

## GCSE (9–1) Computer Science

**J277/02** Computational thinking, algorithms and programming

### Practice – Morning/Afternoon

Time allowed: 1 hour 30 minutes



**Do not use:**

- a calculator



First name										
Last name										
Centre number						Candidate number				

#### 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.
- You should spend at least 40 minutes on Section B.

#### ADVICE

- Read each question carefully before you start your answer.

Answer **all** the questions.

**SECTION A**

1 (a) Tick (✓) **one** box in each row to identify whether the statement refers to a high-level language or a low-level language.

Statement	High-level language	Low-level language
Uses English-like keywords such as <code>print</code> and <code>while</code>		
Must be translated before the processor can execute code		
Code written is portable between different processors		
Requires the programmer to understand the processor's registers and structure		

[4]

(b) A translator is a common tool found in an Integrated Development Environment (IDE).

Describe **two** other common tools or facilities that an IDE can provide.

1 .....

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2 .....

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[4]

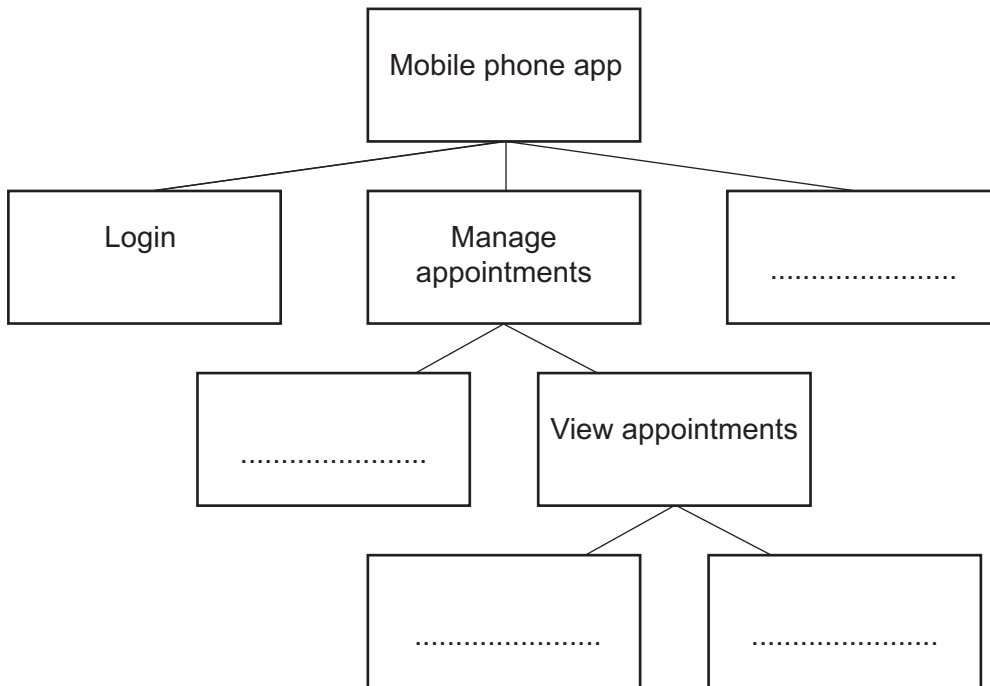
2 A school uses a mobile phone app to allow parents to book appointments for parents' evenings.

Parents must log in before they can use the system. They then choose to book a new appointment, view all appointments already made or update their personal details. If parents choose to view their appointments, they can either view them on-screen or print them off.

(a) 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 new appointment
B	Check attendance of child
C	Update personal details
D	View appointments on-screen
E	Log out of the system
F	Print a paper copy of appointments



[4]

- (b) At the parents' evening, each parent can book up to five appointments with teachers. Appointments for one student are stored in a one-dimensional array with the identifier `appointments`.

In the array, each element is either the name of a teacher or an empty string where no appointment has been made.

An example for one student is shown:

```
array appointments = ["Miss E", "", "Mr C", "Mr B", ""]
```

The following code shows an algorithm to count up how many empty slots remain in the array and output this value.

```
01 for i = 0 to 4
02     empty = 0
03     if appointments[i] == "" then
04         empty = empty + 1
05     endif
06 next i
07 print("empty")
```

- (i) The algorithm contains logic errors.

Define the term logic error.

.....  
..... [1]

- (ii) Identify the line number of **two** logic errors in the code in **part (b)** and explain why each is an error.

Logic error 1 .....

Explanation .....

Logic error 2 .....

Explanation .....

[4]

(c) Each teacher has the assessment grades for each student. These grades are stored in numerical order.

(i) The grades for one student are shown:

2	3	4	5	6	7	8
---	---	---	---	---	---	---

Show the steps that a binary search would take to check whether the student has achieved a grade 7 in any assessment.

Your answer must refer to the grades provided.

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..... [4]

(ii) Explain how a binary search would determine that a value does not appear in a given array.

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..... [2]

(iii) Give **one** advantage of a binary search over a linear search.

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..... [1]

- 3 A cinema uses the following criteria to decide if a customer is allowed to see a film that has a 15 rating:

Customers have to be 15 years of age or older to see the film. They also need to either have a ticket or have the money to buy a ticket.

The table shows the inputs to the system that will output whether the customer can watch the film.

Input	Criteria (True / False)
A	The customer is 15 or over
B	The customer has a ticket
C	The customer has the money to buy a ticket

- (a) Draw this system using logic gates.

[2]

- (b) Complete the following algorithm to output whether the customer is allowed to see the film or not.

```
A = input("Is the customer 15 or over?")
B = input("Does the customer have a ticket?")
C = input("Does the customer have money to buy a ticket?")
```

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 .....  
 .....  
 .....  
 .....  
 .....

[3]

- (c) The cinema has three screens: "Red", "Black" and "Yellow".

The function `freeseats()` counts how many seats are available in each screen. The name of the screen is passed in as a string parameter and the number of free seats is returned as an integer.

Write code using the function `freeseats()` to find the number of seats available in screen Red and assign this to a variable with identifier `redseats`.

.....  
..... [2]

4 A car dealership uses a computer system to record details of the cars that it has for sale. Each car has a make, model, age and number of miles driven.

(a) Each car is given a star rating of 1 to 5, based on the age of the car and the number of miles it has been driven. This rating is recorded in the computer system.

(i) Define the term abstraction.

.....  
..... [1]

(ii) Give **one** example of how abstraction has been used in the design of this star rating system.

.....  
..... [1]

(iii) Explain how authentication could be used as part of the defensive design considerations for this computer system.

.....  
.....  
.....  
..... [2]







## SECTION B

We advise you to spend at least 40 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.

5 OCR Tech is an online shop that sells electronics such as TVs and game consoles.

(a) Items for sale are stored in the database table `tblStock`. An extract of this table is shown.

ItemCode	ItemName	Price (£)	Stock
GSC5	GameStation5 console	249.99	102
TV4K	4K Television	499.99	18
ABRR	Audiobook reader	59.99	27
NAGC	TV streaming stick	24.99	192

`tblStock`

Tick (✓) **one** box in each section to identify the correct SQL statement to select the item code and item name for all items that have a price of £60 or over.

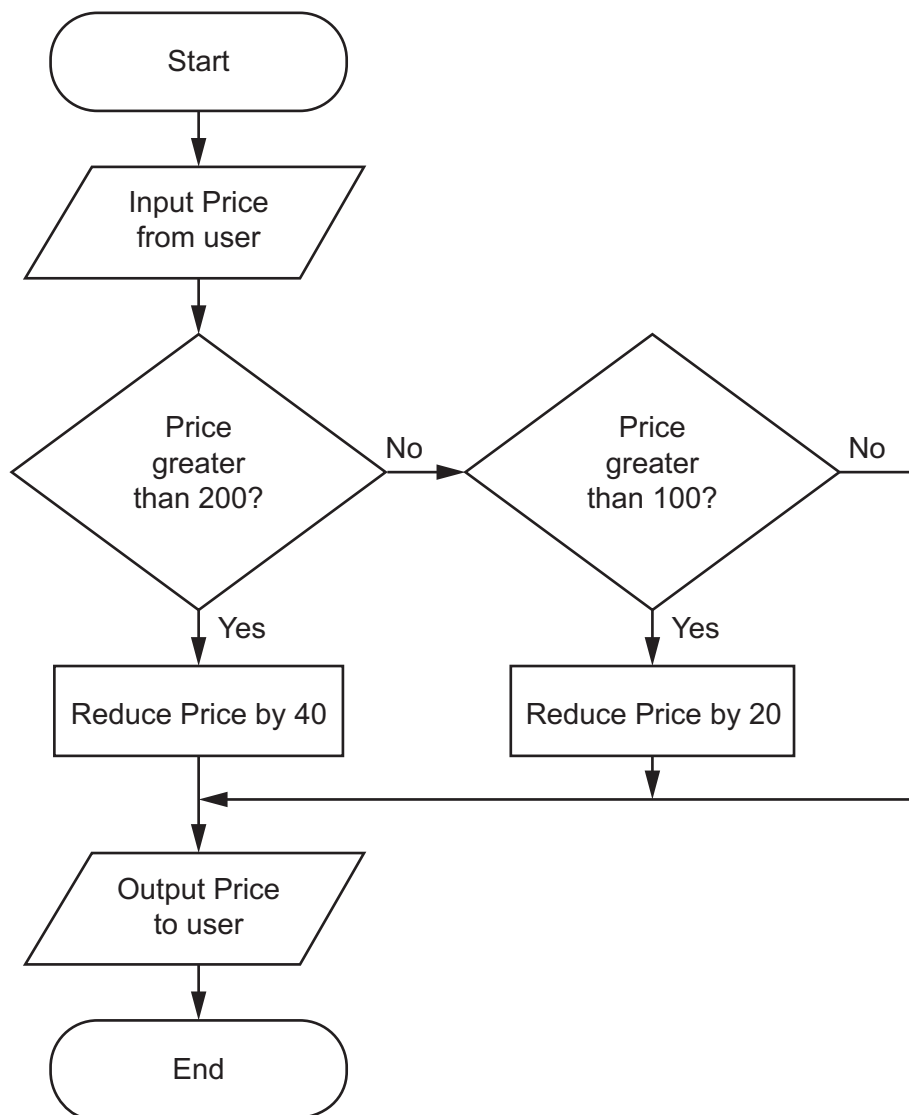
	Tick (✓) <b>one</b> box
<code>SELECT ItemCode AND ItemName</code>	
<code>SELECT ItemCode, ItemName</code>	
<code>SELECT ItemCode &amp; ItemName</code>	

	Tick (✓) <b>one</b> box
<code>FROM tblStock</code>	
<code>FROM table</code>	
<code>FROM database</code>	

	Tick (✓) <b>one</b> box
<code>WHERE Price &lt;= 60</code>	
<code>WHERE Price &gt; 60</code>	
<code>WHERE Price &gt;= 60</code>	

[3]

- (b) The following flowchart shows an algorithm to calculate the price of an item during a sale period.



- (i) Complete the following test plan for the algorithm.

Price input	Test type	Expected price output
50	Normal	
100	Boundary	
150	Normal	
200	Boundary	
250	Normal	

[3]



- (c) An item is classified as "In demand" if OCR Tech have between 5 and 25 inclusive in stock.

A program is written that allows the user to input the current stock level and output whether the item is in demand or not.

```

stocklevel = input("Enter stock level")
if stocklevel >= 5 or =< 25 then
    print(Not in demand)
else
    print(In demand)
endif

```

The program contains syntax and logic errors.

Refine the program to correct the errors and write the refined version of the program.

You must use **either**:

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

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..... [5]

- (d) Customers can use a discount code to reduce the price of their purchase. Valid discount codes and their value (in pounds) are stored in a global two-dimensional (2D) array with the identifier `discount`. The following table shows part of this 2D array.

	0	1
0	PVFC7	10
1	CPU5	5
2	BGF2	15

For example, `discount[2,0]` holds discount code BGF2 and `discount[2,1]` holds the discount of 15 pounds.

A function searches through the 2D array and applies the discount to the price. The price and discount code are passed in as parameters. The algorithm design is not complete.

- (i) Complete the design for the algorithm.

```
function checkdiscount(price, code)
    newprice = price
    size = len(discount) - 1
    for x = 0 to .....
        if discount[x,0] == ..... then
            newprice = ..... - discount[.....]
        endif
    next x
    .....
endfunction
```

**[5]**

- (ii) Identify **two** variables used in this function design.

1 .....

2 .....

**[2]**





**ADDITIONAL ANSWER SPACE**

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

A large area of lined paper for writing, consisting of 25 horizontal dotted lines. A solid vertical line runs down the left side of the page, creating a margin. The rest of the page is open for writing.

This image shows a blank sheet of white paper with a vertical margin line on the left side. The page is ruled with horizontal lines, consisting of a solid line on the left and dotted lines on the right. There are 26 horizontal lines in total, including the margin line. The page is otherwise empty of any text or markings.



A large rectangular area for writing, bounded by a solid vertical line on the left and horizontal dotted lines on the top, bottom, and right.



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