Paper reference 4CP0/02
Pearson Edexcel
International GCSE (9 – 1)

Total Marks

COMPUTER SCIENCE
PAPER 2: APPLICATION OF COMPUTATIONAL THINKING

Time: 3 hours

In the boxes below, write your name, centre number and candidate number.

Surname					
Other names					
Centre Number					
Candidate Number					

X72406A

Pearson

YOU MUST HAVE

- **A computer workstation with appropriate programming language code editing software and tools, including a code interpreter/compiler, CODES folder containing code and data files,and pseudocode command set (provided separately).**

YOU WILL BE GIVEN

- **A separate Data Booklet.**

You do not need any other materials.

INSTRUCTIONS

- **Answer ALL questions.**
- **Answer the questions REQUIRING A WRITTEN ANSWER in the spaces provided – there may be more space than you need.**
- **Only ONE programming language (Python, C# or Java) must be used throughout the examination.**

(continued on the next page)

INSTRUCTIONS continued

- Carry out practical tasks on the computer system and save new or amended code using the name given in the question with the appropriate file extension.
- Do NOT overwrite the original code and data files provided to you.
- You must NOT use the internet during the examination.

INFORMATION

- The total mark for this paper is 80.
- The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.
- This paper covers Python, C# and Java.
- The CODES folder in your user area includes all the code and data files you need.
- The invigilator will tell you where to store your work.

ADVICE

- **Read each question carefully before you start to answer it.**
- **Save your work regularly.**
- **Check your answers if you have time at the end.**

Answer ALL questions.

Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Carry out practical tasks on the computer system and save new or amended code using the name given with the appropriate file extension.

Use only ONE programming language throughout the examination.

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Indicate the programming language that you are using with a cross in a box .

C#	
Java	
Python	

Question 1 is on the next page

1. Programmers write code to solve problems.

(a) Identify the description of a variable in a computer program.
(1 mark)

☐ A A value that cannot be used more than once

☐ B A value that must be input

☐ C A value that is always used in a calculation

☐ D A value that can change

(continued on the next page)

Question 1 continued

(b) Identify the technique that improves the readability of code.

(1 mark)

☐ **A** Using indents on every line

☐ **B** Using descriptive names for variables

☐ **C** Using the correct operators

☐ **D** Using suitable data structures

(continued on the next page)

Question 1 continued

(c) Complete the table by giving an example value for EACH data type.

The first row has been completed for you.

Data Type	Example Value
integer	12
char	
real	

(continued on the next page)

Question 1 continued

(d) Describe ONE difference between the data used in boundary testing and the data used in erroneous testing.

(2 marks)

(continued on the next page)

Question 1 continued

(e) A program should output the value 2

However, there is an error in the code and the actual output is 4

Name this type of error.
(1 mark)

(continued on the next page)

Question 1 continued

(f) Open Q01f in the code editor.

The program should allow the input of the length of the side of a square and output the area of the square.

There are THREE errors in the code.
Amend the code to correct the errors.

Save your amended code as Q01fFINISHED with the correct file extension for the programming language.
(3 marks)

(continued on the next page)

Question 1 continued

(g) A program is needed that will accept the input of a letter and compare it with a stored letter.

It will check whether the letter comes earlier in the alphabet, later in the alphabet or is the same letter as the stored letter.

It will output the letter and the stored letter with an appropriate message.

Open Q01g in the code editor.

Amend the code to complete the if statement used to produce the output.

You must use the structure given in Q01g to complete the program.

Do not add any further functionality.

Save your code as Q01gFINISHED with the correct file extension for the programming language.
(4 marks)

(Total for Question 1 = 14 marks)

2. Raza is writing a program to tell the user whether a number they input is a prime number.

A prime number is a whole number, larger than one, that can only be divided by one and itself with no remainder.

Look at the pseudocode for Question 2 in the separate Data Booklet.

This pseudocode contains the logic required to complete the program.

(a) Answer these questions about the pseudocode.

(i) Identify a line number where SELECTION starts.
(1 mark)

(continued on the next page)

Question 2 (a) continued

(ii) Identify the line number where ITERATION starts.

(1 mark)

(iii) Identify a line number where a STRING and a NUMBER are printed on the same line.

(1 mark)

(iv) Identify the name of a LOCAL VARIABLE.

(1 mark)

(continued on the next page)

Question 2 (a) continued

(v) Identify the name of a PARAMETER.
(1 mark)

(b) Write a program to implement the logic in the pseudocode.

Open Q02b in the code editor.

Write the program.

You must use the structure given in Q02b to complete the program.

Do not add any further functionality.

Save your code as Q02bFINISHED with the correct file extension for the programming language.

(11 marks)

(Total for Question 2 = 16 marks)

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3. Manjit sells copies of a science textbook to schools.

She needs a program to process textbook orders.

It must:

- accept the input of the number of textbooks required
- generate the price per textbook
- generate the total cost of the order
- display the price per textbook and the total cost of the order.

The price of one textbook depends on the number ordered:

Quantity	Price per textbook
1-5	£20.00
6-9	£15.00
10 or more	£12.00

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Question 3 continued

Open Q03 in the code editor.

Write the program.

You must use the structure given in Q03 to complete the program.

Do not add any further functionality.

Save your code as Q03FINISHED with the correct file extension for the programming language.

(Total for Question 3 = 6 marks)

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4. Several encryption algorithms have been developed.

(a) Identify what is meant by encryption.
(1 mark)

- ☐ **A** Conversion of ciphertext into plaintext
- ☐ **B** Conversion of plaintext into ciphertext
- ☐ **C** Conversion of code into data
- ☐ **D** Conversion of data into information

(b) Look at Figure 1 for question 4 (b) in the separate Data Book. Figure 1 shows a Pigpen cipher grid.

(continued on the next page)

Question 4 continued

Complete the table by adding the symbol for each letter in the word MAY.

LETTER	M	A	Y
SYMBOL			

(c) The message THE ENEMY IS NEAR is encoded using a different encryption algorithm.

Look at Figure 2 for Question 4 (c) in the separate Data Book. Figure 2 shows the first stage of the encryption process.

(continued on the next page)

Question 4 (c) continued

(i) Give the key used in the first stage of the encryption process.
(1 mark)

(ii) Give the ciphertext that is produced by the encryption algorithm.
(1 mark)

(iii) Give the name of the encryption algorithm that has been used to produce the ciphertext.
(1 mark)

(Total for Question 4 = 7 marks)

5. Julia runs a computer gaming club.

(a) She wants a program to check passwords stored in a file.

The file passwords.txt contains the list of passwords.

The program must:

- **check each password to ensure that:**
  - **the first character is an uppercase letter**
  - **if it is, that it also includes at least one digit (0–9)**
- **if a password does not meet these requirements:**
  - **display the password**
  - **increment the number of incorrect passwords**
- **display the total number of incorrect passwords after all the passwords have been checked.**

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Question 5 (a) continued

Open Q05a in the code editor.

Write the program.

You must use the structure given in Q05a to write the program.

Do not add any further functionality.

Save your code as Q05aFINISHED with the correct file extension for the programming language.
(9 marks)

(continued on the next page)

Question 5 continued

(b) **Figure 3** shows an array that stores player scores after a game.

Figure 3

3	2	10	8	1	9

(i) Julia uses a bubble sort algorithm to sort the scores.

Look at the table for Question 5 (b) in the separate Data Book.

Complete the table to show how the bubble sort algorithm will sort the scores.

You may not need to use all the rows.
(3 marks)

(continued on the next page)

Question 5 (b) continued

(ii) Explain ONE reason why a bubble sort is very efficient in terms of memory usage. (2 marks)

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Question 5 continued

(c) Describe the steps a linear search algorithm takes to find a search item.
(3 marks)

(Total for Question 5 = 17 marks)

6. Carlos wants you to create a GUESS THE ANIMAL game.

   Open Q06 in the code editor.

   The code contains an array of animals.

   It also contains a function that randomly selects an animal from the array. This is the secret word the user needs to guess.

   Carlos wants the program to:

   - generate the number of attempts the user has to guess the secret word. The maximum number of attempts is the length of the secret word +3.
     For example, the user has 8 attempts to guess when the secret word is tiger
   - keep track of letters from incorrect attempts that are in the secret word and those that are not. There should be no duplicated letters

(continued on the next page)

Question 6 continued

- display a message telling the user:
  - the number of letters in the secret word
  - how many attempts they have left
- force the user to input a word that is the same length as the secret word
- check whether the input word matches the secret word:
  - if the words match then a message that includes the secret word and the number of attempts taken to guess it is displayed
- if the words do not match then:
  - letters from the attempt that appear in the secret word should be added to the correct letters store
  - letters from the attempt that do not appear in the secret word should be added to the wrong letters store
  - the contents of the correct and wrong letter stores are displayed

(continued on the next page)

Question 6 continued

- **allow the user another attempt until they have guessed the word or have run out of attempts**
- **display a message telling the user the game is over including the random word if the maximum attempts have been taken and the word has not been guessed.**

Figure 4 shows the contents of the correct and wrong stores after two attempts to guess the secret word cow.

Figure 4

SECRET WORD cow	
FIRST ATTEMPT	**SECOND ATTEMPT**
input dog	input cat
correct store o	correct store o c
wrong store d g	wrong score d g a t

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Question 6 continued

YOUR PROGRAM SHOULD INCLUDE AT LEAST TWO SUBPROGRAMS THAT YOU HAVE WRITTEN YOURSELF.

YOU MUST INCLUDE COMMENTS IN THE CODE TO EXPLAIN THE LOGIC OF YOUR SOLUTION.

Save your code as Q06FINISHED with the correct file extension for the programming language.

You may use this space for planning/design work. The content of this space will NOT be assessed.

Question 6 continued

(Total for Question 6 = 20 marks)

TOTAL FOR PAPER = 80 MARKS

END OF PAPER
