
COMPUTER SCIENCE

9608/22

Paper 2 Fundamental Problem-solving and Programming Skills

October/November 2015

PRE-RELEASE MATERIAL

No Additional Materials are required.

This material should be given to candidates up to six months before the examination.

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 **7** printed pages and **1** blank page.

This material is intended to be read by teachers and candidates prior to the November 2015 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)

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 the documenting of 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, (or the reverse)

Key Focus: Text file

Preliminary work:

You should create a text file `BOOK-FILE` using a text editor.

The file will consist of around 30 book titles with each book title on a new line.

TASK 1

A program is to be written to:

- read the data values from the text file `BOOK-FILE` into a 1D array `Book`
- output each book title from the array

Key Focus: Arrays

TASK 1.1

Write the **pseudocode** for this program.

Key Focus: Program code

TASK 1.2

Write **program code**, in your chosen language, for the pseudocode design produced in TASK 1.1.

Extension Task

Write **program code** to add a main menu to the program which shows:

1. Display the file contents
2. Search the array for a particular book
3. End the program

Write **program code** for menu option 2 as follows:

The program will:

- prompt the user for entry of a book title
- input the book title
- carry out a linear search of the Book array to output either:
 - BOOK FOUND
 - BOOK NOT FOUND

TASK 2

TASK 2.1

A second program is to be written to search the file for a particular book.

The program will:

- prompt the user for entry of a book title
- input the book title
- carry out a linear search of the file to output either:
 - BOOK FOUND
 - BOOK NOT FOUND

Key Focus: Linear search

The pseudocode for this program is given below.

The pseudocode assumes the exact number of books in the file is not known.

```

OPENFILE "BOOK-FILE" FOR READ
IsFound ← FALSE
OUTPUT "Enter book"
INPUT ThisBook

REPEAT
  READFILE "BOOK-FILE", FileBook
  IF FileBook = ThisBook
    THEN
      IsFound ← TRUE
      OUTPUT "BOOK FOUND"
    ENDF
UNTIL IsFound = TRUE OR EOF("BOOK-FILE")

IF IsFound = FALSE
  THEN
    OUTPUT "BOOK NOT FOUND"
  ENDF

```

Key Focus: Pseudocode

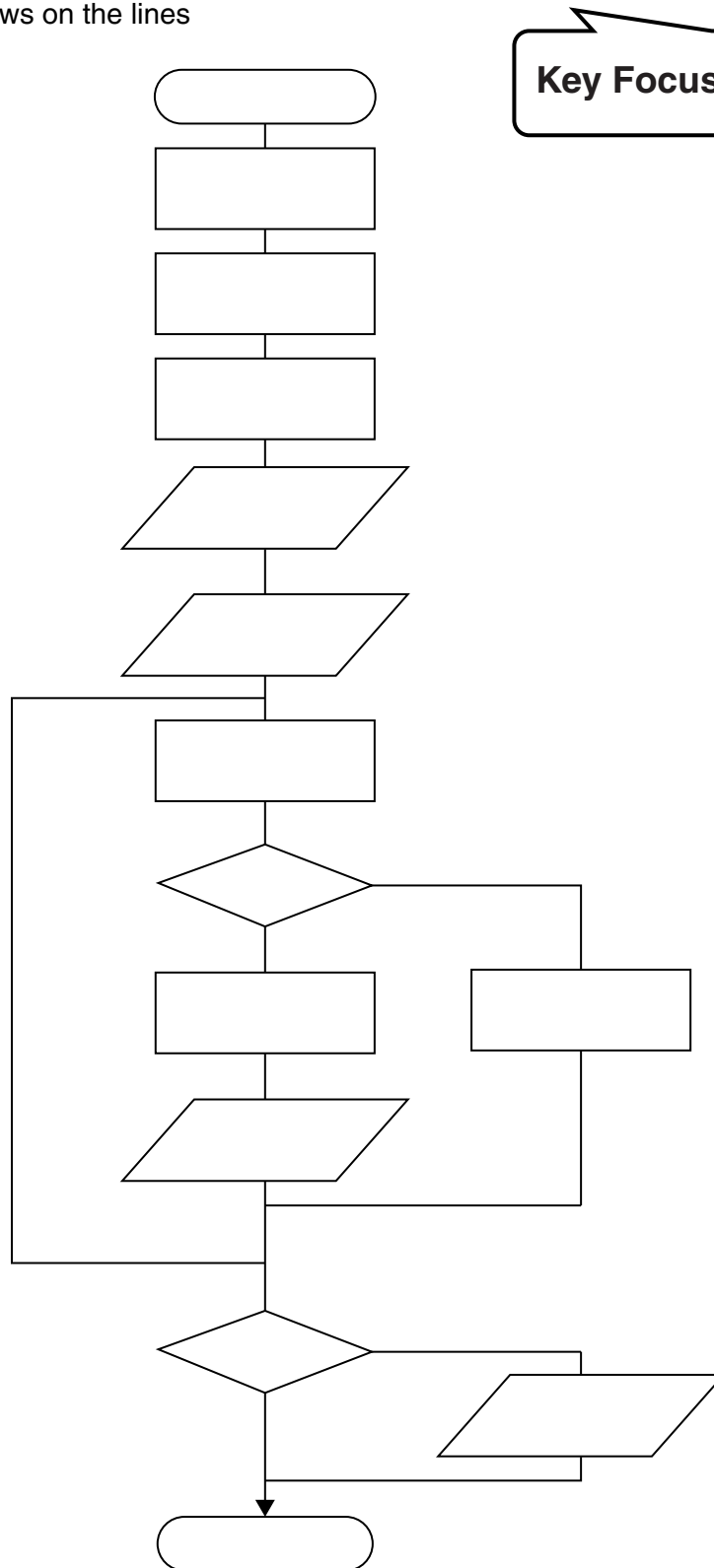
Write **program code** from this pseudocode design.

TASK 2.2

Alternatively, the program design for TASK 2.1 could have been given as a program flowchart.

Complete the following **program flowchart** from the given pseudocode, by:

- Labelling the boxes
- Drawing arrows on the lines



Key Focus: Program flowchart

& Operator

The & operator will be used to concatenate two strings.

For example: "Birthday" & "Party"

Evaluates to: "Birthday Party"

Built-in Functions

Any high-level programming language will have many built-in functions for the programmer to use.

It is appreciated that the three programming languages often implement these functions with very different syntax. Candidates should be familiar with the syntax used in their chosen programming language.

If a built-in function is to be used in pseudocode on the examination paper, the function will be shown and explained. Examples of this follow.

Key Focus: Built in function definitions

String handling functions (Pseudocode)

ONECHAR(ThisString : STRING, Position: INTEGER) RETURNS CHAR
returns the character at index position Position (counting from the start of the string with value 1) from the string ThisString.

For example: ONECHAR("Hockey", 4) returns 'k'

CHARACTERCOUNT(ThisString : STRING) RETURNS INTEGER
returns the number of characters in string ThisString.

For example: CHARACTERCOUNT("Real Madrid") returns 11

SUBSTR(ThisString : STRING, Value1 : INTEGER, Value2 : INTEGER) RETURNS STRING

returns a sub-string from within ThisString.

Value1 is the start index position (counting from the left, starting with 1).

Value2 is the final index position.

For example: SUBSTR("art nouveau", 5, 11) returns "nouveau"

Conversion between data types (Pseudocode)

TONUM(ThisDigit : CHAR) RETURNS INTEGER

For example: TONUM('8') returns integer 8

TOSTRING(ThisNumber : INTEGER or REAL) RETURNS STRING

For example: TOSTRING(83) returns "83"

TOSTRING(704.25) returns "704.25"

Using ASCII character codes (Pseudocode)

CHR(ThisInteger : INTEGER) RETURNS CHAR

For example: CHR(65) returns character 'A'

ASC(ThisCharacter : CHAR) RETURNS INTEGER

For example: ASC('A') returns integer 65

Random Number Generator (Pseudocode)

RANDOM(Integer1 : INTEGER, Integer2 : INTEGER) RETURNS INTEGER
generates a random integer in the range from Integer1 to Integer2 inclusive.

For example: RANDOM(10, 12) returns either: 10, 11 or 12

TASK 3**TASK 3.1**

Write a program with the following specification.

- The user enters two integers (X and Y)
- The difference between X and Y should be at least 20 and $X < Y$
- The program generates a sequence of 20 random numbers between X and Y
- The program outputs the sequence of random numbers

Extension task

At present, the program might generate the same number more than once.
Modify the program design so that duplicates are not displayed.

TASK 4

Use the functions above to evaluate the following expressions:

1. ONECHAR("Tiger", 3)

2. CHARACTERCOUNT("Great Pyramid of Giza")

3. TONUM('3') + TONUM('29')

4. p ← "The" & "Titanic"

q ← SUBSTR(p, 8, 4)

q

5. IDE ← "Integrated Development Environment"

Using the SUBSTR and/or ONECHAR functions, write expressions to return:

(a) "Integrated"

(b) "Development"

(c) "IDE"

6. Use an ASCII code table to find the value for:

(a) (ASC('F') + 30) / 50

(b) 2 * (ASC(<Space>) + ASC('D'))

7. Write the text string output by the following sequence of statements.

A ← "The answer is: "

B ← TOSTRING(42)

OUTPUT A & B

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.