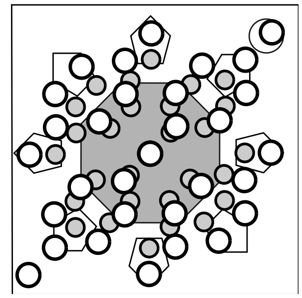
On the Subject of Organized UltraStores



Floating UFOs like you have never seen before.

This module consists of eight black buttons, a large central button, and sixty-four floating discs.

These discs travel in straight lines, remsembling rotations of a hexeract (6D cube).
These rotations correspond to functions in the tables below.

There are three stages, each with one more rotation than the previous.

There will be a long pause between rotations, indicating where the sequence restarts.

Apply each operation successively until the end of the sequence and use the result to determine the sequence of coloured buttons to press for each stage.

If at any point an operator yields-

- **a value greater than 364, then subtract 365 from the value until it is less than 365.**
- **a value less than -364, then add 365 to the value until it is greater than -365.**

Section 1: Determining Initial Values

To determine the number to be entered into the sequence of operators, interpret the following pairs of digits in the serial number as two-digit base-36 numbers and take them modulo 365:

- For stage 1, a_0 is obtained by using the 3rd and 4th digits.
- For stage 2, b_0 is obtained by using the 5th and 6th digits.
- For stage 3, c_0 is obtained by using the 1st and 2nd digits.

Section 2: Operation Tables

In each stage, each rotation is associated with an operation, expressed here as a function:

- n is the current step of the sequence.
- D is the sum of the individual base-36 digits of the serial number.

		Stage 1	Stage 2	Stage 3
X	XY	$XY(x) = x + D$	$XY(x) = x + a_{n-1}$	$XY(x) = x + b_{n-1} - a_{n-1}$
	XZ	$XZ(x) = 2x - D$	$XZ(x) = 2x - a_{n-1}$	$XZ(x) = 2x - b_{n-1} - a_{n-1}$
	XU	$XU(x) = x + 365 - D$	$XU(x) = x + 365 - abs(a_{n-1})$	$XU(x) = x + 365 - abs(a_{n-1}) - abs(b_{n-1})$
	XV	$XV(x) = 2(D - x)$	$XV(x) = 2x - 3(D - a_{n-1})$	$XV(x) = 2x - 4(D - b_{n-1})$
	XW	$XW(x) = 2D - x$	$XW(x) = 3D - x - a_{n-1}$	$XW(x) = 4D - x - b_{n-1} - a_{n-1}$
Y	YX	$YX(x) = x - D$	$YX(x) = x - a_{n-1}$	$YX(x) = x - b_{n-1} + a_{n-1}$
	YZ	$YZ(x) = x + 2D$	$YZ(x) = x + 2a_{n-1}$	$YZ(x) = x + 2b_{n-1} - a_{n-1}$
	YU	$YU(x) = 2x - 365 + D$	$YU(x) = 2x - 365 + abs(a_{n-1})$	$YU(x) = 2x - 365 + abs(a_{n-1}) + abs(b_{n-1})$
	YV	$YV(x) = x + (D \bmod 6)^3 - 35n$	$YV(x) = x + (a_{n-1} \bmod 7)^3 - 12n^2$	$YV(x) = x + (b_{n-1} \bmod 8)^3 - 5n^3$
	YW	$YW(x) = 2x + D - 35n$	$YW(x) = 2x + abs(a_{n-1}) - 12n^2$	$YW(x) = 2x + abs(b_{n-1}) + abs(a_{n-1}) - 5n^3$
Z	ZX	$ZX(x) = 2x + D$	$ZX(x) = 2x + a_{n-1}$	$ZX(x) = b_{n-1} + a_{n-1} - 2x$
	ZY	$ZY(x) = x - 2D$	$ZY(x) = x - 2a_{n-1}$	$ZY(x) = x + 2a_{n-1} - b_{n-1}$
	ZU	$ZU(x) = x + 365 - 2D$	$ZU(x) = x + 365 - 2*abs(a_{n-1})$	$ZU(x) = x + 365 - 2*abs(a_{n-1}) - 2*abs(b_{n-1})$
	ZV	$ZV(x) = (x - x \bmod 2)/2 + D$	$ZV(x) = x + (x - x \bmod 2)/2 - a_{n-1}$	$ZV(x) = (x - x \bmod n)/n + 2b_{n-1}$
	ZW	$ZW(x) = x + (x \bmod 6)^3$	$ZW(x) = x + (a_{n-1} \bmod 7)^3$	$ZW(x) = x + (b_{n-1} \bmod 6)^3 + (a_{n-1} \bmod 6)^3$
U	UX	$UX(x) = x - 365 - D$	$UX(x) = x - 365 - abs(a_{n-1})$	$UX(x) = x - 365 + abs(a_{n-1}) - abs(b_{n-1})$
	UY	$UY(x) = 2x - 365 - D$	$UY(x) = 2x - 365 - abs(a_{n-1})$	$UY(x) = 2x - 365 + abs(a_{n-1}) - abs(b_{n-1})$
	UZ	$UZ(x) = x + 365 + 2D$	$UZ(x) = x + 365 + 2*abs(a_{n-1})$	$UZ(x) = x + 365 + 2*abs(a_{n-1}) - 2*abs(b_{n-1})$
	UV	$UV(x) = nx - D$	$UV(x) = n(x - a_{n-1} - D)$	$UV(x) = n(x - a_{n-1} - b_{n-1})$
	UW	$UW(x) = 365 - 2*abs(x)$	$UW(x) = 365 - 2*abs(x) - abs(a_{n-1})$	$UW(x) = 365 - 2*abs(x) - abs(a_{n-1}) - abs(b_{n-1})$
V	VX	$VX(x) = 2(D + x)$	$VX(x) = 2x - 3(D + a_{n-1})$	$VX(x) = 2x - 4(D + b_{n-1})$
	VY	$VY(x) = x - (D \bmod 6)^3 - 35n$	$VY(x) = x - (a_{n-1} \bmod 7)^3 - 12n^2$	$VY(x) = x - (b_{n-1} \bmod 8)^3 - 5n^3$
	VZ	$VZ(x) = (x - x \bmod 2)/2 - D$	$VZ(x) = x + (x - x \bmod 2)/2 + a_{n-1}$	$VZ(x) = (x - x \bmod n)/n - 2b_{n-1}$
	VU	$VU(x) = nx$	$VU(x) = n(x - a_{n-1})$	$VU(x) = n(x - a_{n-1} + b_{n-1})$
	VW	$VW(x) = 5x + 3D$	$VW(x) = 8x + 5D - 3a_{n-1}$	$VW(x) = 13x + 8D - 5a_{n-1} + 3b_{n-1}$
W	WX	$WX(x) = 2D + x$	$WX(x) = 3D + x - a_{n-1}$	$WX(x) = 4D + x - b_{n-1} - a_{n-1}$
	WY	$WY(x) = 2x - D - 35n$	$WY(x) = 2x - abs(a_{n-1}) - 12n^2$	$WY(x) = 2x - abs(b_{n-1}) - abs(a_{n-1}) - 5n^3$
	WZ	$WZ(x) = x - (x \bmod 7)^3$	$WZ(x) = x - (a_{n-1} \bmod 6)^3$	$WZ(x) = x - (b_{n-1} \bmod 7)^3 - (a_{n-1} \bmod 7)^3$
	WU	$WU(x) = 365 - abs(x)$	$WU(x) = 365 - abs(x) - abs(a_{n-1})$	$WU(x) = 365 - abs(x) - abs(a_{n-1}) - abs(b_{n-1})$
	WV	$WV(x) = 5x - 3D$	$WV(x) = 8x - 5D + 3a_{n-1}$	$WV(x) = 13x - 8D + 5a_{n-1} - 3b_{n-1}$

Dual Rotations

These operators apply to the two functions corresponding to the individual rotations that occur simultaneously, referred to as R and S.

There will always be two axes that are unchanged, if these axes:

- are both X, Y, or Z, then apply function X.
- are both W, V, or U, then apply function Z.
- do not satisfy one of the two above conditions, then apply function Y.

	Stage 1	Stage 2	Stage 3
X	$a_n =$ $2D - abs(R(a_{n-1}) - S(a_{n-1}))$	$b_n =$ $3D - abs(R(b_{n-1}) + S(b_{n-1}))$	$c_n =$ $4D - abs(R(c_{n-1})) - abs(S(c_{n-1}))$
Y	$a_n =$ $2D - R(a_{n-1}) - S(a_{n-1})$	$b_n =$ $2a_{n-1} - R(b_{n-1}) - S(b_{n-1})$	$c_n =$ $2b_{n-1} - R(c_{n-1}) - S(c_{n-1})$
Z	$a_n =$ $R(a_{n-1}) + S(a_{n-1}) - a_{n-1}$	$b_n =$ $R(b_{n-1}) + S(b_{n-1}) - b_{n-1} - a_{n-1}$	$c_n =$ $R(c_{n-1}) + S(c_{n-1}) - c_{n-1} - b_{n-1} - a_{n-1}$

Triple Rotations

These operators apply to the three individual rotations that occur simultaneously, referred to as R,S, and T.

- If each of the three rotations map an axis from one of X,Y,Z onto one of U,V,W or vice versa, apply function W.
- Otherwise, apply function V.

	Stage 1	Stage 2	Stage 3
W	$a_n =$ $\max(R(a_{n-1}), S(a_{n-1}), T(a_{n-1}))$ $- 2D$	$b_n =$ $R(b_{n-1}) + S(b_{n-1}) + T(b_{n-1})$ $- 3b_{n-1}$	$c_n =$ $R(c_{n-1}) + S(c_{n-1}) + T(c_{n-1})$ $- a_{n-1} - b_{n-1} - c_{n-1}$
V	$a_n =$ $\min(R(a_{n-1}), S(a_{n-1}), T(a_{n-1}))$ $+ 2D$	$b_n = 3b_{n-1}$ $- R(b_{n-1}) - S(b_{n-1}) - T(b_{n-1})$	$c_n =$ $a_{n-1} + b_{n-1} + c_{n-1}$ $- R(c_{n-1}) - S(c_{n-1}) - T(c_{n-1})$

Section 3: Converting Results

Once a result of the sequence of operations has been obtained, it must be converted into **balanced ternary,** a base-3 number system in which the digits have the values 1, 0, and −1. Find a sequence of these values such that multiplying them with each power of 3 from $3^0 = 1$ (the "least significant") to $3^5 = 243$ (the "most significant"), and adding that up, results in the desired number.

Section 4: Entry and Submission

To work out which buttons need to be pressed, first apply the list of conditions on the positions of buttons on the module to each row of the initial correspondences table, starting from the top of the list and working down.

Initial Correspondences	3^0	3^1	3^2	3^3	3^4	3^5
Stage 1	R	G	B	C	M	Y
Stage 2	Y	B	M	G	R	C
Stage 3	M	C	R	Y	G	B

If...	..., then...
the top button is white	reverse the sequence
the top right button is yellow	cycle each colour one space to the left.
the white button is diametrically opposite the black button	swap each colour with its diametric opposite on the module.
the red button is diametrically opposite the cyan button	swap each colour with its complementary (R ↔ C, G ↔ M, B ↔ Y).
the green and magenta buttons have exactly one button between them	cycle each colour in clockwise order of the colours on the module.
the green button is adjacent to the white button	cycle the primary colours (R → G, G → B, B → R).
the magenta button is adjacent to the black button	cycle the secondary colours (C → M, M → Y, Y → C).
the white button is adjacent to the black button	cycle both the primary and secondary colours.
the blue and yellow buttons are on the same side of the module	swap B with the colour opposite in the sequence.
the red button is on the right side of the module	swap R and Y.
the blue button is on the left side of the module	swap G and C.
, starting from the white button, the yellow button is further clockwise than the green button	swap the first and last colours in the sequence.
, starting from the black button, the blue button is further clockwise than the cyan button	swap the colours of the top and bottom buttons on the module (only if neither are white or black).

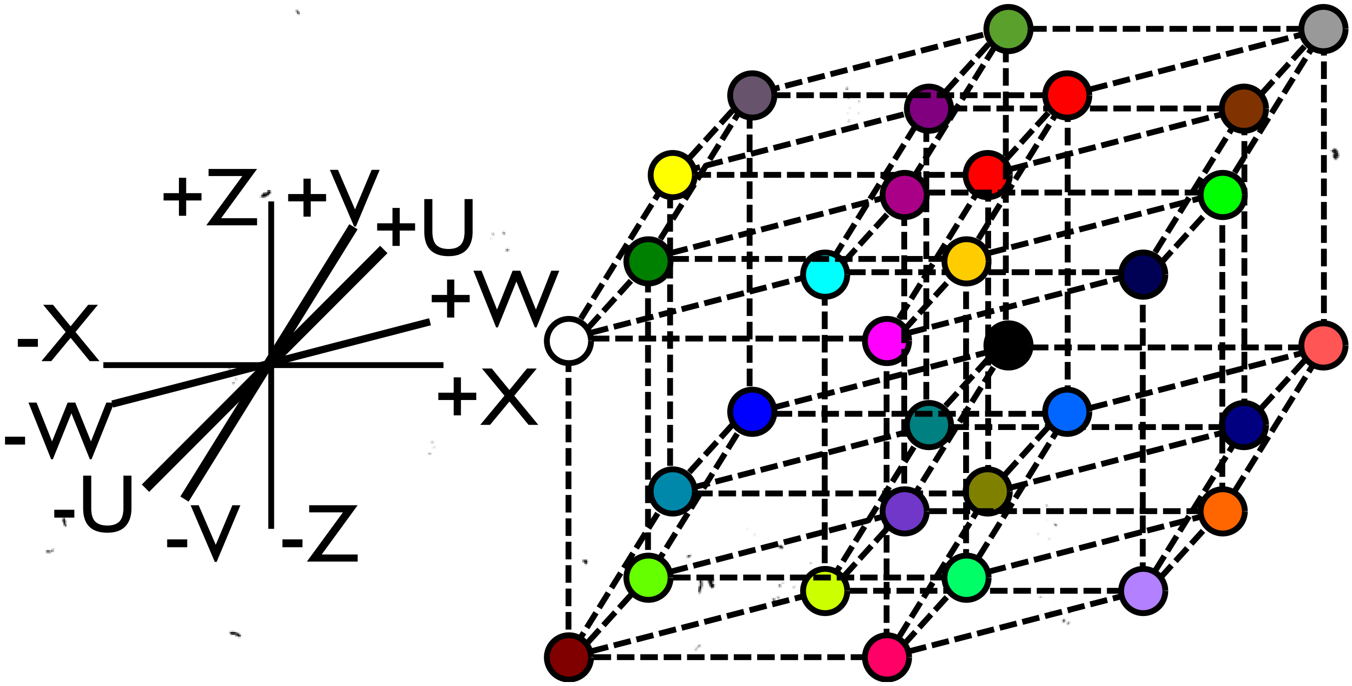
Once a balanced ternary number and the buttons corresponding to powers of 3 for the current stage have both been determined, follow the instructions below:

1. Select the center button. This will cause the sequence to stop and change each of the black buttons to one of eight colours, of which the white button is pre-selected.
2. Using the coloured buttons, enter the non-zero balanced ternary digits in order of **least to most significant:**
    - Pressing the white and black buttons will toggle which of the two are lit.
    - Pressing a coloured button while the white button is lit will enter a '+1' in the corresponding digit.
    - Pressing a coloured button while the black button is lit will enter a '-1' in the corresponding digit.
3. Select the center button again to submit the sequence of inputs.

Submitting the correct sequence of inputs will advance the module to the next stage.

Submitting an incorrect balanced ternary number, or submitting the coloured buttons in the wrong order will result in a strike.

Appendix: 6-dimensional axes



Each of the sixty-four discs are connected to six neighbouring discs via the six-dimensional axes shown above.

The diagram above shows five of the six axes as viewed from the front of the module.

The positive X,Z,W,V, and U axes point up and/or to the right from this viewing angle.

The Y axis cannot be seen from this angle; the positive Y axis points away from the module, as do the positive W, V, and U axes when viewed from a different angle.