

Cambridge International Examinations

Cambridge International AS & A Level	Cambridge International Examinations Cambridge International Advanced Subsidiary and Advanced Level
CANDIDATE NAME	
CENTRE NUMBER	CANDIDATE NUMBER



COMPUTING 9691/23

Paper 2 October/November 2014

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, 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.



www.PapaCambridge.com Rema surveys the students in her class to find out which is the most popular sport. 1

She draws a tally chart:

1	Cricket	\\\\\\
2	Football	\\
3	Tennis	\\\
4	Swimming	\\\\\

Rema plans to collect sport data from students in the whole school. She designs a program to:

- input the number of the sport a student likes best (1, 2, 3 or 4)
- repeatedly ask for input until the input is 0 (zero)
- keep a count of each choice
- on completion of data entry, print out the results as a tally chart (as shown above)

Rema's first attempt is the following pseudocode:

```
Cricket ← 0
Football ← 0
Tennis ← 0
Swimming ← 0
REPEAT
  INPUT Choice
  CASE Choice OF
    1: Cricket ← Cricket + 1
    2: Football ← Football + 1
     3: Tennis ← Tennis + 1
    4: Swimming ← Swimming + 1
  ENDCASE
UNTIL Choice = 0
OUTPUT "Cricket
                 ", Cricket
OUTPUT "Football ", Football
OUTPUT "Tennis ", Tennis
OUTPUT "Swimming ", Swimming
```

Her friend Aisha suggests that the pseudocode could be improved by:

- using a one-dimensional array, Tally, instead of four variables to store the counts
- modularising the design.

The main program should just consist of three procedure calls:

```
InitialiseArrayCounts
InputStudentChoices
OutputTallyChart
```

(a) Write a pseudocode statement to declare the array Tally.

	[0]

www.PapaCambridge.com (b) (i) Write the pseudocode for the procedures InitialiseArrayCounts and InputStudentChoices: PROCEDURE InitialiseArrayCounts ENDPROCEDURE PROCEDURE InputStudentChoices ENDPROCEDURE [4] (ii) State the variable that the array element Tally[2] has replaced.

(c) Rema wants her output to look like this:

```
Cricket \\\\\\
2 Football \\
  Tennis \\\
4 Swimming \\\\\
```

www.PapaCambridge.com She designs two procedures OutputTallyChart and OutputTally.

OutputTallyChart outputs the first two columns of the tally chart and then calls Output Tally to output the correct number of bars (\).

Complete the pseudocode:

```
PROCEDURE OutputTallyChart
 OUTPUT "1 Cricket "
 OutputTally(.....)
 OUTPUT "2 Football
 OutputTally(.....)
 OUTPUT "3
       Tennis "
 OutputTally(.....)
 OUTPUT "4 Swimming "
 OutputTally(.....)
ENDPROCEDURE
PROCEDURE OutputTally (SportCount : INTEGER)
 IF ..... // check there are bars
                        // to output
  THEN
    OUTPUT '\'
    ENDIF
 ENDPROCEDURE
```

[6]

www.PapaCambridge.com (d) Rema wants to test each module before she tests the whole program. The first module she is going to test is the OutputTally procedure using different p values.

Give **three** different types of test data with an example of each.

Justify your choices.

(ii)

Type of test data	Example test data	Justification
		[9]

(e) (i) All programs should be maintainable. Rema has followed good practice in writing her pseudocode. She used some features of maintainable programs.

List three such features.
1
2
3
[3]
Give one further feature that Rema has not used in her solution so far.

Password for this use hindle com

2 Ali sets up user IDs and passwords for his program.

When the user types in their user ID, the program looks up the stored password for this use

The stored password is the encrypted version of the user's password.

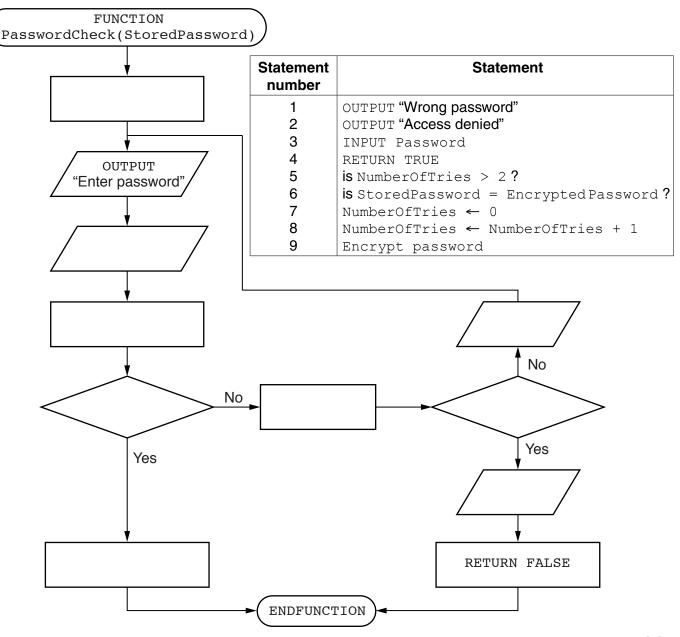
(a) The program calls the function PasswordCheck with the stored password as parameter.

If the user enters the correct password the function returns the value TRUE.

Each time the password is entered incorrectly, the message "Wrong password" is output.

If the user enters an incorrect password 3 times, the user is told that access is denied, and the function returns the value FALSE.

Complete the flowchart using the given statements. Ensure that only statement numbers are present on the flowchart.



(b) Ali uses a sequential file of records to store the user IDs and encrypted passwor

When a user types in their User ID, the program calls a function, FindPassworparameter ThisUserID.

The function searches each record in the file for ThisUserID and returns the encrypted password.

If ThisUserID is not stored in the file, the function returns an error code.

Complete the pseudocode:

FUNCTION Find	Password(ThisUserID	: STRING)	RETURNS		
DECLARE Fou	nd : BOOLEAN				
OPENFILE FO	R INPUT		//	for readin	ıg
Found ← FAI	ISE				
WHILE					
	next record				
IF					
THEN					
• •					
ENDIF					
ENDWHILE					
IF					
THEN					
ELSE		• • • • • • • • •	• • • • • • •	• • • • • • • • •	• • • • • • •
		• • • • • • • • •	• • • • • • • •		• • • • • • •
ENDIF					
CLOSEFILE					
ENDFUNCTION					.
					[8]

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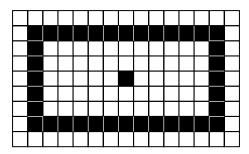
(a)	(i)	runs his own business. He lays floor tiles in rooms for customers. Ahmed want culates how many tiles he needs when he inputs the measurements of the letthe room he is working on. Draw a screen design that is suitable for the following:
		 to enter the length of the room in cm to enter the width of the room in cm to display the number of tiles required.

	(ii)	Explain how Ahmed can enter the data using your screen design in part (i).
		[1]
(b)	The	width of a room will measure at least 100 cm and less than 1000 cm.
	The	program must validate the width input.
		te a logic expression that is TRUE when the width stored in the variable ${\tt RoomWidth}$ is in the expected range.

TilesForWidth \leftarrow RoomWidth DIV 30)
$TilesForLength \leftarrow RoomLength DIV$	30
TilesRequired \leftarrow TilesForWidth *	TilesForLength

	the transfer of the transfer o
	9
	is going to write the program for Ahmed. The size of one floor tile is 30 cm
	is going to write the program for Ahmed. The size of one floor tile is 30 cm ows that the following calculations are required: TilesForWidth ← RoomWidth DIV 30 TilesForLength ← RoomLength DIV 30 TilesRequired ← TilesForWidth * TilesForLength
(i)	If the room width measures 100 cm, give the value stored in TilesForWidth.
	[1]
	he room measurements are not exact multiples of 30 cm, the number of tiles must be inded up so that Ahmed has enough tiles.
Ali	knows that he can use the MOD operator to test for this.
(ii)	Write a logic expression that is ${\tt TRUE}$ when the room width is ${\bm not}$ an exact multiple of 30 cm.
	[1]
(iii)	Ahmed wants the program to add an extra 10% to the number of tiles required in case any tiles get broken during the work.
	In a high-level language, write programming statements to calculate the total number of tiles required, TilesRequired, after the values for RoomLength and RoomWidth have been input and validated.
	Language
	Code
	[6]

www.PapaCambridge.com Ahmed combines white tiles with tiles of one other colour to make a pattern. He dra Here is one example:



Ahmed wants a program to calculate how many tiles he needs of each colour.

- (a) Ali stores the design in a 2-dimensional array, FloorDesign. The length and width of the room will be no more than 35 tiles each.
 - Suggest a value Ali should use to represent the white and coloured tiles. White tile Coloured tile[1] (ii) Initially, every tile should be white. In a high-level language, write statements to declare the array FloorDesign and initialise it. Language

www.PapaCambridge.com **(b)** Ali stores a design of size 15 tiles by 10 tiles in array FloorDesign. Using pseudocode or a flowchart, show the algorithm to calculate the number of who and the number of coloured tiles in the design.

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5 (a) Dry-run the pseudocode algorithm by completing the trace table.

```
PROCEDURE Guess(a)

x ← 8

REPEAT

IF a >= x

THEN

OUTPUT '1'

a ← a - x

ELSE

OUTPUT '0'

ENDIF

x ← x / 2

UNTIL a = 0

ENDPROCEDURE
```

a	x	a >= x
13		
	8	

	OUTPUT[2
(b)	What does the procedure Guess do?
	[1

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