



AS

# COMPUTER SCIENCE

Paper 1

June 2022

## Preliminary Material

To be opened and issued to candidates on or after **1 March 2022** subject to the instructions given in the **Teachers' Notes** (7516/1/TN).

### Note

- The **Preliminary Material**, **Skeleton Program** and **Data Files** are to be seen by candidates and their teachers **only**, for use during preparation for the Summer 2022 examination. They **cannot** be used by anyone else for any other purpose, other than that stated in the instructions issued, until after the examination date has passed. They must **not** be provided to third parties.

### Information

- A Skeleton Program is provided separately by your teacher and must be read in conjunction with this Preliminary Material.
- You are advised to familiarise yourself with the Preliminary Material and Skeleton Program before the examination.
- A copy of this Preliminary Material and the Skeleton Program will be made available to you in hard copy and electronically at the start of the examination.
- You must **not** take any copy of the Preliminary Material, Skeleton Program and Data Files or any other material into the examination room.

Candidates will need access to a text file editor, such as Notepad or TextEdit.

## INSTRUCTIONS FOR CANDIDATES

The question paper is divided into **three** sections.

### Section A

You will be asked to create a new program and answer questions **not** related to the **Preliminary Material** or **Skeleton Program**.

### Section B

Questions will refer to the **Preliminary Material** and the **Skeleton Program**, but will not require programming.

### Section C

Questions will use the **Preliminary Material** and the **Skeleton Program** and may require the `puzzle1.txt`, `puzzle1P.txt` and `puzzle1S.txt` **Data Files**.

### Electronic Answer Document

Answers for **all** questions, for **all** sections, must be entered into the word-processed document made available to you at the start of the examination and referred to in the question paper rubrics as the **Electronic Answer Document**.

### Preparation for the Examination

You should ensure that you are familiar with this **Preliminary Material** and the **Skeleton Program** for your programming language.

## Number Puzzle

The **Skeleton Program** accompanying this **Preliminary Material** is a number puzzle program for a single user.

A puzzle consists of a 9 x 9 grid with nine 3 x 3 sub-grids. The grid contains some given digits between 1 and 9.

To solve the puzzle, the user fills in the grid with single digits so that each row, each column and each of the nine sub-grids contain all of the digits from 1 to 9.

**Figure 1** shows the main menu that is displayed when the program is started.

**Figure 1**

```
Main Menu
=====
L - Load new puzzle
P - Load partially solved puzzle
S - Solve puzzle
C - Check solution
K - Keep partially solved puzzle
X - Exit
```

There are six options on the menu:

#### Option L

The program loads a new puzzle. When loading a new puzzle, the program starts with a partially complete grid of digits (referred to as given digits).

#### Option P

The program loads a partially solved puzzle that has previously been saved (see Option K below).

#### Option S

The program enters solve mode, allowing the user to attempt to solve the loaded puzzle.

In solve mode the user enters the co-ordinates and the digit as a single string.

For example, entering 257 means place the digit 7 in row 2, column 5

To exit solve mode, the user presses the Enter key.

#### Option C

The program checks the digits the user has placed and calculates a score.

#### Option K

The program saves a partially solved puzzle. This can be reloaded by the user (see Option P).

#### Option X

The program ends.

Turn over ►

IB/G/Jun22/7516/1/PM

### Data File Naming Convention

The **Skeleton Program** stores puzzle data in data files. The naming convention for these files is as follows, where N represents a positive integer:

- `puzzleN.txt` contains the data for an unsolved puzzle (a partially complete grid)
- `puzzleNS.txt` contains the solution to `puzzleN`
- `puzzleNP.txt` contains the data for a partial solution of `puzzleN`

The `puzzle1.txt` file contains data for the puzzle shown in **Figure 2**.

**Figure 2**

```
1 2 3 4 5 6 7 8 9
|===.===.===|===.===.===|===.===.===|
1| 8 . . 5 | . . | . . 7 |
|.....|.....|.....|
2| 9 . . | 5 . . 4 | . . |
|.....|.....|.....|
3| 4 . 1 . | . 6 . | . . |
|===.===.===|===.===.===|===.===.===|
4| . . | 7 . . | 1 . 6 . |
|.....|.....|.....|
```

```

5| 1 . . | 4 . . 6 | . . 3 |
|.....|.....|.....|
6| . 5 . 8 | . . 1 | . . |
|===.===.===|===.===.===|===.===.===|
7| . . | . 1 . | . 4 . 9 |
|.....|.....|.....|
8| . . | 2 . . 7 | . . 1 |
|.....|.....|.....|
9| 2 . . | . . | 5 . . 6 |
|===.===.===|===.===.===|===.===.===|

```

The contents of file **puzzle1S.txt**, shown in **Figure 3**, contains data for the solution of puzzle1.

**Figure 3**

```

865192437
932574618
417863952
324789165
179456823
658321794
783615249
596247381
241938576

```

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The file **puzzle1P.txt** contains the data shown in **Figure 4**.

**Figure 4**

```

puzzle1
-1
4
257
337
616
527

```

**Figure 5** shows the partially solved puzzle1.

**Figure 5**

```

1 2 3 4 5 6 7 8 9
|===.===.===|===.===.===|===.===.===|
1| 8 . . 5 | . . | . . 7 |
|.....|.....|.....|

```

2		9	.	.		5	.	7	.	4		.	.	
		..... ..... .....												
3		4	.	1	.	7		.	6	.		.	.	
		===.===.=== ===.===.=== ===.===.===												
4		.	.		7	.	.		1	.	6	.		
		..... ..... .....												
5		1	.	7	.		4	.	.	6		.	.	3
		..... ..... .....												
6		6	.	5	.	8		.	.	1		.	.	
		===.===.=== ===.===.=== ===.===.===												
7		.	.		.	1	.		.	4	.	9		
		..... ..... .....												
8		.	.		2	.	.	7		.	.	1		
		..... ..... .....												
9		2	.	.		.	.		5	.	.	6		
		===.===.=== ===.===.=== ===.===.===												

**END OF PRELIMINARY MATERIAL**

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