

## **Cambridge International Examinations**

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



**COMPUTER SCIENCE** 

9608/22

Paper 2 Fundamental Problem-solving and Programming Skills

May/June 2015

2 hours

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

## **READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

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

DO **NOT** WRITE IN ANY BARCODES.

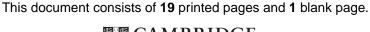
Answer all questions.

No marks will be awarded for using brand names of software packages or hardware.

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.

The maximum number of marks is 75.





Throughout the paper you will be asked to write either <b>pseudocode</b> or <b>program code</b> .
Complete the statement to indicate which high-level programming language you will use.
Programming language

1 A marathon runner records their time for a race in hours, minutes and seconds.

An algorithm is shown below in structured English.

INPUT race time as hours, minutes and seconds
CALCULATE race time in seconds
STORE race time in seconds
OUTPUT race time in seconds

(a) The identifier table needs to show the variables required to write a program for this algorithm.
Complete the table.

Identifier	Data type	Description
RaceHours	INTEGER	The hours part of the race time.

[3]

**(b)** Before the program is written, the design is amended.

The new design includes input of the runner's current personal best marathon time (in seconds).

The output will now also show one of the following messages:

- "Personal best time is unchanged"
- "New personal best time"
- "Equals personal best time"
- (i) Show the additional variable needed for the new design.

Identifier	Data type	Description

[1]

(ii) Write program code for the new design.
Visual Basic and Pascal: You should include the declaration statements for variables.
Python: You should show a comment statement for each variable used with its data type.
Programming language
[7

(c)	The	program code will be tested using white-box testing.
	(i)	Explain what is meant by white-box testing.
		[2]
		•
	(ii)	Complete the table heading.
		Complete Test Number 1.

	Input values				Output	
Test number	Race hours	Race minutes	Race seconds		Total time (seconds)	Message
1	3	4	13	11053	11053	
2				11053		
3				11053		

Add the data for Test Number 2 and Test Number 3.

[6]

- 2 A program displays a menu with choices 1 to 4. The code to display the menu is written as the procedure DisplayMenu.
  - (a) Pseudocode which uses this procedure is:

```
CALL DisplayMenu
       REPEAT
          OUTPUT "Enter choice (1..4)"
          INPUT Choice
       UNTIL Choice >= 1 AND Choice <= 4
   (i) Describe what this pseudocode will do.
       .....[3]
   (ii) State why a loop is required.
(b) The following pseudocode is a revised design.
       CONSTANT i ← 3
       CALL DisplayMenu
       NoOfAttempts \leftarrow 0
       REPEAT
           OUTPUT "Enter choice (1..4)"
           INPUT Choice
           NoOfAttempts ← NoOfAttempts + 1
       UNTIL (Choice >= 1 AND Choice <= 4) OR NoOfAttempts = i
   (i) Give the maximum number of inputs the user could be prompted to make.
                                                                         [1]
   (ii)
       State why this algorithm is an improvement on the one given in part (a).
```

.....[1]

(c) The pseudocode is in its initial stage of development.

The table below shows the action currently taken by the pseudocode following each menu choice.

Menu choice	Description	Program response
1	Read data from the customer file	Calls a procedure ReadFile which for testing purposes outputs the message "Read file code"
2	Add a customer	Outputs message "Add customer code"
3	Search for a customer	Outputs message "Search customer code"
4	Terminates the program	Ends

Complete the pseudocode for the design in **part (b)**, shown again below, to respond to each menu choice.

```
CONSTANT i ← 3

CALL DisplayMenu

NOOfAttempts ← 0

REPEAT

OUTPUT "Enter choice (1..4)"

INPUT Choice

NOOfAttempts ← NoOfAttempts + 1

UNTIL (Choice >= 1 AND Choice <= 4) OR NoOfAttempts = i
```

- (d) The algorithm in part (c) is to be amended. The program will:
  - repeatedly display the menu and respond to the user's choice
  - terminate when the user enters 4

Write **program code** for this final design which will be made up of:

- the main program
- procedure ReadFile
- procedure DisplayMenu

Visual Basic and Pascal: You should include the declaration statements for variables. Python: You should show a comment statement for each variable used with its data type.		
Programming language		

**3** When the guarantee on a computer runs out, the owner can take out insurance to cover breakdown and repairs.

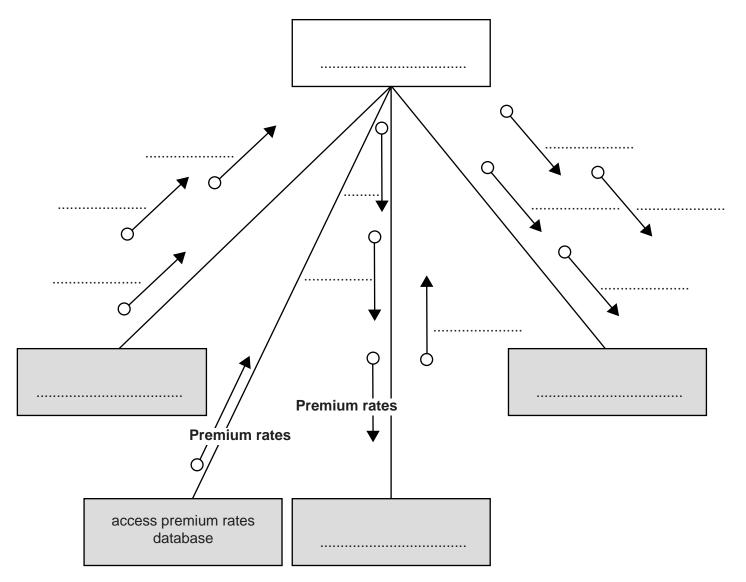
The price of the insurance is calculated from:

- the model of the computer
- the age of the computer
- the current insurance rates

Following an enquiry to the insurance company, the customer receives a quotation letter with the price of the insurance.

A program is to be produced.

The structure chart below shows the modular design for this process:



(a) Using the letters A to D, add the labelling to the chart boxes on the opposite page.

Modules	
А	Send quotation letter
В	Calculate price
С	Produce insurance quotation
D	Input computer details

[2]

(b) Using the letters **E** to **J**, complete the labelling on the chart opposite.

Some of these letters will be used more than once.

Data items		
Е	CustomerName	
F	CustomerEmail	
G	Model	
Н	Age	
I	PolicyCharge	
J	PolicyNumber	

[4]

- **4** A game is played between two players:
  - they take turns at rolling a six-sided die (numbered 1 to 6) and record their throw
  - a player scores 1 point if their throw is higher than their opponent
  - they each roll the die 20 times
  - if the player's throw is the same as their opponent, the total points is unchanged
  - the winner is the player with the larger number of points after 20 throws

The pseudocode will use variable NoOfThrows as shown.

Identifier	Data type	Description
NoOfThrows	INTEGER	Loop control variable

(i) Complete the pseudocode for the given algorithm.

```
INPUT Player1Throw

IF Player1Throw > Player2Throw
THEN

ENDIF
IF Player2Throw > Player1Throw
THEN
Player2Total ← Player2Total + 1
ENDIF

IF Player1Total > Player2Total
THEN
OUTPUT "Player1 is the winner"
ELSE
OUTPUT "Player2 is the winner"
ENDIF

ENDIF

(ii) Identify the game result which will produce incorrect output.
```

Question 5 begins on page 12.

**5** A company creates two new websites, Site X and Site Y, for selling bicycles.

Various programs are to be written to process the sales data.

These programs will use data about daily sales made from Site X (using variable SalesX) and Site Y (using variable SalesY).

Data for the first 28 days is shown below.

	SalesDate	SalesX	SalesY
1	03/06/2015	0	1
2	04/06/2015	1	2
3	05/06/2015	3	8
4	06/06/2015	0	0
5	07/06/2015	4	6
6	08/06/2015	4	4
7	09/06/2015	5	9
8	10/06/2015	11	9
9	11/06/2015	4	1
28	01/07/2015	14	8

(a)	Name the data structure to be used in a program for SalesX.	

**(b)** The programmer writes a program from the following pseudocode design.

(i) Trace the execution of this pseudocode by completing the trace table below.

x	DayNumber	OUTPUT
0		

	[4]
Describe, in detail, what this algorithm does.	
	•••••
	[0]

**(c)** The company wants a program to output the total monthly sales for one of the selected websites.

The programmer codes a function with the following function header:

```
FUNCTION MonthlyWebSiteSales(ThisMonth : INTEGER, ThisSite : CHAR)

RETURNS INTEGER
```

The function returns the total number of bicycles sold for the given month and website.

The function will use the following:

Identifier	Data type	Description
ThisMonth	INTEGER	Represents the month number e.g. 4 represents April
ThisSite	CHAR	Coded as:  X for website X Y for Website Y

- (i) Give the number of parameters of this function. [1]
- (ii) Some of the following function calls may be invalid.

Mark each call with:

- a tick (✓), for a valid call
- a cross (X), for an invalid call

For any function calls which are invalid, explain why.

Function call	Tick (✓) /cross (✗)	Explanation (if invalid)
MonthlyWebSiteSales(1, "Y")		
MonthlyWebSiteSales(11, 'X', 'Y')		
MonthlyWebSiteSales(12, 'X')		

**(d)** The company decides to offer a discount on selected dates. A program is written to indicate the dates on which a discount is offered.

The program creates a text file, DISCOUNT\_DATES (with data as shown), for a number of consecutive dates.

01/07/2015	FALSE
	-
11/06/2015	FALSE
10/06/2015	TRUE
09/06/2015	FALSE
08/06/2015	FALSE
07/06/2015	FALSE
06/06/2015	FALSE
05/06/2015	FALSE
04/06/2015	FALSE
03/06/2015	TRUE

Each date and discount indicator is separated by a single <Space> character.

The discount indicators are:

- FALSE indicates a date on which no discount is offered
- TRUE indicates a date on which a discount is offered

A programming language has the built-in function CONCAT defined as follows:

```
CONCAT(String1: STRING, String2: STRING[, String3: STRING])

RETURNS STRING

For example: CONCAT("San", "Francisco") returns "SanFrancisco"

CONCAT("New", "York", "City") returns "NewYorkCity"
```

The use of the square brackets indicates that the parameter is optional.

The following incomplete pseudocode creates the text file DISCOUNT\_DATES.

Complete the pseudocode.

CLOSEFILE	[4
OUTPUT "File now created"	
INPUT NextDate	
WRITEFILE "DISCOUNT_DATES", NextLine	
= CONCAT(NextDate, " ", Discount)	
INPUT Discount	
WHILE NextDate <>"XXX"	
INPUT	
OPENFILE "DISCOUNT_DATES" FOR	•••••

Question 5(e) continues on page 18.

(e) The DISCOUNT\_DATES text file is successfully created.

The company now wants a program to:

- key in a date entered by the user
- search the text file for this date
- if found, output one of the following messages:
  - o "No discount on this date"
  - o "This is a discount date"
- if not found, output "Date not found"
- (i) Add to the identifier table to show the variables you need for this new program.

Identifier	Data type	Description
DISCOUNT_DATES	FILE	Text file to be used

[3]

(ii)	Write	the	program	code
111	, ,,,,,,,	เมเษ	program	COUC

Do not include any declaration or comment statements for the variables used.
Programming language
[7]

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