Candidate forename		Candidate surname	

Centre number					Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
ADVANCED SUBSIDIARY GCE
F452
COMPUTING
Programming Techniques and Logical Methods

TUESDAY 7 JUNE 2011: Morning
DURATION: 1 hour 30 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

None

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES
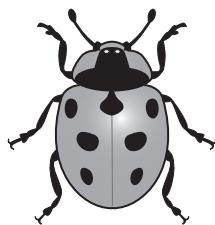
- Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.

- Use black ink. Pencil may be used for graphs and diagrams only.

- Read each question carefully. Make sure you know what you have to do before starting your answer.

- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).

- Answer ALL the questions.

INFORMATION FOR CANDIDATES

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

- The total number of marks for this paper is 100.

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1   Wayne is writing an application for a touch screen mobile phone to identify types of ladybird.

(a) The application will use a single interface which has

- a facility to input the size of the ladybird in mm,
- a facility to input the number of spots (0 to 30),
- a facility to input the colour of the spots (BLACK, WHITE, RED or OTHER),
- an output to show photographs and short descriptions of the types of ladybird fitting the criteria which have been input.

Draw a design in the outline on the opposite page or describe a design for the interface of this application. The design may be drawn larger than actual size.
You may annotate your design or description to explain how it works.   [8]

Question 1(a) – Design for a touch screen mobile phone application

Wayne uses IF statements in the code to determine whether the data input matches known types of ladybird.

(b) Wayne uses the following IF statement to determine whether the spot colour which has been input matches a type of ladybird which has white spots.

```
IF InputSpotColour = "WHITE" THEN
```

Show how an IF statement can be used to check whether the spot colour which has been input matches a ladybird which can have either red or black spots.

_____

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_____

_____ **[2]**

(c) Wayne's program uses the following variables.
InputSpots: The number of spots input by the user.
MaxSpots, MinSpots: The maximum and minimum number of spots that a type of ladybird can have.

Show how an IF statement can be used to check whether the value of InputSpots is within the range from MinSpots to MaxSpots.

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_____ **[3]**

(d) Wayne's program also contains the following variables.
InputLength: The length input by the user.
AveLength: The average length of a type of ladybird.

Show how an IF statement can be used to check whether the value of InputLength is within 1 mm of AveLength.

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_____ [3]

(e) Wayne decides that his IF statements need to be nested.

Describe what is meant by nesting.

_____

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_____ [2]

(f) Wayne decides to release a beta version of the application.

Explain the use of beta versions, and the advantages AND disadvantages of their use in this case.

The quality of written communication will be assessed in your answer to this question.

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_____ [8]

2 A company is producing a computer program for a new cash point.

The company uses Rapid Application Development (RAD).

(a) Describe what is meant by Rapid Application Development (RAD) and how it can be used to help in producing the program.

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_____ **[4]**

Here is part of the code for the program. This code contains some errors.

```
01  PROCEDURE WithdrawCash(AccountNo:INTEGER)
02    VARIABLE Amount:REAL   //how much to withdraw
03    VARIABLE Print:BOOLEAN //whether a receipt is wanted
04    Amount = GetAmountWanted()
05    Print = GetWhetherReceiptWanted()
06    IF Balance(AccountNo) < Amount  THEN
07      DispenseCash(Amount)
08      IF Print = TRUE  THEN
09        PrintReceipt(AccountNo, Amount)
10      END IF
11    ELSE
12      OUTPUT "Insufficient Funds"
13    END IF
14  END PROCEDURE
```

(b) In this extract the procedure WithdrawCash is defined.

(i) Define the term procedure and explain how a procedure is used.

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_____ **[4]**

12

(ii) State the name of a procedure used in the code OTHER THAN WithdrawCash.

_____ **[1]**

(c) **GetAmountWanted** is a function which prompts the user for an amount to withdraw and returns this amount.

(i) Explain ONE difference between a procedure and a function.

_____

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_____ **[2]**

(ii) State the name of a function used in the code OTHER THAN GetAmountWanted.

_____ **[1]**

(d) Explain what is meant by a parameter, using an example from the code.

_____

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_____ [3]

(e) When the code is tested, the variable Print causes a keyword violation error.

  (i) Describe what is meant by a keyword.

_____

_____

_____

_____ [2]

  (ii) State why this keyword violation is a syntax error.

_____

_____ [1]

Here is a copy of the code shown on page 8.
This code contains some errors.

```
01  PROCEDURE WithdrawCash(AccountNo:INTEGER)
02    VARIABLE Amount:REAL   //how much to withdraw
03    VARIABLE Print:BOOLEAN //whether a receipt is wanted
04    Amount = GetAmountWanted()
05    Print = GetWhetherReceiptWanted()
06    IF Balance(AccountNo) < Amount  THEN
07      DispenseCash(Amount)
08      IF Print = TRUE  THEN
09        PrintReceipt(AccountNo, Amount)
10      END IF
11    ELSE
12      OUTPUT "Insufficient Funds"
13    END IF
14  END PROCEDURE
```

(f) There is an error in line 06.

(i) State the error and what the implication is to
the customer.

_____

_____

_____

_____ **[2]**

(ii) State what type of error this is.

_____ **[1]**

(g) The program also contains the function GetAmountWanted. A description of this function is given below.

- It prompts the user to input the amount to withdraw.
- The amount input by the user is checked to make sure that it can be dispensed in £10 notes.
- If this is possible, the function returns the amount input by the user.
- If it is not possible, the user is given the option to input a different amount or cancel. If the user chooses to cancel, the function returns the number -1.

Write an algorithm, in pseudo-code, for this function.

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_____ **[8]**

3 A company organises a mobile phone quiz. Players are sent a multiple-choice question by text message. If they answer correctly the next question is sent. If the answer is wrong, they are eliminated. Players who answer 20 questions correctly win a prize.

(a) 10000 players register and their details are held in an indexed sequential file.

(i) Define what is meant by an indexed sequential file.

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_____ [2]

(ii) Explain why an indexed sequential file is used to store the details of the players.

_____

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_____ [3]

(b) To take part, players must register their 11 digit mobile phone number (with no spaces or other characters).

Explain why the phone number should NOT be stored as an integer.

_____

_____

_____

_____ [2]

(c) As well as the mobile phone number, the file also contains
- the number of the last question answered correctly,
- whether the player has been eliminated.

Design a record format for the file using the table below.   [6]

Field Name	Data Type	Maximum size in bytes
PhoneNumber		
LastCorrectQuestion		
Eliminated		

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(d) Estimate the size in kilobytes of a file of 10000 players.

You must show your working.

_____

_____

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_____

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_____ **[4]**

(e) Before a new round of 20 questions starts, the data in the file needs to be reset.

   (i) Explain why the data in the file needs to be reset.

_____

_____

_____

_____ **[2]**

(ii) Part of the algorithm for the process used to reset the data in the file is given in pseudo-code below.

Complete the blank spaces in the pseudo-code. [2]

```
OPEN PlayerFile

SET CurrentRecord to the first record

REPEAT

   CurrentRecord.LastCorrectQuestion = 0

   _____

   Set CurrentRecord to next record

   UNTIL _____

CLOSE PlayerFile
```
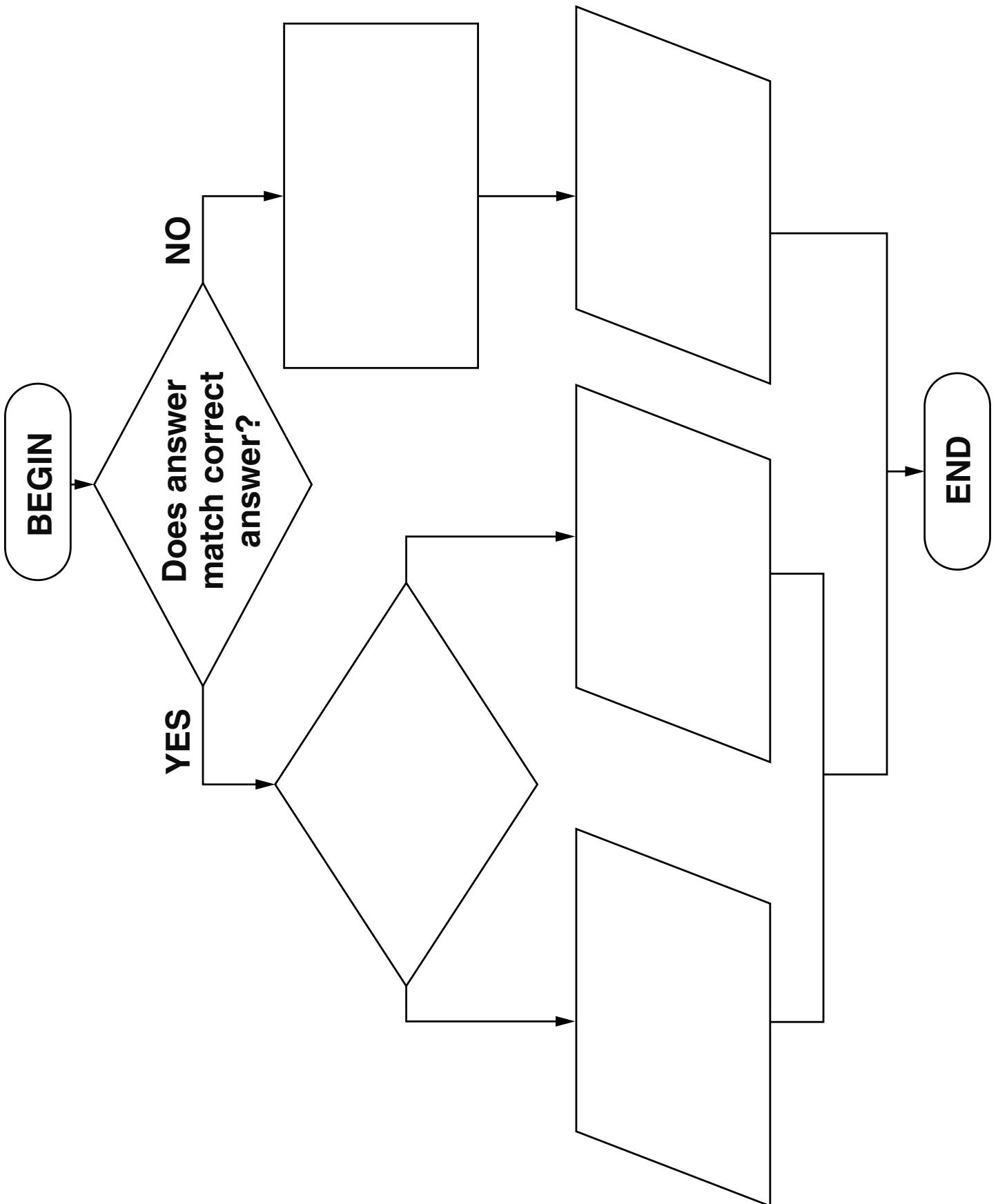
(f) When a player receives a question, they must reply by sending A, B, C or D.

Part of the process for checking the answer is described below.

- The computer checks whether the answer matches the correct answer.
- If the answer is correct it checks whether the player has answered 20 questions.
- If the player has answered 20 questions it replies with the message "You have won a prize"
- If the answer was correct but the player has not answered 20 questions then it replies with the next question.
- If the answer does not match the correct answer it records that the player is eliminated in the player file and replies with the message "Wrong answer. You are Eliminated"

Complete the flow chart on the opposite page to show this part of the process. **[5]**

BEGIN

Does answer match correct answer?

NO

YES

END

4 **A sequence of numbers begins**

  2, 4, 7,...

Here is an algorithm in pseudo-code for a function which returns the nth number of the sequence. For example, SequenceItem(3) returns the 3rd number in the sequence.

```
01  FUNCTION SequenceItem(n:INTEGER) : INTEGER
02     Answer = 1
03     FOR i = 1 TO n
04        Answer = Answer + i
05     NEXT i
06     RETURN Answer
07  END FUNCTION
```

(a) This algorithm uses iteration.

  Describe what is meant by iteration, and show how it has been used in this algorithm.

  _____

  _____

  _____

  _____

  _____

  _____

  _____

  _____ **[4]**

(b) **Using the algorithm complete the trace table to calculate the value of SequenceItem(5). [6]**

n	i	answer

(c) Every algorithm which uses iteration can also be written using recursion.

   (i) Describe what is meant by a recursive algorithm.

   _____

   _____

   _____

   _____ [2]

   (ii) Write a recursive function in a high level language of your choice to find the nth number in the sequence.

   State the name of the language you use. Use good program writing techniques to ensure that your code can be understood by another programmer.

Name of Language _____

Code

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[7]**