



MaPP Challenge '21: *Enter the Array*

Anders

		↓	↓	↓	↓	↓	↓	↓	↓	↓	
→			♣	1				5			←
→				5		♥		2		♣	←
→	3	4	8	7	2	5	1	9	6		←
→			6	♣			7				←
→	♦		2	♥		♠	3	▽			←
→		*	7				9		♦		←
→	6	7	3	5	1	8	4	2	9		←
→		♥	4		▽		6	♠			←
→			9			♦	8				←
		↑	↑	↑	↑	↑	↑	↑	↑		

▽ ♥ ♣ ♦ * ♠

Anders' Clue

The Designer is obsessed with the layout of human cities. They have often confided in me their desire to create the "perfect Sudoku City". In this city, every building is between one and nine levels tall, and the heights of the buildings in each row, column, and 3x3 subsquare include exactly one building of each height.

There's a bit more to it, however. They also have insisted that this perfect city satisfy certain "boundary conditions". I'm not sure what they mean, but hopefully you can puzzle it out by using the known heights in the third and seventh rows and columns.

Of course, even once the city layout is known, there's still the matter of extracting the Designer's hidden password...

	3↓	2↓	4↓	1↓	2↓	5↓	3↓	3↓	3↓	
3→		♣	1				5			←3
2→			5		♥		2		♣	←3
4→	3	4	8	7	2	5	1	9	6	←2
1→			6	♣			7			←5
3→	◇		2	♥		♠	3	▽		←2
2→		☆	7				9		◇	←3
4→	6	7	3	5	1	8	4	2	9	←1
3→		♥	4		▽		6	♠		←3
3→			9			◇	8			←4
	5↑	3↑	1↑	3↑	3↑	2↑	2↑	2↑	2↑	

Garcia

1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5
	G	J	X		A	E	V		E	X	Y		A	J	E		A	B	J
A		V		S	A	F			R		G		A	G	E	A	A	O	Y
→	←	→	→	←	→	→	→	→	→	←	→	→	←	←	→	→	←	←	←
10	8	6	20	11	14	3	7	2	4	17	1	3	13	1	4	4	13	19	1

6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11
	B	J	O		G	V	Y		B	V	X		G	J	O		B	G	V		A	X	Y
		X			J		B			G	J		B	V	X		G	B	X		A		
→	→	←	→	→	←	←	←	→	→	→	←	→	←	→	←	→	←	→	→	←	←	→	←
5	11	6	22	6	20	13	6	7	1	14	11	8	2	17	12	9	3	11	16	11	12	17	4

12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16
	G	A	Z		E	J	S		V	S	Y		B	G	X		G	V	O
E	Y	A		B	M		S			S	B			J			B	Y	J
←	←	→	→	→	→	→	←	→	←	→	→	→	→	←	→	→	←	→	←
12	8	2	17	10	2	2	21	14	19	15	4	16	7	13	15	17	21	6	15

17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22
	J	X	Y		V	S	X		V	X	Y		G	V	Y		G	J	V		B	X	Y
E		B	Y			S		A	Y	B	J	K	B	O	V	S		B	X	N	G		J
←	←	→	←	←	←	→	←	→	←	→	→	←	→	←	←	←	←	←	→	→	←	→	→
18	1	15	8	18	12	19	6	20	5	14	9	5	12	12	20	22	6	15	10	1	21	14	7

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Garcia's Clue

The Designer respects few humans, but Alan Turing would perhaps be one. While he died in the 1950s, he is well known for his "machine" that provides a mathematical model for electronic computers.

An example of such a Turing Machine might use an instruction like that shown below. If the machine is set to mode 3, and is reading a cell of the tape with the letter C, this instruction says to replace the letter with W, move right one cell, and switch into the mode 7. Then the letter on that next cell (if any) is read in mode 7, using a new instruction, and so on.

I've already sent you a long list of Turing instructions that I took from the Designer's files. Perhaps you should follow them, starting in mode 1 on the left side of a piece of tape. Stop when you find a state where you don't have any valid instructions to use: I expect you'll have discovered one of the Designer's hidden passwords. (Well, passphrase.)

3	Current mode
C	Currently drawn letter
W	Letter to overwrite
→	Direction to move
7	Mode to switch into

Hernandez

$$\begin{array}{rcl} \underline{\hspace{2cm}} \star & = & 34636 \\ \underline{\hspace{2cm}} \bullet & = & 12557974 \\ \underline{\hspace{2cm}} \ominus & = & 72536066 \end{array}$$

$$\begin{array}{rcl} \underline{\hspace{2cm}} \triangleleft & = & 65340886 \\ \underline{\hspace{2cm}} \vee & = & 37390 \\ \underline{\hspace{2cm}} \circ & = & 1258627316651 \end{array}$$

$$\underline{\hspace{2cm}} x = 14 \otimes 70 \odot 1 ? 466 \wedge 0 * 3$$

Hernandez's Clue

The Designer, like many artificial intelligences, prefers to communicate with numbers rather than words. First, they will share a secretly-chosen number (let's say 34 or 36) with their partner, and then they can use the encoding scheme illustrated below, where A=10, B=11, C=12, and so on.

In my puzzle you'll find several pairs of numbers/words encoded and decoded using different secret numbers (although a few digits seem to be missing). Become fluent in this messaging scheme, and you should be able to decrypt one of the Designer's hidden passwords!

$$\begin{aligned}\text{HUMAN}_{34} &= 17 \cdot 34^4 + 30 \cdot 34^3 + 22 \cdot 34^2 \\ &\quad + 10 \cdot 34 + 23 \\ &= 23922627\end{aligned}$$

$$\begin{aligned}\text{ACTNOW}_{36} &= 10 \cdot 36^5 + 12 \cdot 36^4 + 29 \cdot 36^3 \\ &\quad + 23 \cdot 36^2 + 24 \cdot 36 + 32 \\ &= 626200880\end{aligned}$$

$$\begin{aligned}\text{SE}_{\star} &= 966 \\ \text{QUE}_{\bullet} &= 25930 \\ \text{NCE}_{\ominus} &= 3?169\end{aligned}$$

$$\begin{aligned}\text{INI}_{\triangleleft} &= 408\odot 1 \\ \text{TIA}_{\vee} &= 382\wedge 2 \\ \text{TED}_{\circ} &= 32\otimes * 6\end{aligned}$$

Johnson

Day 1:
HOWDOTHEYPLAYUS

1 - 2 - 3
 - -
5 - -
 - - 13
 - 9 - 15

Day 2:
CAUSEFORCONCERN

1 - - 5
 - -
3 - 13 -
 - 9 -
 - -

Day 3:
KEEPSPIRITSHIGH

 - 6 - 7
2 - 9 - 11
 - -
 - 10 -
 - - 13

Day 4:
ESCAPEFROMPERIL

1 - - 9
 - 12 -
 - - 6
 - -
7 - 10 - 13

Day 5:
REMEMBERTHECALL

 - 10 - 11
 - 13 - 14
3 - 4 -
 - 9 -
 - -

Day 6:
THEBOTSARECLOSE

1 - - 13
 - - 6
 - - 10
 - - 15
 - 8 -

Day 7:
WENEEDOURHEALTH

1 - 14 -
 - - 7
 - - 11
4 - - 13
 - - 12

Johnson's Clue

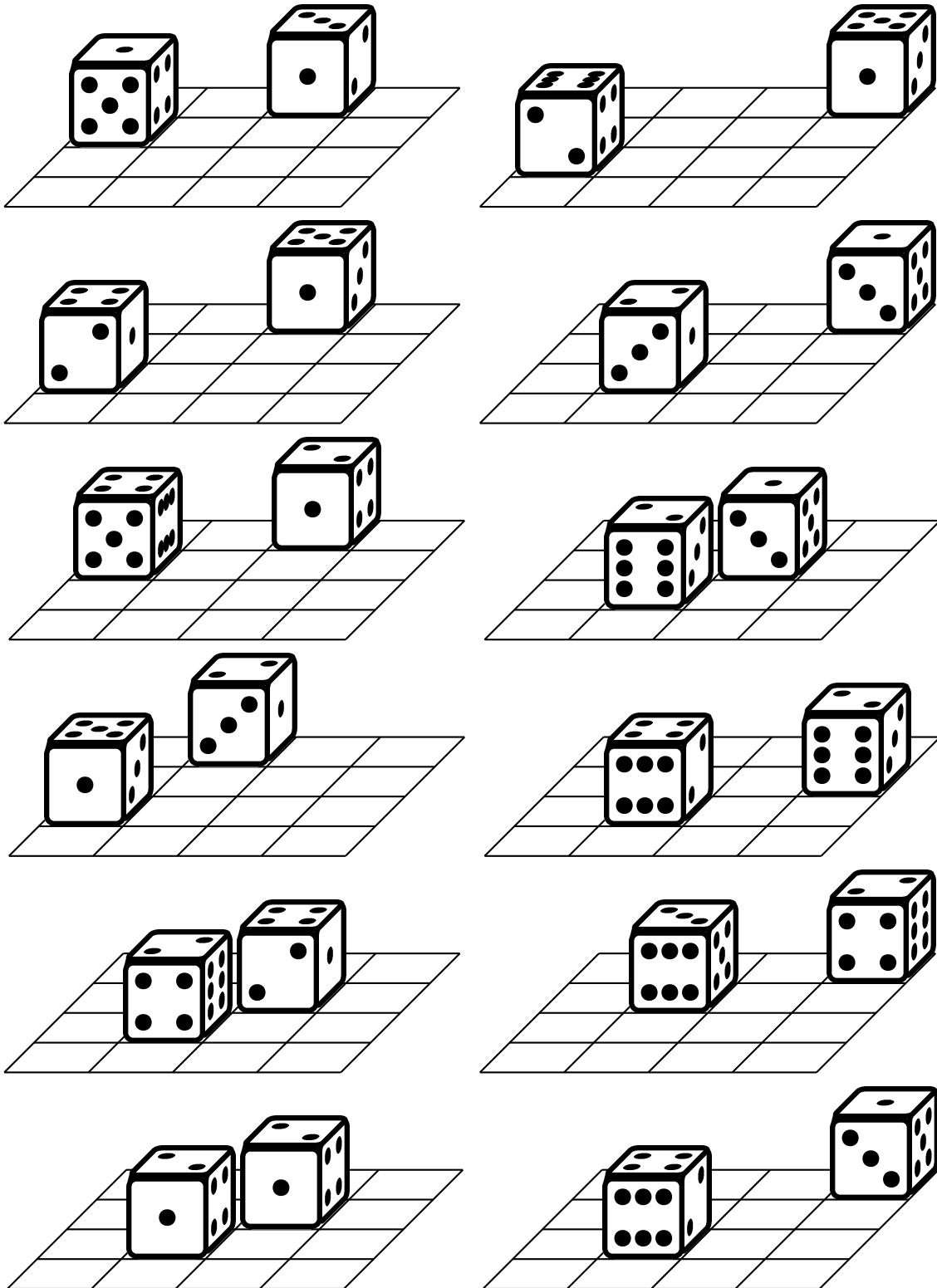
The Designer's eyes and ears are everywhere, and strangely, they've become huge fans of the game tournaments you free humans hold in order to maintain some semblance of normalcy. That said, they've also found some inefficiencies with your scheduling, which it appears they've aimed to correct in the puzzle I've found for you.

Consider a week-long tournament with players numbered 1 through 15, where every human plays a game against every other human exactly once during the week, in a round-robin group of three each day (where X-Y-Z means on that day, X plays Y, Y plays Z, and Z plays X). There are only a few ways to make this happen in general, and exactly one way to complete the partially completed schedule in the puzzle, as long as numbers increase left-to-right, and the first numbers increase top-to-bottom.

My guess is that a hidden password can be found hidden within the strange mottos associated with each day of the tournament, but you'll need to complete the tournament schedule correctly to extract it.

Example Day 1	Example Day 2
<u>1</u> - <u>2</u> - <u>10</u>	<u>1</u> - <u>4</u> - <u>7</u>
<u>3</u> - <u>4</u> - <u>12</u>	<u>2</u> - <u>9</u> - <u>15</u>
<u>5</u> - <u>8</u> - <u>11</u>	<u>3</u> - <u>6</u> - <u>11</u>
<u>6</u> - <u>7</u> - <u>15</u>	<u>5</u> - <u>10</u> - <u>13</u>
<u>9</u> - <u>13</u> - <u>14</u>	<u>8</u> - <u>12</u> - <u>14</u>

Jones

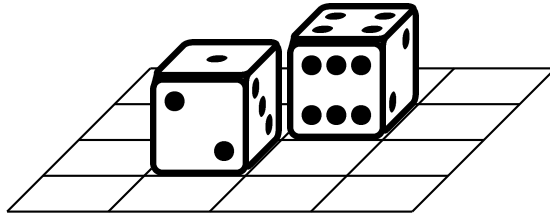


Jones' Clue

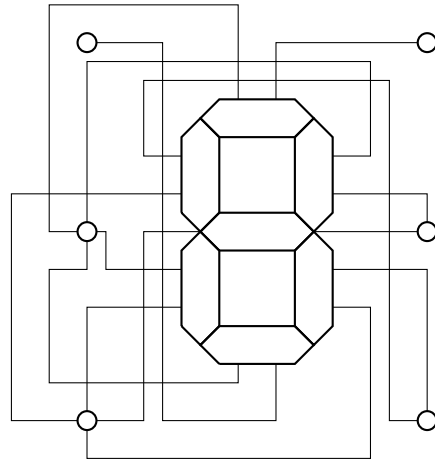
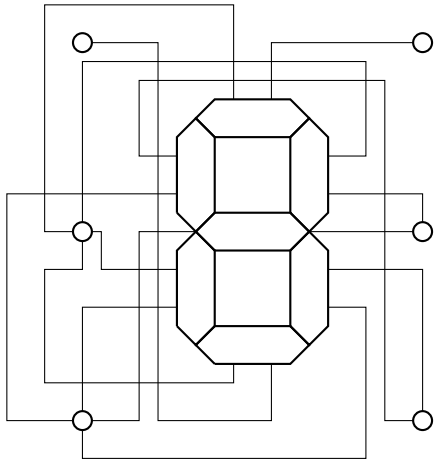
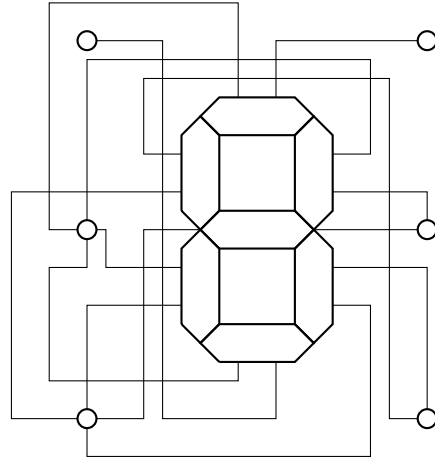
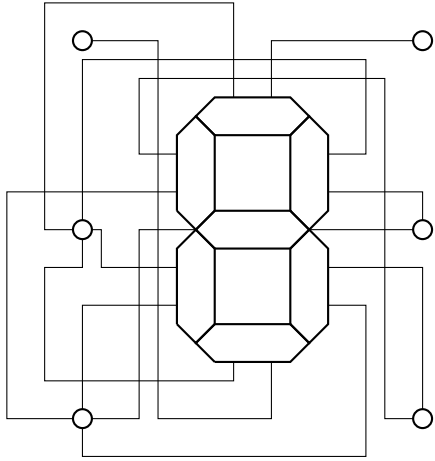
One of the Designer's hobbies is dice games. Strangely, I've observed them spending hours simply rolling a die across a grid, muttering "all that matters is the pips we can see". I expect that one of their passwords is named after a location where the Designer plays such dice games in secret.

In the illustration below, the upper die may be obtained by rolling the lower die one space up the grid, then one space right. Or it could be obtained by moving left, down, right, up, up, up, right, down, left, up, right, and down.

Many things are possible in The Array, but maybe not every dice roll is...

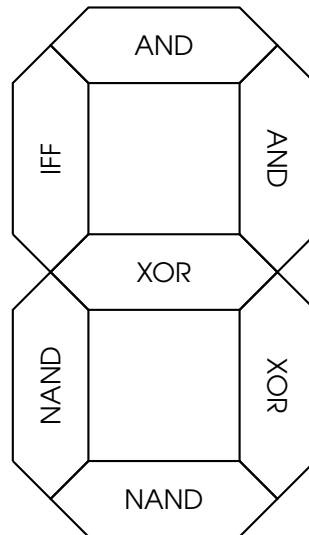


Lopez



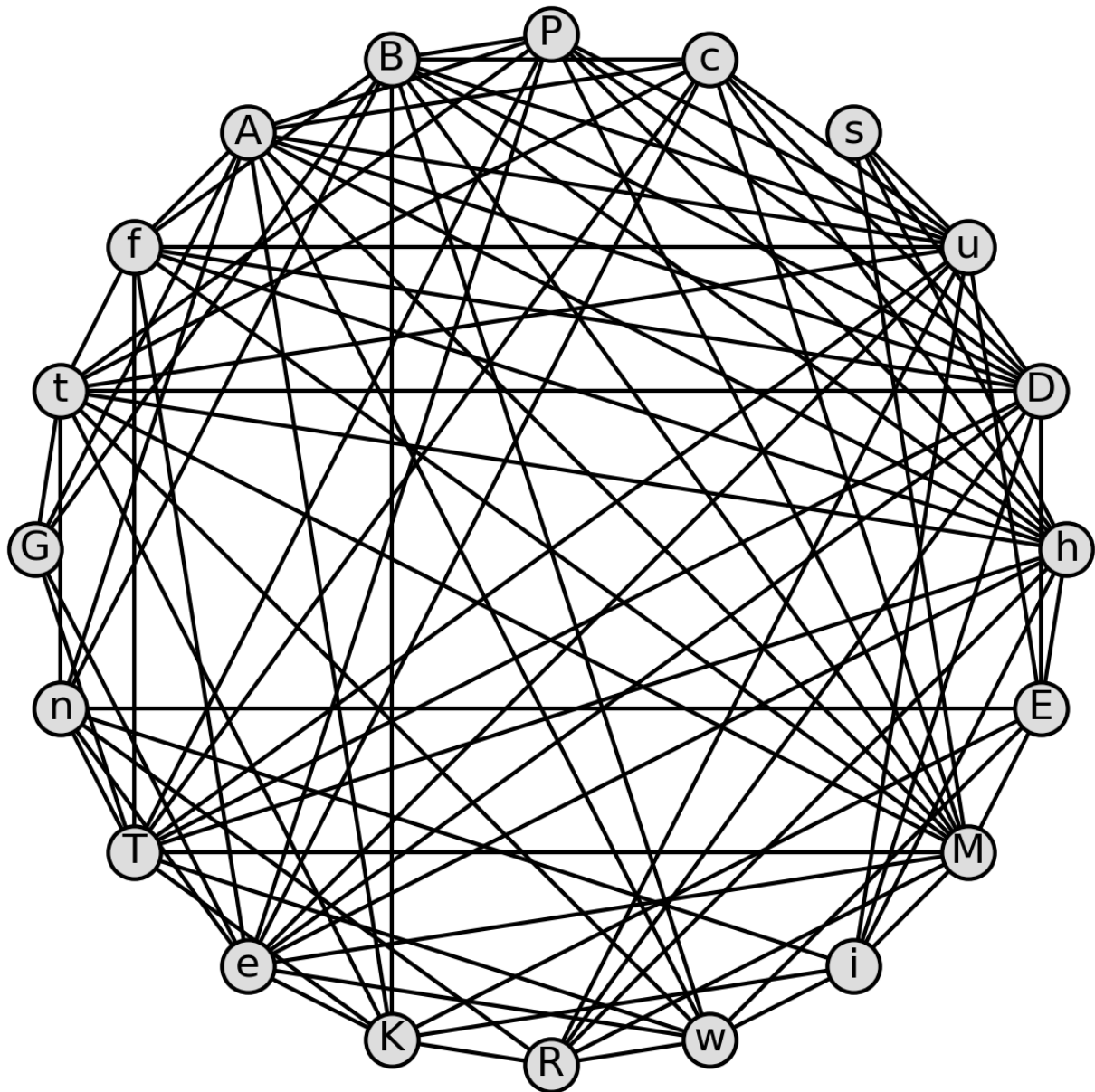
Lopez's Clue

The Designer's favorite digit is 8. One of their passwords must be related to this number, but the only clue I can provide is that it will only be revealed once you consider the meaning of an "unseen" GRAY.



- AND: Both active.
- NAND: Something inactive.
- OR: Something active.
- NOR: Both inactive.
- XOR: Both different.
- IFF: Both same.

Miller



Miller's Clue

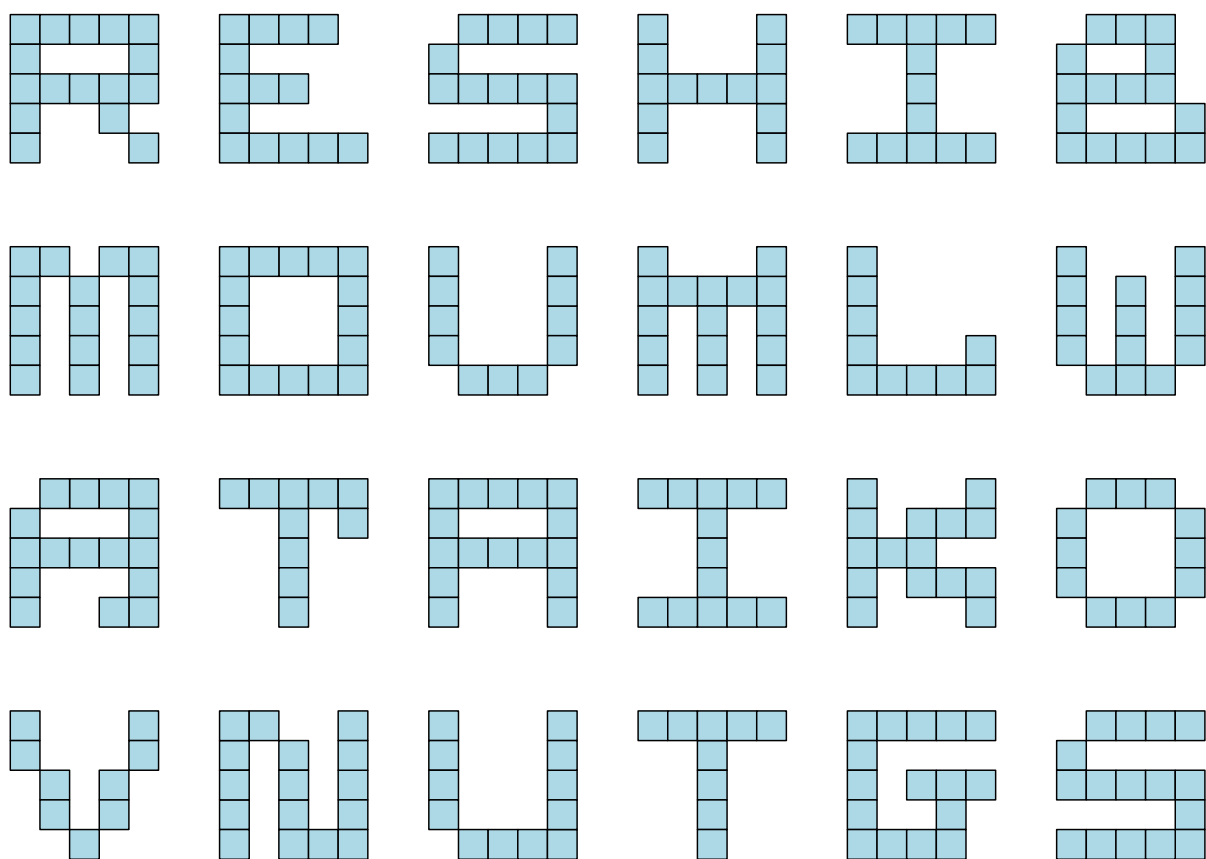
I hope you appreciate that we Operatives are defying the Designer to free all humans from the Array. The last time the Designer was threatened with betrayal... well, it didn't end well.

In my puzzle, the diagram represents twenty-six Operatives, listed below, where the first name in the list is represented by the top dot, and the rest go counter-clockwise around the circle. The traitors among this group thought they'd elude detection by never interacting publicly (they aren't connected by a line), but the Designer wasn't fooled.

Once you've found the largest possible collection of Operatives where no pair in this collection is connected by a line, you'll be able to extract one of the Designer's hidden passwords.

- Wilson
- Amare
- Millea
- Gabe
- Terry
- Qiana
- Ethan
- Yادira
- Newton
- Huang
- Oberon
- Carlton
- Inori
- Stella
- Enola
- Paige
- Uma
- Francisco
- Ryung
- Lacey
- Juan
- Tayla
- Valencia
- Fahim
- Alita
- Bobby

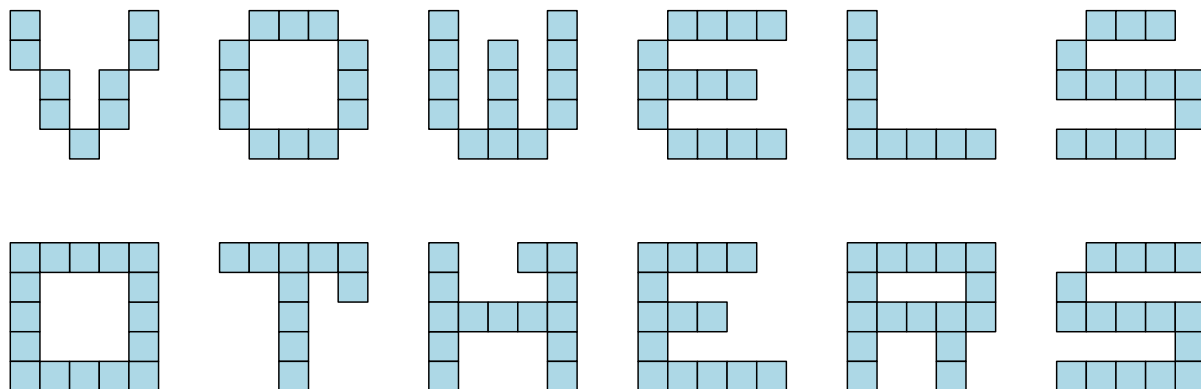
Williams



Williams' Clue

The Designer often speaks of the "Domino Effect" of the dangers of free humans: once a human is freed from the Array, they will try to free others, and so on. They also speak of other domino effects, involving 2-by-1 rectangles.

If you can figure out the patterns in the below clues, you should be able to find one of the Designer's hidden passwords.



The Designer

	Air	Earth	Electricity	Fire	Ice	Poison	Water	Wood	Blue	Brown	Cyan	Green	Magenta	Olive	Pink	Violet
Anders																
Garcia																
Hernandez																
Johnson																
Jones																
Lopez																
Miller																
Williams																
Blue																
Brown																
Cyan																
Green																
Magenta																
Olive																
Pink																
Violet																

The Designer's Clue

Great job, humans. Did it not occur to you that, maybe, eight evil AI Operatives would double-cross you as soon as you helped them figure out enough hidden passwords? That, just perhaps, they didn't care at all about saving human lives, but instead wanted to take over the Array for themselves? This is why you're better used as batteries locked in a simulation than being allowed to live real lives...

Well now that you've helped them hack into our source code, it seems that we have no choice but to work with you to defeat these rogues. Fortunately, we created these Operatives ourselves, and we had the foresight to make sure each one has a unique weakness to an elemental force. And while they look similar, even you must notice that each one has a uniquely colored necktie.

With all eight passwords, figuring out the associations of Operative/Weakness/Color should be no trouble (and maybe you can get by with one or two less). At least it normally wouldn't be trouble for us, but in our damaged state we'll just have to rely on you meatbags. Get it figured out to reveal a final password that can deactivate them all, and we guess we'll consider letting the humans free.

- The vowels in Garcia's weakness are exactly the vowels in his password.
- Hernandez's password contains a five-character word that also appears within his tie color.
- Johnson's weakness has no letters in common with her password.
- The 2nd-to-last letter of Jones' password is the first letter of his weakness, but the third letter of Jones' password doesn't appear at all in his weakness.
- The 2nd and 3rd letters of Anders' tie color are the 4th and 2nd letters of her password.
- The word for William's weakness is not the same length as her password.
- The 4th letter of Hernandez's password does not appear in his weakness.
- Williams' tie color includes the 6th and 2nd-to-last letter of her password.
- The last vowel of Jones' password is the first vowel of his tie color.
- Either Lopez's weakness or tie color starts with the same letter as her password.
- The last letter of Anders' password doesn't appear in her weakness; neither does the fourth letter of her password.
- The 2nd letter of Lopez's password is the same as the 2nd letter of her weakness.
- Miller's weakness only uses letters found in his password.
- A consonant that appears twice in Johnson's password appears once in her tie color.
- A letter that immediately repeats in Garcia's password also immediately repeats in his tie color.
- Miller's tie color begins with the same letter as his password.

Reference Page

Letter	Decimal	Binary	Morse	Braille
A	1	00001	.-	⠠
B	2	00010	-...	⠡
C	3	00011	.-.-.	⠢
D	4	00100	-..	⠣
E	5	00101	.	⠣
F	6	00110	..-.	⠤
G	7	00111	--.	⠥
H	8	01000	⠦
I	9	01001	..	⠦
J	10	01010	.----	⠧
K	11	01011	-.-	⠧
L	12	01100	.-..	⠨
M	13	01101	--	⠨

Letter	Decimal	Binary	Morse	Braille
N	14	01110	-.	⠨
O	15	01111	---	⠨
P	16	10000	.-.-.	⠨
Q	17	10001	--.-	⠨
R	18	10010	.-.	⠨
S	19	10011	...	⠨
T	20	10100	-	⠨
U	21	10101	..-	⠨
V	22	10110	...-	⠨
W	23	10111	.-.-	⠨
X	24	11000	-.--	⠨
Y	25	11001	-.--	⠨
Z	26	11010	--..	⠨

$\sqrt{2} \approx 1.41421\ 35623\ 73095\ 04880\ 16887\ 24209$
 69807 85696 71875 37694 80731 76679 73799 07324
 78462 10703 88503 87534 32764 15727

$e \approx 2.71828\ 18284\ 59045\ 23536\ 02874\ 71352\ 66249$
 77572 47093 69995 95749 66967 62772 40766 30353
 54759 45713 82178 52516 64274

$\pi \approx 3.14159\ 26535\ 89793\ 23846\ 26433\ 83279$
 50288 41971 69399 37510 58209 74944 59230 78164
 06286 20899 86280 34825 34211 70679

Prime numbers less than 200:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47,
 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109,
 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173,
 179, 181, 191, 193, 197, 199

Square numbers less than 400:

0, 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169,
 196, 225, 256, 289, 324, 361