

## On the Subject of Look and Say

*Make sure you look and THEN say, otherwise this would just be nonsense.*

This module consists of a screen and 6 interactable buttons. The screen will display a 12 digit sequence, and the buttons include the numbers 1-4, a submit, and a reset.

121431241212			
1	2	3	4
submit	reset		

### Introduction

- In order to solve this module, you must submit a sequence of numbers consisting of digits 1-4, and then press the submit button.
- If you attempt to add more digits to the sequence than necessary for the solution, you will get a strike.
- You will not get a strike for pressing the wrong digits, but if you try to submit the wrong sequence you will get a strike.
- You can press reset at any time to delete your sequence, and the original displayed sequence will return to the screen. There is no penalty for pressing reset.
- This module uses the technique which is used to generate terms in the "Look-and-Say" mathematical sequence to "decrypt" and "encrypt" a list of moves in a maze. An example of how the sequence works can be found in Appendix A.
- In order to generate the next term in a "Look-and-Say" sequence, you read how many of each digit occurs consecutively, and record that length, and the value itself as two numbers in the new sequence.
- For example, 1133334 → 21 43 14 because there are two 1s, four 3s, and one 4 in the original sequence. Separating the new sequence into pairs like this just makes it easier to understand, but the sequence is not actually separated in this way.
- You can find the first several terms of the actual "Look-and-Say" sequence for reference in Appendix A.
- NOTE: If the module screen only says **OVERLOAD** then just press any button to solve it. We will just have to contact tech support and hope the bomb doesn't still explode...

### Step 1: Finding the maze and offset

1. If the 1st character of the serial number is a letter, convert it to a number using A1Z26.
2. Take this value, and add the first digit of the displayed sequence, then take this sum mod 5 to find the correct maze. You can find the mazes in Appendix B.
3. Convert the 2nd character of the serial number to a number if necessary then add the last digit of the sequence and take the sum mod 5 to find the offset.

### Step 2: Calculate Starting and Ending Position

1. Take the 3rd and 4th characters of the serial number as well as the 2nd and 3rd digits of the displayed sequence.
2. Convert the characters from the serial number to values A1Z26 as necessary, then add the 2nd digit to the 3rd serial character mod 5, and add the 3rd digit to the 4th serial character mod 5 to get the row and column of the starting position (**S1**) respectively.
3. Do the same steps for the 5th/6th characters of the serial and 10th/11th digits of the displayed sequence to get your ending position **E**.

### Step 3: Decrypting the Display

1. Using the Look-and-Say technique described on the first page, convert the display to a new sequence of numbers.
2. Now convert the digits of the new sequence to Up, Right, Down, and Left. Use the table below to find the values, using the offset from Step 1.
3. Find the encrypted starting position (**S1**) in the correct maze, and perform your list of moves (starting from **S1**) to find the decrypted starting location (**S2**) in the maze. For this step, ignore all the walls in the maze, and wraparound as needed.
4. Starting from **S2**, determine the list of moves required to take the shortest possible path to the end position (**E**). For this step, you must avoid the walls, and you cannot wraparound in the maze.
5. This list of moves will be called the **Move List**.

Up	Right	Down	Left
$[(\text{offset}) \% 4] + 1$	$[(1 + \text{offset}) \% 4] + 1$	$[(2 + \text{offset}) \% 4] + 1$	$[(3 + \text{offset}) \% 4] + 1$

6. NOTE: If S2 is in the same position as E, then use S1 as your decrypted start position instead of S2. Otherwise, if S1 and S2 are the same, then use (0,0) as your decrypted start position. If S1 and S2 are already (0,0), then use (4,4) as your decrypted starting position.

### Step 4: Encrypt your moves

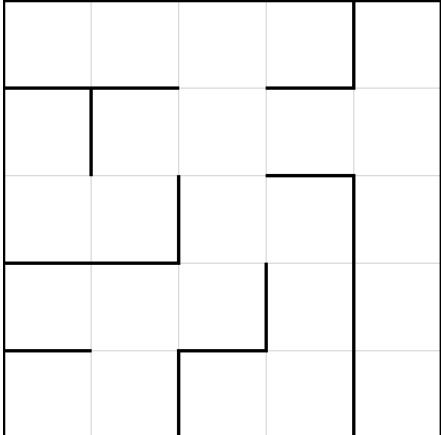
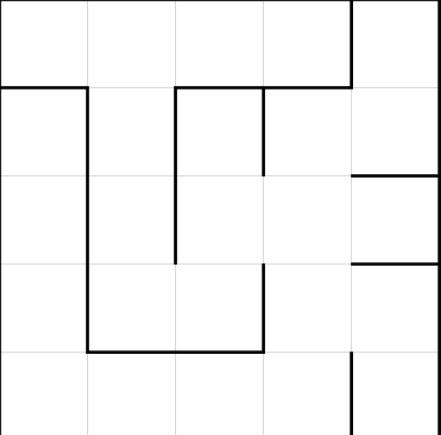
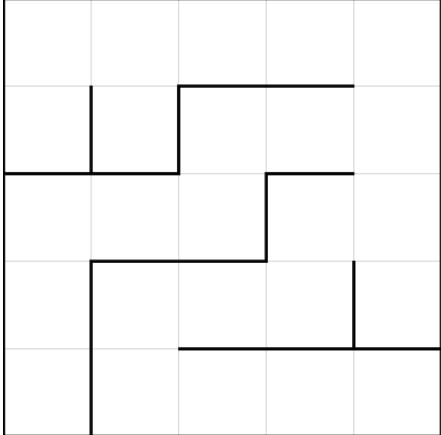
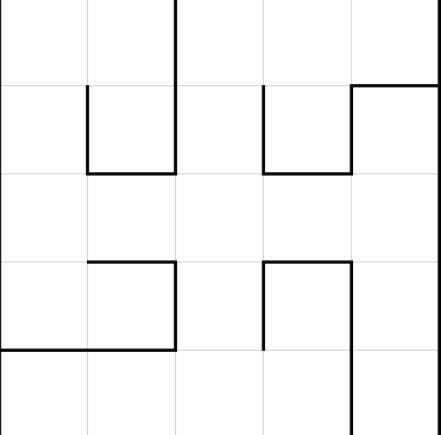
1. Now you will encrypt your **Move List**. First convert your moves back to numbers using the same mapping as you used in step 3.
2. Now you have to reverse the "Look-and-Say" technique on this string of numbers. In order to do this, split your sequence into pairs. If you have an odd number of digits, append a 1 to the end.
3. For each pair XY, you will have X Ys in the final sequence. (ex. 41->1111)
4. Once you have your final sequence, you are ready to submit. Use the numbered buttons to enter your sequence, and then press the submit button to solve the module.

### Appendix A: Look-and-Say Sequence

- 1
- 11
- 21
- 1211
- 111221
- 312211
- 13112221
- 1113213211
- 31131211131221
- 13211311123113112211
- 11131221133112132113212221
- 3113112221232112111312211312113211
- 132113213211121312211231131122211311221131221
- 1113122113121113123112111311222112132113212211331222113112211

## Appendix B: Mazes

The mazes are defined with the top left corner as (0,0).

Maze 0	Maze 1
	
Maze 2	Maze 3
	
Maze 4	
