Syntax and logic errors

Teacher's Notes

Lesson Plan

Length	60 mins	Specification Link	2.1.7/p_q	
Learning objective		Candidates should be able to: (a) describe syntax errors and logic errors which may occur while developing a program (b) understand and identify syntax and logic errors		

Time (min)	Activity	Further Notes
10	Explain that syntax errors are very common, not just when programming, but in everyday life. Using a projector, display the **Interactive Starter Activity** and ask the students to suggest where the five syntax errors are. Stress that even though there are syntax errors, we can still interpret the meaning of the message but computers are not as accommodating and will reject anything that does not meet the rules of the language being used.	greatful, you're, their, CD's, Although there is much discussion of Internet security.
15	Watch the set of videos pausing to discuss the content.	
5	Discuss the videos to assess learning. Ask questions such as: • What is a syntax error? • Can you list some common syntax errors? • What is a logic (or logical error)?	A syntax error is an error in the source code of a program. Since computer programs must follow strict syntax to compile correctly, any aspects of the code that do not conform to the syntax of the programming language will produce a syntax error. • Spelling mistakes • Missing out quotes • Missing out brackets • Using upper case characters in key words e.g. IF instead of if • Missing out a colon or semicolon at end of a statement • Using tokens in the wrong order A logic error (or logical error) is a 'bug' or mistake in a program's source code that results in incorrect or unexpected behaviour. It is a type of runtime error that may simply produce the wrong output or may cause a program to crash while running.
15	Pupils to complete **Worksheet 1** either on paper or on a computer. Ask individual students for their responses and discuss with the class so that all students have the correct answers.	Answers provided. Ask students with the correct responses to explain to the class how they arrived at their answers.

Time (min)	Activity	Further Notes
10	The students use **Interactive Activity 1**. After five incorrect attempts they will be allowed to see the lines that still contain errors.	The errors are in: Line 7: Should be if(answer == 'white') Line 8: total = total – 1 Line 10: if(answer == 'blue') Line 11: total = total + 2 Line 13: print total
	Extension Challenge/Homework Students to complete and submit **Worksheet 2** for homework.	
5	**Plenary – Peer test** Ask the students to work in pairs. Each writes some lines of code containing a syntax or logical error for their partner to debug.	

WORKSHEET 1 ANSWERS

1 **Explain what is meant by the following terms.**

(a) Syntax

All languages have a set of rules for how words and sentences should be structured. These rules are collectively known as the language syntax.

In computer programming, syntax serves the same purpose, defining how declarations, functions, commands, and other statements should be arranged.

(b) Syntax errors

A syntax error is an error in the source code of a program. Since computer programs must follow strict syntax to compile correctly, any aspects of the code that do not conform to the syntax of the programming language will produce a syntax error.

Syntax errors are small grammatical mistakes, sometimes limited to a single character. For example, a missing semicolon at the end of a line or an extra bracket at the end of a function may produce a syntax error.

(c) Logic errors

A logic error (or logical error) is a 'bug' or mistake in a program's source code that results in incorrect or unexpected behaviour. It is a type of runtime error that may simply produce the wrong output or may cause a program to crash while running.

Many different types of programming mistakes can cause logic errors. For example, assigning a value to the wrong variable may cause a series of unexpected program errors. Multiplying two numbers instead of adding them together may also produce unwanted results.

2 **List *five* common syntax errors.**

Spelling mistakes.

Missing out quotes.

Missing out brackets.

Using upper case characters in key words e.g. IF instead of if.

Missing out a colon or semicolon at end of a statement.

Using tokens in the wrong order.

WORKSHEET 1 ANSWERS

3 **A student has written a program to find the average of their test results.**

```
var test1
var test2
var test3
var average

average = test1 + test 2 + test3 / 3
print average
```

When the student runs the program, they get results that are obviously incorrect. It is not a syntax error as the code can be compiled and run.
What is the logic error?

The program is dividing test3 by 3 and then adding it to test1 and test2.

Should be (test1 + test2 + test3)/3

4 **The student is also having problems with the following code.**

```
var first_number  As integer
var second_number As integer
var result As integer

result = first_number * second_number
```

He inputs 13.5 as the first number and 3 as the second number but the result is 39 and not 40.5 as he was expecting.
What is the logic error?

The student has declared all of the variables as integers and so the computer will treat 13.5 as 13. Hence the result is 39.

The student should have declared them as variables able to hold decimal numbers e.g. as float or double.

WORKSHEET 2 ANSWERS

1 **A student has written the following code to find the number of times the letter 'c' appears in a piece of text.**

```
Dim i As Integer
Dim occurrences As Integer
Dim text as string
Dim letter as Char

text  = "logic errors in computer code"

For
i = 1 to text.Length-1
letter = text.Substring(1)

If letter = "c" Then
occurrences = occurrences + 1
End if

Next
Print " The letter c appears " + occurences + " times."
```

The student expected the result to be 3 but it never was.
Explain the logical error in his code. (3)

In the loop, the student has written 'letter = text.Substring(1)' (1) instead of letter = text. Substring(i). (1)

Therefore the loop will never get beyond the first letter in the text. (1)

2 **A programmer has created an algorithm to reset the contents of an array with ten items back to zero.**
This is the algorithm but it contains a logical error.

```
I = 1
REPEAT
Array(i) = 0
I = i + 1
UNTIL  i = 10
```

WORKSHEET 2 ANSWERS

2 **(a) State what is meant by a logic error. (1)**

The program is written to do something other than what the programmer intended.

(b) State why the algorithm above contains a logic error. (2)

It will only reset the first 9 elements / will not reset the 10th element

After setting Array(9) = 0, i will become10...

... and the loop will stop

It should be UNTIL i > 10 / or other working correction