

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

<b>Total Marks</b>
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**COMPUTER SCIENCE**  
**PAPER 2: Application of Computational**  
**Thinking**

**Monday 10 – Wednesday 12 June 2024**

**Time: 3 hours**

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

<b>Surname</b>					
<b>Other names</b>					
<b>Centre Number</b>					
<b>Candidate Number</b>					

**X75737A**

## **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 (enclosed)**

## **YOU WILL BE GIVEN**

- **A separate Data Book**
- **A separate Resource Booklet**

## **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)**

**Turn over**

## **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.**

**Answer the questions requiring a written answer 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.**

**(continued on the next page)**

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

C#

☐

Java

☐

Python

☐

1. Programmers write programs to solve problems.

(a) Programmers use many different techniques and tools to solve problems.

Identify what is meant by the term  
**ABSTRACTION.**

(1 mark)

☐

**A** Breaking a problem down into smaller more manageable parts

☐

**B** Deciding if a program is efficient in terms of execution time

☐

**C** Drawing flowcharts with symbols used in the computer industry

☐

**D** Removing unnecessary detail to highlight the important points

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**Turn over**

**Question 1 continued**

**(b) Open Q01b in the code editor.**

**A user enters a name and an age when the program executes.**

**The program should display a welcome message when the user is less than 30 years of age.**

**Amend the code to complete the program.**

**Save your amended code as Q01bFINISHED with the correct file extension for the programming language.**

**(4 marks)**

**(continued on the next page)**



**Question 1 continued**

**(c) Open Q01c in the code editor.**

**Use the code to answer these questions.**

**(i) Give the text of a comment used in the code.  
(1 mark)**

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**(ii) Give the text of a line that creates and  
initialises a variable.  
(1 mark)**

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**(iii) Give the keyword that starts the selection  
used in the code.  
(1 mark)**

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**Turn over**

**Question 1 (c) continued**

**(iv) Give the logical operator used in the code.**

**(1 mark)**

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**Question 1 continued**

**(d) Arrays and records are data structures.**

**Identify the data that MUST BE stored in a record rather than an array.**

**(1 mark)**

☐

**A “King Lear”, “Macbeth”, “Romeo and Juliet”, “The Tempest”**

☐

**B “King Lear”, 1983, 78.32, 99**

☐

**C 1978, 1985, 1990, 2001**

☐

**D 13.99, 12.75, 10.58, 11.43**

**(continued on the next page)**

**Turn over**

**Question 1 continued**

**(e) Complete the table to show the data type for EACH item.**

**(2 marks)**

<b>ITEM</b>	<b>DATA TYPE</b>
<b>45.82</b>	
<b>True</b>	

**(Total for Question 1 = 12 marks)**

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**2. Programmers design, correct and test programs.**

**(a) Programmers design programs.**

**(i) Identify the term for a step–by–step description to complete a task.**

**(1 mark)**

☐

**A Algorithm**

☐

**B Computational thinking**

☐

**C Decomposition**

☐

**D Pseudocode**

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**Turn over**

**Question 2 (a) continued**

- (ii) A constant is a memory location whose value does not change during program execution.**

**Give the name for a memory location whose value can change during program execution.**

**(1 mark)**

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**(continued on the next page)**

**Question 2 continued**

**(b) Programs can have runtime errors.**

**(i) State what is meant by the term  
RUNTIME ERROR.**

**(1 mark)**

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**(ii) Give ONE example of a runtime error.**

**(1 mark)**

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**Question 2 continued**

**(c) Open Q02c in the code editor.**

**The program generates a random number for the width of a rectangle.**

**The length of the rectangle is always 4**

**The program should calculate the perimeter of the rectangle.**

**The program should display the width, the length and the perimeter of the rectangle.**

**There are THREE errors in the code.**

**Amend the code to correct the errors.**

**Save your amended code as Q02cFINISHED with the correct file extension for the programming language.**

**(3 marks)**

**(continued on the next page)**



## Question 2 continued

- (d) **Figure 1** below shows part of an online form displayed in a browser.

**Figure 1**

Memorable word  (2–8 letters)

Date

Complete the table below to show **TWO** examples of erroneous, **ONE** example of normal and **ONE** example of boundary test data for the **MEMORABLE WORD** field.

Each example must be different.

(4 marks)

<b>ERRONEOUS</b>	
<b>ERRONEOUS</b>	
<b>NORMAL</b>	
<b>BOUNDARY</b>	

(Total for Question 2 = 11 marks)

3. Programs use logic, display data and validate input.

(a) The truth table shows the initial values for **A** and **B**.

Complete the truth table below to show the results of each operation.

(4 marks)

A	B	A OR B	NOT B	(A OR B) AND (NOT B)
0	0			
0	1			
1	0			
1	1			

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**Question 3 continued**

- (b) **Figure 2** below shows the intended output from a program that displays every other name in an array of star names.

**Figure 2**

**Alasia**

**Castor**

**Electra**

**Gudja**

**Izar**

**Kang**

**Maia**

**Ogma**

**Open Q03b in the code editor.**

**Amend the code to display every other name in the array of star names.**

**Do not add any further functionality.**

**Save your code as Q03bFINISHED with the correct file extension for the programming language.**

**(3 marks)**

**(continued on the next page)**

**Turn over**

**Question 3 continued**

- (c) Look at **Figure 3** for Question 3 (c) in the separate Data Book. Figure 3 is a Table. A program validates a number input by the user. **Figure 3** shows the output messages based on the inputted number.
- Open **Q03c** in the code editor.
- Amend the code to ensure the messages are generated correctly.
- Do not add any further functionality.
- Save your code as **Q03cFINISHED** with the correct file extension for the programming language.
- (6 marks)

**(Total for Question 3 = 13 marks)**

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4. Programmers write code that keeps track of values, is efficient and uses subprograms.

(a) Global variables are different from local variables.

(i) State where a GLOBAL variable is created.

(1 mark)

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(ii) State where a LOCAL variable is accessible.

(1 mark)

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**Question 4 continued**

- (b) An algorithm reports the range that an integer falls within.

Integers from 0 to 39 are in the low range.

Integers from 40 to 69 are in the middle range.

Integers from 70 to 100 are in the high range.

**Figure 4 and Figure 5** below show two algorithms that solve this problem.

**Figure 4**

```
1  SEND 'Enter an integer: ' TO DISPLAY
2  RECEIVE theNumber FROM (INTEGER) KEYBOARD
3  IF (theNumber < 40) THEN
4      SEND 'Low range' TO DISPLAY
5  ELSE
6      IF (theNumber < 70) THEN
7          SEND 'Middle range' TO DISPLAY
8      ELSE
9          SEND 'High range' TO DISPLAY
10     END IF
11 END IF
```

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**Turn over**

**Question 4 (b) continued****Figure 5**

```
1  SEND 'Enter an integer: ' TO DISPLAY
2  RECEIVE theNumber FROM (INTEGER) KEYBOARD
3  IF (theNumber < 40) THEN
4      SEND 'Low range' TO DISPLAY
5  END IF
6  IF (theNumber > 39) AND (theNumber < 70) THEN
7      SEND 'Middle range' TO DISPLAY
8  END IF
9  IF (theNumber > 69) THEN
10     SEND 'High range' TO DISPLAY
11  END IF
```

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**Question 4 (b) continued**

**Explain the reason that the algorithm in Figure 4 is more efficient than the algorithm in Figure 5.**  
**(2 marks)**

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**Question 4 continued**

**(c) A program is required to create a new key.**

**The program takes two inputs.**

**The first input is a four–character string.**

**The second input is a whole number.**

**The key is constructed by joining the first two characters from the string, the number and the final two characters from the string.**

**When the user enters the four–character string `abcd` and the integer `123`, the program must construct and display the new key `ab123cd`**

**(continued on the next page)**

**Question 4 (c) continued**

**Open Q04c in the code editor.**

**Amend the code to:**

- **complete the subprogram to construct the new key**
- **complete the call to the subprogram.**

**Do not add any further functionality.**

**Save your code as Q04cFINISHED with the correct file extension for the programming language.**

**(6 marks)**

**(Total for Question 4 = 10 marks)**

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5. Programmers refine algorithms, use searches and read data from files.

Look at **Figure 6** for Question 5 in the separate Data Book.

**Figure 6** shows an algorithm that determines whether the animal name inputted by the user is found.

Explain **ONE** improvement to this algorithm that will reduce the number of variables required and will enable it to work with any number of animals.

(2 marks)

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**Question 5 continued**

**Binary search is a divide and conquer algorithm.**

**Here is a list of data.**

10	12	13	14	15	16	17	18	19	20
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**A binary search is used to check whether the number 11 is in the list.**

**The midpoint is calculated by adding the high index to the low index and **INTEGER DIVIDING** by 2**

**Complete the table below to show the values for the high index, the low index and the midpoint on each pass of a binary search.**

**You may not need to use all the rows in the table.**

**(4 marks)**

HIGH INDEX	LOW INDEX	MIDPOINT

**(continued on the next page)**

**Turn over**

**Question 5 continued**

- (c) **Figure 7** below shows the **SALES.TXT** file.  
It stores sales information.

**Figure 7**

264, 140, 120, 284, 192  
420, 377, 435, 376, 392  
619, 589, 606, 586, 600  
799, 811, 788, 814, 788  
982, 1007, 1013, 989, 1009

A program is required to calculate and display:

- a subtotal for each line of sales
- a grand total for all the sales in the file.

**Figure 8** below shows the intended output from the program.

**Figure 8**

1000  
2000  
3000  
4000  
5000  
Grand total: 15000

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**Turn over**

**Question 5 (c) continued**

**Open Q05c in the code editor.**

**Amend the code to produce the intended output.**

**You must use the structure and variables given in Q05c to complete the program.**

**Do not add any further functionality.**

**Save your code as Q05cFINISHED with the correct file extension for the programming language.**

**(8 marks)**

**(Total for Question 5 = 14 marks)**

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6. A program stores pairs of words in a two-dimensional array.

Each word in a pair starts with a different letter.

Each pair of words should be in alphabetical order, but some are not.

The last pair in the array is an empty pair.

The program must:

- replace the final blank pair of words with the variables **word1** and **word2**
- display the pair number of each pair, followed by each word in the pair, without punctuation
- display the longer word in the pair, indented
- display any pair found to be not in alphabetical order, in alphabetical order, indented, without punctuation.

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**Question 6 continued**

**Figure 9** below shows part of the intended output from a functional program.

**Figure 9**

**1 apple banana**

**banana**

**2 wrist leg**

**wrist**

**leg wrist**

**3 blue yellow**

**yellow**

**4 speaker keyboard**

**keyboard**

**keyboard speaker**

**(continued on the next page)**



**Question 6 continued**

**Open the file Q06 in the code editor.**

**Write a program to produce the intended output.**

**You must use the structure and variables given in Q06 to complete the program.**

**Your program should function correctly even if the number of pairs in the array is changed.**

**You should use techniques to make your code easy to read.**

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

**(20 marks)**

**(continued on the next page)**

**Question 6 continued**

**You may use this space for planning / design work.  
Space for planning / design work continues on the  
next page.**

**The content of this space will NOT be assessed.**

**Question 6 continued**

**(Total for Question 6 = 20 marks)**

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**TOTAL FOR PAPER = 80 MARKS**

**END OF PAPER**

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