Max’s Magnificent Symmetry Challenge

Learning objective: To identify, describe, and represent the position of a shape following a reflection, and to identify lines of symmetry in 2D shapes.

Max the monkey has been busy decorating his jungle treehouse with geometric patterns. Use your knowledge of reflective symmetry to complete the tasks below. Remember to use a ruler for your lines of symmetry!

Max is designing a mosaic floor for his treehouse. He believes that everything in nature is a maths puzzle waiting to be solved. He has noticed that many leaves and butterfly wings possess 'reflective symmetry'. This means that if you draw a line down the centre, one side is an exact mirror image of the other. Max is currently working on a complex pattern involving regular polygons. He reminds us that a shape can have more than one line of symmetry, but it must be perfectly balanced to count. If you fold a shape along its line of symmetry, both halves must match perfectly.

Word bank: Reflective symmetry · Line of symmetry · Vertical · Horizontal · Diagonal · Mirror image · Congruent · Axis

1. Max has drawn a regular pentagon. Explain why a regular pentagon has five lines of symmetry, whereas an irregular pentagon might have none. Justify your answer. (2 marks)

2. Compare and contrast the number of lines of symmetry found in a square versus a rectangle. Why does the rectangle have fewer lines of symmetry? (2 marks)

3. Max wants to buy decorative tiles costing £1.50 each to create a symmetrical border. If he needs 12 tiles for one half of the border, calculate the total cost for the full symmetrical design. (2 marks)

4. What might happen to the symmetry of a shape if it is rotated by 90 degrees? Does the line of symmetry move with the shape? (2 marks)

5. Draw a scalene triangle. Explain why it is impossible to draw a line of symmetry through this specific shape. (2 marks)

6. Max is building a wooden frame. He says, 'If a shape has a line of symmetry, it must be a regular polygon.' Critique this statement. Is he correct? Provide an example to support your argument. (2 marks)

Draw: Using a grid, draw a complex, non-regular composite shape that contains exactly one vertical line of symmetry and one horizontal line of symmetry.

Extension challenge: Design a symmetrical logo for Max's 'Treehouse Maths Club'. Your design must incorporate at least two different 2D shapes and feature at least two lines of symmetry (one horizontal and one diagonal). Write a short paragraph explaining the geometric properties of your design.