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9691/21

May/June 2012

**2 hours**

Candidates answer on the Question Paper.

No additional materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.

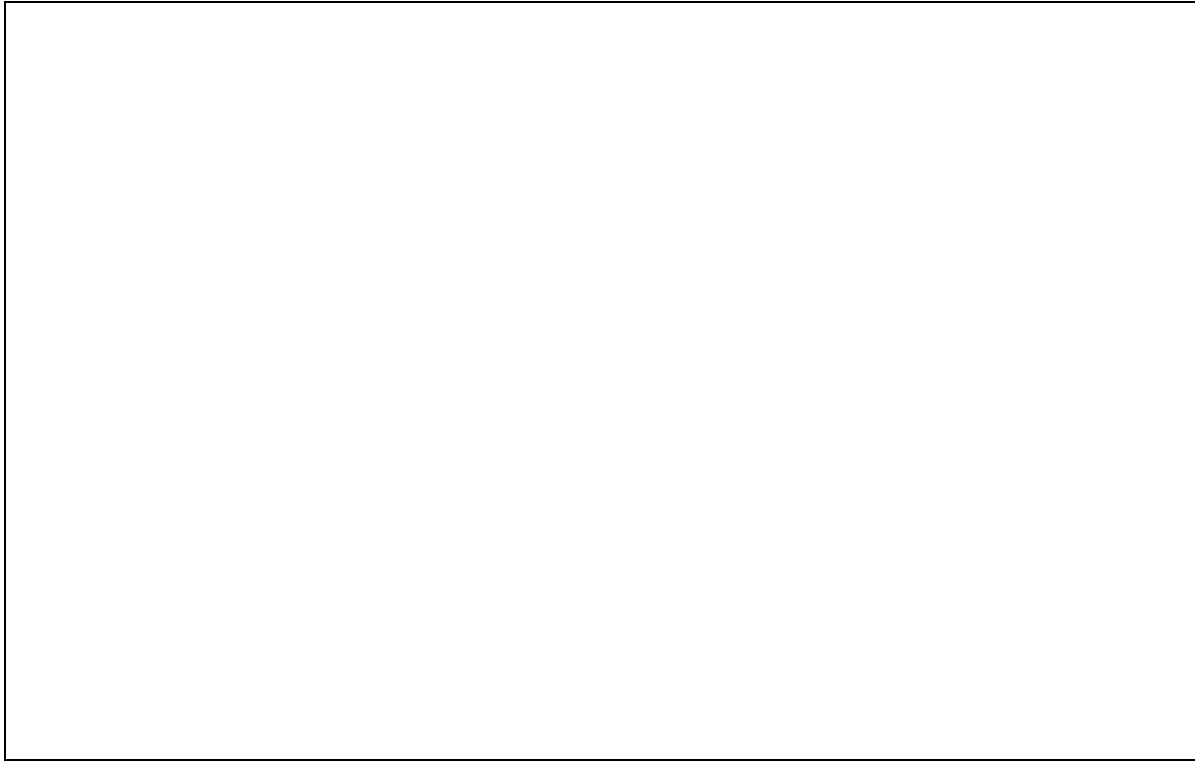
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **11** printed pages and **1** blank page.

- 1 Anna wants to find out about her fellow students' reading habits. It will be part of her Literature coursework. She will ask questions online, so starts by designing a screen layout. The first four questions will ask for:

- student's first name
- date of birth
- type of book they prefer (printed, audio-book or e-book)
- whether student reads novels (yes/no)

**(a)** Draw a suitable screen layout.



[4]

**(b)** Justify the design of your screen layout in **(a)**.

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[3]

(c) The responses from each student will be stored as a record consisting of the following fields:

- FirstName
- DateOfBirth
- BookType
- ReadsNovels

Complete the following table. Only a single value should be given for the Field Size.

Field Name	Data Type	Field Size (bytes)
FirstName		
DateOfBirth		
BookType		
ReadsNovels		

[8]

For  
Examiner's  
Use

Using nested IF...THEN statements, complete the pseudocode to calculate the totals for each BookType (printed, audio-book or e-book).

REPEAT

[illegible]

UNTIL no more student records

[5]

(e) Anna will want a report that shows these totals.

Design a printed report that shows for each BookType:

- the total for that type
- the percentage for that type



[3]

(f) The records will be held in a serial file.

Give **three** statements from a high-level language that may be used for the file handling and explain what each does.

Language .....

1 .....

.....

2 .....

.....

3 .....

..... [6]

- 2 Philippe is trying different ways of designing the process of entering data into an array. He declares a variable called `ArraySize` and sets it to 3. He declares an array `Number[ArraySize]`.

He then writes the following pseudocode.

```

Element ← 1
WHILE Element < ArraySize DO
    INPUT Number[Element]
    Element ← Element + 1
ENDWHILE

```

- (a) In the following table trace the effect of entering 24, 57, 12.

ArraySize	Element	Element < ArraySize	Number		
			[1]	[2]	[3]
3					
	1				
		true			

[5]

- (b) (i) There appears to be an error in the above pseudocode. State the type of error.

..... [1]

- (ii) The error can be corrected by changing **one** line. Write the corrected line of pseudocode.

.....

..... [1]

- (c) Philippe is not convinced that a WHILE loop was the best choice for this pseudocode. Instead he considers using a REPEAT...UNTIL loop.  
Rewrite the corrected pseudocode using a REPEAT...UNTIL loop.

For  
Examiner's  
Use

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..... [2]

- (d) Philippe wants to increase the size of the array to 500. This is too large to check with a trace table.  
Describe how you would check that the logic of the pseudocode is correct for 500 iterations.

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..... [3]

- 3 Gina is developing her programming skills in string handling. She is going to input two strings. Each string is made up of three parts:

- letters, followed by
- a single '\*' character, followed by
- letters

The groups of letters after the '\*' characters are joined together to form a new string which is then output.

For example, with "DFG\*COM" and "B\*PUTER" as inputs, the new string output will be "COMPUTER".

- (a) Using a high-level programming language, write the code to perform this task. (Ensure that you use meaningful variable names and lay the code out clearly.)

Programming language .....

Code .....

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[8]



(b) She writes this code as the function `JoinStrings` because it is to be used several times.

(i) State the parameters of the function.

.....  
..... [2]

(ii) Write the function header in the language you used in part (a).

.....  
..... [2]

(iii) State why Gina used a function rather than a procedure.

.....  
..... [1]

4 Raul writes software for a melon packing plant. He wants to check his understanding of different arithmetic operators for a melon packing problem that he has to solve.

(a) Evaluate the following expressions for Raul.

(i)  $10/3$  .....

(ii)  $10 \text{ MOD } 3$  .....

(iii)  $10 \text{ DIV } 3$  ..... [3]

(b) Raul has Y melons which are to be packed into boxes. Each box contains X melons. Write expressions to calculate:

(i) the number of full boxes

.....  
..... [1]

(ii) the number of melons left over

.....  
..... [1]

- 5 Romana is learning about recursion. She designs a recursive function.

```
01      FUNCTION Happening (Num)
02          IF Num = 1
03              THEN
04                  Happening  $\leftarrow$  1
05              ELSE
06                  Happening  $\leftarrow$  Happening (Num - 1) + Num
07          ENDIF
08      ENDFUNCTION
```

- (a) Calculate the value returned by the function call `Happening(4)`.  
Show your working.

Happening(4) = ..... [6]

- (b) (i) State **two** line numbers in the given pseudocode (other than lines 01 and 08) that show the subroutine is a function. Give your reason for choosing these.

Line numbers .....

Reason .....

[3]

- (ii) State the line number in the given pseudocode that shows the function is recursive. Give your reason for choosing this.

Line number .....

Reason .....

[2]

- (c) State what will happen if the function is called with `Happening(-1)`.

.....

[1]

- (d) The same process could have been solved iteratively using a FOR loop. Discuss the merits of iterative and recursive solutions to this problem, particularly when the initial value of `Num` is very large.

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[4]

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