

Kit's Computing Challenge: Algorithmic Adventures

Learning objective: To design, write, and debug programs by decomposing problems into precise, sequential algorithms using selection and iteration.

Read each challenge carefully. Use your understanding of logical sequencing, loops, and conditions to solve the problems. Remember to use precise vocabulary when explaining your reasoning.

Kit the fox is building a robotic assistant to help tidy the woodland library. An algorithm is a set of step-by-step instructions. To ensure the robot functions correctly, Kit must break down the task (decomposition) and ensure every instruction follows a logical sequence.

Word bank: algorithm · decomposition · sequence · iteration · selection · debug · variable · bug

1. Kit needs the robot to pick up 10 scattered books. Write an algorithm using an 'iteration' (a loop) to instruct the robot to pick up a book and place it on the shelf 10 times. (2 marks)

2. Explain why 'decomposition' is a vital first step before writing any code for a complex task. (2 marks)

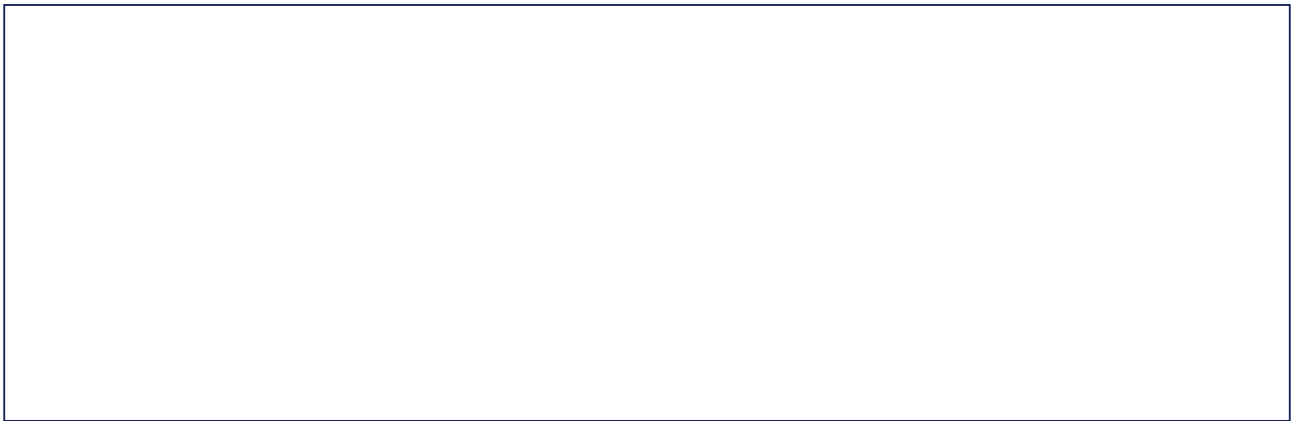
3. The robot reaches a fork in the path. Write a 'selection' statement (an 'if' or 'if/else' command) that tells the robot how to decide whether to turn left toward the Science section or right toward the Fiction section. (2 marks)

4. Kit's robot keeps trying to walk through a wall. What term do we use for this error in the code, and what is the process of fixing it called? (2 marks)

5. Compare and contrast a 'sequence' of instructions with an 'iteration'. Why might you choose one over the other? (3 marks)

6. Justify your answer: What might happen to the robot's performance if the instructions provided are not in the correct order? (2 marks)

Draw: Draw a flowchart that represents a simple algorithm for making a piece of toast, using standard symbols like ovals for start/end and rectangles for processes.



Extension challenge: Design a 'conditional' algorithm for a smart umbrella. It must check the weather and decide whether to stay folded or open up. Use the format: 'If [condition], then [action], else [action]'. Then, create a new scenario where a 'variable' (like 'battery level') would change the outcome of your algorithm.