The Great Code Clean-Up: Mastering Debugging

1. A bug is an error, flaw, or fault in a computer programme that causes it to produce an incorrect or unexpected result. (1 mark)

Working: N/A

Accept any definition identifying a bug as an error or mistake in code.

2. Testing is important to ensure the code performs the intended task safely and efficiently without errors, preventing issues like the robot hitting a wall. (2 marks)

Look for: Mention of safety, efficiency, or preventing unexpected outcomes.

Good: It is important so you can see if the code works properly.

Better: Testing is important because it helps you find mistakes before the robot crashes into things.

Best: Testing allows the programmer to verify that the sequence of instructions achieves the goal safely and identifies any logical errors before the final code is run.

What moves an answer up: Moving from 'good' to 'best' requires linking the testing process to the prevention of specific errors or safety issues.

3. Step 4 contains the logical error. It tells the robot to turn right, which directs it into the wall instead of towards the corner where the bin is located. (3 marks)

Working: The passage states: 'the second turn should have been a left turn'.

Identify Step 4 and explain the direction error.

4. 1. Move forward 5 metres. 2. Turn left 90 degrees. 3. Move forward 3 metres. 4. Turn left 90 degrees. 5. Move forward 2 metres. (4 marks)

Working: Replacing 'Turn right' with 'Turn left' in step 4.

All 5 steps must be in the correct order with the fix applied.

5. A syntax error is a typing mistake (e.g., missing a bracket or misspelling a command). A logical error is a mistake in the plan (e.g., telling a robot to turn right when it needs to go left). (5 marks)

Look for: Clear distinction between 'typing' vs 'planning' and relevant examples.

Good: Syntax is a spelling mistake and logical is a plan mistake.

Better: A syntax error is like a typo in the code, like forgetting a semicolon. A logical error is when the code runs but does the wrong thing, like turning the wrong way.

Best: A syntax error occurs when the code violates the rules of the programming language, such as a missing bracket. A logical error occurs when the code is written correctly but the sequence of steps is wrong, such as telling a robot to move forward before it has turned to face the correct direction.

What moves an answer up: The 'best' answer provides clear, technical definitions and distinct examples.

6. This is a logical error because the instruction contradicts the goal of using a light sensor. To debug it, change the instruction to: 'If light is NOT detected (darkness), turn light on.' (5 marks)

Look for: Identification of the contradiction and a logical fix.

Good: It is wrong because it turns the light off when it is dark. You should change it to turn on.

Better: This is a logical error because the robot does the opposite of what is needed. If it is dark, the sensor should turn the light on, not off.

Best: This is a logical error because the condition and the action are mismatched for the intended purpose. To debug it, the code should be updated to: 'If light is not detected, turn light on,' which ensures the light activates when it is dark.

What moves an answer up: The 'best' answer explains the mismatch and provides the corrected logic.

7. Not necessarily. If the error is a 'logical error' that only affects one specific path, the rest of the sequence might still work. However, if the error changes the robot's position or state, subsequent steps will likely fail because they are being performed from the wrong location.

(5 marks)

Look for: Nuanced understanding that it depends on the nature of the error.

Good: Yes, because the robot is now in the wrong place.

Better: It depends. If the error is just a small mistake, the rest might work, but usually, if the robot is in the wrong place, the next steps will fail.

Best: Not always, but usually. If step 3 puts the robot in the wrong location, all subsequent steps will be executed from that incorrect position, causing the entire sequence to fail to reach the goal.

What moves an answer up: The 'best' answer acknowledges the dependency of steps on the robot's current state.

What a secure answer looks like

A secure answer demonstrates that the pupil understands that code is a sequence where position and direction are relative to the previous step. Encourage pupils to trace the path on paper.

If your child is stuck

Ask the child to act out the robot's movements physically in the room. If they hit a wall, they will immediately see which turn was incorrect.

Common mistakes to watch for

Pupils often confuse syntax errors (typos) with logical errors (planning). Also, they may forget that a robot's 'left' and 'right' are relative to the direction it is currently facing.