codebash

OCR GCSE (9–1) Computer Science J277

J277/02 Computational thinking, algorithms and programming

Mock examination | Set A

Time allowed: 1 hour 30 minutes
You must have: a black pen, a pencil and a ruler
You must not use: a calculator

Candidate name _____

Class _____ **Candidate number** _____

Instructions

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space, use the additional answer page at the end of this paper and write the question number(s) clearly.
- Answer **all** the questions.
- Where a question asks you to write an algorithm or program code, use either OCR Exam Reference Language or a high-level programming language that you have studied.

Information

- The total mark for this paper is **80**.
- The marks for each question are shown in brackets **[ ]**.
- Section A is worth 50 marks and Section B is worth 30 marks. You are advised to spend about 55 minutes on Section A and 35 minutes on Section B.
- This document has **15** pages.

For teacher use

Question	Max	Mark
1	8	
2	9	
3	9	
4	7	
5	6	
6	11	
7	30	
Total	**80**	

Student self-assessment (complete after the mock)
What went well?
Where can I improve, and how?
Percentage: **Grade:**

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SECTION A

Answer **all** the questions in this section.

1 A school is writing a program to run its sports day.

(a) The program shows a map of the school field. The map only shows where each event takes place.

(i) Explain how abstraction has been used to create this map.

[2]

(ii) State what is meant by decomposition.

[1]

(b) Complete the table by giving the most suitable data type for each item of data.

Data	Data type
The number of runners in a race, e.g. 8	
A runner's time in seconds, e.g. 12.47	
The name of a runner's house, e.g. "Kestrel"	
Whether a runner has qualified for the final	

[2]

(c) Complete the table to show the output from each algorithm.

Algorithm	Output
`x = 23 MOD 4` `print(x)`	
`print(23 DIV 4)`	

`total = 0`
`for i = 1 to 4`
`  total = total + i * 2`
`next i`
`print(total)`	

[3]

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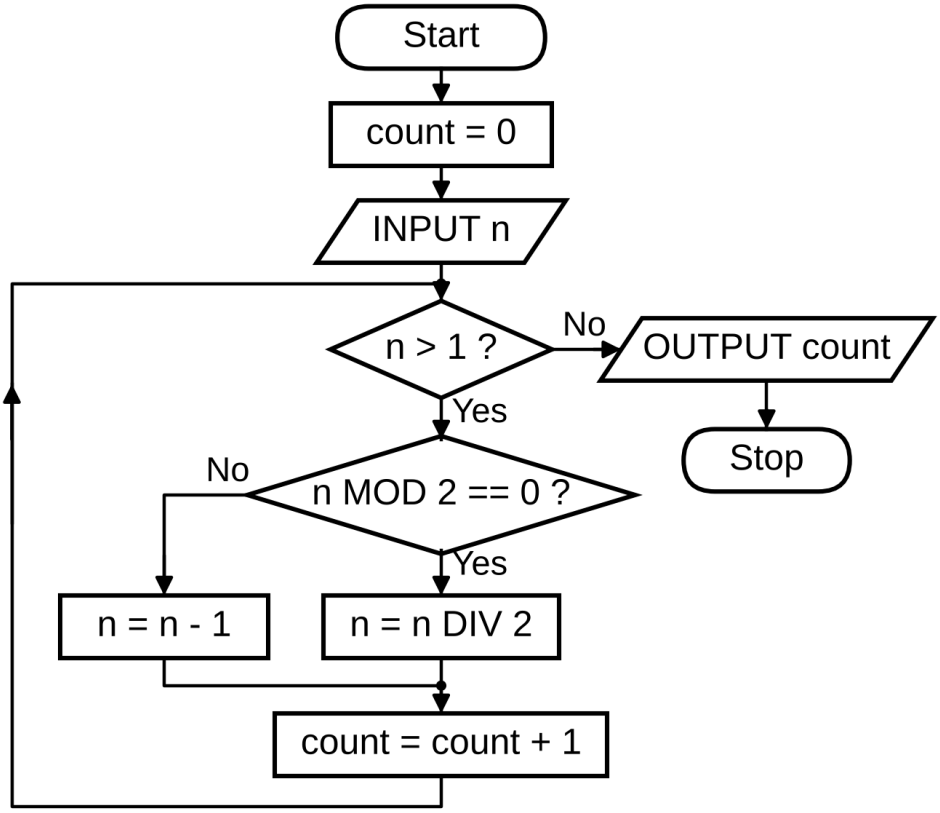
2 The flowchart shows an algorithm.



(a) Complete the trace table for the algorithm when the input is 13. The first row has been completed for you. You may not need to use all the rows.

n	count	Output
13	0	

[4]

(b) State the output of the algorithm when the input is 8.

_____

_____ **[1]**

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(c) Write the algorithm shown in the flowchart as program code.

You must use either:

- OCR Exam Reference Language, or
- a high-level programming language that you have studied.

[4]

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3 A list of race times (in seconds) needs to be sorted.

(a) Show how a **merge sort** would sort this list into ascending order. Show each stage.

42	17	63	5	28	91	36	14

[4]

(b) A different list is sorted into ascending order using a **bubble sort**.

9	4	7	1	6

Show the list after the **first pass** of the bubble sort.

[2]

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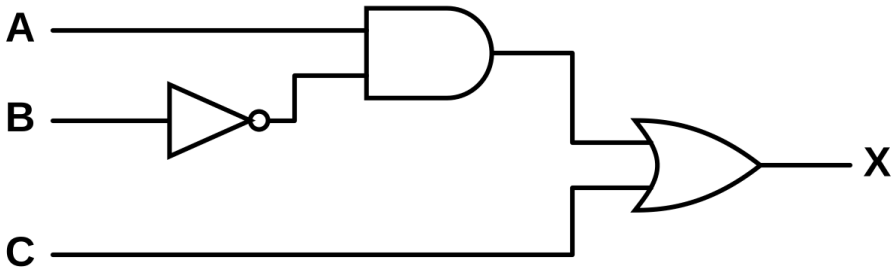
(c) A sports club stores the names of its 2000 members in a list. The names are **not** in any order.

Explain whether a linear search or a binary search should be used to find a member's name in this list.

[3]

4 (a) The diagram shows a logic circuit.



Complete the truth table for this logic circuit.

A	B	C	X
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]

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(b) A security light (L) switches on when it is **not** daylight (D) and movement (M) is detected. The light also switches on whenever the manual switch (S) is on.

Draw the logic circuit for the security light. Use the inputs D, M and S and the output L.



[3]

5 The sports day program is written in a high-level language.

(a) Give **two** differences between high-level languages and low-level languages.

1

2

[2]

(b) The program is being written using an Integrated Development Environment (IDE).

Describe **two** features of an IDE that help the programmer to find and fix errors.

1

2

[2]

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(c) The finished program will be given to other schools to run. The school does not want other schools to see or change its source code.

State which type of translator should be used and justify your choice.

Translator: _____

[2]

6 The sports day program asks staff to enter each runner's time in seconds. A valid time is between 9.0 and 60.0 inclusive.

(a) Complete the test plan.

Test data	Type of test data	Expected result
23.5	Normal	Accepted
60.0		
	Invalid	Rejected
"fast"		

[3]

(b) Explain the difference between iterative testing and final (terminal) testing.

[2]

(c) A programmer writes this code to reject invalid times.

```
if time > 60.0 AND time < 9.0 then
    print("Invalid time")
endif
```

The code runs, but it never outputs "Invalid time". Identify the type of error in this code.

[1]

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(d) Only staff should be able to enter results. The staff password is stored in a variable called correct.

Write an algorithm that:

- allows the user to enter a password up to **three** times
- outputs “Access granted” and stops asking as soon as the correct password is entered
- outputs “Locked” if all three attempts are wrong.

You must use either OCR Exam Reference Language or a high-level programming language that you have studied.

[5]

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SECTION B

Answer **all** the questions in this section. Where you are asked to write an algorithm or program code, you must use either OCR Exam Reference Language or a high-level programming language that you have studied.

7 A climbing centre has three climbing walls. It uses a program to manage bookings.

(a) Bookings are stored in a database table called Bookings. Part of the table is shown.

BookingID	Surname	Wall	Climbers	Day
B101	Okafor	Summit	4	Sat
B102	Lewis	Boulder	2	Sat
B103	Chen	Summit	1	Sun
B104	Patel	Overhang	5	Sun
B105	Murphy	Summit	3	Sun

Write an SQL statement to display the Surname and Climbers of every booking for the Summit wall that has **more than two** climbers.

[3]

(b) Each booking has a booking code. The code is the first three letters of the customer's surname in upper case, followed by the number of climbers.

For example, surname "Okafor" with 4 climbers has the code "OKA4". Every surname has at least three letters.

Write an algorithm that asks the user to enter the surname and the number of climbers, and then outputs the booking code.

[4]

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(c) The number of climbers on each wall each day last week is stored in a 2D array called climbs. The first index is the wall number and the second index is the day number.

	0 (Mon)	**1 (Tue)**	**2 (Wed)**	**3 (Thu)**	**4 (Fri)**	**5 (Sat)**	**6 (Sun)**
0 (Summit)	14	9	11	16	22	31	27
1 (Boulder)	8	13	7	10	15	26	24
2 (Overhang)	5	6	4	9	11	18	20

For example, climbs[0, 3] holds 16.

(i) State the value of climbs[2, 5].

[1]

(ii) Write a function called dayTotal that:

- takes a day number as a parameter
- returns the total number of climbers across all three walls on that day.

For example, dayTotal(0) returns 27.

[4]

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(iii) The variable total in dayTotal is a local variable.

Explain **one** difference between a local variable and a global variable.

[2]

(iv) Write an algorithm that uses your dayTotal function to output the day number (0 to 6) with the **highest** total number of climbers.

[3]

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(d) Each booking code is stored on a separate line of a text file called bookings.txt. This algorithm counts the bookings in the file.

Complete the algorithm.

```
count = 0
myFile = _____________("bookings.txt")
while NOT myFile._____________()
    line = myFile._____________()
    count = _____________
endwhile
myFile.close()
print(count)
```

[4]

(e) Each day, one of the three walls (0, 1 or 2) is chosen at random as "wall of the day". Climbers on wall 1 get a 10% discount if it is chosen. This algorithm contains **three** errors.

```
01  wall = random(0, 3)
02  price = 12.50
03  if wall = 1 then
04      price = price * 0.9
05  endif
06  print("Price: " + price)
```

Identify the line number of each error and write the corrected line.

Line number	Corrected line

[3]

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(f) The centre charges £12.00 per climber. Members get 20% off the total cost. A booking must be for between 1 and 8 climbers inclusive.

Write an algorithm that:

- asks the user to enter the number of climbers, and keeps asking until a value between 1 and 8 inclusive is entered
- asks whether the person booking is a member (they enter “Y” or “N”)
- calculates the total cost, including the member discount where it applies
- outputs the total cost.

You must use either OCR Exam Reference Language or a high-level programming language that you have studied.

[6]

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If you need extra space to answer a question, use the lined page below. Write the question number(s) clearly in the margin.

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