

# Origami Maze Puzzle Font

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A new result in computational origami design is that any orthogonal maze, with vertical walls protruding equal heights from a rectangular floor, can be folded efficiently from a rectangle of paper just a small factor larger than the floor [DDK10]. The design algorithm has been implemented as a freely available web application:<sup>1</sup> you can design a maze or generate one randomly, and the application produces a crease pattern, which you can print and fold into your design.

The crease pattern by itself provides a kind of encoding of a maze, which can be decoded by folding. We applied this idea to encode textual messages in crease patterns that can be decoded by folding. Figure 1 shows a simple font we designed with the constraint that each character is a small orthogonal maze, with dimensions between  $0 \times 2$  and  $3 \times 2$ . (With larger dimensions, the font might be easier to read, but harder to fold.)

Given the crease pattern of a message written in this font, it is a puzzle to decipher the original text. One approach is to print and fold the crease pattern, which provides a physical challenge. Another approach is to fold the crease pattern in your head, providing a mental challenge. A third approach is to treat the pattern as a geometric substitution cipher, look for patterns, and try to match patterns to letters.

In the following pages, we provide a series of such puzzles with hidden messages.

This font is part of a series of *puzzle fonts* where reading the message is a puzzle [DDP10], and part of a series of *mathematical fonts* illustrating a mathematical theorem or open problem [DD03, DDP10].

## Puzzle Solutions:

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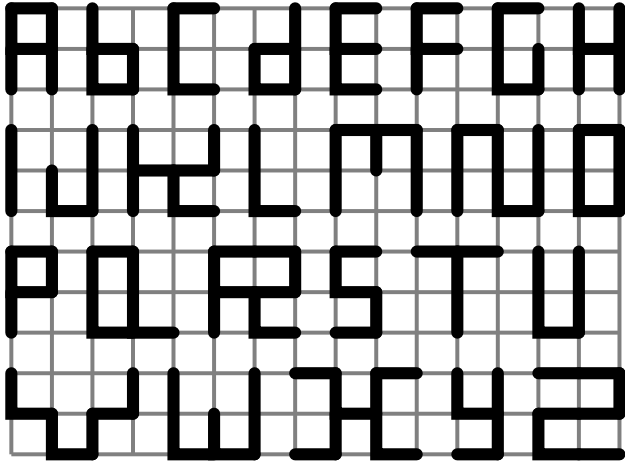
## References

- [DD03] Erik D. Demaine and Martin L. Demaine. Hinged dissection of the alphabet. *Journal of Recreational Mathematics*, 31(3):204–207, 2003.
- [DDK10] Erik D. Demaine, Martin L. Demaine, and Jason Ku. Folding any orthogonal maze. In *Proceedings of the 5th International Conference on Origami in Science, Mathematics and Education*, Singapore, July 2010. To appear.
- [DDP10] Erik D. Demaine, Martin L. Demaine, and Belén Palop. Conveyer belt puzzle font. In *Proceedings of the 9th Gathering for Gardner*, 2010.

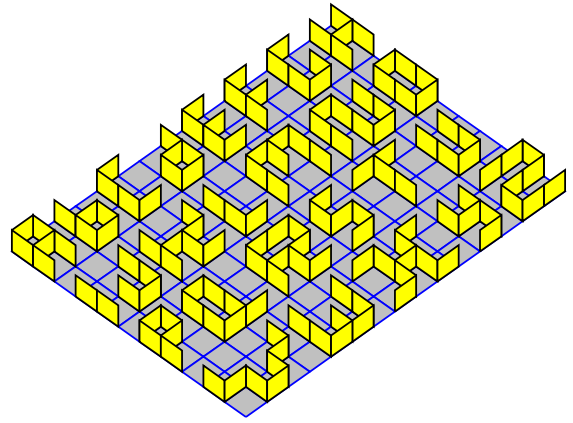
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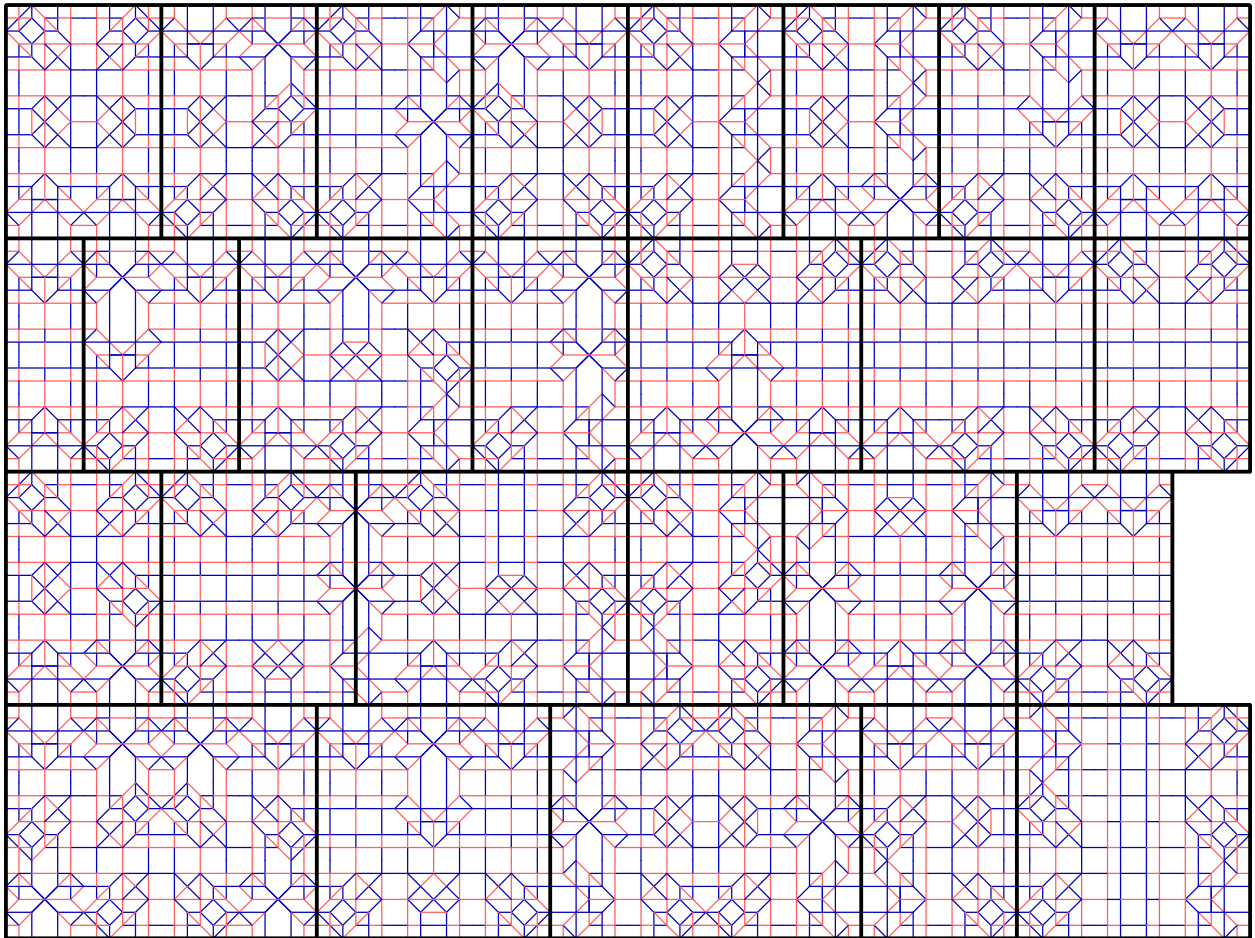
<sup>1</sup><http://erikdemaine.org/fonts/maze/>



(a) 2D orthogonal maze



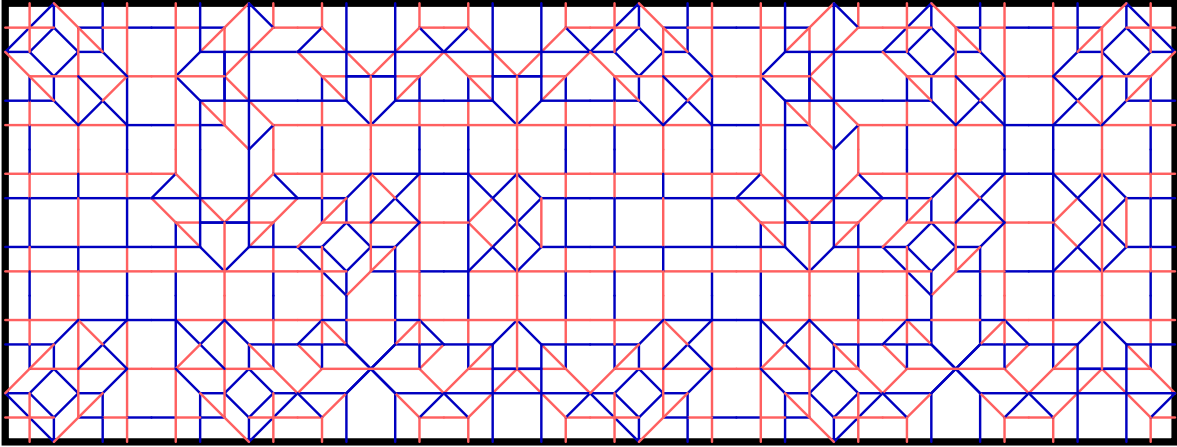
(b) 3D extrusion



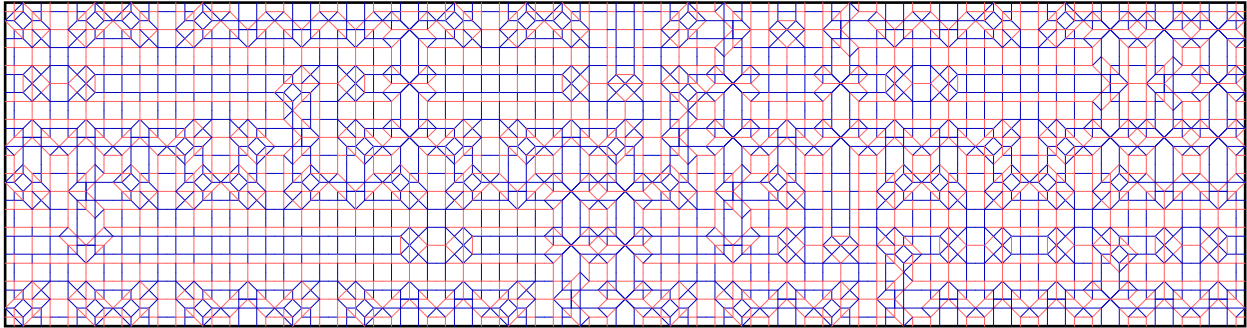
(c) Crease pattern

Figure 1: Origami maze alphabet: (c) folds into (b), which is an extrusion of (a). Dark lines are mountain folds; light lines are valley folds; bold lines delineate letter boundaries and are not folds.

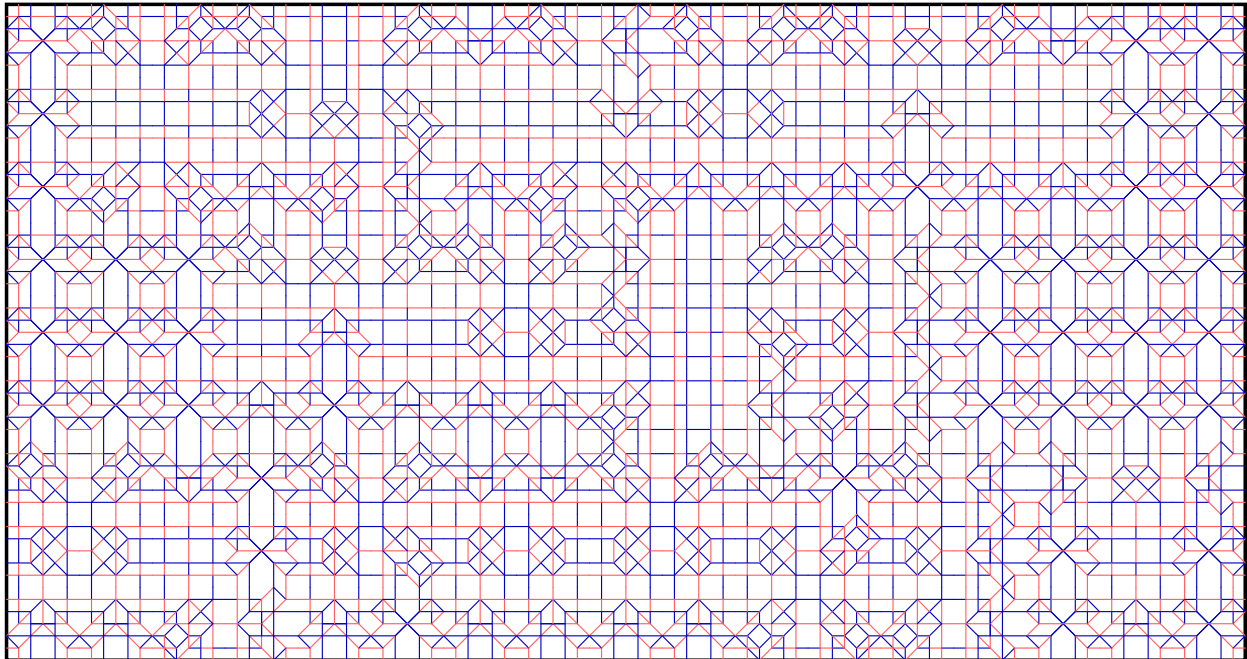
Puzzle 1:



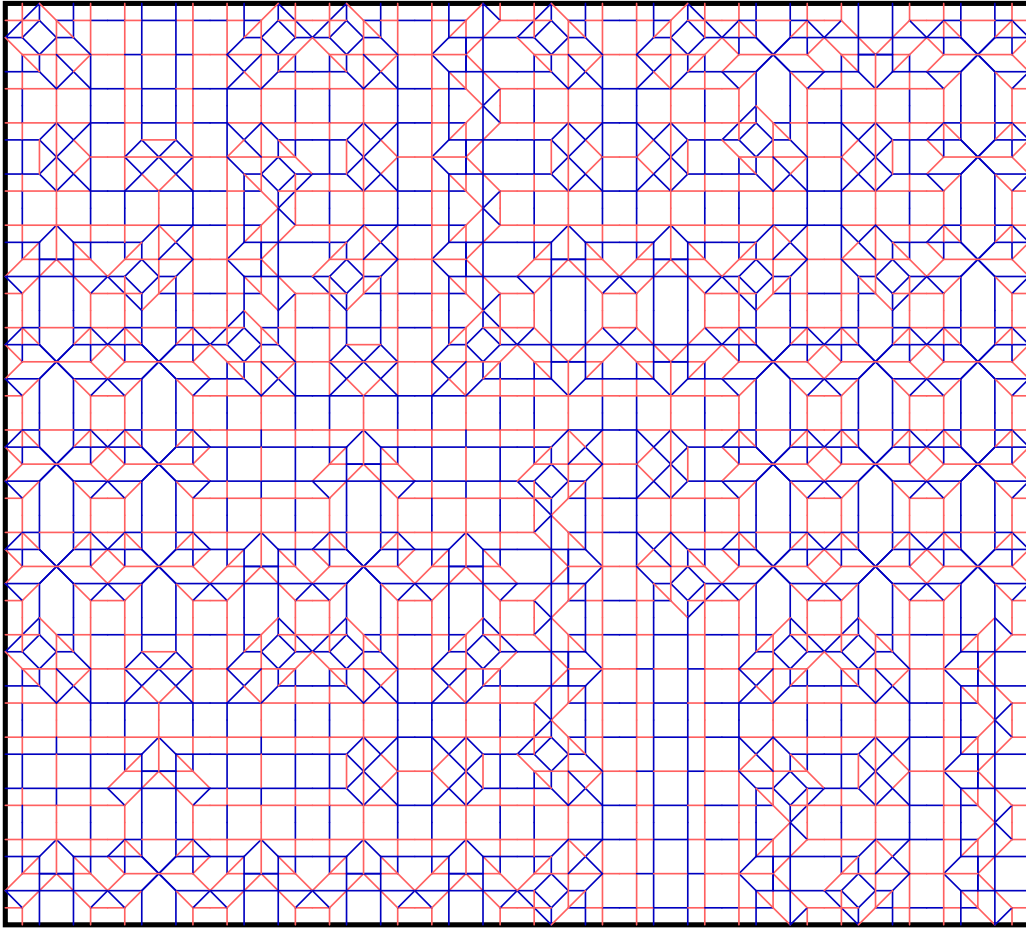
Puzzle 2:



Puzzle 3:



Puzzle 4:



Puzzle 5:

