



# WPF PUZZLE GP 2024 COMPETITION BOOKLET

## Host Country: USA

David Altizio, Kevin "Kaz" Zhou, Wei-Hwa Huang (tester: Walker Anderson)

**Special Notes:** Sudoku and Kakuro were both invented in the USA more than 40 years ago, and were a highlight of a logic-puzzle dedicated magazine (possibly even the first!) called *Dell Math Puzzles and Logic Problems*, first published in 1989. Here are some of our favorite puzzle types a solver might have seen in that magazine in the 20th century, adjusted slightly to fit a modern international audience. Enjoy!

### 1-11. Numberama [Wei-Hwa Huang] (4 points each)

A number sequence with a logical pattern is provided, but with one missing number replaced with a blank space. The patterns will all involve simple arithmetic relationships between adjacent numbers in the sequence. Determine the missing number.

**Answer:** Enter the number.

**Example Answer:** 8

14, 28, 11, 9, 27, 12, **8**, 32, 19, 13, 65, 54, 46  
( $\times 2$ ,  $-17$ ,  $-2$ ) ( $\times 3$ ,  $-15$ ,  $-4$ ) ( $\times 4$ ,  $-13$ ,  $-6$ ) ( $\times 5$ ,  $-11$ ,  $-8$ )

- 1 20, 2, 6, 2, 24, 3, \_\_, 3, 36, 6, 42, 6, 72
- 2 14, 6, 12, 18, 10, 20, \_\_, 18, 36, 42, 34, 68, 74
- 3 11, 25, 27, 10, 20, 35, \_\_, 19, 38, 54, 56, 37, 74
- 4 40, 28, 56, 40, 26, 52, \_\_, 21, 42, 28, 10, 20, 7
- 5 36, 33, 40, 10, 21, 19, \_\_, 9, 22, 21, 30, 15, 30
- 6 25, 50, 40, 28, 56, 48, \_\_, 68, 62, 46, 92, 88, 70
- 7 69, 76, 38, 46, 23, 32, \_\_, 26, 13, 24, 12, 24, 12
- 8 12, 2, 11, 27, 15, 3, \_\_, 31, 20, 5, 16, 36, 26
- 9 15, 30, 25, 16, 32, 28, \_\_, 42, 39, 34, 68, 66, 63
- 10 18, 25, 7, 2, 20, 28, \_\_, 3, 24, 33, 15, 6, 36
- 11 51, 47, 40, 22, 44, 38, \_\_, 13, 39, 31, 26, 6, 24

**12-15. Word Arithmetic (divisor on left) [Wei-Hwa Huang] (20 points each)**

Each one of ten letters represents a different (base ten) digit. Figure out which letter corresponds to which digit so that the long-division tableau is correct. All ten digits will be used. Numbers cannot start with the digit 0 (zero)—as per the example, differences of 0 are left as blank and a 0 in the quotient causes an extra digit to be copied from the dividend instead of adding a “subtraction by 0” row. (If the remainder of the division is 0, the last row will be left blank.)

The list of digits above the diagram is only used to help you enter your answer. Two different notational versions will be provided (on separate pages); the puzzles between versions are identical.

**Answer:** Enter the letters corresponding to the digits 0123456789. The answer will not necessarily spell a word.

**Example Answer:**  
UPEZMSLCXA

12 → 0 1 2 3 4 5 6 7 8 9

$$\begin{array}{r} \text{GRAND} \overline{) \text{BEGINNING}} \\ \underline{\text{BBGNNP}} \\ \text{PNBXP I} \\ \underline{\text{IRNINR}} \\ \text{BBP I R N} \\ \underline{\text{AGEENI}} \\ \text{GGGGGG} \\ \underline{\text{GNIENX}} \\ \text{GDEPR} \end{array}$$

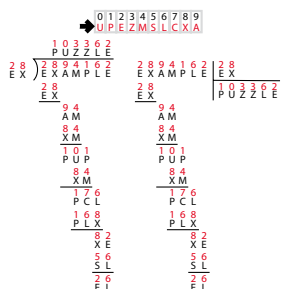
13 → 0 1 2 3 4 5 6 7 8 9

$$\begin{array}{r} \text{GRAND} \overline{) \text{TRAINING}} \\ \underline{\text{XRXRT}} \\ \text{NINLPI} \\ \underline{\text{AADDR}} \\ \text{NTDDNG} \\ \underline{\text{NXRRNG}} \\ \text{NGGII} \end{array}$$

14 → 0 1 2 3 4 5 6 7 8 9

$$\begin{array}{r} \text{GRAND} \overline{) \text{STANDARD}} \\ \underline{\text{GRAND}} \\ \text{DXAAAA} \\ \underline{\text{DDRPDX}} \\ \text{TDXRNR} \\ \underline{\text{DSNPRP}} \\ \text{TRTRGD} \\ \underline{\text{TTXPXT}} \\ \text{PRTRS} \end{array}$$

15 → 0 1 2 3 4 5 6 7 8 9

$$\begin{array}{r} \text{GRAND} \overline{) \text{ORDINARY}} \\ \underline{\text{GRAND}} \\ \text{NADGDA} \\ \underline{\text{PGXAOI}} \\ \text{YOYINR} \\ \underline{\text{YNYNAI}} \\ \text{GADPGY} \\ \underline{\text{YOONRY}} \\ \text{NIXNA} \end{array}$$




16-19. Word Arithmetic (divisor on left) [Wei-Hwa Huang] (20 points each)

Answer: Enter the letters corresponding to the digits 0123456789. The answer will not necessarily spell a word.

16 → 0 1 2 3 4 5 6 7 8 9

$$\begin{array}{r} \text{P R I X} \\ \text{G R A N D } \overline{) \text{O R I G I N A L}} \\ \underline{\text{G R A N D}} \\ \text{X L A G O N} \\ \underline{\text{A O O O D D}} \\ \text{A G R N P A} \\ \underline{\text{A X P G N L}} \\ \text{P I G A A L} \\ \underline{\text{P X D D N G}} \\ \text{P I X A R} \end{array}$$

17 → 0 1 2 3 4 5 6 7 8 9

$$\begin{array}{r} \text{P R I X} \\ \text{G R A N D } \overline{) \text{C A R D I N A L}} \\ \underline{\text{C G D R I}} \\ \text{I I C X N} \\ \underline{\text{G R A N D}} \\ \text{R P D I A A} \\ \underline{\text{R P D I P A}} \\ \text{C X L} \end{array}$$

18 → 0 1 2 3 4 5 6 7 8 9

$$\begin{array}{r} \text{P R I X} \\ \text{G R A N D } \overline{) \text{L E A R N I N G}} \\ \underline{\text{G R A N D}} \\ \text{X A N L P I} \\ \underline{\text{X L I L L G}} \\ \text{P E D E P N} \\ \underline{\text{P E P X G L}} \\ \text{A X R I G} \\ \underline{\text{R E L P A}} \\ \text{R P X E} \end{array}$$

19 → 0 1 2 3 4 5 6 7 8 9

$$\begin{array}{r} \text{P R I X} \\ \text{G R A N D } \overline{) \text{I N S P I R I N G}} \\ \underline{\text{I N D N D P}} \\ \text{I H R N I N} \\ \underline{\text{D X D D S I}} \\ \text{N G A X A G} \\ \underline{\text{N I S A H X}} \\ \text{N D I G D} \end{array}$$



12-15. Word Arithmetic (divisor on right) [Wei-Hwa Huang] (20 points each)

Each one of ten letters represents a different (base ten) digit.

Figure out which letter corresponds to which digit so that the long-division tableau is correct.

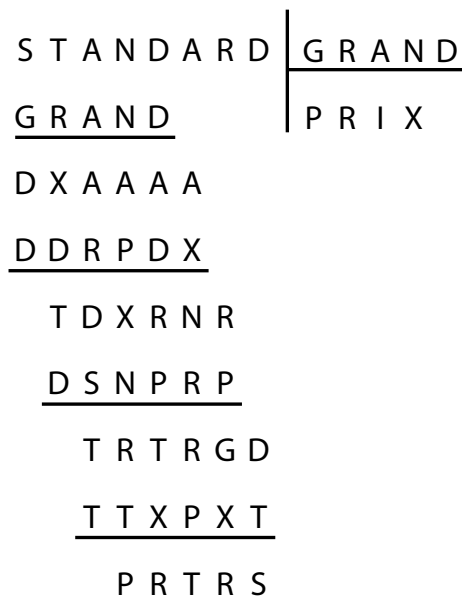
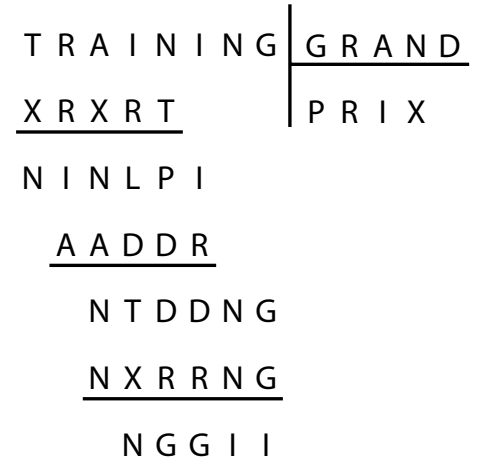
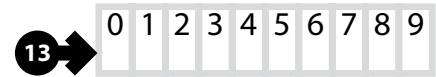
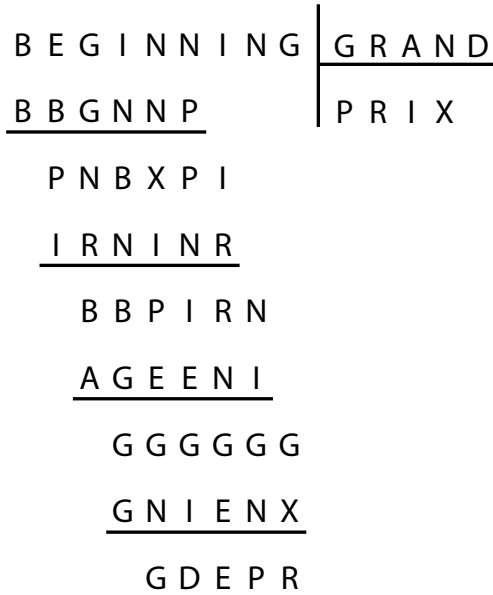
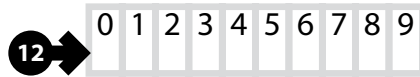
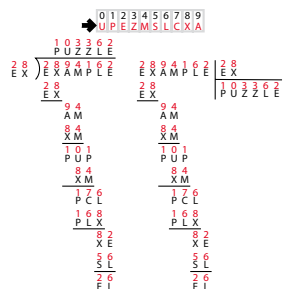
All ten digits will be used. Numbers cannot start with the digit 0 (zero)—as per the example, differences of 0 are left as blank and a 0 in the quotient causes an extra digit to be copied from the dividend instead of adding a "subtraction by 0" row. (If the remainder of the division is 0, the last row will be left blank.)

The list of digits above the diagram is only used to help you enter your answer. Two different notational versions will be provided (on separate pages); the puzzles between versions are identical.

**Answer:** Enter the letters corresponding to the digits 0123456789. The answer will not necessarily spell a word.

**Example Answer:**

UPEZMSLCXA





## 16-19. Word Arithmetic (divisor on right) [Wei-Hwa Huang] (20 points each)

**Answer:** Enter the letters corresponding to the digits 0123456789. The answer will not necessarily spell a word.

16 → 0 1 2 3 4 5 6 7 8 9

ORIGINAL	GRAND
GRAND	PRIX
XLAGON	
<u>AOODD</u>	
AGRNPAA	
<u>AXPGNL</u>	
PIGAAL	
<u>PXDDNG</u>	
PIXAR	

17 → 0 1 2 3 4 5 6 7 8 9

CARDINAL	GRAND
CGDRI	PRIX
IICXN	
<u>GRAND</u>	
RPDIAA	
<u>RPDIPA</u>	
	CXL

18 → 0 1 2 3 4 5 6 7 8 9

LEARNING	GRAND
GRAND	PRIX
XANLPI	
<u>XLILLG</u>	
PEDEPN	
<u>PEPXGL</u>	
AXRIG	
<u>RELPA</u>	
RPXE	

19 → 0 1 2 3 4 5 6 7 8 9

INSPIRING	GRAND
INDNDP	PRIX
IHRNIN	
<u>DXDDSI</u>	
NGAXAG	
<u>NISAHX</u>	
NDIGD	



### 20-23. Jigsaw Logic [Wei-Hwa Huang, David Altizio, Kaz, Wei-Hwa Huang] (8, 15, 18, 44 points)

Place the given shapes into the grid such that each letter appears exactly once in each row and column. Shapes may be rotated but not reflected; rotating a shape does not rotate the shape's letters. The shapes must cover the grid with no overlap (that is, every cell must be part of exactly one shape). Some cells in the grid are labeled with letters; those cells must have the labeled letter on it after shape-placement.

20a →

20b →

While not required, you are allowed to use scissors and tape to help you solve this puzzle. This is an exception to the usual rules.

**Answer:** For each designated row, enter its contents from left-to-right.

**Example Answer:**  
EADBC, ACEDB

→

→

B	E	C	A	D
D	B	A	C	E
E	A	D	B	C
A	C	E	D	B
C	D	B	E	A

21a →

21b →

22a →

22b →

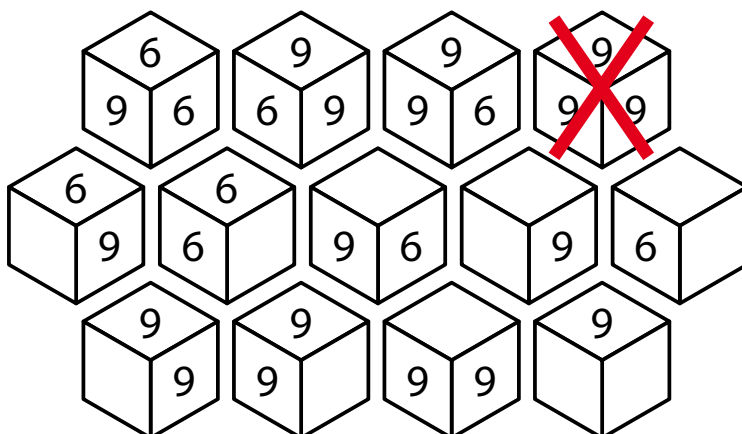
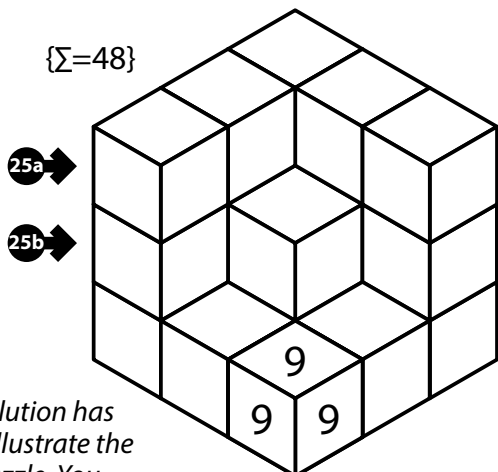
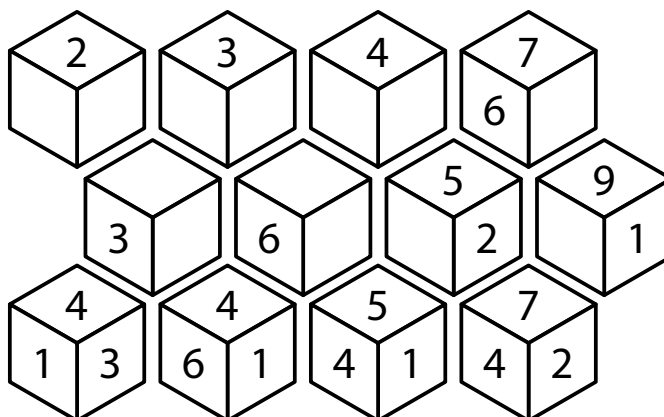
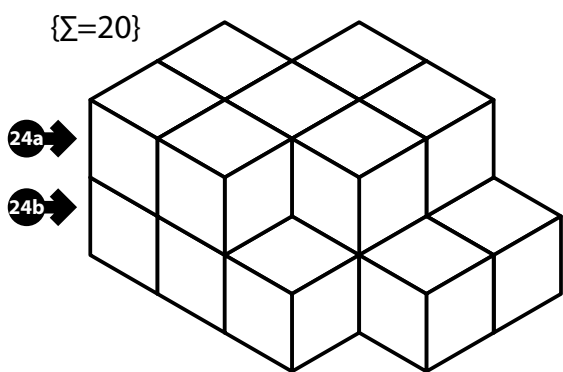
23a →

23b →



24-26. On the Surface [Wei-Hwa Huang] (13, 16, 24 points)

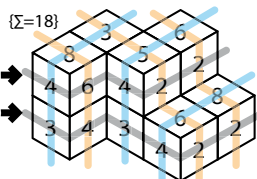
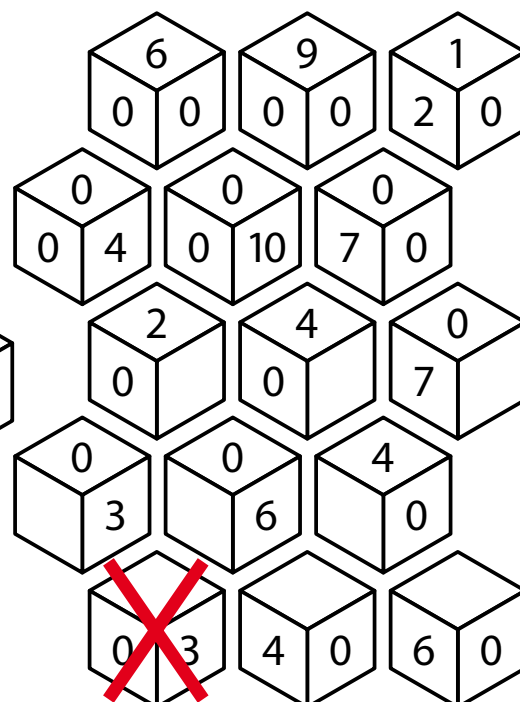
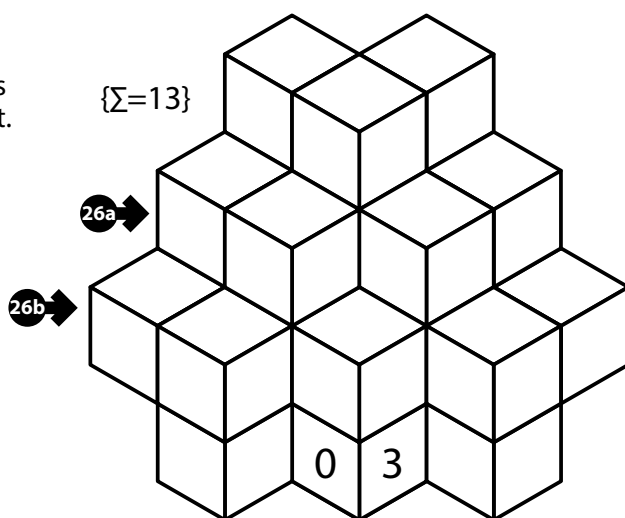
Place the given cubes into the provided arrangement so that all numbers on cube faces are visible and the sum of the numbers on every "row" is identical; this sum is provided for you. A "row" is a sequence of visible cube faces that connects two outside edges by going through some number of cube faces that are adjacent across opposite edges. The cubes cannot be rotated or reflected, and do not need to obey the laws of gravity.



The example solution has lines that help illustrate the "rows" in the puzzle. You do not need to draw these lines in your solution.

**Answer:** For each designated "row", enter its contents from left to right. Use only the last digit for two-digit numbers; e.g., use '0' for the number 10.

**Example Answer:**  
46422, 343422





### 27-29. Sum Logic [Kaz, Wei-Hwa Huang, Wei-Hwa Huang] (12, 33, 24 points)

Place the numbers outside the grid into the empty grid cells, one number per cell. Each such number must stay within its row or column. The sum of the numbers in each row, each column, and the two main diagonals must be identical; this sum is provided for you.

**Answer:** For each designated row, enter its contents from left to right. Use only the last digit for two-digit numbers; e.g., use '0' for the number 10. Do not enter numbers outside the grid.

**Example Answer:** 28000, 04042

{Σ=50}

	10	10	14	10	2	
11	6	11	14	8	11	11
→ 12	12	8	10	10	10	10
→ 14	10	14	10	14	2	14
8	10	7	8	12	13	13
12	12	10	8	6	14	6
	10	7	8	8	10	

{Σ=31}

	2	2	2	4	2	
8			1			16
27a →	1			2		4
27b →	1			4		16
1		8				4
1			16			4
	16	16	8	8	8	

{Σ=22}

	3	4	6	4	5	
1		3				4
28a →	5				3	6
2			3			8
28b →	3	3				5
4				3		4
	6	4	7	6	8	

{Σ=65}

	1	2	3	4	5	
25	19					6
29a →	22	21				7
20				17		8
18		23				9
29b →	16				24	10
	15	14	13	12	11	



**30-32. Kakuro (Renban) [David Altizio, David Altizio, Wei-Hwa Huang] (7, 33, 84 points)**

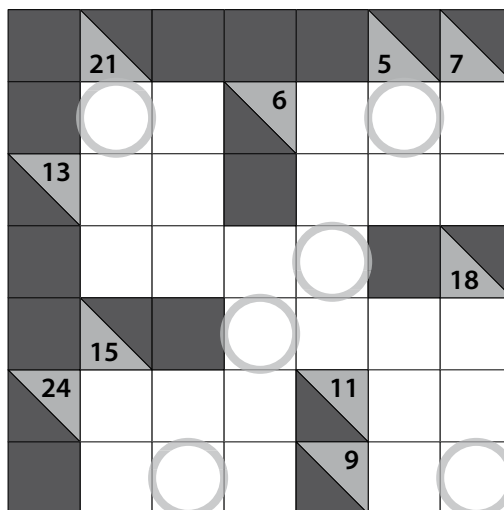
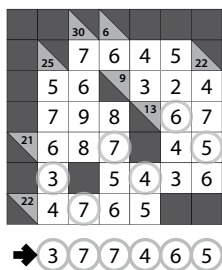
Place a digit from 1 to 9 into each white cell. The numbers in grey triangles indicate the sum of digits in the adjacent "word" across or down. (Across "words" are to the right of their sums; Down "words" are below their sums.) Digits cannot repeat within a "word."

It is possible for some "words" to not have a provided sum. Every "word" (even those without given sums) must be entirely composed of consecutive digits, with no gaps. The digits within a word do not need to be in order.

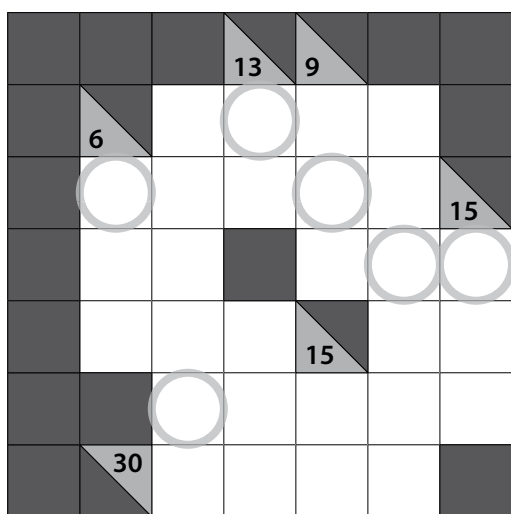
*The circles in cells are only used for entering your answers.*

**Answer:** Enter the contents of each circled cell, reading the cells from left to right. (Ignore which row the circles are in.)

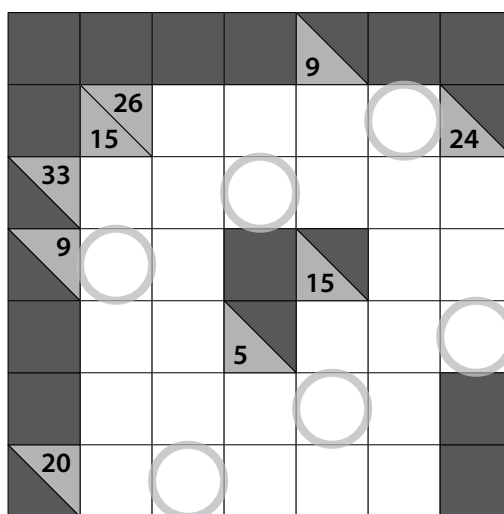
**Example Answer:** 377465



30 → ○ ○ ○ ○ ○ ○



31 → ○ ○ ○ ○ ○ ○



32 → ○ ○ ○ ○ ○ ○



### 33-35. Magic Square Logic [Kaz, Kaz, Wei-Hwa Huang] (5, 26, 38 points)

Place a number into each cell. All numbers from 1 to N (N is the number of cells in the grid) must be used once each. The sum of the numbers in each row, each column, and the two main diagonals must be identical. Some cells are identified with a letter; equations given next to the grid indicate relations between the numbers in the identified cells.

A set of all numbers from 1 to N is provided for your convenience.

**Answer:** For each designated row, enter its contents from left to right. Use only the last digit for two-digit numbers; e.g., use '0' for the number 10.

**Example Answer:** 753, 294

1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---

A	B	8
C	5	3
2	9	4

→

→

$A + B = 7$

$A \times C = 42$

1 2 3 4 5 6 7 8 9

A	B	
		C
		D

$A \times D = 16$   
 $B \div C = 3$

33a →

33b →

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

A	B	C	
			D
			E
			F

$A \times 2 = B$   
 $B \times 2 = C$   
 $D - 3 = E$   
 $E - 3 = F$

34a →

34b →

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

35a →

35b →

Q		O	L	U
R	P	H	M	F
S	G	N		
T	A	B	D	C
E	I		J	K

$A = B + 1$	$L = H \times 2$
$B = C + 1$	$M = N \times 2$
$C = D + 1$	$O = P \times 2$
$E = F + 1$	$Q = R \times 2$
$G = H \times 5$	$R = S \times 2$
$B = I \times 4$	$S = T \times 2$
$J = K \times 3$	$T = U \times T$



### 36-38. Trigons [Wei-Hwa Huang, Wei-Hwa Huang, Kaz] (15, 62, 33 points)

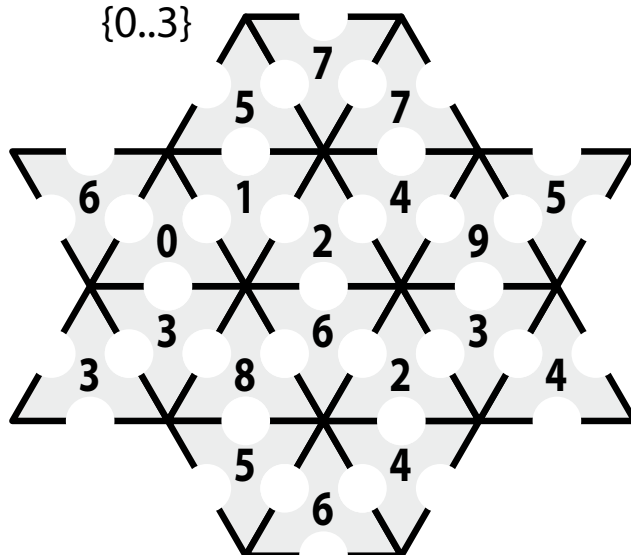
Place a number in the given range on every triangle edge so that no two triangles touch the same group of three numbers. Some triangles are labeled with a number; that number must be the sum of the three numbers on the edges of that triangle. Every combination of three numbers will be used.

A checklist of the full set of possible triangle sets, grouped by their sums, is provided for your convenience.

0	1	2	3	4	5	6	7	8	9
000	001	002	003	013	023	033	133	233	333
		011	012	022	113	123	223		
			111	112	122	222			

{0..3}

36a →



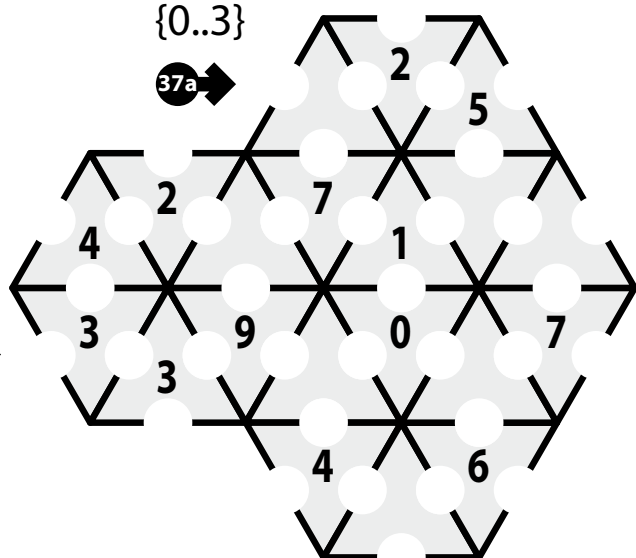
36b →

0	1	2	3	4	5	6	7	8	9
000	001	002	003	013	023	033	133	233	333
		011	012	022	113	123	223		
			111	112	122	222			

{0..3}

37a →

37b →

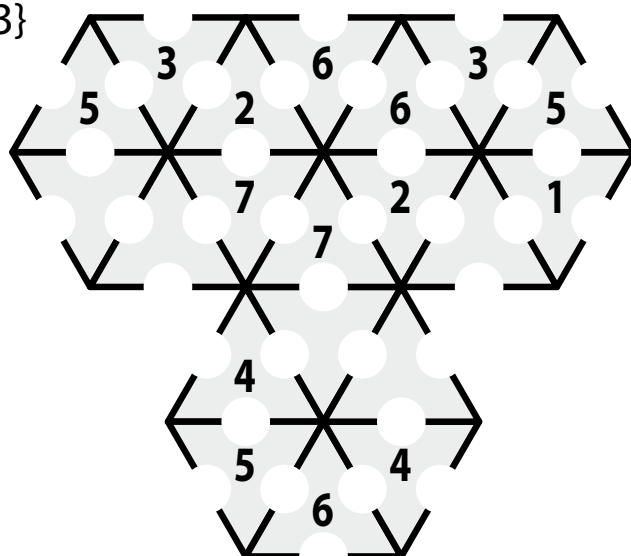


0	1	2	3	4	5	6	7	8	9
000	001	002	003	013	023	033	133	233	333
		011	012	022	113	123	223		
			111	112	122	222			

{0..3}

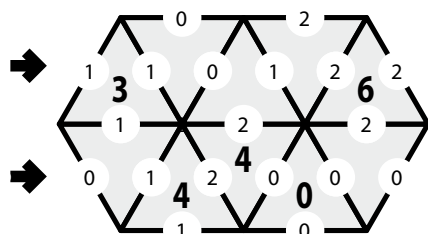
38a →

38b →



**Answer:** For each designated row, enter all the digits on triangle edges in that row, from left to right. (Do not enter any triangle sums.)

**Example Answer:** 110122, 012000



**39-40. Bingo Plays [Wei-Hwa Huang] (40, 52 points)**

Reconstruct the Bingo card and find the winning combination. The card is a 5-by-5 grid of numbers, except for the center cell which is marked "FREE". The columns are labeled with the individual letters in the word "BINGO", from left to right. For each column, all numbers in that column must be in a specific range; that range is 1-15 for B, 16-30 for I, 31-45 for N, 46-60 for G, and 61-75 for O. All numbers on the card are different. Exactly one group of five cells is the "winning combination"; those cells are either one of the five rows, one of the five columns, or one of the two main diagonals.

A digit below the grid indicates that that digit cannot be found in that column. A digit to the left of the grid indicates that that digit cannot be found in that row. A digit inside a cell indicates that the number in that cell cannot include that digit. The digits inside the circle to the right of the grid cannot appear on the card as a single-digit number or in a multiple of 11. The digits inside the octagon to the right of the grid cannot appear in the winning combination. There will be only one possible winning combination.

**Answer:** Enter the numbers in the winning combination from left to right, then enter the numbers in the indicated row from left to right. If the winning combination is a column, enter its numbers from top to bottom instead of from left to right. Enter the digit '0' for the "FREE" space. Use only the last digit for two-digit numbers; e.g., use '0' for the number 10. Do not enter numbers outside the grid.

**Example Answer:** 90099, 31115

	B	I	N	G	O
	1-15	16-30	31-45	46-60	61-75
023	7 1	16	44 1	59 17	61 457
0569	12 3	22 134	32 47	71 4	
179	2	23 0456	FREE	54 2	64 5
47	13 2	21 036	31 2	51 2	65
57	9	30	40 3	49	69

0458 5789 5689 0368 238

**39a** → ??

	B	I	N	G	O
	1-15	16-30	31-45	46-60	61-75
23689	5				5
1489				6	5
0239	5		FREE		
24589					3

3      2      126    123789    16

1345  
689

125

**40a** → ??

	B	I	N	G	O
	1-15	16-30	31-45	46-60	61-75
017					
			3	23	3
<b>40b</b> → 237	4				189
45			FREE		9
78	49	1	4	2	
90					
		167	4	2	3

0356    3489    12567    1489    0257

123  
568

1349

**41. Bingo Plays [Wei-Hwa Huang] (49 points)**

**Answer:** Enter the numbers in the winning combination from left to right, then enter the numbers in the indicated row from left to right. If the winning combination is a column, enter its numbers from top to bottom instead of from left to right. Enter the digit '0' for the "FREE" space. Use only the last digit for two-digit numbers; e.g., use '0' for the number 10. Do not enter numbers outside the grid.

**Example Answer:** 90099, 31115

	B		I		N		G		O	
	1-15	16-30	31-45	46-60	61-75					
023	7 1	16 1	44 1	59 17	61 457					
0569	12 3	22 134	32 47	47 4	71 4					(1356)
179	2	23 0456	FREE	54 2	64 5					
47	13 2	21 036	31 2	51 2	65 2					(127)
57	9	30	40 3	49	69					
	0458	5789	5689	0368	238					

41a → ??

41b → 24

	B	I	N	G	O
	1-15	16-30	31-45	46-60	61-75
		678	89	12389	
156					
	47		28	9	4
0789			FREE		
	345	1		123	234
01					
	56	678	8	89	2349
4					
	5	0678		1239	
	012	345	4567	067	01589

(239)

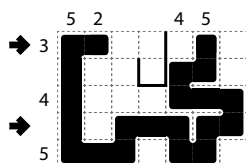
(03689)

**42. Math Maze [Kaz] (10 points)**

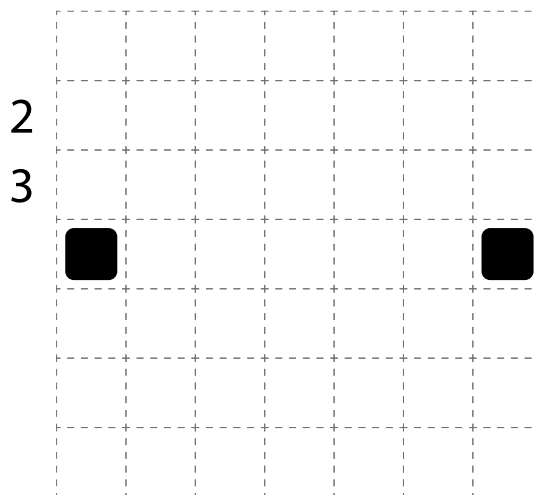
Draw a path that passes orthogonally through centers of cells. The ends of the path are given. The path cannot cross itself or use any cell more than once. Numbers outside the grid, if given, indicate how many cells in that row or column are occupied by the path. The grid may contain walls; the path cannot go through them.

**Answer:** For each designated row, enter the letter for each cell, from left to right. The letter for a cell is 'I' if the path goes straight through the cell or ends in the cell, 'L' if the path turns in the cell, and 'X' if the path does not go through the cell. You may use other letters or numbers, as long as they are distinct.

**Example Answer:** LIXXXIX, IXLILL



2 7 6 5 5 7 3



42a →

42b →





**46-48. Secret Squares [Kaz, Wei-Hwa Huang, Wei-Hwa Huang] (12, 69, 67 points)**

Place a natural number (positive integer) into each cell so that each cell has one number and all the numbers are different. The sum of the numbers in each row, each column, and the two main diagonals must be identical; this sum is provided for you. Each letter represents a different (base ten) digit. The numbers of some cells are given for you, either in letters, digits, or both. Partial numbers are never given (for example, if one letter is given, then the number cannot have two digits). The correspondence between letters and digits is for you to discover. Numbers cannot start with the digit 0 (zero).

{Σ=66}

A	BC	AD	D
4	16	43	3
23	BE	F	GH
13	29	BA	10
26	6	B	DD
		1	33



**Answer:** For each designated row, enter its contents from left to right. Ignore any given letters (but do not ignore given numbers). Use only the last digit for two-digit numbers; e.g., use '0' for the number 10.

**Example Answer:** 3940, 6613

{Σ=18}

AB	A	



{Σ=90}

AB		J	EE
	CD		H 9
ED		EF	
	I 3		G



{Σ=34}

AB	AA		
	B		
			A

