
A-Level COMPUTER SCIENCE

Paper 1

June 2018

Preliminary Material

To be opened and issued to candidates on or after 1 September 2017, subject to the instructions given in the Teachers' Notes (7517/1/TN).

Note

- The Preliminary Material and Skeleton Program are to be seen by candidates and their teachers **only**, for use during preparation for the examination on **Monday 11 June 2018**. It **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. It 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 or any other material into the examination room.

There is no Preliminary Material printed on this page

INSTRUCTIONS FOR CANDIDATES

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.

Turn over ►

WORDS WITH AQA

WORDS WITH AQA is a two-player game. Each player starts with 15 randomly-selected tiles. Each tile represents a single letter; each letter has a points value as shown in **Figure 1**. The tiles that a player has are called their "hand". Each player starts with a score of 50.

Figure 1

Letter	Points letter is worth
A	1
B	2
C	2
D	2
E	1
F	3
G	2
H	3
I	1
J	5
K	3
L	2
M	2
N	1
O	1
P	2
Q	5
R	1
S	1
T	1
U	2
V	3
W	3
X	5
Y	3
Z	5

Players take turns to spell a two or more letter word using only the letter tiles in their hand. Each tile may only be used once in the word. If on their turn they spell a valid word then the tiles used in that word are removed from their hand and their score is increased. The amount their score increases by depends on which tiles were used and the number of tiles used in the word. Initially the score increases by the total points value of the tiles used. If a valid word is spelt that uses more than seven tiles an additional 20 points are added to the player's score. If a valid word is spelt that uses six or seven tiles an additional five points are added to the player's score.

The player may then choose to either get three new tiles, get a number of new tiles equal to the number of tiles used in the word they just spelt, get a number of new tiles equal to three larger than the number of tiles used in the word they just spelt or to get no new tiles. New tiles come from the tile queue.

If the word they spelt is not valid then their turn is over. No tiles are removed from their hand and they get three tiles from the tile queue.

A valid word is one in which all the tiles needed to spell the word are in their hand and it is a correctly-spelt English word.

The tile queue contains 20 randomly-selected tiles. The tiles in the queue are shown in order, the tile at the front of the queue will be the next tile given to a player who gets a new tile. When a tile is removed from the front of the queue and given to a player, a new randomly-selected tile is added to the rear of the queue. Players may look at the contents of the tile queue at any time.

The game ends when either a player has used a total of more than 50 tiles in the valid words they have spelt or when their hand contains 20 or more tiles. If Player One uses more than 50 tiles first or has a hand with 20 or more tiles then Player Two gets to have their turn before the game ends. At the end of the game each player's score is reduced by the points value of the letters on the tiles remaining in their hand. The winner is the player with the highest score.

Figures 2 to 7 show an example game.

Figure 2

Player One's hand at the start of the game:

B	T	A	H	A	N	D	E	N	O	N	S	A	R	J
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Player Two's hand at the start of the game:

C	E	L	Z	X	I	O	T	N	E	S	M	U	A	A
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

The tile queue at the start of the game:

V	H	H	D	W	I	P	J	G	O	L	T	D	X	I	O	K	O	L	P
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Figure 3

Player One goes first and spells the word DATA. This is a valid word so Player One's score is increased by five points, 2 (D) + 1 (A) + 1 (T) + 1 (A), and the four tiles used in that word are removed from the player's hand. Player One chooses to get a number of new tiles equal to three more than the number of tiles used in the word they just spelt and so the first seven tiles in the tile queue are removed from the queue and added to Player One's hand. Seven random tiles are added to the rear of the tile queue.

Player One's hand before playing word with tiles being used highlighted:

B	T	A	H	A	N	D	E	N	O	N	S	A	R	J
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Player One's hand with tiles used removed and the seven tiles from the front of the tile queue added to player's hand:

B	H	N	E	N	O	N	S	A	R	J	V	H	H	D	W	I	P
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Seven random letter tiles are added to the rear of the tile queue to replace those removed:

J	G	O	L	T	D	X	I	O	K	O	L	P	L	W	C	N	A	G	E
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Figure 4

It is now Player Two's turn. Player Two spells the word AXONEMAL. This is a valid word so Player Two's score is increased by 34 points – 1 (A) + 5 (X) + 1 (O) + 1 (N) + 1 (E) + 2 (M) + 1 (A) + 2 (L) + 20 (word more than 7 letters long) – to 84, and the eight tiles used in that word are removed from the player's hand. Player Two chooses not to get any new tiles.

Player Two's hand before playing word with tiles being used highlighted:

C	E	L	Z	X	I	O	T	N	E	S	M	U	A	A
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Player Two's hand with tiles used removed:

C	Z	I	T	E	S	U
---	---	---	---	---	---	---

The tile queue is unchanged:

J	G	O	L	T	D	X	I	O	K	O	L	P	L	W	C	N	A	G	E
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Figure 5

It is now Player One's turn again. Player One spells the word NEED. This is not a valid word as they have only got one E tile in their hand and the word they have spelt needs two Es. Player One's score is unchanged, no tiles are removed from Player One's hand and the first three tiles in the tile queue are removed from the queue and added to Player One's hand. Three random tiles are added to the rear of the tile queue.

Player One's hand at start of turn:

B	H	N	E	N	O	N	S	A	R	J	V	H	H	D	W	I	P
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Tile queue at start of turn:

J	G	O	L	T	D	X	I	O	K	O	L	P	L	W	C	N	A	G	E
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Player One's hand at end of turn:

B	H	N	E	N	O	N	S	A	R	J	V	H	H	D	W	I	P	J	G	O
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

The queue at end of turn:

L	T	D	X	I	O	K	O	L	P	L	W	C	N	A	G	E	D	R	A
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Player One has now got more than 20 tiles in their hand (21) so the game will end. However, Player Two gets their turn before the game ends.

Figure 6

It is now Player Two's turn. Player Two spells the word ZIC. This is not a valid word as it is not an English word. Player Two's score is unchanged, no tiles are removed from Player Two's hand and the first three tiles in the tile queue are removed from the queue and added to Player Two's hand. Three random tiles are added to the rear of the tile queue.

Player Two's hand at start of turn:

C	Z	I	T	E	S	U
---	---	---	---	---	---	---

Tile queue at start of turn:

L	T	D	X	I	O	K	O	L	P	L	W	C	N	A	G	E	D	R	A
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Player Two's hand at end of turn:

C	Z	I	T	E	S	U	L	T	D
---	---	---	---	---	---	---	---	---	---

Tile queue at end of turn:

X	I	O	K	O	L	P	L	W	C	N	A	G	E	D	R	A	X	X	U
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

The game now stops and the final scores are calculated.

Figure 7

To calculate Player One's final score the value of the tiles in their hand is subtracted from their current score. Player One's current score is 55. The value of the tiles in their hand is 43. So their final score is $55 - 43 = 12$.

B	H	N	E	N	O	N	S	A	R	J	V	H	H	D	W	I	P	J	G	O
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

$2 + 3 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 5 + 3 + 3 + 3 + 2 + 3 + 1 + 2 + 5 + 2 + 1 = 43$

To calculate Player Two's final score the value of the tiles in their hand is subtracted from their current score. Player Two's current score is 84. The value of the tiles in their hand is 18. So their final score is $84 - 18 = 66$.

C	Z	I	T	E	S	U	L	T	D
---	---	---	---	---	---	---	---	---	---

$2 + 5 + 1 + 1 + 1 + 1 + 2 + 2 + 1 + 2 = 18$

Player One has a final score of 12 and Player Two has a final score of 66 so Player Two has won the game.

In the **Skeleton Program** there is a main menu containing three options.

The first option is to play the game with the players having a random selection of letters in their starting hands. The starting contents of the tile queue are random.

The second option is to play a training game in which the players have the same selection of letters in their starting hands as shown in **Figure 2**. The starting contents of the tile queue are random.

The third option is to quit the program.

When playing the game each player takes it in turn to spell a word. When a player has their turn they have five choices.

If they enter the string 1 then the point values of the 26 letters are displayed. The player's turn continues and they can choose any of the five options.

If they enter the string 4 then the current contents of the tile queue are displayed. The player's turn continues and they can choose any of the five options.

If they enter the string 7 then the current contents of their hand are displayed. The player's turn continues and they can choose any of the five options.

If they enter the string 0 then the player's hand will be given enough tiles to take them over the maximum number of tiles allowed in a hand. This will mean that the game will finish (though if Player One chooses this option, Player Two will still have their turn before the game finishes). The player's turn then finishes.

If they enter any other string then this is treated as being an attempt at spelling a word and the program checks to see if the word is valid. The player's turn then finishes.

To check that a word is valid the program checks if the word is:

- spelt using only letter tiles that are in the player's hand
- in the list of allowed words. The allowed words are the words contained in the **Data File aqawords.txt**.

Data File

A **Data File** named **aqawords.txt** is supplied with the **Skeleton Program**. This stores the list of allowed English words that can be used in the game.

END OF PRELIMINARY MATERIAL

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