OCR
Oxford Cambridge and RSA

GCSE (9–1) Computer Science

J276/02 Computational thinking, algorithms and programming

Practice Paper

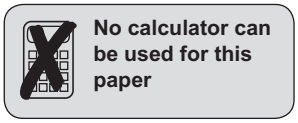
Time allowed: 1 hour 30 minutes

You may not use:
- a calculator

First name									
Last name									
Centre number						Candidate number				

INSTRUCTIONS
- Use black ink.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

INFORMATION
- The total mark for this paper is **80**.
- The marks for each question are shown in brackets **[ ]**.
- This document consists of **16** pages.



Answer **all** questions.

1 A school kitchen stores details of each student in the school so that students are able to pay for school meals.

(a) The kitchen computer system stores an abstract representation of each student.

(i) Describe what is meant by abstraction.

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

(ii) Explain why abstraction is used by the school kitchen when storing details for each student.

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

(iii) Teachers and school kitchen staff use different abstract representations of a student. Explain one way in which these abstract representations differ.

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

(b) The kitchen computer system uses a function called `newbalance()` to calculate a student's new account balance when they pay for a meal.

For example, if a student with an account balance of `9.50` has a meal costing `2.20` the `newbalance()` function should return the new balance of `7.30`.

(i) Write an algorithm for this function which:

- takes the student's account balance as a parameter
- takes the cost of the meal as a parameter
- returns the new account balance.

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..... **[4]**

(ii) State the data type of the value returned by this function, justifying your answer.

Data type .....

Justification .....

.....

[2]

(c) The kitchen computer system uses an algorithm to decide if the student has enough money on their account to pay for the meal. The account balance and the meal cost are entered and the algorithm outputs a suitable message depending on if the student has enough money on their account to pay for their meal.

```
01    mealcost = input("Enter cost of meal : ")
02    balance = input("Enter student account balance : ")
03    if mealcost < balance then
04         print("Balance OK, meal can be purchased")
05         balance = newbalance(balance, mealcost)
06         print("New balance is " + str(balance))
07    else
08         pirnt("Balance too low")
09    endif
```

(i) The algorithm contains **two** errors.

Identify the line number of each error, give the type of error and show the corrected pseudocode for that line.

Line number of error.....

Error type .....

Corrected pseudocode.....

.....

Line number of error.....

Error type .....

Corrected pseudocode.....

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[6]

(ii) Define what is meant by casting, explaining how this is used in the algorithm above.

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..... **[3]**

2 During the implementation of an algorithm, a programmer attempts to swap over the value of two variables. The code used is shown below:

```
x = input("enter first number : ")
y = input("enter second number : ")
//swap values over
x = y
y = x
```

(a) The values **12** and **20** are inputted into this algorithm as the first and second number.

Give the values of x and y once this program has been executed.

x .....

y .....

[2]

(b) Complete the program below so that the numbers are successfully swapped over.

```
x = input("enter first number : ")
y = input("enter second number : ")
//swap values over

..... = y

y = .....

x = .....
```

[3]

(c) Tick (✓) **one** box per row to show whether each of these constructs are used in the program in part **(b)**.

Construct	Is used in (b)	Is not used in (b)
Sequence		
Selection		
Iteration		

[3]

3 Grant is writing a program to keep track of appointments in a diary.

(a) As part of this program, the following algorithm calculates how many hours and minutes are contained in a time entered as minutes. For example, 160 minutes is 2 hours and 40 minutes.

```
temp = input("enter time in minutes : ")
hours = temp DIV 60
minutes = temp MOD 60
```

(i) Explain the use of `DIV` in the above algorithm.

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

(ii) Explain the use of `MOD` in the above algorithm.

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

(b) Each appointment must be in blocks of 15 minutes. For example, an appointment for 2 hours and 45 minutes would be allowed but an appointment for 1 hour and 17 minutes would not be allowed.

Complete the algorithm below which implements this restriction.

```
temp = input("enter time in minutes : ")
hours = temp DIV 60
minutes = temp MOD 60

if minutes …… 15 == 0 then
     print("allowed")

……
     print("not allowed")
end if
```

[2]

4 A Gymnastics club stores data about gymnasts and their highest competition scores in a database table. Figure 1 below shows the data returned from this database when the SQL command `SELECT * FROM Gymnasts` is executed:

ID	Name	HighScore	Competition
0001	River	9.6	Vault
0002	Eric	6.7	Floor
0003	Millie	8.2	Rings
0004	Tom	7.9	Vault
0005	Xavier	8.4	Floor
0006	Victoria	9.1	Rings

Fig. 1 `Gymnasts` table

(a) State the ID(s) of the records returned when the following SQL statements are executed.

(i) `SELECT * FROM Gymnasts WHERE Name = 'Xavier'`

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

(ii) `SELECT * FROM Gymnasts WHERE HighScore > 8.4`

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

(b) Give the SQL command that would be needed to show only the Name and HighScore fields for all gymnasts who have taken part in the Vault competition.

.....

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..... **[3]**

5 An image is made up of pixels arranged in a 6 × 6 grid as shown below.

0000	0000	0001	0001	0000	0000
0000	0000	0001	0001	0000	0000
0010	0010	0001	0001	0010	0010
0010	0010	0001	0001	0010	0010
0000	0000	0001	0001	0000	0000
0000	0000	0001	0001	0000	0000

(a) Each pixel is allocated a 4-bit binary code to represent the colour of that pixel.

(i) State the number of different colours that are used in this image.

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

(ii) State the maximum number of colours that could be used in an image in this format, giving the reason why this is the case.

Maximum number of colours .....

Reason .....

.....

[2]

(b) Explain **two** ways that the file size of this image could be reduced.

1 .....

.....

.....

2 .....

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[4]

(c) Give **two** items of metadata that would be stored with this image.

1.....

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2.....

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[2]

6 **(a)** Convert the binary number 10001111 into hexadecimal.

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

(b) Convert the hexadecimal number E2 into binary.

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

(c) Explain why computers process data in binary format.

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

(d) Explain why hexadecimal is used by computer scientists.

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

7 OCR Airlines keeps track of customers' luggage using a printed tracking code on each item of luggage. Each tracking code is made up of 8 characters and begins with the letter P or Q.

(a) Write an algorithm that:

- Allows a tracking code to be entered
- Decides if the tracking code is valid or not.
- Outputs "VALID" if the code follows the above rules and "INVALID" if it does not.

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..... **[4]**

(b) Explain how a check digit could be used as part of this tracking code.

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..... **[3]**

OCR Airlines allows passengers to carry up to 25 kg of luggage free of charge. Any additional luggage is charged at £10 per kg. No luggage weighing over 50 kg is allowed.

A computer system is created to calculate how much people should be charged depending on the weight of their luggage. The luggage weight is entered (in kg) and the system outputs the cost of any charges.

(c) Explain the purpose of testing of this system.

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

(d) State what is meant by the following terms:

(i) iterative testing

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

(ii) final testing

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

(e) Complete the table below to show **three** items of test data that could be used to test this system, giving the purpose of each test.

Test data	Purpose of this test

[6]

(f) Write an algorithm that:

- ○ Asks the user to enter the weight of luggage (in kg)
- ○ Displays an error message if the luggage is over 50 kg.
- ○ If the luggage is allowed, calculates the price to be paid and outputs this.

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.... **[6]**

END OF QUESTION PAPER

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).