

ICS4U Summative Proposal

Scrabble

Overview!

Scrabble is a word game in which players score points by forming words made from individual letter tiles on a 15-by-15 game board. The game is extremely popular; it is sold in 121 countries in 29 different languages. Over 150 million Scrabble sets have been sold world-wide.

A list of legitimate words is compiled in *The Official Scrabble Players Dictionary*. Words are often played horizontally and vertically in crossword fashion. The objective of the game is to score as much points as possible by the end of the game.

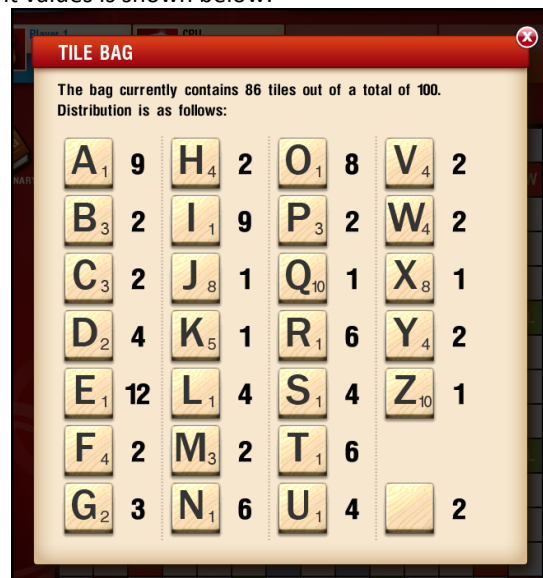
Gameplay

Scrabble is played between two to four players. The game is played on a 15-by-15 grid (resulting in 225 individual cells), each of which can hold one tile and consequently, one letter.

The Tiles

There are 100 tiles in the English version of Scrabble, 98 of which have a letter and a corresponding point value. The number of points of each letter is related to the frequency the letter occurs in the English language. Common letters have lower points while rare letters have more points. The points range from one to ten. Of the 100 tiles, there are two tiles that are referred to as “blanks”. These tiles do not have any value, but can represent any letter in the alphabet.

The distribution of point values is shown below:

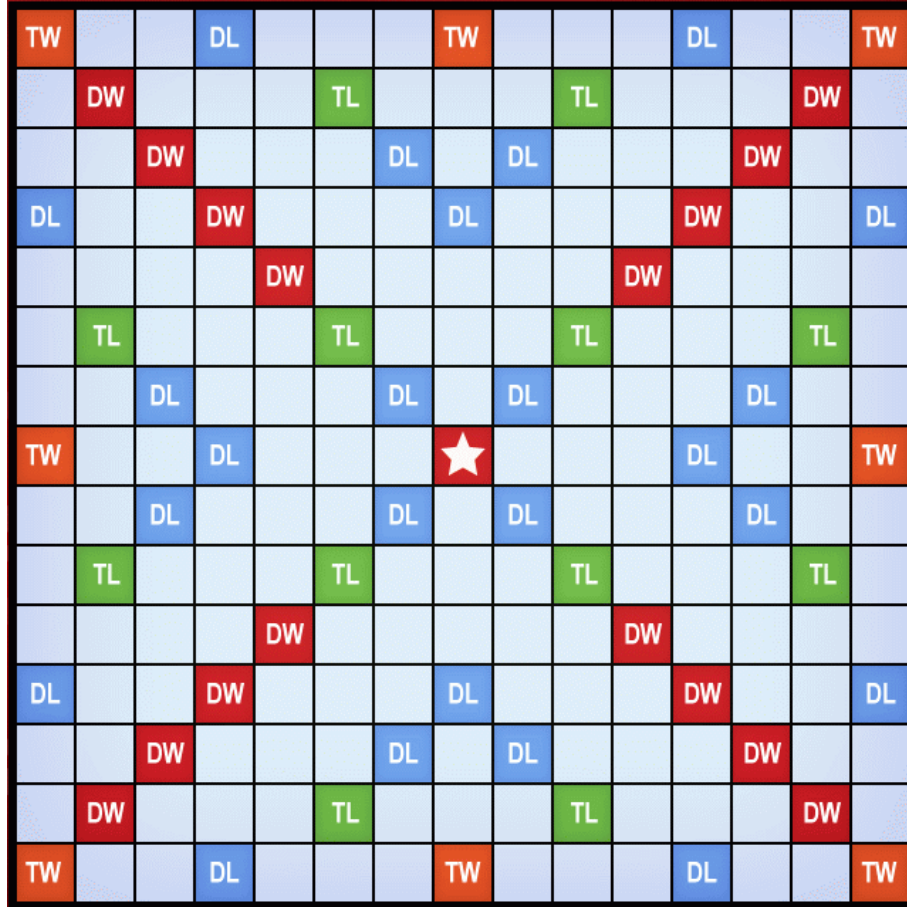


TILE BAG			
The bag currently contains 86 tiles out of a total of 100. Distribution is as follows:			
A ₁ 9	H ₄ 2	O ₁ 8	V ₄ 2
B ₃ 2	I ₁ 9	P ₃ 2	W ₄ 2
C ₃ 2	J ₈ 1	Q ₁₀ 1	X ₈ 1
D ₂ 4	K ₅ 1	R ₁ 6	Y ₄ 2
E ₁ 12	L ₁ 4	S ₁ 4	Z ₁₀ 1
F ₄ 2	M ₃ 2	T ₁ 6	
G ₂ 3	N ₁ 6	U ₁ 4	

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The Board

A standardized playing board looks similar to:



Tile	Effect
	A regular tile. It can hold 1 letter, and the number of points is the same as the number of points on the tile.
	A double letter tile. It can hold 1 letter, and the number of points of the letter is doubled. (Only the letter's value is doubled. For example, a "E" would be worth 2 points if it is placed on this tile")
	A triple letter tile. It can hold 1 letter, and the number of points of the letter is tripled. (Only the letter's value is tripled. For example, a "E" would be worth 3 points if it is placed on this tile")
	A double word tile. It can hold 1 letter, and the number of points of the word is doubled. (The entire word's value is doubled. For example, if the word "Bee" is played and one of the letters is on a double word tile, the number of points would be $2(2 + 1 + 1) = 8$)

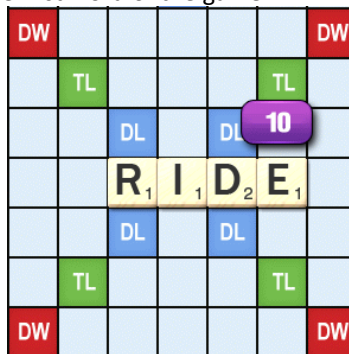
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	<p>A triple word tile. It can hold 1 letter, and the number of points of the word is tripled. (The entire word's value is tripled. For example, if the word "Bee" is played and one of the letters is on a triple word tile, the number of points would be $3(2 + 1 + 1) = 12$)</p>
	<p>The Star tile. The first word of every game must include a letter placed on this tile. This tile has the effect of a double word tile</p>

Points

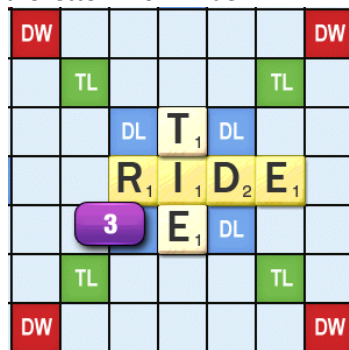
The number of points is determined both by the individual points of the letters and the tiles on which the letters are placed.

Case 1: The word "ride" was played as the first word of the game.



Points: The *Star* gave the word a "double word" effect. $2(1 + 1 + 2 + 1) = 10$

Case 2: The word "tie" is played by using the letter I from "ride".



Points: Even though the letter "I" is on the star, the word tie does **not** receive the double word effect. The tile only affects the *initial word* that is played on it, and any subsequent uses of the letter on the tile do **not** receive any bonuses. Therefore, the points are $(1 + 1 + 1) = 3$

Case 3: The word "pet" is played using the letter T from "Tie"

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DW						DW
	TL				TL	
	P ₃	E ₁	T ₁	DL		
		R ₁	I ₁	D ₂	E ₁	
		DL	E ₁	DL		
	TL				TL	
DW						DW

Points: In this case, two words are formed: “pet”, and “er”. This is allowed because the letters are played in a straight line and the words formed are in the official Scrabble dictionary. Regarding points, the total amount of points is equal to the sum of each word’s points. Moreover, the letter “e” is on a double letter tile.

Pet: $(3 + 2(1) + 1) = 6$

Er: $(2(1) + 1) = 3$

Total = $6 + 3 = 9$

If the player uses **all 7 letters** of their rack, the player receives **50** extra points.

If a word spans two double word tiles, the **word’s initial point value is quadrupled**. Similar bonuses are applied when a word spans a double and a triple, or two triples.

Gameplay

A game is normally played between 2-4 people.

In the beginning, each player is given 7 tiles out of the tile bag. Player one will go first, followed by player two and so forth. Who is player one will be decided by the players themselves.

Thereafter, each player takes turn to play words on the board. For each turn, there are three options:

i) Play a word

The player receives points based on the play.

ii) Swap tiles

The player can choose to swap any of the tiles in his hand for other tiles in the bag. The player can swap from 1 tile to his entire rack (7 tiles). The swap will take a turn and the player will not receive any points. The player cannot play a word after the swap.

iii) Skip turn

The player can choose to skip his turn and score nothing.

The game ends when either:

- i)** One player has played every tile in their rack and there are no more tiles in the bag
- ii)** Six successive scoreless turns have occurred (ie: Six successive skip turns)

At the end, each player's score is **reduced** by the sum of his/her unplayed tiles. If a player has used all the letters, the sum of the other player's unplayed tiles is **added** to the player's score.

A blank tile can be substituted for **any** letter. The blank tile will remain that letter for the rest of the game. A blank tile is worth **0** points.

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Words are viewed from **left to right** and from **top to bottom**. It is important to note that words can only be played if the letters played are adjacent to or connects to letters already on the board. You **cannot** place a word that does not connect to any other letter (with the exception of the first move). However, you can use placed letters as letters for your word.

Our Program

Our program will try to adhere to the basic rules of Scrabble to the best of our abilities. However, Java limitations prevent us from following the official rules in every aspect. Differences between our program and the original game include:

- We will use the **English TWL** dictionary for the list of possible words
- Instead of manually picking tiles, we will use a **random number generator** to produce tiles for each player

Features

- 2-4 players in game
 - Ability to pick the name of each player
-

We will start off at the main page. There, there will be different links that can lead the user to different aspects of the game.

Links on main page:

- a) **Play game!**
Creates a new game by leading to the page where the user can determine how many players and their customizable names (We can call this the player selection page).
- b) **Settings**
On the settings page, we can toggle music options.
- c) **Help (In the form of a question mark link)**
Clicking this button will lead to the first page of a help manual in a new window. This will include game rules and instructions on how to navigate through the program.

After clicking “play game”, the program will lead to the “Player selection” page.

Player Selection Page

By default, this page will include two rows with the players’ names being “Player 1” and “Player 2”. On the side, there will be a button (in the form of a “+”) that allows the user to add more players (up to 4). Each new row will have the default name in the form “Player X”, with X being the number assigned to each player (1, 2, 3, 4).

On the bottom left corner, there will be a return arrow so that the user can return to the main page.

On the bottom left right corner, there will be a forward arrow so that the user can enter the game with a brand new board on which there will be no tiles. The game will consequently start.

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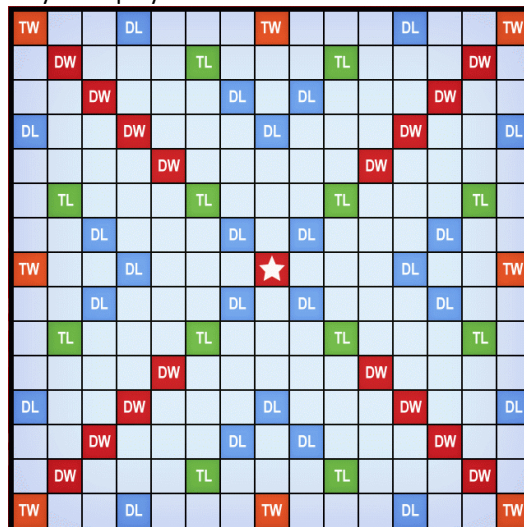
The Game

The game will start off with an empty board. Player 1 (the topmost row on the player selection page) will automatically start with his/her turn.

Features

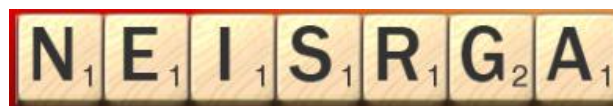
a) Game Board

The place where tiles are placed by each player



b) Rack

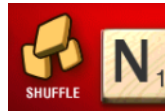
The rack will start with seven randomly generated tiles. Each player can only view their own rack (i.e.: only one rack will be shown on the screen at a time). The letters will be placed in a random order. The rack will be placed on the bottom of the screen, below the game board.



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c) Shuffle

The shuffle button will be placed to the immediate left of the rack. Clicking the button will randomly rearrange the tiles on the player's rack.



d) Swap

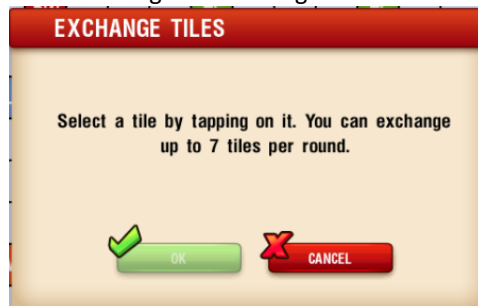
The swap button will be placed to the immediate left of the shuffle. A pop-up will appear on the screen.

Pop-up

In the pop-up, there will be a clickable rack along with the following buttons:

- i) Swap
Change the selected tile with the randomly selected remaining tiles. The swap button will be inactive until one or more tiles are selected.
- ii) Return
Return back to the game board page.

Each tile in the rack can be clickable. Upon the user clicking a tile, the tile will be highlighted. This means that the tile is selected to be swapped. Clicking the same tile again will cause the tile to return back to its un-highlighted form, therefore removing it from being selected.



e) Pass

A confirmation pop-up will appear with a confirmation message and a "Yes" and a "No" button. If "yes" is clicked, the player's turn will be skipped and no points are awarded. The next person's turn starts immediately. If "no" is clicked, the program will return to the game board page.



f) Tile bag

Shows how many tiles are left in the "bag". The tile bag is clickable and shows the point values of each letter.

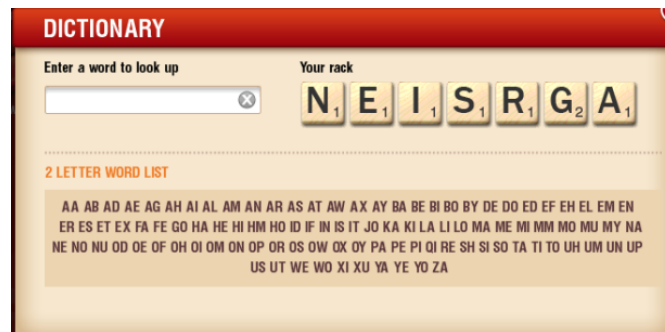
ICS4U Summative Proposal



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B ₃	2	I ₁	9	P ₃	2	W ₄	2		
C ₃	2	J ₈	1	Q ₁₀	1	X ₈	1		
D ₂	4	K ₅	1	R ₁	6	Y ₄	2		
E ₁	12	L ₁	4	S ₁	4	Z ₁₀	1		
F ₄	2	M ₃	2	T ₁	6				
G ₂	3	N ₁	6	U ₁	4				

g) Dictionary

Upon clicking the dictionary a pop-up will appear. In the pop-up there will be a text box for the player to type in a word to confirm if the word is valid. If the word is valid it will return “_____ is a valid word.” If the word is not valid it will return “_____ is not a valid word.” The players’ rack will be displayed to the left of the text box. On the bottom of the pop-up the list of two letter words will be shown.



h) Players

Lists the players name in order and their corresponding points



i) Word History

A box will display past words played and the points obtained by each word. The left side will show the player name, the middle the word, and the right side the points obtained.

PLAYER	WORD	POINTS	TOTAL
Player 1	Skip Turn	-	0
Player 2	Skip Turn	-	0
Player 3	AS	4	4

j) Menu

The menu button will return the user back to the start screen.



Upon Placing Tiles

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To the right of the word, a box will display how many points will be gained. The “Shuffle” button will turn into a “Recall” button. The “recall” button will remove the players’ tiles from the board back into their rack. The “Pass” button will turn into a “Play” button. Upon clicking play, there is no confirmation, and the word will be played on the board after checking that it is a valid word. If the word is invalid, a pop-up will show and say “_____ is an invalid word.”

Points gained by the word played will be added to the corresponding players point totals.



Displaying/Placing Words

Each tile can be played by clicking a tile on the rack and the spot on which the tile is to be played. Then, each tile will be displayed on the game board and no longer on the rack.

Blank Tiles

If a player wishes to play a blank tile, the player can click the tile and a spot on the board. Immediately, a pop-up will appear which will allow the player to choose which letter the blank tile will represent. When the word is confirmed and played, the blank tile is shown as the letter selected, but the font color is red, rather than black.

End of Game

The game will end when one player has no more tiles and there are no more tiles in the bag. The game will also end when there are 6 successive “pass” turns.

When the game ends, a pop-up will display showing each player’s score and a message showing which player won based on points. Penalties and additional points are subtracted/added before displaying the winner. The pop-up will have a return button, which will bring the user back to the main menu.

