

## **Cambridge O Level**

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

COMPUTER SCIENCE

Paper 2 Algorithms, Programming and Logic

For examination from 2023

SPECIMEN PAPER

1 hour 45 minutes

2210/02

You must answer on the question paper.

No additional materials are needed.

#### **INSTRUCTIONS**

- Answer all questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do not use an erasable pen or correction fluid.
- Do not write on any bar codes.
- Calculators must not be used in this paper.

#### **INFORMATION**

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].
- No marks will be awarded for using brand names of software packages or hardware.

This document has 16 pages. Any blank pages are indicated.

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- 1 Four pseudocode descriptions and five pseudocode statements are shown.
  - (a) Draw a line to link each pseudocode description to the most appropriate pseudocode statement.

Some pseudocode statements will **not** be used.

# **Pseudocode description** Pseudocode statement FOR...TO...NEXT a loop that will always iterate at least once IF...THEN...ELSE...ENDIF a conditional statement to deal with many possible outcomes WHILE...DO...ENDWHILE a loop that will always iterate a set number of times CASE...OF...OTHERWISE...ENDCASE a conditional statement with different outcomes for true and false REPEAT...UNTIL [4] (b) Using a single loop, write an algorithm in pseudocode to output 50 names that have been stored in the array, Name []

2	Describe the purpose of validation and verification checks during data entry.	
	Include an example for each.	
	Validation check	
		•
	Verification check	•
	[4	

			•	
3	Tick (✓)	one box to s	show the named section of a program that performs a specific task.	
	Α	file		
	В	function		
	С	parameter		
	D	process		[1]
4	A satelli	te navigation	system is an example of a computer system that is made up of sub-system	S.
	• allo	ws the user t	rigation system: to enter details for a new destination or select a previously saved destination ns in the form of a visual map or as a list.	n
	Draw a	structure diaç	gram for this part of the satellite navigation system.	
				4]

An algorithm has been written in pseudocode to input some numbers. It only outputs any numbers that are greater than or equal to 100. The number 999 is not output and stops the algorithm.

WHI	UT Number  LE Numbers <> 999 DO  IF Number > 100  THEN  OUTPUT Number  ENDIF WHILE PUT Number
(a)	Identify the <b>four</b> errors in the pseudocode and suggest corrections.
	Error 1
	Correction
	Error 2
	Correction
	Error 3
	Correction
	Error 4
	Correction
	[4]
(b)	Write a pseudocode statement to change the corrected algorithm to output all numbers between 100 and 200 inclusive.
	You do <b>not</b> need to rewrite the whole algorithm

6 Consider this logic expression.

$$\mathbf{X} = (\mathbf{A} \text{ AND } \mathbf{B}) \text{ OR } (\mathbf{B} \text{ AND NOT } \mathbf{C})$$

(a) Draw a logic circuit for this logic expression.

Each logic gate must have a maximum of **two** inputs.

Do **not** simplify this logic expression.



**(b)** Complete the truth table from the given logic expression.

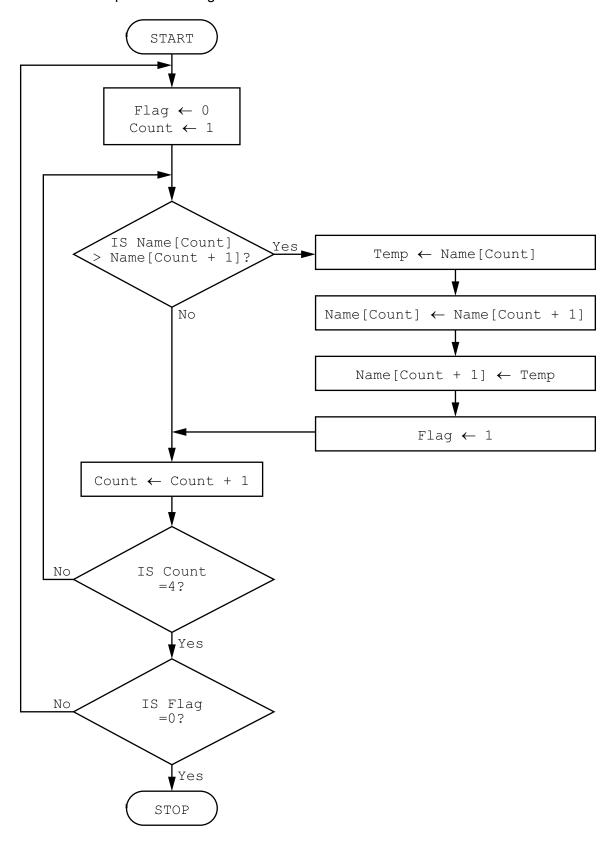
Α	В	С	Working space	х
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

[4]

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7 This flowchart represents an algorithm.



(a) The array Name[1:4] used in the flowchart contains the following data:

Name[1]	Name[2]	Name[3]	Name[4]
Jamal	Amir	Eve	Tara

Complete the trace table using the data given in the array.

Flag	Count	Name[1]	Name[2]	Name[3]	Name[4]	Temp
		Jamal	Amir	Eve	Tara	
		]				

(b)	Describe what the algorithm represented by the flowchart is doing.	

[5]

8	A progra	ammer has w	ritten an a	lgorithm to d	check that price	es are less than \$10	.00
	These v	alues are use	ed as test	data:			
			10	0.00	9.99	ten	
	State wh	ny each value	e was chos	sen as test o	data.		
	10.00						
	9.99						
							[3]
9	Explain	why a progra	m might n	eed to store	e data in a file.		
	•••••						
	•••••						
							[3]
10	A function	on is declared	d using pso	eudocode.			
		NCTION Cor RETURN Ind DFUNCTION			: REAL) RET	URNS REAL	
	Tick (✓)	one box whi	ch accura	tely describe	es the use of th	ne variable Inches	
	Α	answer					
	В	call					
	С	parameter					
	D	response					

**11** A database table, 2018MOV, is used to keep a record of movie details.

CatNo	Title	Genre1	Genre2	Blu-ray	DVD	Streaming
18m01	Power Rangers	Adventure	Fantasy	Yes	No	Yes
18m02	Baywatch	Comedy	Drama	Yes	No	Yes
18m03	Table 19	Comedy	Drama	Yes	Yes	No
18m04	Wonder Woman	Action	Fantasy	Yes	No	Yes
18m05	Justice League	Action	Fantasy	Yes	Yes	Yes
18m06	Twilight	Thriller	Action	Yes	Yes	No
18m07	Ant Man	Action	Fantasy	No	Yes	No
18m08	Venice Beach	Action	History	No	Yes	No
18m12	Fast Five	Action	Thriller	No	Yes	No
18m15	King Kong	Adventure	Fantasy	No	Yes	No
18m16	Transformers: The Last Knight	Action	Sci-Fi	Yes	Yes	Yes
18m17	The Dark Tower	Fantasy	Sci-Fi	Yes	Yes	No
18m19	Beauty and the Beast	Fantasy	Romance	Yes	Yes	Yes
18m21	The Mummy	Action	Fantasy	No	No	Yes
18m22	Star Wars: Episode VIII	Sci-Fi	Action	Yes	No	Yes
18m23	Guardians of the Galaxy	Action	Sci-Fi	Yes	Yes	Yes
18m26	Thor	Action	Sci-Fi	No	Yes	Yes
18m27	Twilight	Fantasy	Sci-Fi	No	No	Yes
18m30	Beneath	Action	Fantasy	Yes	No	No
18m31	Despicable Me	Animation	Action	Yes	Yes	No

(a)	Sta	te the number of records in the database table.				
			. [1]			
(b)	(i)	Give the name of the field that would be used for the primary key.				
			. [1]			
	(ii)	State the reason for choosing this field for the primary key.				
			. [1]			

(c) Complete the table to identify the most appropriate data type for each field based on the data shown in the database table, 2018MOV.

Field	Data type
CatNo	
Title	
Genre1	
Streaming	

[2]

(d) Complete the structured query language (SQL) to return the category number and title for all Comedy movies.

SELECT	CatNo,		Title	
			2018MOV	
WHERE	Genre1	=	;	

[2]

12	e variables X, Y and Z are used to store data in a program:	
	•	X stores a string Y stores a position in the string (e.g. 2) Z stores the number of characters in the string.
	(a)	Write pseudocode statements to declare the variables $\mathtt{X},\mathtt{Y}$ and $\mathtt{Z}.$
		[3]
	(b)	The function $Length(X)$ finds the length of a string $X$ .
		The function $SubString(X,Y,Z)$ finds a substring of $X$ starting at position $Y$ and $Z$ characters long. The first character in $X$ is in position 1.
		Write pseudocode statements to:  store the string "Programming is fun" in X  find the length of the string and output it  extract the word fun from the string and output it.

13 The 1D array StudentName[] contains the names of students in a class. The 2D array StudentMark[] contains the mark for each subject, for each student. The position of each student's data in the two arrays is the same, for example, the student in position 10 in StudentName[] and StudentMark[] is the same.

The variable ClassSize contains the number of students in the class. The variable SubjectNo contains the number of subjects studied. All students study the same number of subjects.

The arrays and variables have already been set up and the data stored.

Students are awarded a grade based on their average mark.

Average mark	Grade awarded
greater than or equal to 70	distinction
greater than or equal to 55 and less than 70	merit
greater than or equal to 40 and less than 55	pass
less than 40	fail

Write a program that meets the following requirements:

- calculates the combined total mark for each student for all their subjects
- calculates the average mark for each student for all their subjects, rounded to the nearest whole number
- outputs for each student:
  - name
  - combined total mark
  - average mark
  - grade awarded
- calculates, stores and outputs the number of distinctions, merits, passes and fails for the whole class.

You must use pseudocode or program code and add comments to explain how your code works.

You do <b>not</b> need to initialise the data in the array.	


[15]

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