SOLUTIONS

Encoding LEGO Blocks Additional Practice

You've already tried *encoding* instructions to build a LEGO tower into binary and *decoding* binary instructions to build a LEGO tower.

What are some advantages of encoding the instructions?

- Computers and machines ultimately carry out instructions in binary via the presence or absence of an electric signal, which is represented as a 1 or 0
- Encoding requires a systematic, consistent definition of attributes like color, size, position, and orientation. The legend needs to include all cases and encode the same attribute the same way every time! Humans describe things inconsistently.
- Lots of other possibilities here! Creativity is welcome.

What are some disadvantages of encoding the instructions into binary? How might you some some of those problems?

- 1s and 0s are incomprehensible to most humans. We can solve this problem by including a legend so that we can decode the binary instructions. We can also create binary encodings that are *intuitive*, or follow some pattern, rather than ones that are random and need to be *memorized*. An example is encoding the size of the blocks by converting their dimensions into binary, rather than just number all the possible sizes (1 x 1 is 00, 1 x 2 is 01, 2 x 2 is 10, and so on)
- Again, lots of possibilities! Creativity welcome.

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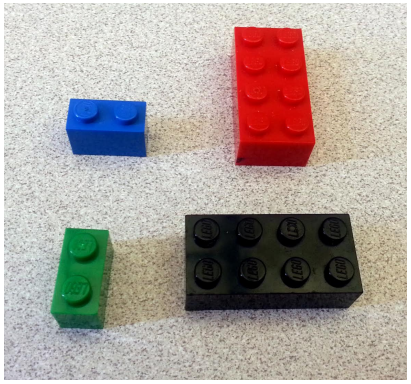
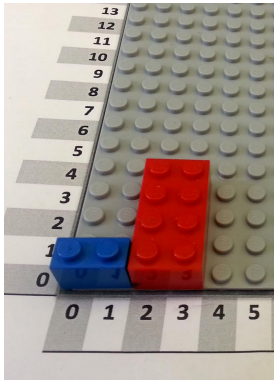
Color	
Red	001
Yellow	010
Black	011
Blue	100
Green	101

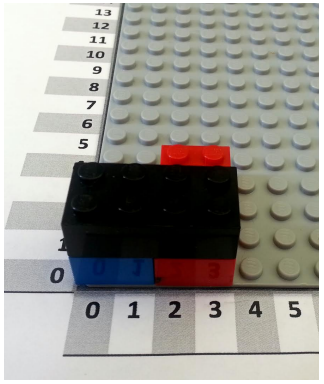
Brick Type	
2 x 4	010100
2 x 3	010011
2 x 2	010010
1 x 2	001010

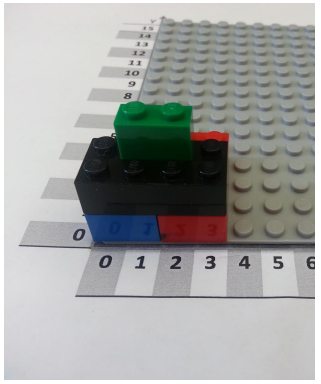
Orientation	
Horizontal	00
Vertical	01

Number	
1	001
2	010
3	011
4	100
5	101
6	110









Can you make an instruction table for this tower?
Hint: start with a normal instruction table, and *then* encode it into binary afterwards.
You might need to add some colors and sizes to the legend on the left.

Block	Color	Size	Orientation	X	Y
0	Blue	1 x 2	Horizontal	0	0
1	Red	2 x 4	Vertical	2	0
2	Black	2 x 4	Horizontal	0	0
3	Green	1 x 2	Horizontal	1	1

The binary instruction table may vary depending on what they put in their legend!

Block	Color	Size	Orientation	X	Y
00	100	001010	00	000	000
01	001	010100	01	010	000
10	011	010100	00	000	000
11	101	001010	00	001	001

Color	
Red	001
Yellow	010
Black	011
Blue	100
White	101
Brick Type	
2 x 4	010100
2 x 3	010011
2 x 2	010010
1 x 1	001001
1 x 2	001010
1 x 4	001100
Orientation	
Horizontal	00
Vertical	01

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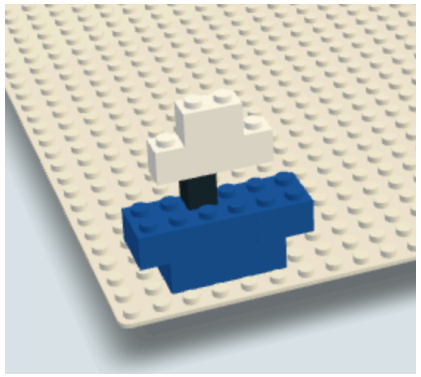
Can you figure out what this tower is supposed to look like?
Hint: first, *decode* the instruction table using the legend on the left, and then follow the instructions to recreate the tower.

Block	Color	Size	Orientation	X	Y
000	100	010100	00	010	001
001	100	010011	00	001	001
010	100	010010	01	101	001
011	011	001001	01	011	010
100	101	001100	00	010	010
101	101	001010	00	011	010

Here is an image of the resulting structure built from the the *decoded* instruction table



Block	Color	Size	Orientation	X	Y
0	Blue	2 x 4	Horizontal	2	1
1	Blue	2 x 3	Horizontal	1	1
2	Blue	2 x 2	Vertical	5	1
3	Black	1 x 1	Vertical	3	2
4	White	1 x 4	Horizontal	2	2
5	White	1 x 2	Horizontal	3	2