Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE **9608/41**

Paper 4 Further Problem-solving and Programming Skills **October/November 2018**

PRE-RELEASE MATERIAL

7077714685

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.

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Teachers and candidates should read this material prior to the November 2018 examination for 9608 Paper 4.

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.

The practical skills for Paper 4 build on the practical skills covered in Paper 2. We therefore recommend that candidates choose the same high-level programming language for this paper as they did for Paper 2. This will give candidates the opportunity for extensive practice and allow them to acquire sufficient expertise.

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

- structured English
- pseudocode
- program code

A program flowchart or the use of Jackson Structured Programming should be considered as an alternative to pseudocode for the documenting of a high-level 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
- the production of a JSP structure diagram from a given scenario

Candidates will also benefit from using pre-release materials from previous examinations. These are available on the teacher support site.

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.

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TASK 1

Key focus:

Object-oriented programming

A computer shop sells different types of computer. Each type of computer performs different tasks.

The shop has a system to store and retrieve key information about the computers, so that customers can find out more about them.

The program is written using object-oriented programming.

- The class `Computer` has the properties:
  - Code (for example, CMP001)
  - Width (for example, 20.7)
  - Height (for example, 16.2)
  - Weight (for example, 1.3)
  - Make (for example, ciesoft)
  - Processor (for example, ZX100)
  - RAM size (for example, 4GB)
  - Storage size (for example, 200GB)

- The class `MobilePhone` is a type of computer, it has the properties of the `Computer` class, and:
  - Camera (for example, TRUE)
  - 3G (for example, TRUE)
  - 4G (for example, FALSE)
  - Mobile phone network (for example, CIE Mobile)

- The class `Laptop` is a type of computer, it has the properties of the `Computer` class, and:
  - Touchscreen (for example, FALSE)
  - Removable screen (for example, TRUE)
  - Tablet mode (for example, TRUE)
  - USB 3.0 ports (for example, 2)

TASK 1.1

All of the properties are set to private. Check that you understand the difference between private and public properties and why programmers use them.

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TASK 1.2

Draw a class diagram for the `Computer`, `MobilePhone` and `Laptop` classes. Use the following template to help you with this task.

Make sure you include the appropriate get and set methods.

Key focus:

Defining classes

Computer

MobilePhone

Laptop

TASK 1.3

Check that you understand the meaning of **inheritance**. The `MobilePhone` class and `Laptop` class inherit from the `Computer` class.

Add inheritance to your class diagram.

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TASK 1.4

Write **program code** to create the `Computer` class. Make sure:

- the properties are declared as private
- you have a constructor
- you have get and set methods for each property.

TASK 1.5

Write **program code** to create the `MobilePhone` and `Laptop` classes. Make sure:

- the properties are declared as private
- you have a constructor
- you have get and set methods for each property
- the classes inherit the properties from the `Computer` class.

TASK 1.6

Add validation (where appropriate) to the constructor and set methods for all three classes. For example, USB 3.0 ports might be limited to the range 0 to 6.

TASK 1.7

Create instances of the `MobilePhone` and `Laptop` classes with appropriate data in the main program.

Store the objects in arrays. To get you started, data for an instance of `MobilePhone` are as follows:

- Code = “MB1”
- Width = 6.2
- Height = 10.8
- Weight = 0.3
- Make = “camphones”
- Processor = “CIE234X”
- RAM size = “2GB”
- Storage size = “64GB”
- Camera = TRUE
- 3G = TRUE
- 4G = TRUE
- Mobile Phone Network = “camNetwork”

Key focus:

Creating instances of classes

Key focus:

Using objects in a program

TASK 1.8

Write a procedure to:

- prompt a user to input the code for a computer
- find the computer with that code
- output the information for the computer in an appropriate format.

Key focus:
Declarative language

TASK 2

A declarative language is used to create a set of facts and rules for a job agency.

```
01 job_status(sally, employed).
02 job_status(bill, unemployed).
03 first_aid_trained(sally).
04 first_aid_trained(bill).
05 years_experience(sally, 5).
06 years_experience(bill, 15).
07 qualified_as(sally, doctor).
08 qualified_as(bill, maths_teacher).
09 job_vacancy(autoshop, mechanic).
10 job_vacancy(a_school, maths_teacher).
11 suitable_job(X, Y) IF job_status(X, unemployed) AND qualified_as(X, Z)
   AND job_vacancy(Y, Z).
```

TASK 2.1

Add the following facts:

- Alex is unemployed with 12 years' experience.
- Alex is qualified as a typist and an accountant.

Key focus:
Adding facts

TASK 2.2

Add **two** more people, and **four** more job vacancies.

TASK 2.3

State what is returned for the following goals.

- `qualified_as(sally, B)`
- `job_vacancy(X, doctor)`
- `job_vacancy(a_school, art_teacher)`
- `suitable_job(joe, X)`

Key focus:
Writing goals

TASK 2.4

Write goals to find the following information.

- all people who are employed
- all people who are first aid trained
- all jobs that one of the people you have added in TASK 2.2 is qualified to do
- all job vacancies at a_school
- all jobs for a maths teacher
- the jobs that Sally and Alex are suitable for

TASK 2.5

An autoshop wants to hire a mechanic, with either at least five years' experience or who is first aid trained. Write a goal for this statement.

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TASK 3

A program uses a record structure, `Boat`, to store information about boats. The record has the fields:

- Boat name (for example, “Mr Boaty”)
- Manufacturer (for example, “Camboats”)
- Boat type (for example, “1XSC”)

Key focus:
Record structure

TASK 3.1

Use **pseudocode** to write a definition for the record structure `Boat`.

TASK 3.2

Write **program code** to declare your record structure. If you are using Python, you will need to create a class.

TASK 3.3

Create four boats using your record structure, as separate variables.

TASK 3.4

Amend your program, so the boats are stored in a 1D array.

Key focus:
Storing records

TASK 3.5

Amend the program to allow a user to enter new boats. Each boat should be stored in the array.

TASK 3.6

Amend the program to prompt the user to enter a boat name.

Write a procedure to find and output the information about the boat the user has entered.

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