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**Cambridge International Examinations**  
Cambridge International Advanced Subsidiary and Advanced Level

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**COMPUTER SCIENCE**

**9608/21**

Paper 2 Fundamental Problem-solving and Programming Skills

**October/November 2018**

PRE-RELEASE MATERIAL

No Additional Materials are required.

**This material should be given to the relevant teachers and candidates as soon as it has been received at the Centre.**

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**READ THESE INSTRUCTIONS FIRST**

Candidates should use this material in preparation for the examination. Candidates should attempt the practical programming tasks using their chosen high-level, procedural programming language.

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This document consists of **7** printed pages and **1** blank page.

Teachers and candidates should read this material prior to the November 2018 examination for 9608 Paper 2.

## Reminders

The syllabus states:

- there will be questions on the examination paper which do not relate to this pre-release material.
- you must choose a high-level programming language from this list:
  - Visual Basic (console mode)
  - Python
  - Pascal / Delphi (console mode)

**Note:** A mark of **zero** will be awarded if a programming language other than those listed is used.

Questions on the examination paper may ask the candidate to write:

- structured English
- pseudocode
- program code

A program flowchart should be considered as an alternative to pseudocode for documenting an algorithm design.

Candidates should be confident with:

- the presentation of an algorithm using either a program flowchart or pseudocode
- the production of a program flowchart from given pseudocode and vice versa.

Some tasks may need one or more of the built-in functions or operators listed in the **Appendix** at the end of this document.

There will also be a similar appendix at the end of the question paper.

## Declaration of variables

The syllabus document shows the syntax expected for a declaration statement in pseudocode.

```
DECLARE <identifier> : <data type>
```

If Python is the chosen language, each variable's identifier (name) and its intended data type must be documented using a comment statement.

## Structured English – Variables

An algorithm in pseudocode uses variables, which should be declared. An algorithm in structured English does not always use variables. In this case, the candidate needs to use the information given in the question to complete an identifier table. The table needs to contain an identifier, data type and description for each variable.

## TASK 1 – Structured programming

### TASK 1.1

Write an algorithm, using structured English to describe a process.

Draw examples from different areas such as:

- retail or banking
- sports or leisure clubs
- college or school
- hotels



**Key focus:**

**Problem decomposition**

### TASK 1.2

Split the process into sub-tasks and consider the advantages of this approach.

### TASK 1.3

Convert each sub-task into a program flowchart. Refer to the example program flowchart on page 4.

### TASK 1.4

Convert each program flowchart into a pseudocode algorithm and then into a high-level language program.

### TASK 1.5

Consider the different types of error that developers can identify in the program at different stages of its development cycle.

### TASK 1.6

Consider the advantages of modular programming using both built-in and user-defined functions.

### TASK 1.7

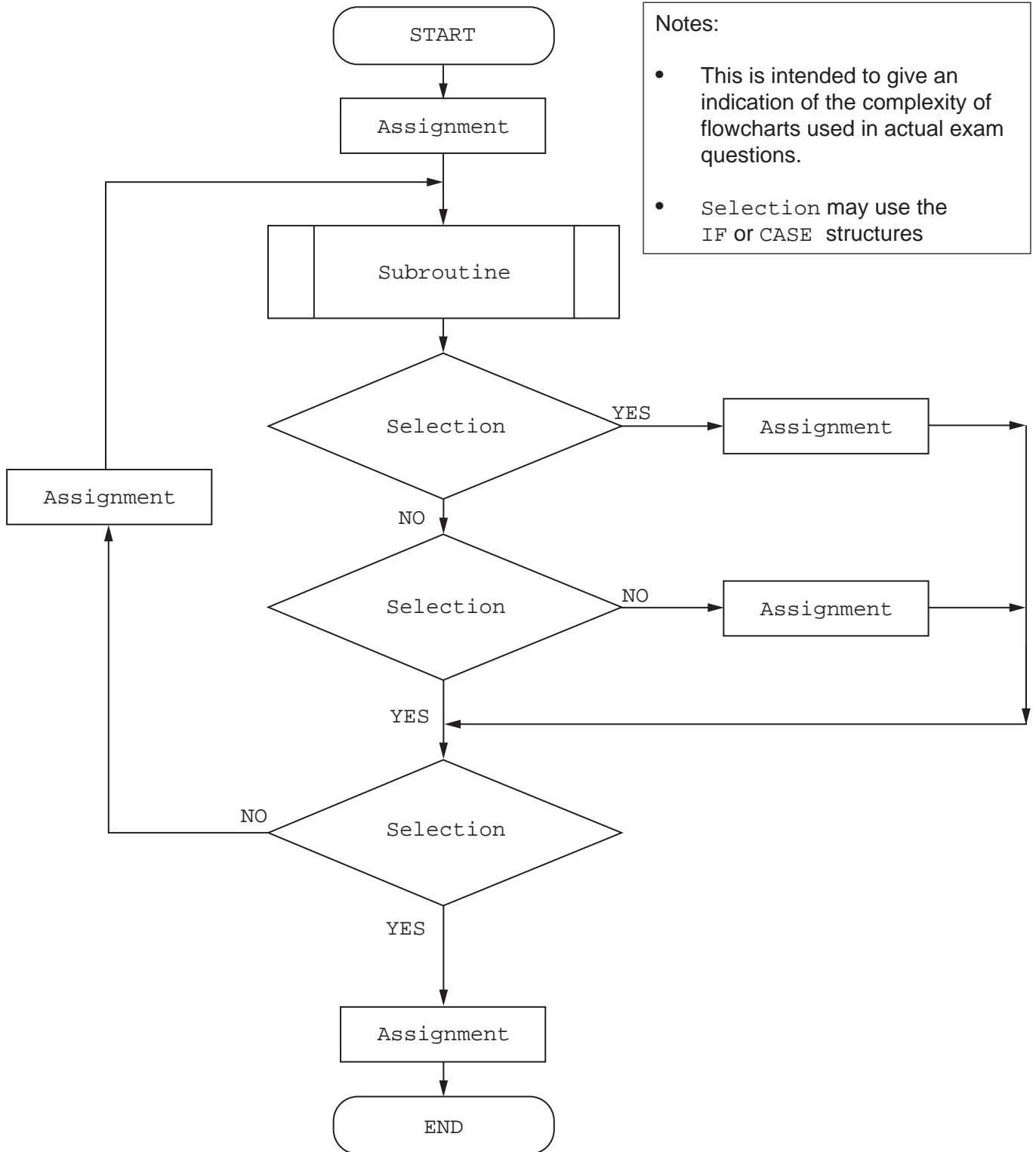
Consider ways of testing the complete program both with and without knowledge of the underlying program code.

Consider ways of testing the main program before all of the user-defined functions have been completed.

### TASK 1 – Example program flowchart

Notes:

- This is intended to give an indication of the complexity of flowcharts used in actual exam questions.
- Selection may use the IF or CASE structures



## TASK 2 – Good programming practice

### TASK 2.1

The use of meaningful names for variables in a computer program is an example of good programming practice.

Discuss other examples of good programming practice.



**Key focus:**

**Implement a program using good programming practice**

### TASK 2.2

Write a program to declare, initialise and output the contents of a 1D array.

Implement different initialisation methods such as:

- Fill the complete array with a single value.
- Fill the array with an incrementing or decrementing sequence of values.
- Fill the array with values obtained using a programmed function. For example, a Fibonacci sequence.

Add a simple menu interface to allow the user to repeatedly:

- select one of the previous initialisation methods
- output the contents of the array.

Use good programming practice throughout.

### TASK 2.3

Swap your program with another student's program. Modify this program so that it processes the elements in the array.

For example, add up all the elements within a range and find the average value.

### TASK 2.4

Modify the program to work with a 2D array.

### TASK 2.5

Describe in detail the purpose of a section of code you have not written yourself.



**Key focus:**

**Document unfamiliar code**

## TASK 3 – File handling

### TASK 3.1

Write **program code** to create a multi-line text file. The program will prompt the user for the filename and the number of lines to be written. The program will write data to the file as follows:

This is line 1  
This is line 2



This is line n

**Key focus:**

**Text file handling in a high-level language**

### TASK 3.2

Open the file using a text editor and check that it contains the expected contents.

### TASK 3.3

Write **program code** for a procedure to output data from the text file.

### TASK 3.4

Write **program code** for a procedure to output a user-specified range of lines from the text file.

Check that your code outputs the lines of text in the correct format.

**Key focus:**

**Dealing with the unexpected**

### TASK 3.5

List possible problems that your program could encounter when it attempts to output a user-defined range of lines from the text file.

## Appendix

### Built-in functions (pseudocode)

Each function returns an error if the function call is not properly formed.

MID(ThisString : STRING, x : INTEGER, y : INTEGER) RETURNS STRING  
returns a string of length y starting at position x from ThisString

Example: MID("ABCDEFGH", 2, 3) returns string "BCD"

LENGTH(ThisString : STRING) RETURNS INTEGER  
returns the integer value representing the length of ThisString

Example: LENGTH("Happy Days") returns 10

LEFT(ThisString : STRING, x : INTEGER) RETURNS STRING  
returns leftmost x characters from ThisString

Example: LEFT("ABCDEFGH", 3) returns string "ABC"

RIGHT(ThisString: STRING, x : INTEGER) RETURNS STRING  
returns rightmost x characters from ThisString

Example: RIGHT("ABCDEFGH", 3) returns string "FGH"

INT(x : REAL) RETURNS INTEGER  
returns the integer part of x

Example: INT(27.5415) returns 27

ASC(ThisChar : CHAR) RETURNS INTEGER  
returns the ASCII value of ThisChar

Example: ASC('A') returns 65

MOD(ThisNum : INTEGER, ThisDiv : INTEGER) RETURNS INTEGER  
returns the integer value representing the remainder when ThisNum is divided by ThisDiv

Example: MOD(10, 3) returns 1

### Operators (pseudocode)

Operator	Description
&	Concatenates (joins) two strings Example: "Summer" & " " & "Pudding" produces "Summer Pudding"
AND	Performs a logical AND on two Boolean values Example: TRUE AND FALSE produces FALSE
OR	Performs a logical OR on two Boolean values Example: TRUE OR FALSE produces TRUE

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