49 36--  32--13--  34--51--  15--30 19  8   62 41   4 23   45 58     14 25   35 56   29 10   52 39 42--59--  7--22--  57--44--  24  5    55 38 26 11 40 53  9 28   2     47     17     64    31-----50-----16-----33 </pre>	<p style="text-align: center;">943/ 22-----59-----5-----44</p> <pre>   11     38     28     53 47 62  2 19  64 45 17  4   50 35--  31--14--  33--52--  16--29 20  7   61 42   3 24   46 57     13 26   36 55   30  9   51 40 41--60--  8--21--  58--43--  23  6    56 37 25 12 39 54 10 27   1     48     18     63    32-----49-----15-----34 </pre>
<p style="text-align: center;">949/ 25-----56-----10-----39</p> <pre>    8     41     23     58 48 61  1 20  63 46 18  3   49 36--  32--13--  34--51--  15--30 19 12   62 37   4 27   45 54     14 21   35 60   29  6   52 43 38--55--  11--26--  53--40--  28  9    59 42 22  7 44 57  5 24   2     47     17     64    31-----50-----16-----33 </pre>	<p style="text-align: center;">955/ 26-----55-----9-----40</p> <pre>    7     42     24     57 47 62  2 19  64 45 17  4   50 35--  31--14--  33--52--  16--29 20 11   61 38   3 28   46 53     13 22   36 59   30  5   51 44 37--56--  12--25--  54--39--  27 10    60 41 21  8 43 58  6 23   1     48     18     63    32-----49-----15-----34 </pre>	

[Solution Counts = 960]

The next list shows the check results if each of the necessary sums is correct.

\*\*\* 'Composite & Complete' Magic Cubes of Order 4: \*\*\*  
\*\* Sample Solutions with precise Check-Sum Errors \*\*

1/ 1-----63-----10-----56	CS Rw,C1,&P1 Pantriagonals Composite Fours
<pre>   1     60     6     51     13 62 37  4 27  53 46 11 20   7     32--  57--34--  16--23--  50--41 19 26   45 40   28 17   38 47     42 35   24 29   33 44   31 22 48--55--  18--9--  39--64--  25  2    21 14 43 52 30  5 36 59  12     54     3      61    49-----15-----58-----8 </pre>	<pre>  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 </pre>
<p style="text-align: center;">61/ 1-----62-----4-----63</p> <pre>   1     56     11     53     10 60 41  7 22  57 44  6 23   13 32--  50--35--  16--29--  51--34 21 20   42 47   24 17   43 46     36 37   31 26   33 40   30 27 48--61--  19--2--  45--64--  18  3    25 12 38 55 28  9 39 54   8     59     5      58    49-----14-----52-----15 </pre>	<pre>  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 </pre>

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

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

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

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

\*\* Calculated and Listed by Kanji Setsuda on  
Aug. 8, 2015 with MacOSX 10.10.4 & Xcode 6.4 \*\*

The total count of solutions 960 is so small, smaller than any other types, and it tells us our object is really the rarest and the most precious cubes, I would say.

It also has so many common characteristics with the former CPMC444 such as:

- (1) Number 1 also has its own fixed followers {32, 48, 56, 60, 62, 63 and 64} around it: the first 6 are on the same axes where 1 is situated on and the rest one 64 is placed only on the Pan-magic Symmetric Center.
- (2) While the first 6 followers can sit freely among those 6 fixed seats, the rest one 64 never goes out of the 'Pan-magic Symmetric Center'.
- (3) Wherever Number 1 goes out of the Origin n1, the 7 fixed followers always go along with 1 regularly at the same time.

How similar those two types are!

Yes. It is because that this 'Composite & Complete' type is really a part of the former 'Composite & Pan-triagonal' type of Magic Cubes of Order 4. All the solutions of the former type are included in the solution set of the latter type.

It is the solution set whose  $n1+n43=65$  ('Complete Conditions') is especially fulfilled.

Therefore, the total solution count  $960=(1/7)\times 6720$ ; It is not an accident at all.

### #6. How about the 'Composite and Self-Complementary' type of MC444?

Can we make such the MC444 as the 'Composite & Self-Complementary' type?

We, Japanese researchers, have had a long tradition of studying the 'S-C' type with the 'Complete' one at the same time. The comparative study of those two types has been one of the most important topics so that we have been always concerned with.

As a custom we now ask if we can make 'Composite & Self-Complementary' type.

\*\* Definition of 'Composite & S-C' type of Magic Cubes of Order 4 \*\*

\* Conditions for Composite Fours: C=130; \*

$n1+n2+n5+n6=C$	...c1a;	$n1+n2+n17+n18=C$	...c1b;	$n1+n5+n17+n21=C$	...c1c;
$n2+n3+n6+n7=C$	...c2a;	$n2+n3+n18+n19=C$	...c2b;	$n2+n6+n18+n22=C$	...c2c;
$n3+n4+n7+n8=C$	...c3a;	$n3+n4+n19+n20=C$	...c3b;	$n3+n7+n19+n23=C$	...c3c;
$n4+n1+n8+n5=C$	...c4a;	$n4+n1+n20+n17=C$	...c4b;	$n4+n8+n20+n24=C$	...c4c;
$n5+n6+n9+n10=C$	...c5a;	$n5+n6+n21+n22=C$	...c5b;	$n5+n9+n21+n25=C$	...c5c;
$n6+n7+n10+n11=C$	...c6a;	$n6+n7+n22+n23=C$	...c6b;	$n6+n10+n22+n26=C$	...c6c;
$n7+n8+n11+n12=C$	...c7a;	$n7+n8+n23+n24=C$	...c7b;	$n7+n11+n23+n27=C$	...c7c;
$n8+n5+n12+n9=C$	...c8a;	$n8+n5+n24+n21=C$	...c8b;	$n8+n12+n24+n28=C$	...c8c;
$n9+n10+n13+n14=C$	...c9a;	$n9+n10+n25+n26=C$	...c9b;	$n9+n13+n25+n29=C$	...c9c;
$n10+n11+n14+n15=C$	...c10a;	$n10+n11+n26+n27=C$	...c10b;	$n10+n14+n26+n30=C$	...c10c;
$n11+n12+n15+n16=C$	...c11a;	$n11+n12+n27+n28=C$	...c11b;	$n11+n15+n27+n31=C$	...c11c;
$n12+n9+n16+n13=C$	...c12a;	$n12+n9+n28+n25=C$	...c12b;	$n12+n16+n28+n32=C$	...c12c;
$n13+n14+n1+n2=C$	...c13a;	$n13+n14+n29+n30=C$	...c13b;	$n13+n1+n29+n17=C$	...c13c;
$n14+n15+n2+n3=C$	...c14a;	$n14+n15+n30+n31=C$	...c14b;	$n14+n2+n30+n18=C$	...c14c;
$n15+n16+n3+n4=C$	...c15a;	$n15+n16+n31+n32=C$	...c15b;	$n15+n3+n31+n19=C$	...c15c;
$n16+n13+n4+n1=C$	...c16a;	$n16+n13+n32+n29=C$	...c16b;	$n16+n4+n32+n20=C$	...c16c;
$n17+n18+n21+n22=C$	...c17a;	$n17+n18+n33+n34=C$	...c17b;	$n17+n21+n33+n37=C$	...c17c;
$n18+n19+n22+n23=C$	...c18a;	$n18+n19+n34+n35=C$	...c18b;	$n18+n22+n34+n38=C$	...c18c;
$n19+n20+n23+n24=C$	...c19a;	$n19+n20+n35+n36=C$	...c19b;	$n19+n23+n35+n39=C$	...c19c;
$n20+n17+n24+n21=C$	...c20a;	$n20+n17+n36+n33=C$	...c20b;	$n20+n24+n36+n40=C$	...c20c;
$n21+n22+n25+n26=C$	...c21a;	$n21+n22+n37+n38=C$	...c21b;	$n21+n25+n37+n41=C$	...c21c;
$n22+n23+n26+n27=C$	...c22a;	$n22+n23+n38+n39=C$	...c22b;	$n22+n26+n38+n42=C$	...c22c;
$n23+n24+n27+n28=C$	...c23a;	$n23+n24+n39+n40=C$	...c23b;	$n23+n27+n39+n43=C$	...c23c;
$n24+n21+n28+n25=C$	...c24a;	$n24+n21+n40+n37=C$	...c24b;	$n24+n28+n40+n44=C$	...c24c;
$n25+n26+n29+n30=C$	...c25a;	$n25+n26+n41+n42=C$	...c25b;	$n25+n29+n41+n45=C$	...c25c;
$n26+n27+n30+n31=C$	...c26a;	$n26+n27+n42+n43=C$	...c26b;	$n26+n30+n42+n46=C$	...c26c;
$n27+n28+n31+n32=C$	...c27a;	$n27+n28+n43+n44=C$	...c27b;	$n27+n31+n43+n47=C$	...c27c;
$n28+n25+n32+n29=C$	...c28a;	$n28+n25+n44+n41=C$	...c28b;	$n28+n32+n44+n48=C$	...c28c;
$n29+n30+n17+n18=C$	...c29a;	$n29+n30+n45+n46=C$	...c29b;	$n29+n17+n45+n33=C$	...c29c;
$n30+n31+n18+n19=C$	...c30a;	$n30+n31+n46+n47=C$	...c30b;	$n30+n18+n46+n34=C$	...c30c;
$n31+n32+n19+n20=C$	...c31a;	$n31+n32+n47+n48=C$	...c31b;	$n31+n19+n47+n35=C$	...c31c;
$n32+n29+n20+n17=C$	...c32a;	$n32+n29+n48+n45=C$	...c32b;	$n32+n20+n48+n36=C$	...c32c;
$n33+n34+n37+n38=C$	...c33a;	$n33+n34+n49+n50=C$	...c33b;	$n33+n37+n49+n53=C$	...c33c;
$n34+n35+n38+n39=C$	...c34a;	$n34+n35+n50+n51=C$	...c34b;	$n34+n38+n50+n54=C$	...c34c;
$n35+n36+n39+n40=C$	...c35a;	$n35+n36+n51+n52=C$	...c35b;	$n35+n39+n51+n55=C$	...c35c;
$n36+n33+n40+n37=C$	...c36a;	$n36+n33+n52+n49=C$	...c36b;	$n36+n40+n52+n56=C$	...c36c;
$n37+n38+n41+n42=C$	...c37a;	$n37+n38+n53+n54=C$	...c37b;	$n37+n41+n53+n57=C$	...c37c;
$n38+n39+n42+n43=C$	...c38a;	$n38+n39+n54+n55=C$	...c38b;	$n38+n42+n54+n58=C$	...c38c;
$n39+n40+n43+n44=C$	...c39a;	$n39+n40+n55+n56=C$	...c39b;	$n39+n43+n55+n59=C$	...c39c;
$n40+n37+n44+n41=C$	...c40a;	$n40+n37+n56+n53=C$	...c40b;	$n40+n44+n56+n60=C$	...c40c;
$n41+n42+n45+n46=C$	...c41a;	$n41+n42+n57+n58=C$	...c41b;	$n41+n45+n57+n61=C$	...c41c;
$n42+n43+n46+n47=C$	...c42a;	$n42+n43+n58+n59=C$	...c42b;	$n42+n46+n58+n62=C$	...c42c;
$n43+n44+n47+n48=C$	...c43a;	$n43+n44+n59+n60=C$	...c43b;	$n43+n47+n59+n63=C$	...c43c;
$n44+n41+n48+n45=C$	...c44a;	$n44+n41+n60+n57=C$	...c44b;	$n44+n48+n60+n64=C$	...c44c;
$n45+n46+n33+n34=C$	...c45a;	$n45+n46+n61+n62=C$	...c45b;	$n45+n33+n61+n49=C$	...c45c;
$n46+n47+n34+n35=C$	...c46a;	$n46+n47+n62+n63=C$	...c46b;	$n46+n34+n62+n50=C$	...c46c;
$n47+n48+n35+n36=C$	...c47a;	$n47+n48+n63+n64=C$	...c47b;	$n47+n35+n63+n51=C$	...c47c;
$n48+n45+n36+n33=C$	...c48a;	$n48+n45+n64+n61=C$	...c48b;	$n48+n36+n64+n52=C$	...c48c;
$n49+n50+n53+n54=C$	...c49a;	$n49+n50+n1+n2=C$	...c49b;	$n49+n53+n1+n5=C$	...c49c;
$n50+n51+n54+n55=C$	...c50a;	$n50+n51+n2+n3=C$	...c50b;	$n50+n54+n2+n6=C$	...c50c;

$n_{51}+n_{52}+n_{55}+n_{56}=C \dots c_{51a}$ ;  $n_{51}+n_{52}+n_3+n_4=C \dots c_{51b}$ ;  $n_{51}+n_{55}+n_3+n_7=C \dots c_{51c}$ ;  
 $n_{52}+n_{49}+n_{56}+n_{53}=C \dots c_{52a}$ ;  $n_{52}+n_{49}+n_4+n_1=C \dots c_{52b}$ ;  $n_{52}+n_{56}+n_4+n_8=C \dots c_{52c}$ ;  
 $n_{53}+n_{54}+n_{57}+n_{58}=C \dots c_{53a}$ ;  $n_{53}+n_{54}+n_5+n_6=C \dots c_{53b}$ ;  $n_{53}+n_{57}+n_5+n_9=C \dots c_{53c}$ ;  
 $n_{54}+n_{55}+n_{58}+n_{59}=C \dots c_{54a}$ ;  $n_{54}+n_{55}+n_6+n_7=C \dots c_{54b}$ ;  $n_{54}+n_{58}+n_6+n_{10}=C \dots c_{54c}$ ;  
 $n_{55}+n_{56}+n_{59}+n_{60}=C \dots c_{55a}$ ;  $n_{55}+n_{56}+n_7+n_8=C \dots c_{55b}$ ;  $n_{55}+n_{59}+n_7+n_{11}=C \dots c_{55c}$ ;  
 $n_{56}+n_{53}+n_{60}+n_{57}=C \dots c_{56a}$ ;  $n_{56}+n_{53}+n_8+n_5=C \dots c_{56b}$ ;  $n_{56}+n_{60}+n_8+n_{12}=C \dots c_{56c}$ ;  
 $n_{57}+n_{58}+n_{61}+n_{62}=C \dots c_{57a}$ ;  $n_{57}+n_{58}+n_9+n_{10}=C \dots c_{57b}$ ;  $n_{57}+n_{61}+n_9+n_{13}=C \dots c_{57c}$ ;  
 $n_{58}+n_{59}+n_{62}+n_{63}=C \dots c_{58a}$ ;  $n_{58}+n_{59}+n_{10}+n_{11}=C \dots c_{58b}$ ;  $n_{58}+n_{62}+n_{10}+n_{14}=C \dots c_{58c}$ ;  
 $n_{59}+n_{60}+n_{63}+n_{64}=C \dots c_{59a}$ ;  $n_{59}+n_{60}+n_{11}+n_{12}=C \dots c_{59b}$ ;  $n_{59}+n_{63}+n_{11}+n_{15}=C \dots c_{59c}$ ;  
 $n_{60}+n_{57}+n_{64}+n_{61}=C \dots c_{60a}$ ;  $n_{60}+n_{57}+n_{12}+n_9=C \dots c_{60b}$ ;  $n_{60}+n_{64}+n_{12}+n_{16}=C \dots c_{60c}$ ;  
 $n_{61}+n_{62}+n_{49}+n_{50}=C \dots c_{61a}$ ;  $n_{61}+n_{62}+n_{13}+n_{14}=C \dots c_{61b}$ ;  $n_{61}+n_{49}+n_{13}+n_1=C \dots c_{61c}$ ;  
 $n_{62}+n_{63}+n_{50}+n_{51}=C \dots c_{62a}$ ;  $n_{62}+n_{63}+n_{14}+n_{15}=C \dots c_{62b}$ ;  $n_{62}+n_{50}+n_{14}+n_2=C \dots c_{62c}$ ;  
 $n_{63}+n_{64}+n_{51}+n_{52}=C \dots c_{63a}$ ;  $n_{63}+n_{64}+n_{15}+n_{16}=C \dots c_{63b}$ ;  $n_{63}+n_{51}+n_{15}+n_3=C \dots c_{63c}$ ;  
 $n_{64}+n_{61}+n_{52}+n_{49}=C \dots c_{64a}$ ;  $n_{64}+n_{61}+n_{16}+n_{13}=C \dots c_{64b}$ ;  $n_{64}+n_{52}+n_{16}+n_4=C \dots c_{64c}$ ;

\* Conditions for Self-Complementary Pairs:  $CC=65$ ; \*\*  
 $n_1+n_64=n_2+n_63=n_3+n_62=n_4+n_61=n_5+n_60=n_6+n_59=n_7+n_58=n_8+n_57=n_9+n_56=n_{10}+n_{55}=n_{11}+n_{54}=n_{12}+n_{53}=n_{13}+n_{52}=n_{14}+n_{51}=n_{15}+n_{50}=n_{16}+n_{49}=n_{17}+n_{48}=n_{18}+n_{47}=n_{19}+n_{46}=n_{20}+n_{45}=n_{21}+n_{44}=n_{22}+n_{43}=n_{23}+n_{42}=n_{24}+n_{41}=n_{25}+n_{40}=n_{26}+n_{39}=n_{27}+n_{38}=n_{28}+n_{37}=n_{29}+n_{36}=n_{30}+n_{35}=n_{31}+n_{34}=n_{32}+n_{33}=CC$ ;  
 $n_{33}+n_{32}=n_{34}+n_{31}=n_{35}+n_{30}=n_{36}+n_{29}=n_{37}+n_{28}=n_{38}+n_{27}=n_{39}+n_{26}=n_{40}+n_{25}=n_{41}+n_{24}=n_{42}+n_{23}=n_{43}+n_{22}=n_{44}+n_{21}=n_{45}+n_{20}=n_{46}+n_{19}=n_{47}+n_{18}=n_{48}+n_{17}=n_{49}+n_{16}=n_{50}+n_{15}=n_{51}+n_{14}=n_{52}+n_{13}=n_{53}+n_{12}=n_{54}+n_{11}=n_{55}+n_{10}=n_{56}+n_9=n_{57}+n_8=n_{58}+n_7=n_{59}+n_6=n_{60}+n_5=n_{61}+n_4=n_{62}+n_3=n_{63}+n_2=n_{64}+n_1=CC$ ;

\* Basic Conditions:  $C=130$ ; \*\*  
 $n_1+n_2+n_3+n_4=C \dots b_1$ ;  $n_1+n_5+n_9+n_{13}=C \dots b_2$ ;  $n_1+n_{17}+n_{33}+n_{49}=C \dots b_3$ ;  
 $n_1+n_{22}+n_{43}+n_{64}=C \dots p_1$ ;

When I dictated any program to make that object and tried to execute it, I found no answer could return from my PC.

I tried and tried to revise my program in vain, but found no solutions at all.

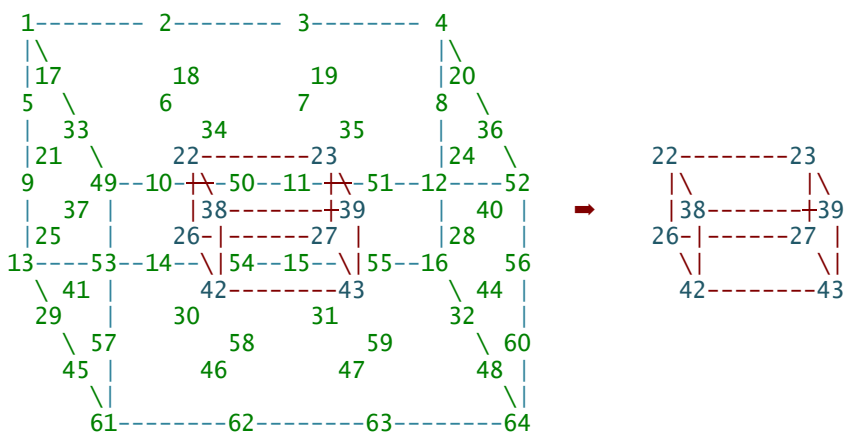
It seemed to be impossible for us to make that object.

Then I decided to find how to prove the impossibility, and got it at last by the process of 'reductio ad absurdum'.

Watch the next diagram with the smallest cube  $2 \times 2 \times 2$  picked out of the whole.

Since the small cube is a part of the whole, it must obey all the definitions.

\*\* Basic Forms for the Logical Proof of Inconsistency \*\*



\*\* Basic Conditions needed for the Logical Proof of Inconsistency:  $C=130$ ; \*\*  
 $n_{22}+n_{23}+n_{26}+n_{27}=C \dots c_{22a}$ ;  $n_{22}+n_{23}+n_{38}+n_{39}=C \dots c_{22b}$ ;  $n_{22}+n_{26}+n_{38}+n_{42}=C \dots c_{22c}$ ;  
 $n_{23}+n_{27}+n_{39}+n_{43}=C \dots c_{23c}$ ;  $n_{26}+n_{27}+n_{42}+n_{43}=C \dots c_{26b}$ ;  $n_{38}+n_{39}+n_{42}+n_{43}=C \dots c_{38a}$ ;

\*\* Self-complementary Conditions needed here:  $CC=65$ ; \*\*  
 $n_{22}+n_{43}=CC$ ;  $n_{23}+n_{42}=CC$ ;  $n_{26}+n_{39}=CC$ ;  $n_{27}+n_{38}=CC$ ;

Let's have some algebraic calculations here.

$$\begin{aligned} n22+n23+n26+n27 &= C \dots c22a; \\ n22+n23+n38+n39 &= C \dots c22b; (-) \\ \hline n26+n27 &= n38+n39 \\ n26+n39 &= n27+n38 = CC(+) \\ \hline 2*n26+n27+n39 &= 2*n38+n27+n39 \\ \text{Therefore } n26 &= n38 \end{aligned}$$

This conclusion means both of the variables n26 and n38 must take the same value. But it is contradictory to our First Promise: we can allow neither duplication nor lack of any number of 1~64 to use there.

This contradiction is derived from the double use of the 'Composite Conditions' and the 'Self-Complementary Conditions'. They prove to be totally incompatible.

Therefore, the simultaneous type of 'Composite & Self-Complementary' MC444 is impossible for us to make. (Q.E.D.)

### \*\* 'Semi-Composite' & Self-complementary Magic Cubes of Order 4 \*\*

[Primitive Solutions with precise Check-Sum Errors:

Rows, Columns & Pillars|Complementary Pairs & Primary Triagonals]

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

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

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

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



481#				CS	Rw,C1,&P1	CP & PT	Composite	Fours
1-----48-----19-----62	CS	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
56 25 38  11		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
63 15 18 34 45 29 4 52		0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	-4 0 0 0
10 58--39--23--28--44--53-- 5		0 0 0 0	0 0 0 0	0 0 -8	0 4 8 0	-8 0 -4	8 0 0 0	-4 0 0 0
6 49   43 32 24 35 57 14		0 0 0 0	0 0 0 0	0 0 4	0 0 8 0	4 -8 0	8 0 -4	-8 0 0 0
51 8 30 41 33 22  16 59		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
60--12-- 21--37--42--26-- 7 55		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
13 61 36 20 31 47 50 2		0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 4 0	0 0 0 0	-4 0 0 0
54   27 40 9		0 0 0 0	0 0 0 0	-4 -8	0 0 8 0	4 -8 0 0	0 0 0 0	4 0 0 0
3-----46-----17-----64		0 0 0 0	0 0 0 0	0 0 -8	0 -4 8 0	0 -8 0 4	8	

601#				CS	Rw,C1,&P1	CP & PT	Composite	Fours
1-----32-----35-----62	CS	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
56 41 22  11		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
63 15 34 18 29 45 4 52		0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	-4 0 0 0
10 58--23--39--44--28--53-- 5		0 0 0 0	0 0 0 0	0 0 -8	0 4 8 0	0 -8 0 -4	8 0 0 0	-4 0 0 0
6 49   27 48 40 19 57 14		0 0 0 0	0 0 0 0	0 0 4	0 0 8 0	4 -8 0 8	0 0 -4	-8 0 0 0
51 8 46 25 17 38  16 59		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
60--12-- 37--21--26--42-- 7 55		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
13 61 20 36 47 31 50 2		0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 4 0	0 0 0 0	-4 0 0 0
54   43 24 9		0 0 0 0	0 0 0 0	-4 -8	0 0 8 0	4 -8 0 0	0 0 0 0	4 0 0 0
3-----30-----33-----64		0 0 0 0	0 0 0 0	0 0 -8	0 -4 8 0	0 -8 0 4	8	

721#				CS	Rw,C1,&P1	CP & PT	Composite	Fours
2-----64----- 5-----59	CS	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
47 17 44  22		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
61 30 3 36 58 25 8 39		0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	-8 0 0 0
20 51--46--13--23--56--41--10		0 0 0 0	0 0 0 0	0 0 -16	0 8 16 0	0 -16 0 -8	16 0 0 0	-8 0 0 0
12 33   54 31 15 38 49 28		0 0 0 0	0 0 0 0	0 0 8	0 0 16 0	8 -16 0 16	0 -8 -16	0 0 0 0
37 16 27 50 34 11  32 53		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
55--24--  9--42--52--19--14 45		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
26 57 40 7 29 62 35 4		0 0 0 0	0 0 0 0	0 0 0	0 0 0 8	0 0 0 0	0 0 -8	0 0 16 0
43   21 48 18		0 0 0 0	0 0 0 0	-8 -16	0 0 16 0	8 -16 0 0	0 0 0 0	8 0 0 0
6-----60----- 1-----63		0 0 0 0	0 0 0 0	0 0 -16	0 -8 16 0	0 -16 0 8	16	

.....

The last list above shows some of the sample solutions of 'Semi-Composite & Self-Complementary' MC444 with their precise check-sum errors. They are built under the exceptions of some Composite Conditions. But they are almost the 'Composite' type, as you see, while they are perfectly the Self-Complementary Magic Cubes of Order 4.

(The Original Written by Kanji Setsuda in 2002, 2007 and 2014;  
 Revised on August 9, 2015 with MacOSX 10.10.4 and Xcode 6.4)

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### << Appendix: Program List >>

```

/** 'Composite & Complete' Magic Cubes of Order 4 **
/** Compact List of the 960 Standard Solutions **
/** 'CCMC444St.c': Dictated by Kanji Setsuda **
/** in '02,'07,'12; Revised on Dec.28, 2014; **
/** and Recompiled on Aug. 7, 2015 **
/** Working with MacOSX 10.10.4 and Xcode 6.4 **
//
#include <stdio.h>
//
// Global Var.
short int cnt, cnt2;
short cnt3;
short CC, SSM, LSM;
short nm[65], ufLg[65];
short tn[8][65];
//
/** Functions(Sub-Routines) *
void stp01(void), stp02(void), stp03(void), stp04(void);

```

```

void stp05(void), stp06(void), stp07(void), stp08(void);
void stp09(void), stp10(void), stp11(void), stp12(void);
void stp13(void), stp14(void), stp15(void), stp16(void);
void stp17(void), stp18(void), stp19(void), stp20(void);
void stp21(void), stp22(void), stp23(void), stp24(void);
void stp25(void), stp26(void), stp27(void), stp28(void);
void stp29(void), stp30(void), stp31(void), stp32(void);
void ansprint(void);
void prans(short x);
//
/* Main Program *
int main(){
short n;
printf("\n");
printf("*** 'Composite & Complete' Magic Cubes of Order 4: ***\n");
printf("*** Compact List of 960 Standard Solutions Normalized ***\n");
CC=65; SSM=130; LSM=130; cnt=0; cnt3=0;
for(n=0;n<65;n++){nm[n]=0; uflg[n]=0;}
stp01();      /* Begin the Calculations *
if(cnt3>0){prans(cnt3);}
printf(" [Solution Counts = %d]\n",cnt);
printf("\n");
printf(" [OK!]\n");
printf("*** Calculated and Listed by Kanji Setsuda on\n");
printf("      Aug. 7, 2015 with MacOSX 10.10.4 & Xcode 6.4 ***\n");
printf("\n");
return 0;
}
//
/** Normalizing Inequality Conditions for Standard Solutions **
/**  n2>n5>n17; n1<n4; n1<n13; n1<n16; n1<n49; n1<n52; n1<n61; and n1<n64;
//
/** Begin the Calculations *
/** Define Level 1: *
/** Set N1 & n43 *
void stp01(){
short a,b;
for(a=1;a<33;a++){b=CC-a;
if((uflg[a]==0)&&(uflg[b]==0)){cnt2=0;
nm[1]=a; nm[43]=b;
uflg[a]=1; uflg[b]=1;
stp02();
uflg[b]=0; uflg[a]=0;}}
}
}
/** Set N2 & n44 *
void stp02(){
short a,b;
for(a=64;a>0;a--){b=CC-a;
if((uflg[a]==0)&&(uflg[b]==0)){//if(nm[1]==1){cnt2=0;}
nm[2]=a; nm[44]=b;
uflg[a]=1; uflg[b]=1;
stp03();
uflg[b]=0; uflg[a]=0;}}
}
}
/** Set N5(<n2) & n47 *
void stp03(){
short a,b;
for(a=nm[2]-1;a>0;a--){b=CC-a;
if((uflg[a]==0)&&(uflg[b]==0)){
nm[5]=a; nm[47]=b;
uflg[a]=1; uflg[b]=1;
stp04();
}
}
}

```

```

        uflg[b]=0; uflg[a]=0;}
    }
}
/** Set n6=130-n1-n2-n5 & n48 *
void stp04(){
short a,b;
a=LSM-nm[1]-nm[2]-nm[5];
if((0<a)&&(a<65)){
b=LSM-nm[43]-nm[44]-nm[47];
if(a+b==CC){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[6]=a; nm[48]=b;
uflg[a]=1; uflg[b]=1;
stp05();
uflg[b]=0; uflg[a]=0;}}}
}
/** Set n17(<n5) & n59 *
void stp05(){
short a,b;
for(a=nm[5]-1;a>0;a--){b=CC-a;
if((uflg[a]==0)&&(uflg[b]==0)){if(nm[1]==1){cnt2=0;}
nm[17]=a; nm[59]=b;
uflg[a]=1; uflg[b]=1;
stp06();
uflg[b]=0; uflg[a]=0;}
}
}
/** Set n18=130-n1-n2-n17 & n60 *
void stp06(){
short a,b;
a=LSM-nm[1]-nm[2]-nm[17];
if((0<a)&&(a<65)){
b=LSM-nm[43]-nm[44]-nm[59];
if(a+b==CC){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[18]=a; nm[60]=b;
uflg[a]=1; uflg[b]=1;
stp07();
uflg[b]=0; uflg[a]=0;}}}
}
/** Set n21=130-n1-n5-n17 & n63 *
void stp07(){
short a,b;
a=LSM-nm[1]-nm[5]-nm[17];
if((0<a)&&(a<65)){
b=LSM-nm[43]-nm[47]-nm[59];
if(a+b==CC){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[21]=a; nm[63]=b;
uflg[a]=1; uflg[b]=1;
stp08();
uflg[b]=0; uflg[a]=0;}}}
}
/** Set n22=130-n2-n6-n18 & n64(>n1) *
void stp08(){
short a,b,c,d;
a=LSM-nm[2]-nm[6]-nm[18];
if((0<a)&&(a<65)){
b=LSM-nm[44]-nm[48]-nm[60];
if((a+b==CC)&&(b>nm[1])){
c=LSM-nm[5]-nm[6]-nm[21];
d=LSM-nm[17]-nm[18]-nm[21];
if((a==c)&&(a==d)){
if((uflg[a]==0)&&(uflg[b]==0)){

```

```

        nm[22]=a; nm[64]=b;
        uflg[a]=1; uflg[b]=1;
        stp09();
        uflg[b]=0; uflg[a]=0;}}}}
}
/** Level 2: *
/** Set N4(>n1) & n42 *
void stp09(){
    short a,b;
    for(a=64;a>nm[1];a--){b=CC-a;
        if((uflg[a]==0)&&(uflg[b]==0)){
            nm[4]=a; nm[42]=b;
            uflg[a]=1; uflg[b]=1;
            stp10();
            uflg[b]=0; uflg[a]=0;}
        }
}
/** Set n3=130-n1-n2-n4 & n41 *
void stp10(){
    short a,b;
    a=LSM-nm[1]-nm[2]-nm[4];
    if((0<a)&&(a<65)){
        b=LSM-nm[43]-nm[44]-nm[42];
        if(a+b==CC){
            if((uflg[a]==0)&&(uflg[b]==0)){
                nm[3]=a; nm[41]=b;
                uflg[a]=1; uflg[b]=1;
                stp11();
                uflg[b]=0; uflg[a]=0;}}}
}
/** Set n7=130-n2-n3-n6 & n45 *
void stp11(){
    short a,b;
    a=LSM-nm[2]-nm[3]-nm[6];
    if((0<a)&&(a<65)){
        b=LSM-nm[44]-nm[41]-nm[48];
        if(a+b==CC){
            if((uflg[a]==0)&&(uflg[b]==0)){
                nm[7]=a; nm[45]=b;
                uflg[a]=1; uflg[b]=1;
                stp12();
                uflg[b]=0; uflg[a]=0;}}}
}
/** Set n8=130-n3-n4-n7 & n46 *
void stp12(){
    short a,b,c,d;
    a=LSM-nm[3]-nm[4]-nm[7];
    if((0<a)&&(a<65)){
        b=LSM-nm[41]-nm[42]-nm[45];
        if(a+b==CC){
            c=LSM-nm[4]-nm[1]-nm[5];
            d=LSM-nm[42]-nm[43]-nm[47];
            if((a==c)&&(b==d)){
                if((uflg[a]==0)&&(uflg[b]==0)){
                    nm[8]=a; nm[46]=b;
                    uflg[a]=1; uflg[b]=1;
                    stp13();
                    uflg[b]=0; uflg[a]=0;}}}}}
}
/** Set n19=130-n2-n3-n18 & n57 *
void stp13(){
    short a,b;
    a=LSM-nm[2]-nm[3]-nm[18];
    if((0<a)&&(a<65)){

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    b=LSM-nm[44]-nm[41]-nm[60];
    if(a+b==CC){
        if((uflg[a]==0)&&(uflg[b]==0)){
            nm[19]=a; nm[57]=b;
            uflg[a]=1; uflg[b]=1;
            stp14();
            uflg[b]=0; uflg[a]=0;}}
    }
    /* Set n20=130-n3-n4-n19 & n58 *
void stp14(){
    short a,b,c,d;
    a=LSM-nm[3]-nm[4]-nm[19];
    if((0<a)&&(a<65)){
        b=LSM-nm[41]-nm[42]-nm[57];
        if(a+b==CC){
            c=LSM-nm[4]-nm[1]-nm[17];
            d=LSM-nm[42]-nm[43]-nm[59];
            if((a==c)&&(b==d)){
                if((uflg[a]==0)&&(uflg[b]==0)){
                    nm[20]=a; nm[58]=b;
                    uflg[a]=1; uflg[b]=1;
                    stp15();
                    uflg[b]=0; uflg[a]=0;}}}}
    }
    /* Set n23=130-n3-n7-n19 & n61(>n1) *
void stp15(){
    short a,b,c,d;
    a=LSM-nm[3]-nm[7]-nm[19];
    if((0<a)&&(a<65)){
        b=LSM-nm[41]-nm[45]-nm[57];
        if((a+b==CC)&&(b>nm[1])){
            c=LSM-nm[6]-nm[7]-nm[22];
            d=LSM-nm[48]-nm[45]-nm[64];
            if((a==c)&&(b==d)){
                if((uflg[a]==0)&&(uflg[b]==0)){
                    nm[23]=a; nm[61]=b;
                    uflg[a]=1; uflg[b]=1;
                    stp16();
                    uflg[b]=0; uflg[a]=0;}}}}
    }
    /* Set n24=130-n4-n8-n20 & n58 *
void stp16(){
    short a,b,c,d,e;
    a=LSM-nm[4]-nm[8]-nm[20];
    if((0<a)&&(a<65)){
        b=LSM-nm[42]-nm[46]-nm[58];
        if(a+b==CC){
            c=LSM-nm[7]-nm[8]-nm[23];
            d=LSM-nm[19]-nm[20]-nm[23];
            e=LSM-nm[20]-nm[17]-nm[21];
            if((a==c)&&(a==d)&&(a==e)){
                if((uflg[a]==0)&&(uflg[b]==0)){
                    nm[24]=a; nm[62]=b;
                    uflg[a]=1; uflg[b]=1;
                    stp17();
                    uflg[b]=0; uflg[a]=0;}}}}
    }
    /* Level 3: *
    /* Set N13(>n1) & n39 *
void stp17(){
    short a,b;
    for(a=64;a>nm[1];a--){b=CC-a;
        if((uflg[a]==0)&&(uflg[b]==0)){
            nm[13]=a; nm[39]=b;

```

```

        uflg[a]=1; uflg[b]=1;
        stp18();
        uflg[b]=0; uflg[a]=0;}
    }
}
/** Set n9=130-n1-n5-n13 & n35 *
void stp18(){
short a,b;
a=LSM-nm[1]-nm[5]-nm[13];
if((0<a)&&(a<65)){
    b=LSM-nm[43]-nm[47]-nm[39];
    if(a+b==CC){
        if((uflg[a]==0)&&(uflg[b]==0)){
            nm[9]=a; nm[35]=b;
            uflg[a]=1; uflg[b]=1;
            stp19();
            uflg[b]=0; uflg[a]=0;}}}}
}
/** Set n10=130-n5-n6-n9 & n36 *
void stp19(){
short a,b;
a=LSM-nm[5]-nm[6]-nm[9];
if((0<a)&&(a<65)){
    b=LSM-nm[47]-nm[48]-nm[35];
    if(a+b==CC){
        if((uflg[a]==0)&&(uflg[b]==0)){
            nm[10]=a; nm[36]=b;
            uflg[a]=1; uflg[b]=1;
            stp20();
            uflg[b]=0; uflg[a]=0;}}}}
}
/** Set n11=130-n6-n7-n10 & n33 *
void stp20(){
short a,b;
a=LSM-nm[6]-nm[7]-nm[10];
if((0<a)&&(a<65)){
    b=LSM-nm[48]-nm[45]-nm[36];
    if(a+b==CC){
        if((uflg[a]==0)&&(uflg[b]==0)){
            nm[11]=a; nm[33]=b;
            uflg[a]=1; uflg[b]=1;
            stp21();
            uflg[b]=0; uflg[a]=0;}}}}
}
/** Set n12=130-n7-n8-n11 & n34 *
void stp21(){
short a,b,c,d;
a=LSM-nm[7]-nm[8]-nm[11];
if((0<a)&&(a<65)){
    b=LSM-nm[45]-nm[46]-nm[33];
    if(a+b==CC){
        c=LSM-nm[8]-nm[5]-nm[9];
        d=LSM-nm[46]-nm[47]-nm[35];
        if((a==c)&&(b==d)){
            if((uflg[a]==0)&&(uflg[b]==0)){
                nm[12]=a; nm[34]=b;
                uflg[a]=1; uflg[b]=1;
                stp22();
                uflg[b]=0; uflg[a]=0;}}}}}}
}
/** Set n14=130-n9-n10-n13 & n40 *
void stp22(){
short a,b,c,d;
a=LSM-nm[9]-nm[10]-nm[13];

```

```

if((0<a)&&(a<65)){
    b=LSM-nm[35]-nm[36]-nm[39];
    if(a+b==CC){
        c=LSM-nm[13]-nm[1]-nm[2];
        d=LSM-nm[39]-nm[43]-nm[44];
        if((a==c)&&(b==d)){
            if((uflg[a]==0)&&(uflg[b]==0)){
                nm[14]=a; nm[40]=b;
                uflg[a]=1; uflg[b]=1;
                stp23();
                uflg[b]=0; uflg[a]=0;}}}}
}
/* Set n15=130-n10-n11-n14 & n37 *
void stp23(){
    short a,b,c,d;
    a=LSM-nm[10]-nm[11]-nm[14];
    if((0<a)&&(a<65)){
        b=LSM-nm[36]-nm[33]-nm[40];
        if(a+b==CC){
            c=LSM-nm[14]-nm[2]-nm[3];
            d=LSM-nm[40]-nm[44]-nm[41];
            if((a==c)&&(b==d)){
                if((uflg[a]==0)&&(uflg[b]==0)){
                    nm[15]=a; nm[37]=b;
                    uflg[a]=1; uflg[b]=1;
                    stp24();
                    uflg[b]=0; uflg[a]=0;}}}}
}
/* Set n16=130-n11-n12-n15 & n1<n16 & n38 *
void stp24(){
    short a,b,c,d;
    a=LSM-nm[11]-nm[12]-nm[15];
    if((nm[1]<a)&&(a<65)){
        b=LSM-nm[33]-nm[34]-nm[37];
        if(a+b==CC){
            c=LSM-nm[15]-nm[3]-nm[4];
            d=LSM-nm[34]-nm[35]-nm[39];
            if((a==c)&&(b==d)){
                if((uflg[a]==0)&&(uflg[b]==0)){
                    nm[16]=a; nm[38]=b;
                    uflg[a]=1; uflg[b]=1;
                    stp25();
                    uflg[b]=0; uflg[a]=0;}}}}
}
/* Level 4: *
/* Set n25=130-n5-n9-n21 & n51 *
void stp25(){
    short a,b,c,d;
    a=LSM-nm[5]-nm[9]-nm[21];
    if((0<a)&&(a<65)){
        b=LSM-nm[47]-nm[35]-nm[63];
        if(a+b==CC){
            c=LSM-nm[21]-nm[37]-nm[41];
            d=LSM-nm[63]-nm[15]-nm[3];
            if((a==c)&&(b==d)){
                if((uflg[a]==0)&&(uflg[b]==0)){
                    nm[25]=a; nm[51]=b;
                    uflg[a]=1; uflg[b]=1;
                    stp26();
                    uflg[b]=0; uflg[a]=0;}}}}
}
/* Set n29=130-n9-n13-n25 & n55 *
void stp26(){
    short a,b,c,d;

```

```

a=LSM-nm[9]-nm[13]-nm[25];
if((0<a)&&(a<65)){
  b=LSM-nm[35]-nm[39]-nm[51];
  if(a+b==CC){
    c=LSM-nm[25]-nm[41]-nm[45];
    d=LSM-nm[39]-nm[43]-nm[59];
    if((a==c)&&(b==d)){
      if((uflg[a]==0)&&(uflg[b]==0)){
        nm[29]=a; nm[55]=b;
        uflg[a]=1; uflg[b]=1;
        stp27();
        uflg[b]=0; uflg[a]=0;}}}}
}
/* Set n26=130-n6-n10-n22 & n52(>n1) *
void stp27(){
  short a,b,c,d,e;
  a=LSM-nm[6]-nm[10]-nm[22];
  if((0<a)&&(a<65)){
    b=LSM-nm[48]-nm[36]-nm[64];
    if((a+b==CC)&&(b>nm[1])){
      c=LSM-nm[9]-nm[10]-nm[25];
      d=LSM-nm[21]-nm[22]-nm[25];
      e=LSM-nm[22]-nm[38]-nm[42];
      if((a==c)&&(a==d)&&(a==e)){
        if((uflg[a]==0)&&(uflg[b]==0)){
          nm[26]=a; nm[52]=b;
          uflg[a]=1; uflg[b]=1;
          stp28();
          uflg[b]=0; uflg[a]=0;}}}}
}
/* Set n30=130-n10-n14-n26 & n56 *
void stp28(){
  short a,b,c,d,e;
  a=LSM-nm[10]-nm[14]-nm[26];
  if((0<a)&&(a<65)){
    b=LSM-nm[36]-nm[40]-nm[52];
    if(a+b==CC){
      c=LSM-nm[13]-nm[14]-nm[29];
      d=LSM-nm[25]-nm[26]-nm[29];
      e=LSM-nm[29]-nm[45]-nm[46];
      if((a==c)&&(a==d)&&(a==e)){
        if((uflg[a]==0)&&(uflg[b]==0)){
          nm[30]=a; nm[56]=b;
          uflg[a]=1; uflg[b]=1;
          stp29();
          uflg[b]=0; uflg[a]=0;}}}}
}
/* Set n27=130-n7-n11-n23 & n49(>n1) *
void stp29(){
  short a,b,c,d,e;
  a=LSM-nm[7]-nm[11]-nm[23];
  if((0<a)&&(a<65)){
    b=LSM-nm[45]-nm[33]-nm[61];
    if((a+b==CC)&&(b>nm[1])){
      c=LSM-nm[10]-nm[11]-nm[26];
      d=LSM-nm[22]-nm[23]-nm[26];
      e=LSM-nm[23]-nm[39]-nm[43];
      if((a==c)&&(a==d)&&(a==e)){
        if((uflg[a]==0)&&(uflg[b]==0)){
          nm[27]=a; nm[49]=b;
          uflg[a]=1; uflg[b]=1;
          stp30();
          uflg[b]=0; uflg[a]=0;}}}}
}

```



```

/** Set n28=130-n8-n12-n24 & n50 *
void stp30(){
short a,b,c,d,e;
a=LSM-nm[8]-nm[12]-nm[24];
if((0<a)&&(a<65)){
b=LSM-nm[46]-nm[34]-nm[62];
if(a+b==CC){
c=LSM-nm[11]-nm[12]-nm[27];
d=LSM-nm[23]-nm[24]-nm[27];
e=LSM-nm[27]-nm[43]-nm[44];
if((a==c)&&(a==d)&&(a==e)){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[28]=a; nm[50]=b;
uflg[a]=1; uflg[b]=1;
stp31();
uflg[b]=0; uflg[a]=0;}}}}
}
/** Set n31=130-n11-n15-n27 & n53 *
void stp31(){
short a,b,c,d,e;
a=LSM-nm[11]-nm[15]-nm[27];
if((0<a)&&(a<65)){
b=LSM-nm[33]-nm[37]-nm[49];
if(a+b==CC){
c=LSM-nm[14]-nm[15]-nm[30];
d=LSM-nm[26]-nm[27]-nm[30];
e=LSM-nm[27]-nm[43]-nm[47];
if((a==c)&&(a==d)&&(a==e)){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[31]=a; nm[53]=b;
uflg[a]=1; uflg[b]=1;
stp32();
uflg[b]=0; uflg[a]=0;}}}}
}
/** Set n32=130-n12-n16-n28 & n54 *
void stp32(){
short a,b,c,d,e;
a=LSM-nm[12]-nm[16]-nm[28];
if((0<a)&&(a<65)){
b=LSM-nm[34]-nm[38]-nm[50];
if(a+b==CC){
c=LSM-nm[15]-nm[16]-nm[31];
d=LSM-nm[27]-nm[28]-nm[31];
e=LSM-nm[48]-nm[29]-nm[45];
if((a==c)&&(a==d)&&(a==e)){
if((uflg[a]==0)&&(uflg[b]==0)){
nm[32]=a; nm[54]=b;
uflg[a]=1; uflg[b]=1;
ansprint(); /* Print the Answers *
uflg[b]=0; uflg[a]=0;}}}}
}
//
/** Print the Answers *
void ansprint(){
short n;
cnt++; cnt2++;
if(cnt2==1){
tn[cnt3][0]=cnt;
for(n=1;n<65;n++){tn[cnt3][n]=nm[n];}
cnt3++;
if(cnt3==3){prans(cnt3); cnt3=0;}
}
}
//

```

```

/** Print the Answers: Sub *
void prans(short x){
short n;
for(n=0;n<x;n++){printf("%29d/",tn[n][0]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" %2d-----%2d-----%2d-----%2d",tn[n][1],tn[n][2],tn[n][3],tn[n][4]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" |%2d |%2d |%2d |%2d",tn[n][17],tn[n][18],tn[n][19],tn[n][20]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" %2d %2d %2d %2d %2d %2d %2d %2d",
tn[n][5],tn[n][33],tn[n][6],tn[n][34],tn[n][7],tn[n][35],tn[n][8],tn[n][36]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" |%2d %2d--+%2d--%2d--+%2d--%2d--+%2d--%2d",
tn[n][21],tn[n][49],tn[n][22],tn[n][50],tn[n][23],tn[n][51],tn[n][24],tn[n][52]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" %2d %2d | %2d %2d | %2d %2d | %2d %2d |",
tn[n][9],tn[n][37],tn[n][10],tn[n][38],tn[n][11],tn[n][39],tn[n][12],tn[n][40]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" |%2d %2d |%2d %2d |%2d %2d |%2d %2d",
tn[n][25],tn[n][53],tn[n][26],tn[n][54],tn[n][27],tn[n][55],tn[n][28],tn[n][56]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" %2d--%2d-|-%2d--%2d-|-%2d--%2d-|-%2d %2d |",
tn[n][13],tn[n][41],tn[n][14],tn[n][42],tn[n][15],tn[n][43],tn[n][16],tn[n][44]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" %2d %2d %2d %2d %2d %2d %2d %2d",
tn[n][29],tn[n][57],tn[n][30],tn[n][58],tn[n][31],tn[n][59],tn[n][32],tn[n][60]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" %2d | %2d | %2d | %2d |",tn[n][45],tn[n][46],tn[n][47],tn[n][48]);
if(n+1<x){printf("
");}}
printf("\n");
for(n=0;n<x;n++){
printf(" %2d-----%2d-----%2d-----%2d",tn[n][61],tn[n][62],tn[n][63],tn[n][64]);
if(n+1<x){printf("
");}}
printf("\n");
}
//
//(End_Of_File)

```