Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Thursday 23 May 2024

Afternoon (Time: 2 hours)

Paper reference **4CP0/01**

Computer Science

PAPER 1: Principles of Computer Science

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.*

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.*
- You are not allowed to use a calculator.

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.
- Marks will not be awarded for using product or trade names in answers without further explanation.

Turn over ▶

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P 7 5 7 3 6 A 0 1 2 8

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

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 There are different ways to connect computers in a network.

(a) Give **two** differences between a WAN and a LAN.

(2)

1 .....

.....

2 .....

.....

(b) Give **one** security risk of connecting computers in a network.

(1)

.....

(c) **Figure 1** shows a network topology.

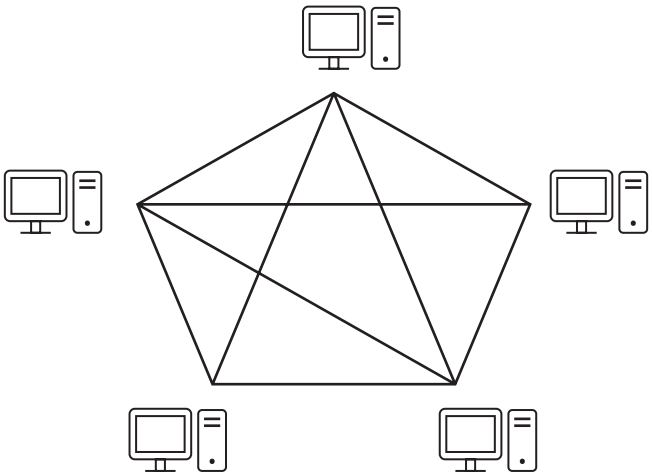

Figure 1

(i) State the name of this network topology.

(1)

.....

(ii) State **one** drawback of using this network topology.

(1)

.....

(iii) A fault tolerant network delivers a reliable service.

Explain **one** reason why this topology is fault tolerant.

(2)

.....

.....

.....

.....

(d) Identify which layer of the 4-layer TCP/IP model is responsible for transferring packets across a network.

(1)

- ☒ **A** Application layer
- ☒ **B** Transport layer
- ☒ **C** Network layer
- ☒ **D** Data link layer

(e) Here is the address for a web page.

https://www.pearson.com/computing/specification.html

(i) State the protocol being used.

(1)

.....

(ii) Give the name of the document being retrieved.

(1)

.....

(Total for Question 1 = 10 marks)

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2 Computer systems use hardware and software.

(a) Two types of software are application software and system software.

(i) State the purpose of application software.

(1)

.....

.....

(ii) One function of an operating system is to provide a user interface.

State **three** other functions of an operating system.

(3)

1 .....

.....

2 .....

.....

3 .....

.....

(b) Computers use different types of storage.

(i) Explain **one** reason why computers need both RAM and ROM.

(2)

(ii) Describe how data is read from a magnetic hard drive.

(3)

(c) Computers perform the fetch-decode-execute cycle.

Complete the table by writing the numbers 1 to 4 in the sequence number column to put each stage in the correct order.

Stage	Sequence number
The instruction is placed onto the data bus	
The Arithmetic and Logic Unit (ALU) performs a calculation	
The address of the next instruction is placed onto the address bus	
The instruction is decoded by the control unit	

(4)

(d) Identify which **one** of these buses is unidirectional.

(1)

- ☒ **A** Address bus
- ☒ **B** Control bus
- ☒ **C** System bus
- ☒ **D** Data bus

(Total for Question 2 = 14 marks)

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3 Computers use binary to represent and store data.

(a) Two images are stored.

- Image 1 has a colour depth of 8 bits.
- Image 2 has a colour depth of 16 bits.

(i) State the number of colours that can be represented in Image 1.

(1)

.....

(ii) Image 2 is 1920 pixels wide by 1080 pixels high.

Construct an expression to show the file size of the image in mebibytes.

You do **not** need to do the calculation.

(3)

(iii) One pixel in Image 1 is represented by the unsigned binary integer

1100 1010

Identify the denary equivalent.

(1)

☒ **A** 54

☒ **B** 191

☒ **C** 202

☒ **D** –74

(b) A register holds the value 1100 0001 as an 8-bit binary value in two's complement.

(i) Convert the two's complement binary integer 1100 0001 to denary.

(2)

(ii) Give the result of applying an arithmetic shift left by one to the binary pattern 1100 0001

(1)

(iii) The value 1111 1111 is added to the value 1100 0001 stored in the register.

An error occurs.

Explain this error.

(2)

(c) The ASCII code for the character **1** is 011 0001

(i) Give the ASCII code for the character **5**

(1)

.....

(ii) Give **two** benefits of using ASCII to encode characters.

(2)

1 .....

.....

2 .....

.....

(Total for Question 3 = 13 marks)

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4 Peter and Marie are employees at a research facility.

(a) Peter is creating a predator-prey population simulation of rabbits and foxes.

He creates rules to simulate the movement and feeding patterns for each animal over time.

One benefit of the predator-prey simulation is that it is simpler than monitoring real life animal populations.

Explain **one other** benefit of using this simulation.

(2)

(b) Identify the computational model in which several computer systems work together to achieve a goal.

(1)

☒ **A** Sequential model

☒ **B** Parallel model

☒ **C** Multi-agent model

☒ **D** Input-process-output model

(c) Employees at the research facility use a biometric identifier to login to the network.

Describe **one other** security measure that could be used to ensure that an employee is who they claim to be.

(2)

(d) Marie is a researcher in nanotechnology.

(i) State what is meant by the term **nanotechnology**.

(1)

(ii) Give **one** application of nanotechnology.

(1)

(e) Marie has a mobile phone.

The address of the device is:

2024:0eb8:3c4d:0015:0000:0000:1a2f:1a2b

Describe the relationship between the structure of this address and the total number of bits required to store it.

(3)

(f) The research facility is considering introducing cameras and facial recognition software to monitor the work and movement of people on and around its site.

Discuss the privacy issues that need to be considered when deciding whether or not to install this new system.

(6)

(Total for Question 4 = 16 marks)

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5 A team is developing a computer game.

(a) Complete the table by adding a tick (✓) to show the characteristics of program language translators.

You may select more than one translator per characteristic.

(3)

	Translator		
Characteristic	**Assembler**	**Interpreter**	**Compiler**
Does **not** have to be present in memory to execute the translated code.			
Translates high level language source code.			
Executes high level code until either the program has finished, or a syntax error is encountered.			
Translates low level language source code into machine code.			

(b) Luca is testing the computer game.

The computer that he is using is an older model with a processor that runs at a low clock speed.

Explain **one** drawback of testing the game using this computer.

(2)

.....

.....

.....

.....

(c) Anna uses utility software.

Complete the table by adding the type of utility software she should use to solve each issue.

Issue	Utility software
Her word processor cannot read all of a file because it is corrupt.	
She has a JPEG image and needs to send it to a publisher who can only read PNG image files.	
There has been a flood and files on a server have been damaged, but Anna needs to access her data.	
Her hard drive is running very slowly when she tries to access a file.	

(4)

(d) Tarik is writing an instruction manual for the computer game.

He decides to use software to compress the instruction manual before emailing it to a proofreader for checking.

State and justify the most appropriate compression method.

(3)

Method

.....

Justification

.....

.....

.....

.....

(e) Members of the team developing the game are either coders or designers.

Coders (C) write the application code.

Designers (D) design the graphics for the game and write instruction manuals.

Team members have one role only.

Construct a logic statement, using AND, OR and NOT with the letters C and D, to show the conditions for being a member of the team.

(3)

(Total for Question 5 = 15 marks)

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6 Pseudocode and flowcharts are used to create algorithms.

(a) The number of minutes a train is early or late are recorded each day for a week.

- A value of 0 is recorded if the train is on time.
- A negative value is recorded if the train is early.
- A positive value is recorded if the train is late.

The algorithm in **Figure 2** has been created to calculate and output the total number of trains that were early, on time or late.

```
01
02  SET arrival TO [-2, 1, 5, 0, -3, 4, 1]
03
04  SET early TO 0
05  SET late TO 0
06  SET index TO 0
07
08  WHILE NOT (index > LENGTH(arrival)) DO
09
10     IF arrival[index] >= 0 THEN
11        SET late TO arrival[index]
12     ELSE
13        IF arrival[index] < 0 THEN
14           SET early TO early + 1
15        END IF
16     END IF
17
18     SET index TO index + 1
19
20  END WHILE
21
22  SEND "Trains early:   " & early TO DISPLAY
23  SEND "Trains on time: " & (late + early) TO DISPLAY
24  SEND "Trains late:    " & late TO DISPLAY
25
```

Figure 2

Identify the type of iteration construct used in **Figure 2**.

(1)

- ☒ **A** Post-conditioned loop
- ☒ **B** Count controlled loop
- ☒ **C** Array loop
- ☒ **D** Pre-conditioned loop

(b) There are **four** errors in the pseudocode in **Figure 2**.

Write the correct code for lines 08, 10, 11 and 23

(i) Line 08

(1)

(ii) Line 10

(1)

(iii) Line 11

(1)

(iv) Line 23

(1)

(c) Give **one** reason for the variable `index` being incremented in line 18.

(1)

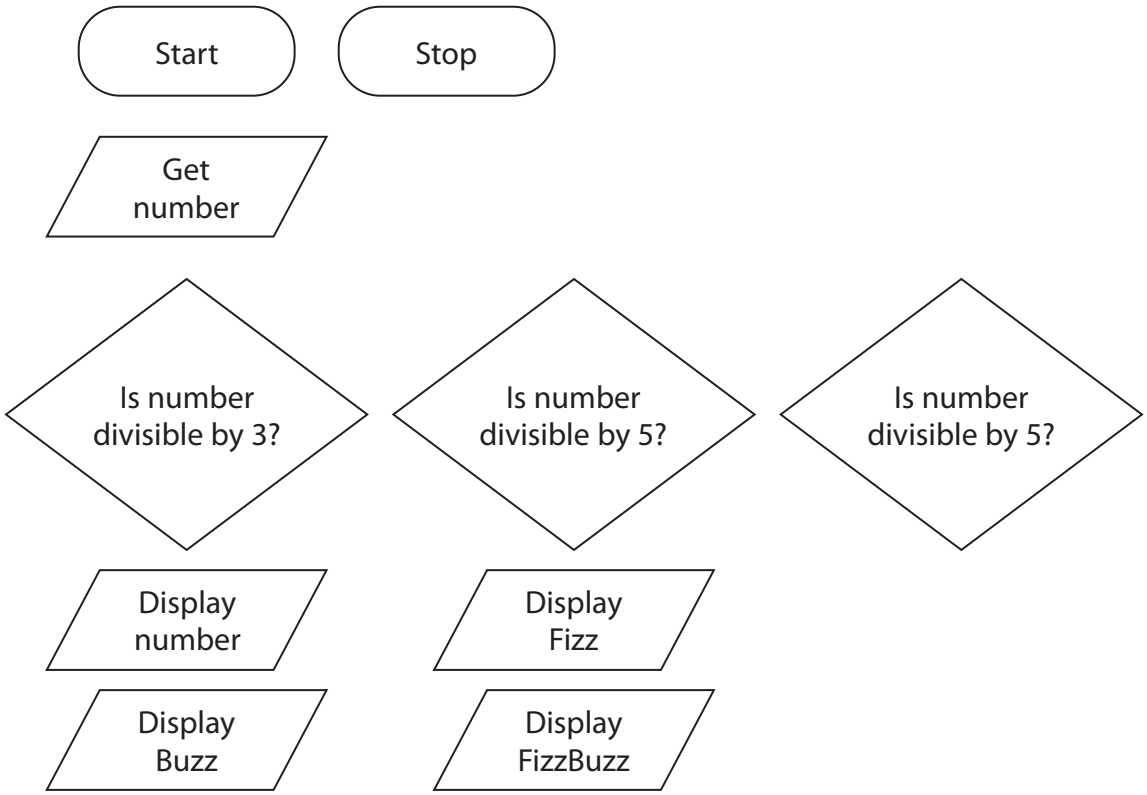
(d) In the game FizzBuzz a user enters a number.

These conditions apply:

- if the number is divisible by 3 the program displays Fizz
- if the number is divisible by 5 the program displays Buzz
- if the number is divisible by both 3 and 5 the program displays FizzBuzz
- if the number is not divisible by either 3 or 5, the program displays the number entered.

Hint: If one number is divisible by another number there is no remainder.

These are the components needed for the flowchart.



Draw the flowchart for the algorithm used in the game in the box on the next page.

Use each component once.

Do not add any additional components.

Use as many arrows and yes/no labels as you need.

(6)

Draw your flowchart here.

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 80 MARKS

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Pearson Edexcel International GCSE (9–1)

Thursday 23 May 2024

Paper reference **4CP0/01**

Computer Science

Component 1
Pseudocode command set

Resource Booklet
Do not return this Booklet with the question paper.

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 following pseudocode, 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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