# Zara’s Symmetry Studio: Patterns in the Wild

*Learning objective: To identify, describe, and draw lines of symmetry in 2D shapes and patterns.*

Read Zara the Zebra’s guide to symmetry below. Use your knowledge of geometric properties to answer the questions. Remember to look for both horizontal and vertical lines of symmetry.

Zara the Zebra loves to paint, but she is very particular about balance! In art, symmetry occurs when one half of an object is a perfect mirror image of the other. If you place a mirror along the line of symmetry, the reflection completes the shape exactly. Not all shapes are symmetrical; some have no lines of symmetry at all, while others, like a regular square, have four! Zara is currently designing a new quilt. She needs to ensure that her patterns are perfectly balanced so that the left side matches the right side, or the top matches the bottom.

*Word bank: Symmetry · Line of symmetry · Reflect · Horizontal · Vertical · Polygon · Congruent · Axis*

**1. Zara has drawn an isosceles triangle and a scalene triangle. Explain why the isosceles triangle has a line of symmetry but the scalene triangle does not. (3 marks)**

**2. A regular hexagon has six lines of symmetry. If you were to draw these lines, compare how many pass through vertices (corners) versus how many pass through the midpoints of opposite sides. (2 marks)**

**3. Max the Monkey has a rectangular tile that costs £2.50. He wants to cut it into two identical halves using one line of symmetry. Justify why a rectangle can have a line of symmetry even if it is not a square. (2 marks)**

**4. Identify two letters of the alphabet that possess at least one vertical line of symmetry and explain how you tested them. (2 marks)**

**5. What might happen to the symmetry of a pattern if you were to rotate a shape by 90 degrees? Does the line of symmetry always remain in the same position relative to the page? (3 marks)**

**Draw: Draw a complex, original geometric pattern inside a 10x10cm square. Ensure your design has exactly two lines of symmetry: one vertical and one horizontal. Use a ruler to mark these lines with a dashed pen stroke.**

*Extension challenge: Design a 'Symmetry Challenge' for a friend. Create a shape that has rotational symmetry but zero lines of reflectional symmetry. Explain to your friend why this shape is mathematically unique.*