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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

5117626256

COMPUTING **9691/21**

Paper 2 **May/June 2013**

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 **14** printed pages and **2** blank pages.

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For Examiner's Use

1 Meena wants to develop a program to keep a record of her coursework assignments.
She will want to enter, sort and print out data.
She decides to modularise the solution.

(a) State **two** reasons why using modules is a sensible way for her to proceed.

1 .....

.....

2 .....

..... [2]

One way of storing her data will be to use a file of records.

Each record will contain at least the following data:

Data	Identifier	Description of input data
subject	`Subject`	Name of the subject, for example Physics
title	`Title`	Title of assignment
date set	`DateSet`	Format DDMMYYYY
hand-in date	`HandInDate`	Format DDMMYYYY
marked?	`IsMarked`	Y or N
date returned	`DateReturned`	Format DDMMYYYY
mark	`Mark`	Range 0 to 100

(b) (i) Each record needs another field to uniquely identify that record.

State an appropriate identifier for this field and state a suitable data type for it.

.....

.....

.....

..... [2]

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(ii) In a programming language write the declaration for the record structure, giving it the identifier `Assignment`.

Programming language .....

Declaration .....

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..... [4]

(iii) State the number of bytes needed to store a value in the field `IsMarked`.

..... [1]

(c) Describe what the function `EOF()` does when used in a program.

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..... [2]

(d) Meena creates a sequential file, `MyAssignments`, of `Assignment` records.

For Examiner's Use

Using pseudocode write the algorithm to search this file for the first Physics assignment.

```
OPENFILE MyAssignments FOR OUTPUT
```

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```
CLOSEFILE MyAssignments
```

[4]

For Examiner's Use

2 The data for each record is validated as it is entered.

(a) Write a logic expression to be used as the validation rule for the acceptance of data in the `IsMarked` field.

.....

[2]

(b) The data input for `HandInDate` also needs validating.
It will be entered as DDMMYYYY.

- DD must be less than 32 and greater than 0
- MM must be less than 13 and greater than 0
- YYYY must be greater than 2012 and less than 2015

Draw a flowchart that shows the logic to validate the hand-in date.

[5]

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(c) (i) Meena uses three items of data to test this logic. In the table below enter 'normal' or 'borderline' in the empty cells.

HandInDate	Type of Data
31122014	.....
30142015	invalid
16062013	.....

[1]

(ii) State the reason why this invalid `HandInDate` is not a good test of the validation rules.

.....

..... [1]

(iii) State **three** hand-in dates that provide a better test to show that invalid data does not get entered.

.....

.....

..... [3]

Meena also wants to check that `HandInDate` is later than both `DateSet` and the current date.

(d) Write a logic expression which tests this condition.

.....

.....

..... [2]

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(e) `DateReturned` will have to be later than `HandInDate`, the same or earlier than the current date, and a mark has been entered.

For Examiner's Use

Write pseudocode that will test whether `DateReturned` is valid or invalid using nested IF statements.

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..... [4]

(f) The table shows the four records currently stored in the file `MyAssignments` for the assignments set so far.

Subject	Title	DateSet	HandInDate	IsMarked	DateReturned	Mark
Physics	…	…	…	…	…	**28**
Maths	…	…	…	…	…	**55**
Biology	…	…	…	…	…	**70**
Drama	…	…	…	…	…	**12**

Meena will write an additional module based on the pseudocode:

```
OPENFILE MyAssignments FOR INPUT
Count ← 0
REPEAT
   FILEREAD next assignment record
   IF Mark < 40
      THEN
         Count ← Count + 1
   ENDIF
UNTIL EOF()
OUTPUT Count
CLOSEFILE MyAssignments
```

(i) Complete the trace table using the data in the table above.

Count	Mark	Mark < 40	Output

[4]

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(ii) What useful information does this pseudocode output?

.....

..... [1]

(iii) Meena has written the above pseudocode with features that make it easy to understand.

State **two** such features.

Feature 1 .....

.....

Feature 2 .....

..... [2]

(iv) State **one** other feature that could be introduced to this pseudocode to make it easier to understand.

.....

..... [1]

(v) Write pseudocode to demonstrate your answer to **(iv)**.

.....

..... [1]

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(vi) The pseudocode at the start of **(f)** was:

```
OPENFILE MyAssignments FOR INPUT
Count ← 0
REPEAT
   FILEREAD next assignment record
   IF Mark < 40
      THEN
         Count ← Count + 1
   ENDIF
UNTIL EOF()
OUTPUT Count
CLOSEFILE MyAssignments
```

Rewrite the pseudocode using a WHILE-ENDWHILE loop.

```
OPENFILE MyAssignments FOR INPUT
```

.....

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```
CLOSEFILE MyAssignments
```

[3]

(vii) Could this pseudocode be written using a FOR-ENDFOR structure?
Justify your answer.

.....

.....

.....

.....

[2]

For Examiner's Use

3 Meena needs to be aware of her average grade and declares a variable `AvMark`, which she decides will be a global variable.

(a) State where in the program a global variable is declared.

.....

[1]

(b) Using only global variables is poor programming practice.

Give a possible problem that could result from this.

.....

.....

[1]

(c) Good programming practice uses local variables.

What is the scope of a local variable?

.....

.....

[1]

To make future computation more straightforward Meena retrieves her marks from the file and stores them in an array, `Marks`. This array has 30 elements, and marks range from 0 to 100.

(d) State a suitable value to initialise each element of the array. Justify your choice.

Initial value .....

Reason .....

.....

[1]

(e) Write program code that will declare and initialise the array.

Programming language .....

Code .....

.....

.....

.....

.....

.....

[4]

For Examiner's Use

(f) Write program code that will calculate the average of all the marks and assign it to `AvMark`.

Programming language .....

Code .....

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.....

.....

.....

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.....

..... [5]

(g) The programming statements to calculate the average mark could be written as a procedure or a function.

(i) State the difference between a procedure and a function.

.....

.....

..... [1]

(ii) State why the sub-routine to calculate the average mark could be written as a function.

.....

..... [1]

For Examiner's Use

(h) A built in function, `INT()`, exists which returns the integer part of a real number.

(i) What is returned by `INT(34.2)`?

.....[1]

`AvMark` may be a decimal number such as 79.7 or 34.2. Meena wants the answer rounded to the nearest whole number.
A variable, `Rounded`, is assigned the result of using the `INT` routine with parameter `(AvMark + 0.5)`.

(ii) What is the value of `Rounded` when `AvMark` is 79.5?

.....[1]

(iii) Write program code for a function `CalculateRounded` which returns the rounded average mark.

Programming language .....

Code .....

.....

.....

.....

.....

.....[4]

For Examiner's Use

4 **(a)** Meena invites her friends to use her program. When designing the user interface, state **three** design features she can incorporate when one of her friends has a sight impairment.

1 .....

.....

2 .....

.....

3 .....

..... [3]

(b) Before making the program available it must be tested.

(i) State when and how syntax errors are detected.

.....

.....

.....

..... [2]

(ii) State when and how logic errors are detected.

.....

.....

.....

..... [2]

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