Max’s Mathematical Squares: A Geometric Adventure

Learning objective: To recognise and calculate square numbers up to 12 x 12 and investigate their geometric properties.

Read the passage below about Max the monkey's orchard project. Use your knowledge of multiplication and arrays to solve the problems. Show your working out clearly.

Max the monkey is helping the forest animals design a new community orchard. He wants to plant fruit trees in perfect square grids. A square number is the result of multiplying a whole number by itself (e.g., 3 x 3 = 9). Max explains that if you have 16 apple trees, you can arrange them in a 4 by 4 grid, creating a perfect square shape. He is now calculating how many trees he needs for larger plots, such as 7 by 7 or 12 by 12, to ensure every animal has enough space to pick fruit.

Word bank: square number · array · product · factor · geometry · calculate · dimensions · pattern

1. Max wants to plant a square of pear trees with 8 rows and 8 trees in each row. Calculate the total number of trees. Explain your method. (2 marks)

2. If Max has 81 plum trees, can he arrange them into a perfect square? Justify your answer by identifying the root number. (2 marks)

3. Compare and contrast a square number with a rectangular number. Use the examples of 9 and 10 to support your reasoning. (3 marks)

4. Max spends £5 on each tree. If he plants a square plot with 6 trees on each side, what will be the total cost of the trees? (3 marks)

5. What might happen if Max tried to plant 20 trees in a perfect square? Explain why this is mathematically impossible using your knowledge of factors. (3 marks)

Draw: Draw an array showing a 5 x 5 square of trees. Label the dimensions and write the square number in the centre of your square.

Extension challenge: Research: Investigate the relationship between consecutive square numbers. For example, look at the gap between 1 and 4, 4 and 9, and 9 and 16. What do you notice about these differences? Can you predict the difference between 16 and 25 without drawing them?