

Rock Formations

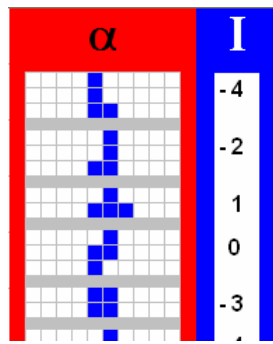
Solution

By Adam Liechty

This puzzle consists of a 10x20 grid of characters and columns of 4-block shapes and integers. A quick look at the shapes should bring Tetris to mind. In fact, the colors of the blocks are the same as the colors on Wikipedia's Tetris article.

Bryan's notes lead you to follow the "path" with the sun next to it—the one with the α and I above it. If you play Tetris, using the blocks in their given orientation and position, offset to the left or right based on the corresponding integer, you end up with a large rectangle with some holes in it:

(	S	_	_	_	A	_	_)											
9	A	L	8	E	P	!	N	U	G										
X	3	D	T		S	7	B	X	I										
\$	N	M	F	E	A	N	4	T	6										
M	E	J	9	0	R	C	-	I	L										
Z	N	A	4	=	1	C	M		C										
8	E	A	K	Q	D	5	*	P	5										
G	U	<	F	L	A	G	M	P	D										
	R	K	)	A	(	E	\$	+	3										
Y	C	E	T	#	E	)	H	M											
G	V	Y	E	S	C	M	O		P										
6	G	/	D	K	I	R	U	H											
	C	F	B	I	E	-		V	Q										
D	=	S	A	V	X	?	Q	Q	4										
L	7	A	S	^	S	I		6	R										
L	K	2	'	F	:	I	W	G											
R	=	F	I	(		R	J	E	3										
A	E	R	'	J	Y	>	U	A	R										
Y	U	D	A	I	Z		X	O											
7	O	2	5	N	B		0	S	V										



For example, the first block, an "L", if translated 4 to the left (-4) and dropped, ends up in the bottom-left corner.

Continue dropping blocks. But remember to follow Tetris rules and erase lines!



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The 9th block causes a line to be erased:

(S	_	_	_	A	_	_)											
9	A	L	8	E	P	!	N	U	G										
X	3	D	T		S	7	B	X	I										
\$	N	M	F	E	A	N	4	T	6										
M	E	J	9	0	R	C	-	I	L										
Z	N	A	4	=	1	C	M		C										
8	E	A	K	Q	D	5	*	P	5										
G	U	<	F	L	A	G	M	P	D										
	R	K	)	A	(	E	\$	+	3										
Y	C	E	T	#	E	)	H	M											
G	V	Y	E	S	C	M	O		P										
6	G	/	D	K	I	R	U	H											
	C	F	B	I	E	-		V	Q										
D	=	S	A	V	X	?	Q	Q	4										
L	7	A	S	^	S	I		6	R										
L	K	2	'	F	:	I	W	G											
R	=	F	I	(		R	J	E	3										
A	E	R	'	J	Y	>	U	A	R										
Y	U	D	A	I	Z		X	O											
7	O	2	5	N	B		0	S	V										

(	S				A)											
9	A	L	8	E	P	!	N	U	G										
X	3	D	T		S	7	B	X	I										
\$	N	M	F	E	A	N	4	T	6										
M	E	J	9	0	R	C	-	I	L										
Z	N	A	4	=	1	C	M		C										
8	E	A	K	Q	D	5	*	P	5										
G	U	<	F	L	A	G	M	P	D										
	R	K	)	A	(	E	\$	+	3										
Y	C	E	T	#	E	)	H	M											
G	V	Y	E	S	C	M	O		P										
6	G	/	D	K	I	R	U	H											
	C	F	B	I	E	-		V	Q										
D	=	S	A	V	X	?	Q	Q	4										
L	7	A	S	^	S	I		6	R										
L	K	2	'	F	:	I	W	G											
R	=	F	I	(		R	J	E	3										
A	E	R	'	J	Y	>	U	A	R										
Y	U	D	A	I	Z		X	O											
7	O	2	5	N	B		0	S	V										

The block causing the erase is shown in red. The above pictures show the board before and after erasing the line.

Finishing the column yields the following board:

(	S	_	_	_	_	A	_	_)
9	A	L	8	E	P	!	N	U	G
X	3	D	T		S	7	B	X	I
\$	N	M	F	E	A	N	4	T	6
M	E	J	9	0	R	C	-	I	L
Z	N	A	4	=	1	C	M		C
8	E	A	K	Q	D	5	*	P	5
E	U	<	F	X	@	G	M	P	D
Y	P	K	)	A	(	)	\$	+	I
P	C	S	T	#	E	G	H	I	
G	V	@	I	S	C	M	I		P
6	G	/	D	L	C	N	U	H	
	C	F	B	U	O	-		V	Q
D	=	S	?	T	X	Y	Q	Q	4
L	7	A	F	L	A	I		6	R
L	K	2	'	F	G	I	W	G	
R	=	F	I	(		R	J	E	3
A	@	R	'	J	Y	>	U	A	R
Y	U	D	A	I	Z		X	O	
7	O	2	5	N	B		0	S	V

The white space in the rectangle is in the shape of a parabola. The characters inside the spaces read:

$$Y = F'(X)$$

This suggests taking the derivative of this parabola. To do this, we first need an equation for the curve. The numbers on the left and bottom of the grid provide a coordinate system. We get the following equation for the parabola:

$$Y = (X - 3)^2 - 5 = X^2 - 6X + 4$$

The derivative is then:

$$Y' = F'(X) = 2X - 6$$

If we plot this equation on the graph, we get:

12	(	S	_	_	_	A	_	_)	
11	9	A	L	8	E	P	!	N	U	G
10	X	3	D	T		S	7	B	X	I
9	\$	N	M	F	E	A	N	4	T	6
8	M	E	J	9	0	R	C	-	I	L
7	Z	N	A	4	=	1	C	M		C
6	8	E	A	K	Q	D	5	*	P	5
5	E	U	<	F	X	@	G	M	P	D
4	Y	P	K	)	A	(	)	\$	+	I
3	P	C	S	T	#	E	G	H	I	
2	G	V	@	I	S	C	M	I		P
1	6	G	/	D	L	C	N	U	H	
0		C	F	B	U	O	-		V	Q
-1	D	=	S	?	T	X	Y	Q	Q	4
-2	L	7	A	F	L	A	I		6	R
-3	L	K	2	'	F	G	I	W	G	
-4	R	=	F	I	(		R	J	E	3
-5	A	@	R	'	J	Y	>	U	A	R
-6	Y	U	D	A	I	Z		X	O	
-7	7	O	2	5	N	B		0	S	V
	0	1	2	3	4	5	6	7	8	9

The characters on this line gives us

$$Y = ABS(5 - X)$$

And plotting the absolute value of 5 - X yields:

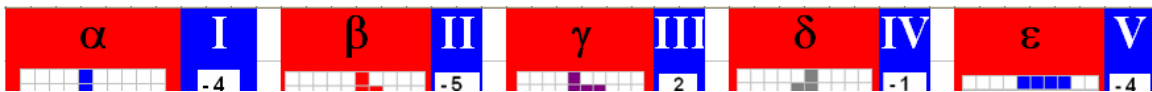
12	(	S	_	_	_	A	_	_)	
11	9	A	L	8	E	P	!	N	U	G
10	X	3	D	T		S	7	B	X	I
9	\$	N	M	F	E	A	N	4	T	6
8	M	E	J	9	0	R	C	-	I	L
7	Z	N	A	4	=	1	C	M		C
6	8	E	A	K	Q	D	5	*	P	5
5	E	U	<	F	X	@	G	M	P	D
4	Y	P	K	)	A	(	)	\$	+	I
3	P	C	S	T	#	E	G	H	I	
2	G	V	@	I	S	C	M	I		P
1	6	G	/	D	L	C	N	U	H	
0		C	F	B	U	O	-		V	Q
-1	D	=	S	?	T	X	Y	Q	Q	4
-2	L	7	A	F	L	A	I		6	R
-3	L	K	2	'	F	G	I	W	G	
-4	R	=	F	I	(		R	J	E	3
-5	A	@	R	'	J	Y	>	U	A	R
-6	Y	U	D	A	I	Z		X	O	
-7	7	O	2	5	N	B		0	S	V
	0	1	2	3	4	5	6	7	8	9

Which in turn yields the text:

Epsilon III

This is not an equation, so we can't continue to plot anything. At this point, it might be tempting to try some of the other "paths" to see what happens. However, as Bryan's note cautions, it is unwise to wander off to other paths. Playing Tetris with the other columns results in the blocks crashing into the top of the 10x20 field.

The text "Epsilon III" instead tells you to use the blocks from the ε column and the integers from the III column, since all the paths are marked with Greek letters and Roman numerals:



If we play a new Tetris game with ε and III, we get the following result:

(	S	_	_	_	A	_	_)		
9	A	L	8	E	P	!	N	U	G	
X	3	D	T		S	7	B	X	I	
\$	N	M	F	E	A	N	4	T	6	
M	E	J	9	0	R	C	-	I	L	
Z	N	A	4	=	1	C	M		C	
8	E	A	K	Q	D	5	*	P	5	
E	U	<	F	X	@	G	M	P	D	
Y	P	K	)	A	(	)	\$	+	I	
P	C	S	T	#	E	G	H	I		
G	V	@	I	S	C	M	I		P	
6	G	/	D	L	C	N	U	H		
	C	F	B	U	O	-		V	Q	
D	=	S	?	T	X	Y	Q	Q	4	
L	7	A	F	L	A	I		6	R	
L	K	2	'	F	G	I	W	G		
R	=	F	I	(		R	J	E	3	
A	@	R	'	J	Y	>	U	A	R	
Y	U	D	A	I	Z		X	O		
7	O	2	5	N	B		0	S	V	



This looks much like a flag, and a quick look at a list of countries' national flags will rule out all flags except for the one from Suriname. The top row of letters in the grid is (S__A__), which confirms the answer to the puzzle is **SURINAME**.