CLOCKWORDS and **FLIPPIN' CLOCKWORDS**

In this puzzle that exercises your spatial reasoning ability, the task is to recreate the original crossword (or solution grid) by identifying the sequence of rotations and reflections applied to the letters in the crossword.

The transformations are applied to letters around the cells numbered **1** to **4**. For example, if letters around **1** are transformed (**1_transformed**), the rest of the grid letters are left unchanged. Subsequently, a rotation or reflection applied to letters around **2** will mean that this transformation was applied to the **1_transformed** grid and the sequence of transformations was **1** → **2**.

(A)

The "Solution Grid" or the original crossword

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

(B)

Puzzle grid with a single clockwise rotation (**c**) of letters around **1** by 90°

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

(C)

Puzzle grid with a single anticlockwise rotation (**ac**) of letters around **1** by 90°

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

(D)

Applying a single rotation of letters around **1** by 180°, **c = ac**

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

(E)

Applying a single vertical plane flip* (**v**) of letters around **1**

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

(F)

Applying a single horizontal plane flip* (**h**) of letters around **1**

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

(G)

Applying two sequential rotations
1c90 → 2ac90

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

(H)

Applying two sequential reflections (or plane flips)
1v → 2h

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

(I)

Applying sequential rotations and reflections
1ac90 → 3v → 2c90

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

*(E), (F) The vertical and horizontal planes pass through the numbered cell and thus letters that lie along the plane retain their original positions. Also note that two vertical or two horizontal flips without any intermediate transformation will result in the original configuration of letters.

CLOCKWORDS and **FLIPPIN' CLOCKWORDS**

Each puzzle grid is the final result of a specific letter transformation sequence that involves either only rotations (**Clockwords** puzzle) or both rotations (**c90**, **ac90**, **180**) and reflections (**v** and **h** plane flips) (**Flippin' Clockwords** puzzle). Note that the desired answer is this transformation sequence.

For example, if through reverse-engineering of the puzzle grid, the solver has identified that the original crossword (solution grid) can be obtained via the following sequential transformations:

[Puzzle Grid] → **4c90** → **3v** → **1ac90** → **2h** → [Original Crossword],

then the correct transformation sequence required as the answer will be as follows:

[Original Crossword] → **2h** → **1c90** → **3v** → **4ac90** → [Puzzle Grid].

Note how a clockwise rotation becomes anticlockwise and vice versa, while vertical and horizontal plane reflections are not affected.