OCR 2025 Predicted Paper 2
GCSE (9–1) Computer Science
J277/02 Computational thinking, algorithms and programming
Time allowed: 1 hour 30 minutes

Do not use a calculator

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 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 [].
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has 14 pages.

ADVICE

- Read each question carefully before you start your answer.
- This is just a predicted paper based off previous years

SECTION A

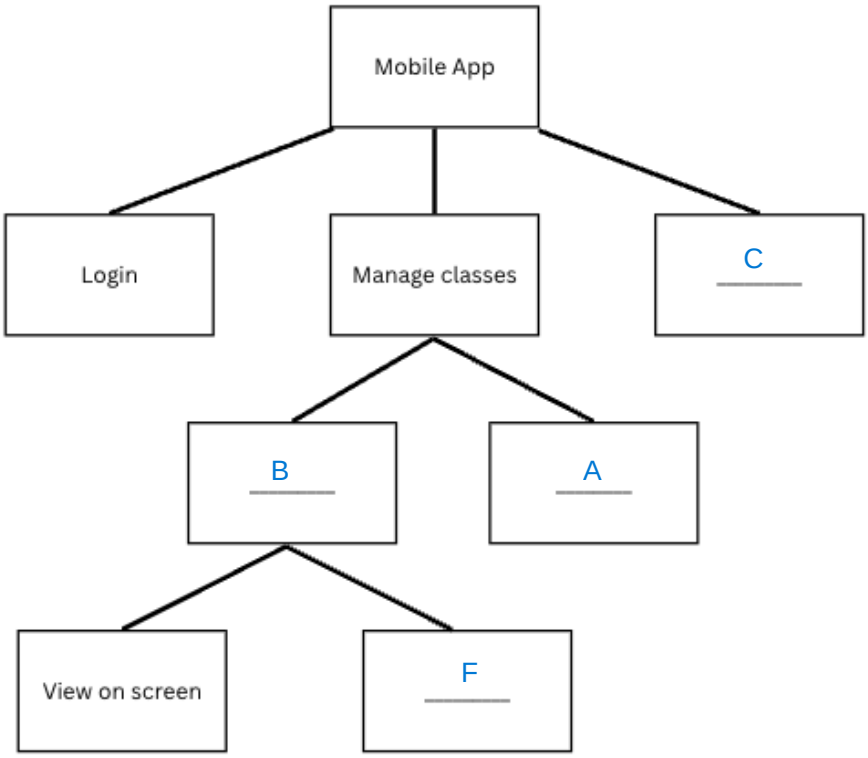
We advise you to spend approximately 60 minutes on Section A

1. (a) A gym uses a mobile phone app to allow members to manage their membership.

Members must log in before they can access the system. They then choose to book a new fitness class, view their booked classes, or update their health and fitness profile. If they choose to view booked classes, they can either see them on the screen or download a PDF schedule.

A structure diagram has been used to design the mobile phone app. Write **one** letter from the following table in each space to complete the structure diagram.

Letter	Task
A	Book a new fitness class
B	View booked classes on screen
C	Update health and fitness profile
D	Access nutrition advice
E	Log in to the system
F	Download a PDF schedule



[4]

(b) When a member books a new fitness class using the app, they must select the class and confirm the booking.

Identify one input, one process, and one output in this scenario.

Input User selects a fitness class and taps "Book".

Process The app checks availability and stores the booking in the database.

Output Confirmation message is shown on the screen.

[3]

(c) A developer is designing the gym's mobile phone app to allow users to manage their fitness classes and profile.

(i) Explain how the principle of abstraction could be applied when designing the mobile phone app.

Ignoring unnecessary details, like the user's shoe size or phone battery level, to focus on important features (e.g., class times, names, capacity).

[2]

(ii) The developer wants to write an algorithm to handle class bookings.
Explain how algorithmic thinking will help the developer solve this problem.

Helps the developer create a step-by-step solution, eg:
Check if class is full
If not, add user to booking list

[2]

(d) The developer declares the following variables.

```
username = "SuperFit_Member11"
status = "Active_True”
```

State the output from the following lines of program code.

(i) print(status.substring(5,5)) e_Tru [1]

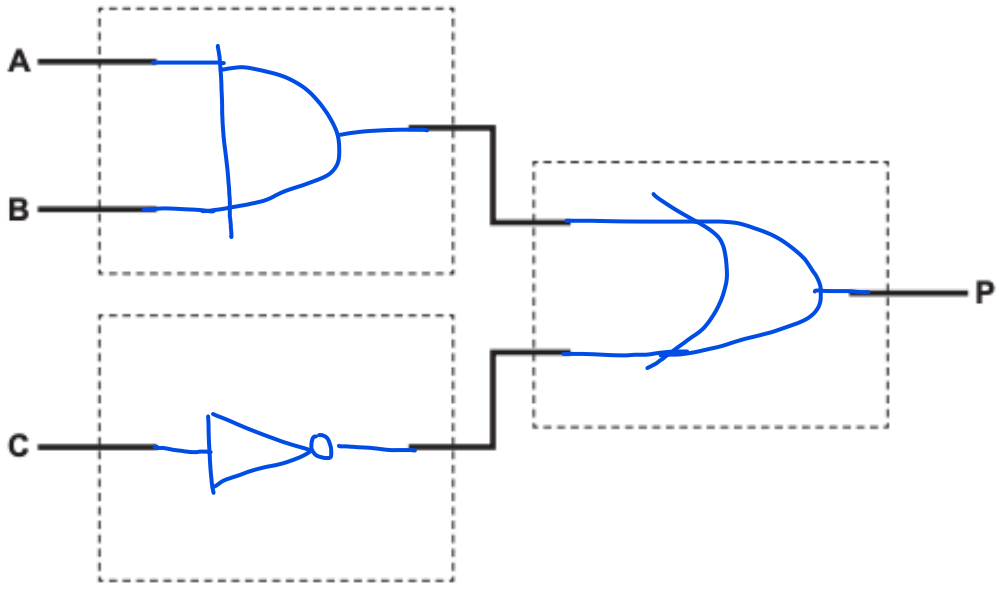
(ii) print(int(username.right(2))*2 MOD status.length) 0 [1]

2. (a) Compute the following truth table

A	B	C	A AND B	NOT C	P = (A AND B) OR (NOT C)
0	0	0	0	1	1
0	0	1	0	0	0
0	1	0	0	1	1
0	1	1	0	0	0
1	0	0	0	1	1
1	0	1	0	0	0
1	1	0	1	1	1
1	1	1	1	0	1

[2]

(b) Complete the following logic diagram for P = (A AND B) OR NOT C by drawing one logic gate in each box.



[3]

(c) Describe the purpose of a truth table.

To show all possible inputs (to the logic circuit) and the associated output (for each input)

[2]

3. A procedure takes as input a number between 1 and 100 (inclusive). It calculates and outputs the square of each number starting from 1, to the number input. The square of a number is the result of multiplying a number itself.

```
01 procedure squares()
02     do
03         number = input("Enter a number between 1 and 100")
04     until number > 1 AND number < 100
05     for x = 1 to number:
06         print(x * 2)
07     next x
08 endprocedure
```

(a) State the name of the programming construct used twice.

iteration [1]

(b) Two types of errors in a program are syntax and logic errors.

Identify two logic errors in the pseudocode algorithm.

Error 1 line number 04

Corrected line until number >= 1 AND number <= 100

Error 2 line number 06

Corrected line print(x*x)

[4]

4. Jake would like to use a bubble sort to sort 250 000 numbers into order from lowest to highest.
   Currently the first 5 numbers before they have been sorted are:

195 584	167 147	158 187	160 125	184 236

(a) Show each stage of an insertion sort on the contents above.

195 584 167 147 158 187 160 125 184 236

167 147 195 584 158 187 160 125 184 236

158 187 167 147 195 584 160 125 184 236

158 187 160 125 167 147 195 584 184 236

158 187 160 125 167 147 184 236 195 584 [4]

(b) Give two advantages of using an insertion sort.

1. They can handle small lists very efficiently.

2. They are very memory efficient as all sorting is done in the original list.

They can quickly check if a list is already sorted. [2]

(c) Describe two features that are commonly found in IDEs that will help Jake write his program code.

1 Autocomplete which will predict variables or built-in functions

2 Auto indent to automatically indent code when selection / iterative statements are used

OR Colour coding to be able to distinguish between the different parts of each line [4]

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

(a) Give two reasons why some programs are written in a high-level language

1 High level languages are designed to be more human-readable

2 High level languages provide built in libraries that simplify complex programming tasks

[2]

(b) Describe the drawbacks of using an interpreter writing a program.

Interpreters execute code line-by-line which is slow and time consuming, no executable file meaning to share the program we need share the source code.

[2]

6. The formula for calculating the area of a trapezium is 0.5(a + b)h. A programmer writes a procedure called foo which takes a parameter n and outputs the area of n trapeziums. The sides a and b start at 1 and increase by 1 each time. The height h stays at 5.

```
01 procedure foo(n)
02     for i = 1 to n
03         a = i
04         b = i + 1
05         t = 0.5 * (a + b) * 5
06         print(t)
07     next i
08 endprocedure
```

(a) Complete the trace table below when foo(4) is called.

i	a	b	t
1	1	2	15/2
2	2	3	25/2
3	3	4	35/2
4	4	5	45/2

[2]

(b) Describe two ways to improve the maintainability of the algorithm.

1 use appropriate variable / function names eg, t could be area

2 add meaningful comments to improve the readability of the program

[2]

(c) A student defines a local variable in the foo procedure. He later tries to reuse the variable outside of the procedure. Explain what will happen.

They will get an error saying the variable is not defined because local variables can't be used outside of the procedure in which they were declared in

[2]

(d) A math app contains the following procedures:

A. calculateSingleArea() B. calculateAreas(n) C. showFormula()

Write program code using a SWITCH statement which:

- asks the user to input a letter and runs the matching procedure based on their input, eg, an input of "A" runs the calculateSingleArea procedure
- displays a message if the input does not match any option

```
userSelection = input("Input a letter")
switch userSelection:
    case "A":
        calculateSingleArea()
    case "B":
        calculateAreas(n)
    case "C":
        showFormuia()
    default:
        print("Selection does not match any option!")
endswitch
```

[4]

(e) A class of students have each been given one trapezium to calculate the area for. The program stores the values of a and b for each trapezium in a 2D array called *sides*, where each row represents a trapezium and contains two values: a and b.

A	B
3	4
5	6
2	3
1	2

In this table, the value of sides[1,1] contains 6

Each pair belongs to a single student (i.e. the first row are Student 1's trapezium, next one are Student 2's, etc.).

Write a procedure that:

- Calculates the area for each trapezium using the formula area = 0.5 × (a + b) × 5
- Outputs each student's number and their total area eg, Student 1's area is 30

You must use either:

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

```
procedure calculate_areas():
    for i = 0 to sides.length - 1:
        a = sides[i, 0]
        b = sides[i, 1]
        area = 0.5 * (a + b) * 5
        print("Student " + (i + 1) + "'s area is " + area)
    next i
endprocedure
```

[6]

SECTION B

We advise you to spend at least 30 minutes on this section.

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.

7. A teacher researches the length of time students spend playing computer games each day.

(a) Tick one box to identify the data type you would choose to store the data and explain

Data Type	Tick one box
String	
Integer	✓
Real	✓
Boolean	

Justification: … number of seconds may be important (1)
• … allows parts/fractions to be stored over integers (1)
…number of seconds not important (1)
• … level of accuracy not needed so round to nearest minute (1) [2]
• …using a decimal to store seconds (0-60) is not appropriate (1)

(b) Explain the difference between the = operator and the == operator.

= assigns a value to a variable, whereas == compares values/variables and returns true if they match

[2]

(c) The student names in the class are stored in a sorted array called students. An example of the data in this array is shown:

Index	0	1	2	3	4	5
Data	"Ali"	"Ben"	"Farah"	"James"	"Ravi"	"Zara"

A binary search function is used to find whether a student is in the class. 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

```
function BinarySearch(studentName)
  low = 0
  high = students.length - 1

  while low <= high
    mid = (low + high) DIV 2
    if students[mid] == studentName then
      return True
    else if studentName < students[mid] then
      high = mid - 1
    else
      low = mid + 1
    endif
  endwhile

  return False
endfunction
```

[4]

(d) Describe the difference between a for loop and a while loop.

for loop is an example of a count controlled loop. The number of iterations is determined and the counter increments within the loop. while loop is an example of a condition controlled loop, and is used when the number of iteration is unknown and the loop will run will the condition is met.

[4]

(e) The data of how much time students spend playing computer games each day is stored in a database table called GameLog.

StudentID	Name	Date	Minutes
1001	Ayaan Khan	2025-04-10	90
1002	Sarah Ahmed	2025-04-10	135
1003	James Lee	2025-04-11	53
1004	Emma Jones	2025-04-11	140
1005	Lucas Patel	2025-04-12	89

Write an SQL query to display the names and dates of students who:
- played games for more than 100 minutes
- on 10th April 2025 and 11th April 2025 but not on 12th April 2025

```
SELECT Name, Date
FROM GameLog
WHERE Minutes > 100 AND Date = '2025-04-10' AND Date = '2025-04-11'
```

[4]

(f) The teacher uses a program to assign a grade to students based on their percentage score in a test.

```
01 number = input("Please enter your mark")
02 total = 80
03 percentage = number / total * 100
04 if (percentage >= 70 AND percentage <= 100) then
05     print("You have achieved a grade A")
06 elseif (percentage >= 50 AND percentage < 70) then
07     print("You have achieved a grade B")
08 elseif (percentage >= 30 AND percentage < 50) then
09     print("You have achieved a grade C")
10 else
11     print("You have failed")
12 endif
```

The program needs to be tested.

Complete the test plan below to test for potential issues of the program

Test Type	Test Data	Reason for testing	Actual Outcome
Normal	60	To ensure the program can handle a correct input	"You have achieved a grade B"
Invalid	99	To ensure the program can handle inputs of the correct data type that should be rejected	"You have failed"
Boundary	80	To ensure the program can handle the largest input value	"You have achieved a grade A"

[3]

(g) A teacher is developing a program to help analyse how long students spend on homework each evening. The data is stored in a text file called homework.txt.

The file contains a single number on each line, representing the number of minutes spent by different students. A program written in a high-level language is used to access the data from the text file.

The program must:

- use a WHILE loop to read each value from homework.txt
- store each value in an array called homeworkTimes
- generate a random student ID (between 1000 and 9999) for each time read and store it in a second array called studentIDs

Write program code to perform this task.

You must use either:

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

```
array homeworkTimes[9999]
array studentIDs[9999]
i = 0
data = open("homework.txt")
while NOT data.endOfFile():
    homeworkTimes[i] = data.readLine()
    studentIDs[i] = random(1000, 9999)
    i = i + 1
endwhile
data.close()
```

[6]

END OF PAPER