Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number	Candidate Number

Time 2 hours

Paper reference **1CP1/02**

Computer Science

PAPER 2: Application of Computational Thinking

You must have:
Pseudocode command set (enclosed)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Use of a calculator is **prohibited**.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- Good luck with your examination.

Turn over ▶

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Pearson

Answer ALL questions. Write your answers in the spaces provided.

Questions in this paper are based on a scenario.

Crawdale Leisure Centre

Crawdale Leisure Centre provides modern sports facilities including an indoor swimming pool, fitness suite, badminton hall and squash courts.

Crawdale Leisure Centre offers five membership schemes: full, junior (under 16), swim only, junior swim only and fitness only.

1 A computer program is used to check and record membership applications. The first name, last name and telephone number of people applying for membership are stored as variables.

(a) State **two** other items that need to be stored as variables.

(2)

1 .....

.....

2 .....

.....

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(b) Full members enjoy free off-peak racket sports and get a 50% discount when booking badminton and squash courts for peak times. A computer program is used to manage the bookings.

Complete the table to show an input, a process and an output.

Input	Process	Output
	Match membership number with membership type	Membership type
Booking date and time required		Available – proceed with booking Not available – return to input
Peak time Yes/no	If yes apply discount to cost of booking	

(3)

(c) The basic cost of a full membership is £432.00 for a 12-month contract. Most members choose to pay this in monthly instalments.

The basic cost of a full membership is adjusted by applying a 5% discount for each consecutive year of membership.

Construct a general expression to calculate the monthly cost of a full membership.

(2)

.....

.....

.....

.....

(Total for Question 1 = 7 marks)

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2 The leisure centre uses an algorithm, based on demand in previous years, to determine peak and off peak times.

Here is the pseudocode for this algorithm.

The values for *month* are 1 = January, 2 = February, … 12 = December

The values for *day* are 1 = Monday, 2 = Tuesday … 7 = Sunday

```
 2  #Peak hours calculator
 3
 4  IF (month = 7) OR (month = 8) THEN
 5      SEND ("Peak rates apply") TO DISPLAY
 6  ELSE
 7      IF ((month > 2) AND (month < 5)) OR ((month > 8) AND (month < 11)) THEN
 8          IF day > 5 THEN
 9              SEND ("Peak weekend rates apply") TO DISPLAY
10          ELSE
11              IF (TIME >= 17:00) AND (TIME <= 20:00) THEN
12                  SEND ("Peak evening rates apply") TO DISPLAY
13              ELSE
14                  SEND ("Off peak rates apply") TO DISPLAY
15              END IF
16          END IF
17      ELSE
18          SEND ("Standard rates apply")
19      END IF
20  END IF
```

(a) State the name of the programming construct used in line 7 of the algorithm.

(1)

.....

.....

(b) Complete the table to show the output of the algorithm for the given inputs.

(3)

Inputs	Output
(month = 7)	
(month = 12) AND (time = 19:00)	
(month = 4) AND (day =6)	

(c) The algorithm needs to be tested.

Construct suitable test data to produce an output stating 'Off peak rates apply'.

(3)

.....

.....

.....

.....

(Total for Question 2 = 7 marks)

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3 The leisure centre runs fitness classes.

(a) This is an algorithm used by instructors to check the Body Mass Index (BMI) of people attending their classes.

```
 2  #BMI Check
 3
 4  [          ] bmiCalc ( [                    ] )
 5
 6
 7  BEGIN FUNCTION
 8
 9      SET calc TO (pMass / (pHeight * pHeight))
10      RETURN calc
11
12  END FUNCTION
13
14
15  # Main program
16
17  RECEIVE mass FROM (REAL) KEYBOARD
18  RECEIVE height FROM (REAL) KEYBOARD
19
20
21
22  SET bmi TO bmiCalc ( [                    ] )
23
24  SEND "BMI:" & bmi & "kg/m2" TO DISPLAY
25
26  IF (bmi >=20) AND (bmi <= 25) THEN
27      SEND "Very good" TO DISPLAY
28  ELSE
29      SEND "Needs attention" TO DISPLAY
30  END IF
```

Lines 4 and 22 of the algorithm are incomplete.

Complete the algorithm by filling in the boxes.

(6)

(b) This is an algorithm that processes details of attendance at the fitness classes stored in an array.

```
#Fitness classes
SET count TO 0
SET T TO 0
SET M TO 0

FOR EACH num FROM arrayAttendance DO
    SET count TO count + 1
    SET T TO T + num
    SEND T TO DISPLAY
END FOREACH

SET M TO T DIV count
SEND M TO DISPLAY
```

(i) State the process being carried out at line 7 of the algorithm.

(1)

.....

.....

(ii) The values in the attendance array are 25, 15, 25, 20, 15

Complete the trace table showing the execution of the algorithm with these five values. You may not need to fill in all the rows in the table.

(6)

count	T	M	DISPLAY

(Total for Question 3 = 13 marks)

4 The leisure centre stores information about the fitness classes. Each class is supervised by a qualified instructor.

(a) The information about instructors must be stored using data types that are the most suitable for the data elements.

Complete the table to identify the missing data types.

(4)

Data element	Example	Data type
ID Reference	26_SMJ_C_3	String
Surname	SMITH	String
Initial	J	
Telephone	08756 554221	
Qualification type	H & F Certificate	
Qualification level	3	
Hourly rate (£)	55.00	

(b) The information about instructors is validated.

(i) Explain the need for validating input data.

(2)

(ii) Describe **two** methods of validating data.

(4)

(Total for Question 4 = 10 marks)

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5 The leisure centre organises a squash competition. Players are ranked in descending order of the points they have scored in matches.

The rankings are set after each match.

The pseudocode for part of the program used to manage the squash competition is shown.

```
 2  #arrayToSort has the format [membershipID, name, points]
 3
 4  PROCEDURE sort()
 5  BEGIN PROCEDURE
 6      SET temp TO[]
 7      FOR player FROM 0 TO LENGTH(arrayToSort) - 1 DO
 8          FOR index FROM 0 TO LENGTH(arrayToSort) - 1 DO
 9              IF arrayToSort[index,2] > arrayToSort[index + 1,2] THEN
10                  SET temp TO arrayToSort[index]
11                  SET arrayToSort[index] TO arrayToSort[index + 1]
12                  SET arrayToSort[index + 1] TO temp
13              END IF
14          END FOR
15      END FOR
16  END PROCEDURE
17
```

(a) (i) The algorithm includes an error on line 9.

Name this type of error.

(1)

.....

.....

(ii) Give a new line of code that will correct the error.

(1)

.....

.....

(b) State the type of data structure referred to in the algorithm.

(1)

.....

.....

(c) (i) Describe how the algorithm could be refined to make it more efficient.

(4)

(ii) State **two** changes that could be made to the algorithm to improve the readability of the pseudocode.

(2)

1 .....

.....

2 .....

.....

(Total for Question 5 = 9 marks)

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6 The leisure centre uses a control system to regulate the water temperature in the pool and the air temperature and humidity in the pool hall.

These are the acceptable conditions for swimming competitions.

- water temperature (wTemp) 28°C maximum and 25°C minimum
- air temperature (aTemp) wTemp + 2°C
- humidity 70% maximum

Air temperature and humidity in the pool hall can be reduced by switching on the air conditioning (AC).

(a) Write an algorithm in pseudocode, using variables wTemp, aTemp and humidity, for achieving acceptable conditions in the **pool hall** for a competition.

(4)

(b) The pool water temperature is adjusted using a pool heater.

Construct a Boolean logic expression using wTemp, aTemp and humidity, where TRUE = within acceptable range.

The expression should set the pool heater to off and the air conditioner to on.

(3)

(Total for Question 6 = 7 marks)

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7 The leisure centre organises a swimming gala. A computer control system is used to manage the swimming races.

The control system consists of a central computer linked to these peripherals:

- starting blocks with pressure sensors
- starter with horn and strobe lights
- false start re-call with horn and strobe lights
- wall mounted touch pads
- automatic timer.

The length of the swimming pool is 25 m.

Create an algorithm for the control of a 50 m race using the peripherals listed.
Use a written description for the algorithm.

(6)

(Total for Question 7 = 6 marks)

8 A swimming event at the gala consists of 3 heats, each with 6 swimmers.
Heat winners and the 3 fastest losers from the heats qualify for the final.

Heat_File is used to record the results of the heats. For each swimmer, the file stores:

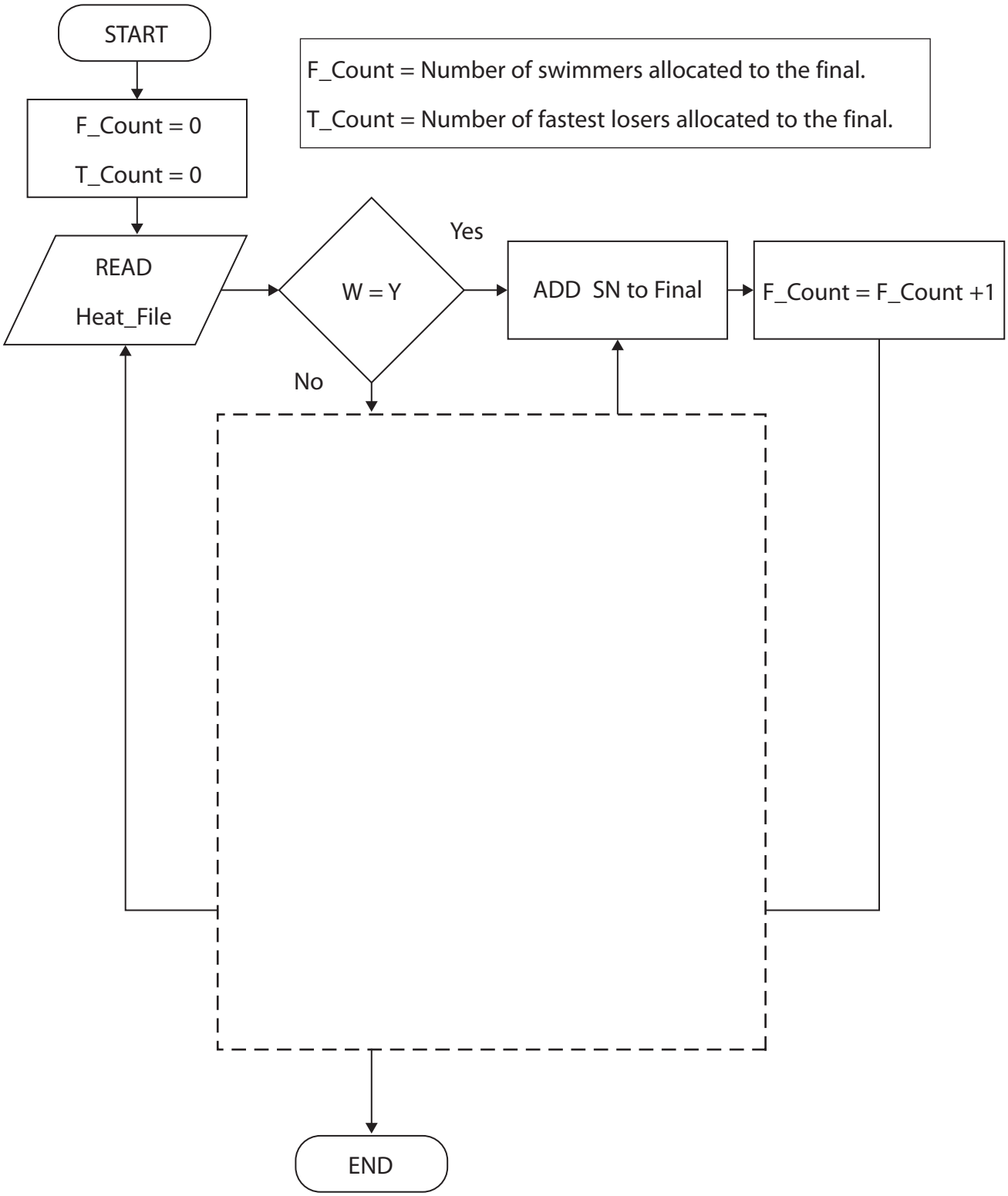
- swimmer number SN (1 – 18)
- heat winner W (Y/N)
- heat time T

The file is sorted by heat time T in ascending order.

(a) Complete the flowchart to illustrate the process of selecting the swimmers for the final.

(6)

This shape is used to represent input and output.



(b) Crawdale Leisure Centre offers five membership schemes.

The swimming gala is open to 'full' members and 'swim only' members. Each event has a limit of 18 entries.

Draw a flowchart to represent the process of checking entries for an event. The flowchart should include an output to indicate if a member is not eligible to enter the event.

Use this shape to represent input and output.

You may not need to use all of the answer space. Put a line through any work you do not want to be marked.

(6)

(Total for Question 8 = 12 marks)

9 The diving competitions at the gala will be scored by five judges. Each judge awards each dive a score between 0.0 and 10.0. The highest and lowest of the judges' scores are discounted.

The final score for a dive is calculated by multiplying the total of the three remaining judges' scores by a degree of difficulty factor.

Construct an algorithm to calculate the score for one dive.

- Use pseudocode or a programming language with which you are familiar.
- Assume inFactor holds the degree of difficulty factor for the dive.

You may not need to use all of the answer space. Put a line through any work you do not want to be marked.

(9)

ARRAY scores

SET scores TO [8.9, 9.1, 8.2, 7.8, 8.1]

REAL inFactor

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(Total for Question 9 = 9 marks)

TOTAL FOR PAPER = 80 MARKS

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Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Paper reference **1CP1/02**

Computer Science

Component 2
Pseudocode command set

Resource Booklet

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Turn over ▶

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Pseudocode command set

Questions in the written examination that involve code will use this pseudocode for clarity and consistency. However, students may answer questions using any valid method.

Data types

INTEGER

REAL

BOOLEAN

CHARACTER

Type coercion

Type coercion is automatic if indicated by context. For example 3 + 8.25 = 11.25 (integer + real = real)

Mixed mode arithmetic is coerced like this:

	INTEGER	REAL
INTEGER	INTEGER	REAL
REAL	REAL	REAL

Coercion can be made explicit. For example, RECEIVE age FROM (INTEGER) KEYBOARD assumes that the input from the keyboard is interpreted as an INTEGER, not a STRING.

Constants

The value of constants can only ever be set once. They are identified by the keyword CONST. Two examples of using a constant are shown.

CONST REAL PI

SET PI TO 3.14159

SET circumference TO radius * PI * 2

Data structures

ARRAY

STRING

Indices start at zero (0) for all data structures.

All data structures have an append operator, indicated by &.

Using & with a STRING and a non-STRING will coerce to STRING. For example, SEND 'Fred' & age TO DISPLAY, will display a single STRING of 'Fred18'.

Identifiers

Identifiers are sequences of letters, digits and '_', starting with a letter, for example:
MyValue, myValue, My_Value, Counter2

Functions

LENGTH()

For data structures consisting of an array or string.

RANDOM(n)

This generates a random number from 0 to n.

Comments

Comments are indicated by the # symbol, followed by any text.

A comment can be on a line by itself or at the end of a line.

Devices

Use of KEYBOARD and DISPLAY are suitable for input and output.

Additional devices may be required, but their function will be obvious from the context.
For example, CARD_READER and MOTOR are two such devices.

Notes

In the pseudocode on the following pages, the < > indicates where expressions or values need to be supplied. The < > symbols are not part of the pseudocode.

Variables and arrays		
Syntax	**Explanation of syntax**	**Example**
SET Variable TO <value>	Assigns a value to a variable.	SET Counter TO 0 SET MyString TO 'Hello world'
SET Variable TO <expression>	Computes the value of an expression and assigns to a variable.	SET Sum TO Score + 10 SET Size to LENGTH(Word)
SET Array[index] TO <value>	Assigns a value to an element of a one-dimensional array.	SET ArrayClass[1] TO 'Ann' SET ArrayMarks[3]TO 56
SET Array TO [<value>, …]	Initialises a one-dimensional array with a set of values.	SET ArrayValues TO [1, 2, 3, 4, 5]
SET Array [RowIndex, ColumnIndex] TO <value>	Assigns a value to an element of a two-dimensional array.	SET ArrayClassMarks[2,4] TO 92

Selection		
Syntax	**Explanation of syntax**	**Example**

IF <expression> THEN
  <command>
END IF
	If <expression> is true then command is executed.	IF Answer = 10 THEN
		  SET Score TO Score + 1
		END IF

IF <expression> THEN
  <command>
ELSE
  <command>
END IF
	If <expression> is true then first <command> is executed, otherwise second <command> is executed.	IF Answer = 'correct' THEN
		  SEND 'Well done' TO DISPLAY
		ELSE
		  SEND 'Try again' TO DISPLAY
		END IF

Repetition		
Syntax	**Explanation of syntax**	**Example**

WHILE <condition> DO
  <command>
END WHILE
	Pre-conditioned loop. Executes <command> whilst <condition> is true.	WHILE Flag = 0 DO
		  SEND 'All well' TO DISPLAY
		END WHILE

REPEAT <command> UNTIL <expression>	Post-conditioned loop. Executes <command> until <condition> is true. The loop must execute at least once.	REPEAT SET Go TO Go + 1 UNTIL Go = 10
REPEAT <expression> TIMES <command> END REPEAT	Count controlled loop. The number of times <command> is executed is determined by the expression.	REPEAT 100-Number TIMES SEND '*' TO DISPLAY END REPEAT

FOR <id> FROM <expression> TO
<expression> DO
  <command>
END FOR
	Count controlled loop. Executes <command> a fixed number of times.	FOR Index FROM 1 TO 10 DO
		  SEND ArrayNumbers[Index] TO DISPLAY
		END FOR

FOR <id> FROM <expression> TO
<expression> STEP <expression> DO
  <command>
END FOR
	Count controlled loop using a step.	FOR Index FROM 1 TO 500 STEP 25 DO
		  SEND Index TO DISPLAY
		END FOR

FOR EACH <id> FROM <expression> DO <command> END FOREACH	Count controlled loop. Executes for each element of an array.	SET WordsArray TO ['The', 'Sky', 'is', 'grey'] SET Sentence to '' FOR EACH Word FROM WordsUArray DO SET Sentence TO Sentence & Word & ' ' END FOREACH

Input/output		
Syntax	**Explanation of syntax**	**Example**
SEND <expression> TO DISPLAY	Sends output to the screen.	SEND 'Have a good day.' TO DISPLAY
RECEIVE <identifier> FROM (type) <device>	Reads input of specified type.	RECEIVE Name FROM (STRING) KEYBOARD RECEIVE LengthOfJourney FROM (INTEGER) CARD_READER RECEIVE YesNo FROM (CHARACTER) CARD_READER

File handling		
Syntax	**Explanation of syntax**	**Example**
READ <File> <record>	Reads in a record from a <file> and assigns to a <variable>. Each READ statement reads a record from the file.	READ MyFile.doc Record
WRITE <File> <record>	Writes a record to a file. Each WRITE statement writes a record to the file.	WRITE MyFile.doc Answer1, Answer2, 'xyz 01'

Subprograms		
Syntax	**Explanation of syntax**	**Example**
PROCEDURE <id> (<parameter>, …) BEGIN PROCEDURE <command> END PROCEDURE	Defines a procedure.	PROCEDURE CalculateAverage (Mark1, Mark2, Mark3) BEGIN PROCEDURE SET Avg to (Mark1 + Mark2 + Mark3)/3 END PROCEDURE

FUNCTION <id> (<parameter>, …)
BEGIN FUNCTION
  <command>
RETURN <expression>
END FUNCTION
	Defines a function.	FUNCTION AddMarks (Mark1, Mark2, Mark3)
		BEGIN FUNCTION
		  SET Total to (Mark1 + Mark2 + Mark3)/3
		  RETURN Total
		END FUNCTION

<id> (<parameter>, …)	Calls a procedure or a function.	Add (FirstMark, SecondMark)

Arithmetic operators	
Symbol	**Description**
+	Add
-	Subtract
/	Divide
*	Multiply
^	Exponent
MOD	Modulo
DIV	Integer division

Relational operators	
Symbol	**Description**
=	equal to
<>	not equal to
>	greater than
>=	greater than or equal to
<	less than
<=	less than or equal to

Logical operators	
Symbol	**Description**
AND	Returns true if both conditions are true.
OR	Returns true if any of the conditions are true.
NOT	Reverses the outcome of the expression; true becomes false, false becomes true.

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