Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE **9608/21**

Paper 2 Fundamental Problem-solving and Programming Skills **May/June 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.

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.

This document consists of **6** printed pages and **2** blank pages.

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

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

There is an **Appendix** at the end of this document. Some tasks refer you to this information.
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 English, flowcharts and program code

Consider examples of processes in a variety of areas, such as:

- clubs or hobbies
- college or school
- home or factory

TASK 1.1

Write an algorithm, using structured English, to describe each of these processes.

Key focus:
Problem decomposition

TASK 1.2

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

TASK 1.3

Convert an algorithm written in structured English into a program flowchart.

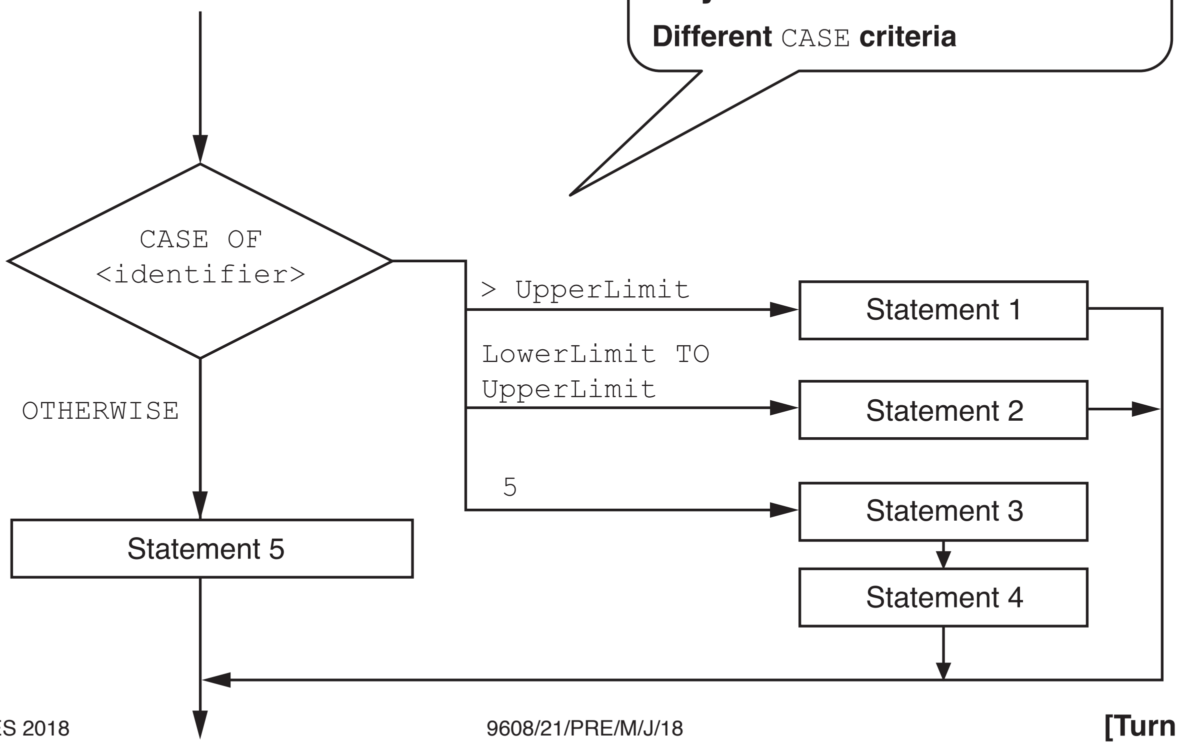
You will need to include some or all of the following when constructing a flowchart.

- input
- output
- iteration (conditional or count-controlled)
- selection (using `IF` or `CASE` statements)
- sequence
- calls to subroutines

Key focus:
Program flowchart

Note: Conditions within a `CASE` statement may contain a range of criteria as illustrated in the following flowchart.

Key focus:
Different `CASE` criteria



TASK 1.4

Convert the program flowchart into **pseudocode** and then into **program code**. A list of typical pseudocode functions can be found in the **Appendix**.

> **Key focus:**
> **Pseudocode and program code**

TASK 1.5

Consider the different types of error that can occur at different stages of the development cycle.

> **Key focus:**
> **Errors**

TASK 1.6

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

> **Key focus:**
> **Modular programming**

> **Key focus:**
> **Testing**

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 2 – Structure charts and procedure declarations

Key focus:
Producing a structure chart

TASK 2.1

Produce a structure chart for a simple modular program. Include one top-level module and at least two lower-level modules.

Add data arrows for both Boolean and non-Boolean variables.

TASK 2.2

Use the chart to produce **pseudocode** declarations for the modules.

Key focus:
Good programming practice

TASK 2.3

Convert the pseudocode into **program code**.

Consider features of the program code that make it easier to read and understand.

TASK 2.4

Produce pseudocode declarations for a different set of modules, with one top-level module and at least two lower-level modules, using different sets of parameters.

TASK 2.5

Produce a structure chart from the pseudocode procedures produced in Task 2.4.

Key focus:
Interpret modular code to produce a structure chart

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 string `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", 4)` returns string `"EFGH"`

`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 character `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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