

Kit's Computing Challenge: Designing Efficient Algorithms

Learning objective: To design, write, and debug programs that accomplish specific goals by using logical, step-by-step algorithms.

Help Kit the fox create a perfect set of instructions for a robot. Read each section carefully and write a logical sequence of steps (an algorithm) to solve the problem. Remember that a computer needs precise, unambiguous instructions to function correctly.

Word bank: Sequence · Algorithm · Input · Output · Debug · Efficiency · Conditional · Process · Variables

1. The Robot's Breakfast: Design an algorithm for a robot to make a piece of toast. List the steps in chronological order. How would you adjust the algorithm if the bread is already toasted? (3 marks)

2. Efficiency Analysis: Compare your algorithm above with a classmate's. Identify which version is more efficient and justify your answer based on the number of steps taken. (3 marks)

3. Conditional Logic: Explain why a 'selection' or 'if-then' statement is necessary in an algorithm. Give an example of a situation where a robot might need to make a choice based on data. (3 marks)

4. Debugging Process: Imagine your robot puts the butter on before the toast is finished. Explain how you would 'debug' this algorithm to ensure the sequence is correct. (2 marks)

5. Predict the Outcome: What might happen if an instruction in your algorithm is missing or ambiguous? Describe the potential impact on the final output. (2 marks)

6. Creative Extension: Design a complex algorithm for a robot to tidy a messy bedroom. Draw a flowchart showing the steps, including at least one decision point (e.g., 'Is the item a book?'). (4 marks)

Extension challenge: Challenge: Research how 'loops' (iteration) can make your algorithms shorter and more powerful. Rewrite your 'Tidy Bedroom' algorithm using at least one loop to repeat a task.