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**COMPUTER SCIENCE**

**9608/21**

Paper 2 Fundamental Problem-solving and Programming Skills

**October/November 2015**

PRE-RELEASE MATERIAL

**This material should be given to candidates on receipt by 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.

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

## Preliminary work

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

**Key focus: Text file**

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.

**Suggested extension task**

Write **program code** to add a main menu to the program. The options are:

- 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"
    ENDIF
UNTIL IsFound = TRUE OR EOF("BOOK-FILE")

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

```

**Key focus: Pseudocode**

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

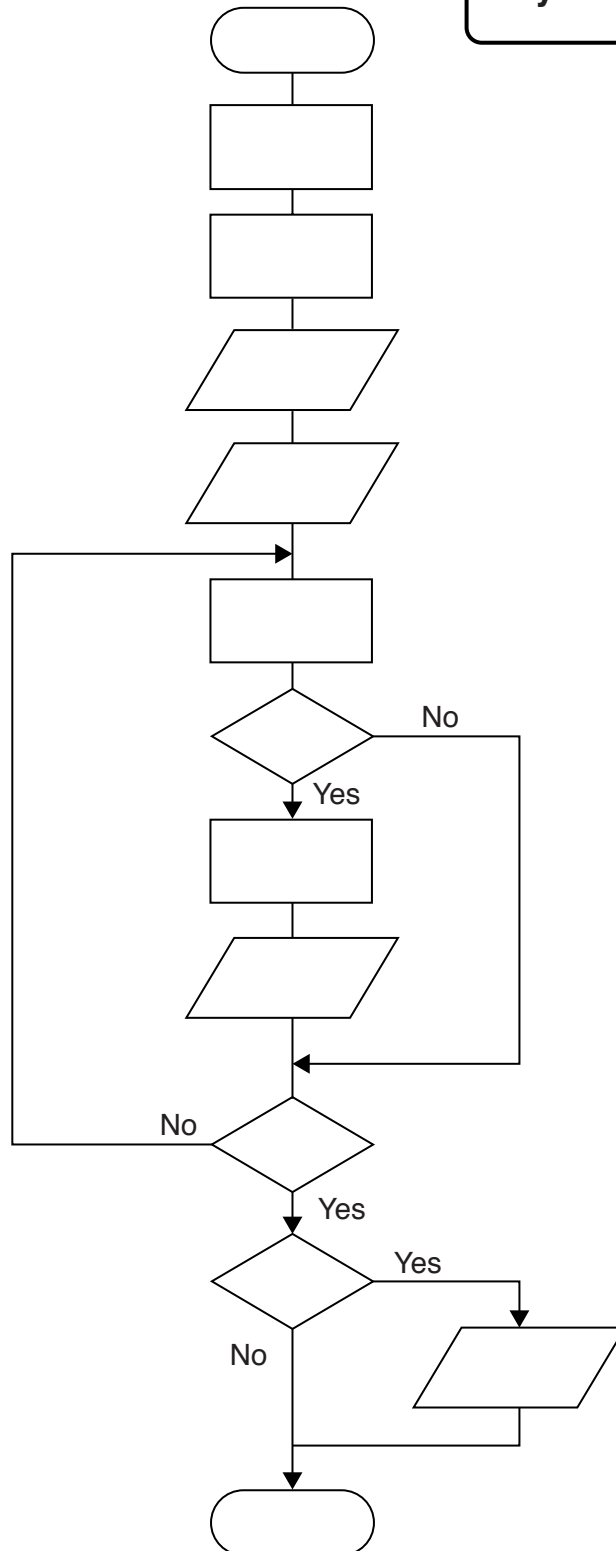
**TASK 2.2**

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 : STRING) RETURNS INTEGER  
 Returns the integer equivalent of the string ThisDigit  
 For example: TONUM("8") returns integer 8

TOSTRING(ThisNumber : INTEGER or REAL) RETURNS STRING  
 Returns characters which make up ThisNumber as a string  
 For example: TOSTRING(83) returns "83"  
  
 TOSTRING(704.25) returns "704.25"

**Using ASCII character codes (Pseudocode)**

CHR(ThisInteger : INTEGER) RETURNS CHAR  
 Returns the character with ASCII value ThisInteger  
 For example: CHR(65) returns character 'A'

ASC(ThisCharacter : CHAR) RETURNS INTEGER  
 Returns the ASCII value for character ThisCharacter  
 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

**Suggested 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 given 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 one or both of the SUBSTR and 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 .....

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