

Data structure

Class:

Board:

Data structures used:

2D array: `Tile[][]`

Explanation:

A scrabble board is always a fixed size, so a 2D array is appropriate as you'd never need to modify the size. It's also ideal as it allows for $O(1)$ access to any cell

Operations:

`placeTile(row, col, tile)` updates the 2D array cell

`getTile(row, col)` retrieves the tile from a specified location

`removeTile(row, col, tile)` sets the tile back to Null

`display()` loops over the array

`isEmpty()` loops over the array

Dictionary:

Data structures used:

`ArrayList<String> acceptedWords`

Explanation:

the dictionary contains a dynamic list of words loaded from a CSV. `ArrayList` allows dynamic resizing as words are added or removed, and it provides fast indexed access for checking or iterating through words

Operations:

`acceptedWords.add(word)` adds a new word

`acceptedWords.contains(word)` checks if the word already exists

Board:

Data structures used:

`ArrayList<Tile> hand`

`ArrayList<PlacedTile> placedTiles`

Explanation:

`ArrayList` is dynamic, which is important because the number of tiles can change during the game

`ArrayList` allows indexed access and iteration, which is useful for displaying hand or processing placed tiles

Operations:

`hand.add(tile)` adds a tile to the player's hand

`hand.remove(tile)` removes a tile once it's placed

`placedTiles.add(new PlacedTile(...))` tracks moves for validation and scoring

`showHand()` iterates through the `ArrayList`

`playWord()` iterates through the `ArrayList`

PlacedTile:

Data structures used:

no data structures, just 2 int variables and 1 Tile variable

Explanation:

the Tile object stored in the variable "tile" stores most of the needed information, the row and col int variables store the position where the tile is placed

Tile:

Data structures used:

no data structures just 1 String variable

Explanation:

only needs to store a single string, has a getter function and the String is set on construction of the object

TileBag:

Data structures used:

List<String> tiles

Explanation:

Array list allows for dynamic addition and removal of tiles

Operations:

addTiles(letter, count) populates the bag

drawTile() randomly removes a tile and constructs a Tile

isEmpty() checks if the bag is empty

Game:

Data structures used:

ArrayList<Player> players

Dictionary acceptedWords

Explanation:

Array list is dynamic and ordered, making it easy to iterate through the list for players turns

Dictionary is shared between all players and is static as the accepted words don't change mid game

Operation:

addPlayer(Player) adds a player dynamically

startGame() iterates through players as it manages the game loop