

AS COMPUTER SCIENCE

Paper 1

June 2019

Preliminary Material

To be opened and issued to candidates on or after 1 March 2019 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 examination on **Tuesday 21 May 2019**. 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 yourselves 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.

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 **game1 . txt**, **game2 . txt**, **game3 . txt** and **game4 . 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.

AQA Board Game

The **Skeleton Program** accompanying this **Preliminary Material** is a two-player board game. The players are referred to as Player A and Player B. The board contains 64 squares, arranged in an 8×8 grid. The squares containing `xs` are not used. Each player has a maximum of 12 pieces. The number of pieces and their starting positions are determined by the contents of a text file. The pieces' IDs consist of the player's letter and consecutive numbers 1 to 12.

Figure 1 shows a game with 12 pieces that has been loaded from the `game1.txt` text file.

Player A has twelve pieces with IDs **a1** to **a12**, occupying rows 0 to 2.

Player B has twelve pieces with IDs **b1** to **b12**, occupying rows 5 to 7.

Figure 1

	0	1	2	3	4	5	6	7
0	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
1	XXXXXX	a1 XXXXXX	XXXXXX	a2 XXXXXX	XXXXXX	a3 XXXXXX	XXXXXX	a4 XXXXXX
2	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
3	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
4	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
5	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
6	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
7	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
8	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
9	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
10	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
11	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
12	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
13	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
14	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
15	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
16	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
17	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
18	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
19	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
20	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
21	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
22	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
23	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
24	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
25	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
26	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
27	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
28	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
29	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
30	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
31	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
32	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
33	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
34	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
35	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
36	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
37	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
38	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
39	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
40	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
41	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
42	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
43	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
44	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
45	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
46	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
47	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
48	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
49	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
50	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
51	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
52	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
53	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
54	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
55	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
56	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
57	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
58	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
59	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
60	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
61	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
62	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
63	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
64	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX

Figure 2 shows a game with eight pieces that has been loaded from the `game2.txt` text file.

Player A has eight pieces with IDs **a1** to **a8**, occupying rows 0 to 1

Player B has eight pieces with IDs **b1** to **b8**, occupying rows 6 to 7

Figure 2

	0	1	2	3	4	5	6	7
0	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
	XXXXX	a1 XXXXX	a2 XXXXX	a3 XXXXX	a4 XXXXX	XXXXX	XXXXX	
	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
1		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
	a5 XXXXX	a6 XXXXX	a7 XXXXX	a8 XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
2	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
3		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
4	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
5		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
6	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
	XXXXX	b5 XXXXX	b6 XXXXX	b7 XXXXX	b8 XXXXX	XXXXX	XXXXX	
	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
7		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
	b1 XXXXX	b2 XXXXX	b3 XXXXX	b4 XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
		XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX

The rules are:

- Player A always starts.
- Players take turns to move.
- A move consists of advancing one of the player's own pieces one square forward along the diagonal (left or right) while remaining on the board.
For example, in **Figure 2** piece **a6**, currently at row 1, column 2, could move to row 2, column 1 or row 2, column 3
- An alternative move is a jump over one of the player's own pieces that is diagonally immediately in front of the piece to be moved.
For example, in **Figure 2** piece **a2**, currently at row 0, column 3, could move to row 2, column 1 or row 2, column 5
- When a piece reaches the opposite end of the board (row 7 for Player A, row 0 for Player B) it is promoted to a dame and the letter of the ID is changed to uppercase. The dame is moved to an empty square in the player's first row (row 0 for Player A, row 7 for Player B). If there is no empty square in the player's first row the dame stays where it is and cannot move.

The **Skeleton Program** presents the user with the current state of the board and shows the possible moves that the player whose turn it is can make.

The player enters the ID of the piece they want to move, followed by the row and column of the board square to which they want to move the piece.

The program confirms if the move was a jump and, if so which piece was jumped over.

When a player has no possible moves available when it is their turn, the game ends and that player has lost the game.

Figure 3 shows a game with eight pieces that has been loaded from the `game3.txt` text file.

Figure 3

	0	1	2	3	4	5	6	7
0	XXXXXX	a1 XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	a4
1		XXXXXX	XXXXXX	XXXXXX	b5 XXXXXX	a8 XXXXXX	XXXXXX	XXXXXX
2	XXXXXX	XXXXXX	XXXXXX	XXXXXX	a7 XXXXXX	XXXXXX	a3	
3	a6	XXXXXX	a5 XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
4	XXXXXX	b1 XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	
5		XXXXXX	XXXXXX	XXXXXX	b4 XXXXXX	b3 XXXXXX	XXXXXX	XXXXXX
6	XXXXXX	a2 XXXXXX	XXXXXX	b6 XXXXXX	XXXXXX	b7 XXXXXX	XXXXXX	b8
7		XXXXXX	b2 XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX

Figure 4 shows a game with 12 pieces that has been loaded from the `game4.txt` text file.

Figure 4

	0	1	2	3	4	5	6	7
0	XXXXXX		XXXXXX		XXXXXX		XXXXXX	
	XXXXXX	A5	XXXXXX	a2	XXXXXX	a3	XXXXXX	
	XXXXXX		XXXXXX		XXXXXX		XXXXXX	
1		XXXXXX		XXXXXX		XXXXXX		XXXXXX
		A6	XXXXXX	a1	XXXXXX	a7	XXXXXX	a4
		XXXXXX		XXXXXX		XXXXXX		XXXXXX
2	XXXXXX		XXXXXX		XXXXXX		XXXXXX	
	XXXXXX	a9	XXXXXX	a10	XXXXXX	a11	XXXXXX	a8
	XXXXXX		XXXXXX		XXXXXX		XXXXXX	
3		XXXXXX		XXXXXX		XXXXXX		XXXXXX
		b9	XXXXXX	b6	XXXXXX	b10	XXXXXX	a12
		XXXXXX		XXXXXX		XXXXXX		XXXXXX
4	XXXXXX		XXXXXX		XXXXXX		XXXXXX	
	XXXXXX	b5	XXXXXX	b1	XXXXXX	b11	XXXXXX	b12
	XXXXXX		XXXXXX		XXXXXX		XXXXXX	
5		XXXXXX		XXXXXX		XXXXXX		XXXXXX
		b2	XXXXXX		XXXXXX	b4	XXXXXX	b3
		XXXXXX		XXXXXX		XXXXXX		XXXXXX
6	XXXXXX		XXXXXX		XXXXXX		XXXXXX	
	XXXXXX		XXXXXX		XXXXXX	b7	XXXXXX	b8
	XXXXXX		XXXXXX		XXXXXX		XXXXXX	
7		XXXXXX		XXXXXX		XXXXXX		XXXXXX
		XXXXXX		XXXXXX		XXXXXX		XXXXXX
		XXXXXX		XXXXXX		XXXXXX		XXXXXX

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