MOLLY AND THE MATHEMATICAL MYSTERY

FIND THE CLUES & LIFT THE FLAPS

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THE ADVENTURE BEGINS...

This is Molly. She's an ordinary girl with an ordinary bedroom. But look, what's that on the floor?

It's a note with Molly's name on it. How strange! She opens it up and starts to read. It's an invitation to do something EXTRAordinary. Can you work out what the note is asking her to do? Let's give it a try...

Molly opens the window and imagines pushing her room right through it. She hears a whooshing sound. It gets louder and louder. Suddenly Molly is swept right up in the sound and everything becomes a blur...

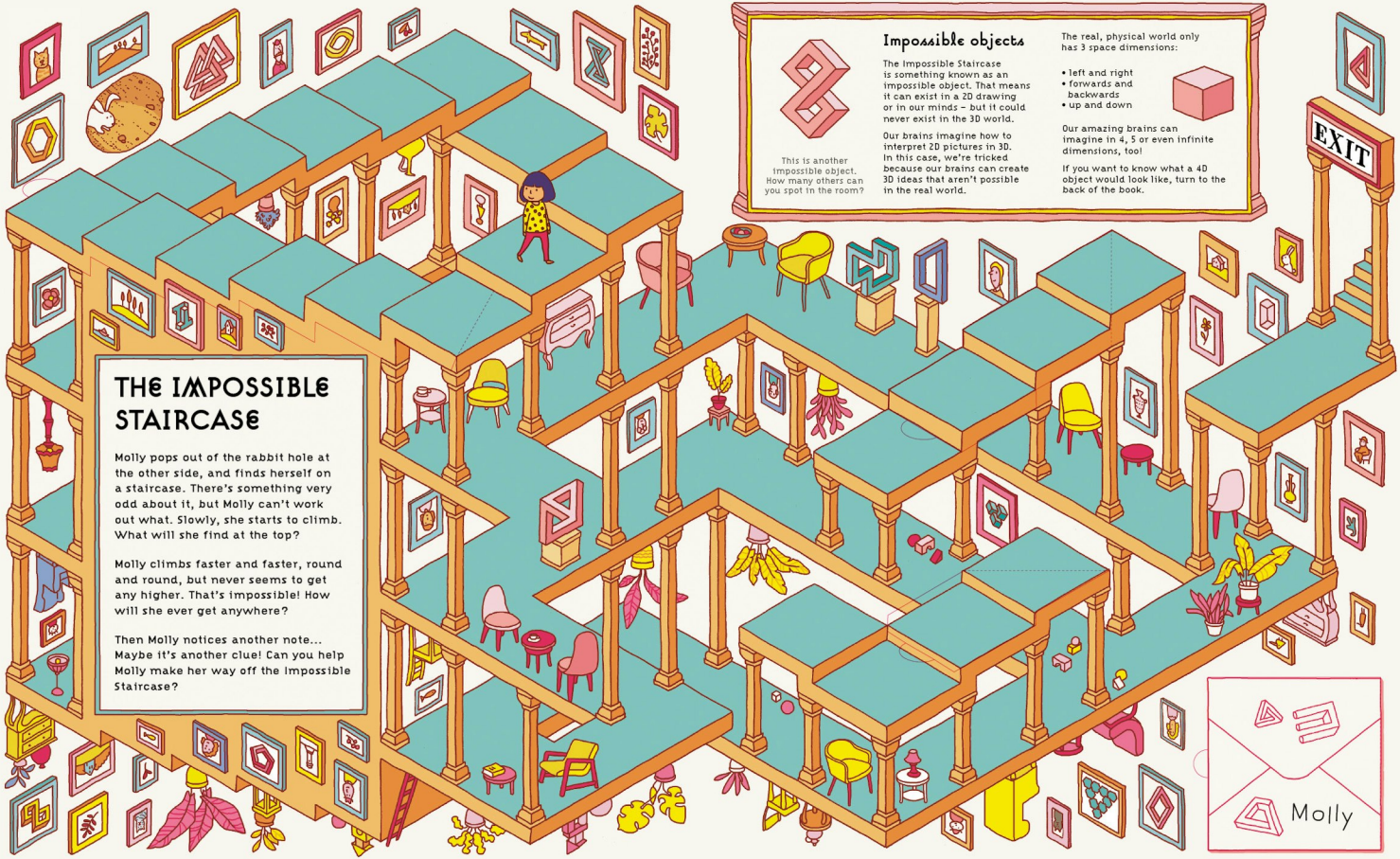
Push open the window to follow Molly on her adventure.

Turning inside out

Can you imagine turning a room inside out like turning a giant sock inside out?

Think about holding a sock (or even find a real sock to experiment with!). To turn the sock inside out you have to push the material through the round opening. Now imagine the opening is a window, and the material is your room. Turning your bedroom inside out doesn't seem so impossible anymore... at least in your imagination! This is what maths is all about.

How many socks can you find in Molly's bedroom? Can you match three pairs?

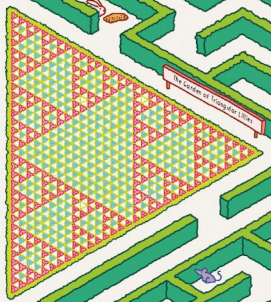

THE IMPOSSIBLE STAIRCASE
Molly pops out of the rabbit hole at the other side, and finds herself on a staircase. There's something very odd about it, but Molly can't work out what. Slowly, she starts to climb. What will she find at the top?
Molly climbs faster and faster, round and round, but never seems to get any higher. That's impossible! How will she ever get anywhere?
Then Molly notices another note... Maybe it's another clue! Can you help Molly make her way off the impossible staircase?
This is another impossible object. How many others can you spot in the room?
Impossible objects
The Impossible Staircase is something known as an impossible object. That means it can exist in a 2D drawing or in our minds – but it could never exist in the 3D world.
Our brains imagine how to interpret 2D pictures in 3D. In this case, we're tricked because our brains can create 3D ideas that aren't possible in the real world.
The real, physical world only has 3 space dimensions:
• left and right
• forwards and backwards
• up and down
Our amazing brains can imagine in 4, 5 or even infinite dimensions, too!
If you want to know what a 4D object would look like, turn to the back of the book.
EXIT
Molly

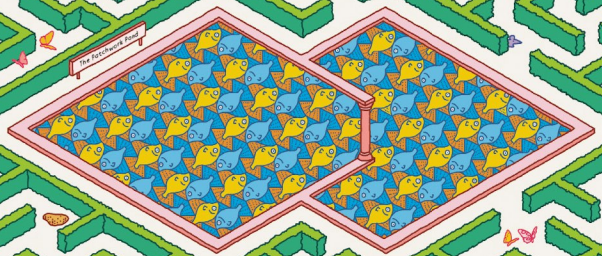
THE GARDEN OF HIDDEN SHAPES

Molly clambers off the Impossible Staircase. She's glad she found a way out of that! Phew...

Now she's in a huge garden full of winding paths. It's some kind of maze! From her starting point, Molly can see a bright triangular flower bed; a patterned pond of swimming fish; and a strangely-shaped sculpture. But where is the way out?

On the far side of the garden is a dramatic-looking house. That must be where Molly needs to go next. But none of the paths seem to lead there. Perhaps opening the next note will give Molly a clue...





Tiling shapes

Sometimes shapes fit together to make other shapes. In this maze, six triangles fit together to make a hexagon. The triangles are special ones where all three sides are the same length: these are called equilateral triangles.

Equilateral triangles fit together perfectly like pieces of a jigsaw. This is called tessellation. It means they're a good building block for creating other shapes, including bigger triangles and stars – you could even use them to completely cover a flat surface, known as tiling the plane. What other shapes could you make with an equilateral triangle, and what other shapes could you use to tile a plane?

This hexagon is made up of six tiled triangles. How many other tiling shapes can you find in the garden?

THE HALL OF ENDLESS DOORS

Molly makes her way through the maze and reaches the front door of the house. She steps inside and looks around in awe. In front of her is a grand staircase, and a dizzying hallway full of doors. Where could they all lead?

The doors all have intricate patterns on them, but there's no sign of what's behind each one. Look, there's another note. Will it help Molly find the way out? Make sure you don't open a never-ending door, or you'll end up in a never-ending room with a never-ending hallway!

Self-symmetry

The doors in this hallway look like they go on forever! Each door pattern has a smaller door inside it, with an even smaller door inside that, and so on... They're a bit like nesting dolls. We could keep zooming in forever... providing the doors keep going forever.

All the smaller doors look identical to the biggest door. This type of symmetry is called self-symmetry.

In maths, something that keeps going forever is called infinite. Let's imagine an infinite set of dolls. You could keep opening them forever without running out of dolls, but they'd get so tiny it would be very hard to see them!

How many nesting dolls can you find hidden in the scene? Can you match up three sets of five dolls?