

Kit's Code-Cracker Challenge: The Mystery of the Malfunctioning Robot

Learning objective: To identify, diagnose, and rectify logical and syntactical errors (bugs) within a sequence of instructions (algorithms) to ensure a program functions as intended.

Kit the fox has programmed his automated garden-bot to plant seeds, but the code is full of bugs! Read the 'Buggy Algorithm' below. Your task is to identify the logical errors, explain why they cause the robot to fail, and write the 'Debugged Algorithm' using the correct sequence of instructions. Use the word bank to help you identify the technical terms for your corrections.

Buggy Algorithm for Garden-Bot:

1. Move forward 5 steps.
2. Dig hole.
3. Move forward 2 steps.
4. Pat down soil (Error: Robot does this before placing the seed!).
5. Place seed.
6. Move backward 10 steps (Error: Robot moves off the garden path!).
7. Repeat steps 1-6 (Error: Robot will try to dig in the same hole forever).

Word bank: Syntax error · Logical error · Algorithm · Sequence · Debug · Loop · Decomposition · Execution

1. Identify the two logical errors in Kit's algorithm and explain how they prevent the robot from completing its task successfully. (4 marks)

2. Why is it important to use 'decomposition' when tackling a complex coding problem like this one? (2 marks)

3. Rewrite steps 4 through 6 to ensure the robot places the seed before patting down the soil and remains within the garden boundary. (3 marks)

4. Justify your answer: If the robot is meant to plant a row of five seeds, why might a 'loop' be a more efficient solution than repeating the instructions manually? (3 marks)

5. Compare and contrast a 'syntax error' with a 'logical error'. Which one is usually easier for a computer to flag for the programmer, and why? (4 marks)

6. What might happen if Kit forgot to include a 'stop' command or a condition to end his loop? Explain the potential consequence for the robot. (2 marks)

Draw: Draw a flow chart showing the corrected sequence of the Garden-Bot, using different shapes to represent the 'start', 'process' (action), and 'decision' (loop) stages.



Extension challenge: Design a 'Code Audit' checklist that Kit could use for his future projects. What three questions should a programmer always ask themselves before running their code to minimise bugs?