

OCR

Oxford Cambridge and RSA

Tuesday 21 May 2024 – Afternoon

GCSE (9–1) Computer Science

J277/02 Computational thinking, algorithms and programming

Time allowed: 1 hour 30 minutes

Do not use:

- a calculator



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

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Candidate number

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First name(s)

Last name

INSTRUCTIONS

- Use black ink.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.

INFORMATION

- The total mark for this paper is **80**.
- The marks for each question are shown in brackets [].
- This document has **20** pages.

ADVICE

- Read each question carefully before you start your answer.
- We advise you to spend approximately 50 minutes on Section A and approximately 40 minutes on Section B.



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SECTION A

We advise you to spend approximately 50 minutes on Section A.

- 1 Tick (✓) **one** box in each row to identify the programming construct where each keyword is used.

Keyword	Programming construct	
	Selection	Iteration
if		
for		
while		

[3]

- 2 An algorithm decides if a number is odd or even.
An odd number divided by 2 will give the remainder 1.

The flowchart statements have been written for the algorithm, but the flowchart is incomplete.

Complete the flowchart.

Start

INPUT num

if num MOD 2 == 0

OUTPUT "Odd"

OUTPUT "Even"

End

[4]

3

3

- (a) State what is meant by the term syntax error. Give **one** example of a syntax error in a program.

Definition

.....

Example

.....

[2]

- (b) A student writes an algorithm to input two numbers and add them together to create a total.

If the total is between 10 and 20 inclusive, "success" is output.

If the total is not between 10 and 20 inclusive, "warning" is output.

```

01 num1 = input("Enter a number")
02 num2 = input("Enter a number")
03 total = num1 + num1
04 if total >= 10 then
05     print("success")
06 else
07     print("warning")
08 endif

```

The algorithm does not work correctly.

Identify the line number of the **two** logic errors in the algorithm and refine the code to correct each logic error.

Line number

Correction

.....

Line number

Correction

.....

[4]

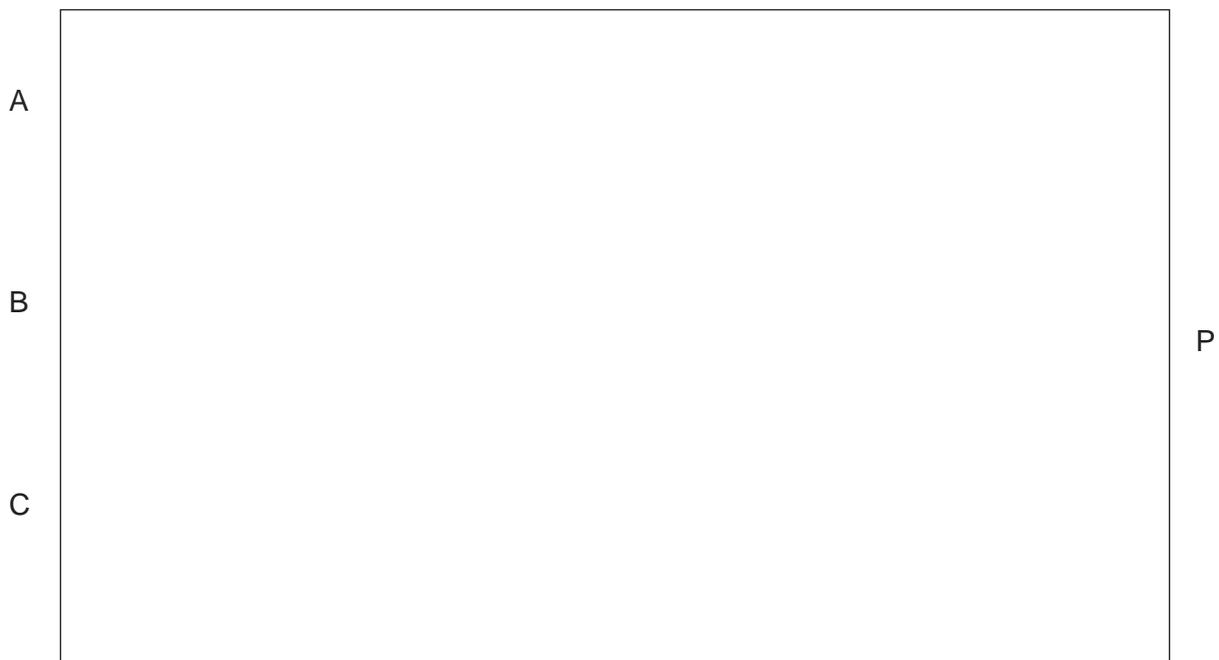
5

5

(a) Complete the truth table for $P = (A \text{ AND } B) \text{ OR } C$

A	B	C	P
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]

(b) Draw a logic circuit for $P = \text{NOT } A \text{ AND } (B \text{ OR } C)$ 

[3]

6

6 The variable `message` is assigned a value.

```
message = "abcd1234"
```

(a) Complete the table to show the output when each statement executes.

The first output has been completed for you.

Statement	Output
<code>print(message.length)</code>	8
<code>print(message.upper)</code>	
<code>print(message.left(4))</code>	
<code>print(int(message.right(4))*2)</code>	

[3]

(b) Write an algorithm in pseudocode to:

- store "Hello" in the variable `word1`
- store "Everyone" in the variable `word2`
- concatenate `word1` and `word2` to store "HelloEveryone" in the variable `message`

.....

.....

.....

..... [3]

7

7 Programs can be written in high-level languages or low-level languages.

(a) Give **two** reasons why some programs are written in a low-level language.

1

.....

2

.....

[2]

(b) Describe the benefits of using a compiler instead of an interpreter when writing a program.

.....

.....

.....

.....

.....

.....

[3]

8

- 8 An algorithm stores the position of a character on a straight line as an integer. A user can move the character left or right.

The following algorithm:

- generates one random number between 1 and 512 (inclusive) to store as the position
- prompts the user to input a direction to move (left or right)
- takes a direction as input until a valid direction is input.

```
p = random(1, 512)
print("The position is ", p)
a = ""
while a != "left" and a != "right"
    a = input("Enter direction, left or right")
endwhile
```

- (a) Describe **two** ways to improve the maintainability of the algorithm.

1

.....

.....

2

.....

.....

[4]

10
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SECTION B

We advise you to spend approximately 40 minutes on Section B.

Some questions require you to respond using either the OCR Exam Reference Language or a high-level programming language you have studied. These are clearly shown.

- 9 Students take part in a sports day. The students are put into teams.

Students gain points depending on their result and the year group they are in. The points are added to the team score.

The team with the most points at the end of the sports day wins.

- (a) Data about the teams and students is stored in a sports day program.

- (i) Identify the most appropriate data type for each variable used by the program.

Each data type must be different.

Variable	Example	Data type
teamName	"Super-Team"	
studentYearGroup	11	
javelinThrow	18.2	

[3]

12

(ii) The student names for a team are stored in an array with the identifier `theTeam`

An example of the data in this array is shown:

Index	0	1	2	3	4	5
Data	Ali	Eve	Ling	Nina	Sarah	Tom

`theTeam`

A linear search function is used to find whether a student is in the team. The function:

- takes a student name as a parameter
- returns `True` if the student name is in the array
- returns `False` if the student name is **not** in the array.

Complete the design of an algorithm for the linear search function.

```
function linearSearch(studentName)
    for count = 0 to .....
        if theTeam[.....] == ..... then
            return .....
        endif
    next count
    return False
endfunction
```

[4]

15

- (d) The individual results for each student in each event are stored in a database.

The database table `TblResult` stores the times of students in the 100m race. Some of the data is shown:

StudentID	YearGroup	TeamName	Time
11GC1	11	Valiants	20.3
10VE1	10	Super-Team	19.7
10SM1	10	Super-Team	19.2
11JP2	11	Champions	19.65

Complete the SQL statement to show the Student ID and team name of all students who are in year group 11

SELECT StudentID,

FROM

.....

[4]

- (e) Abstraction and decomposition have been used in the design of the sports day program.

- (i) Identify **one** way that abstraction has been used in the design of this program.

.....

..... [1]

- (ii) Identify **one** way that decomposition has been used in the design of this program.

.....

..... [1]

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EXTRA ANSWER SPACE

If you need extra space use these lined pages. You must write the question numbers clearly in the margin.

The form consists of a vertical solid line on the left side, creating a margin. To the right of this line, there are 25 horizontal dotted lines spaced evenly down the page, providing a guide for writing answers.

A large rectangular area with a vertical solid line on the left side and horizontal dotted lines across the rest of the page, intended for writing answers.



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