Kit’s Computing Challenge: Mastering Algorithms

Learning objective: To design, write, and debug programs that accomplish specific goals by using sequence, selection, and repetition.

Read each scenario carefully. Use your knowledge of programming logic to solve Kit the Fox’s puzzles. Remember to use precise terminology to describe how your code functions.

Kit the Fox is building a robotic assistant to help organise the BookFlik library. The robot needs clear instructions to sort books by genre and return them to the correct shelves. If the robot encounters an error, it must identify the fault and correct the process.

Word bank: algorithm · debug · loop · variable · sequence · conditional · input · syntax

1. Kit needs to program the robot to walk 5 steps, pick up a book, and turn around. Write an algorithm for this task. Identify where you would use a 'loop' if the robot had to pick up 10 books in a row. (3 marks)

2. Explain why it is essential to follow a specific 'sequence' when programming a robot. What might happen if the commands were provided in the wrong order? (2 marks)

3. The robot uses a 'conditional' statement: 'IF the book is blue, place it on the top shelf; ELSE place it on the middle shelf.' Justify why this is a more efficient way to code than writing two separate lists of instructions. (3 marks)

4. The robot keeps dropping the books. Describe the process of 'debugging' this programme. How would you systematically find the error? (2 marks)

5. Compare and contrast a 'variable' and a 'fixed value' in a computer program. Give an example of how a variable might be used to track the number of books sorted. (3 marks)

6. If you were to add a sensor to the robot, how would the 'input' change the robot's behaviour? Provide a creative example of a sensor-based instruction. (2 marks)

Draw: Draw a flowchart representing your robot's path through the library. Use standard symbols (ovals for start/end, rectangles for processes, and diamonds for decisions) to show the path from the entrance to the book shelf.

Extension challenge: Design a 'pseudocode' script for a new feature: the robot must greet a visitor if they enter the library. Include a conditional statement that checks the time of day to determine if the robot should say 'Good morning' or 'Good afternoon'. Justify your choice of structure.