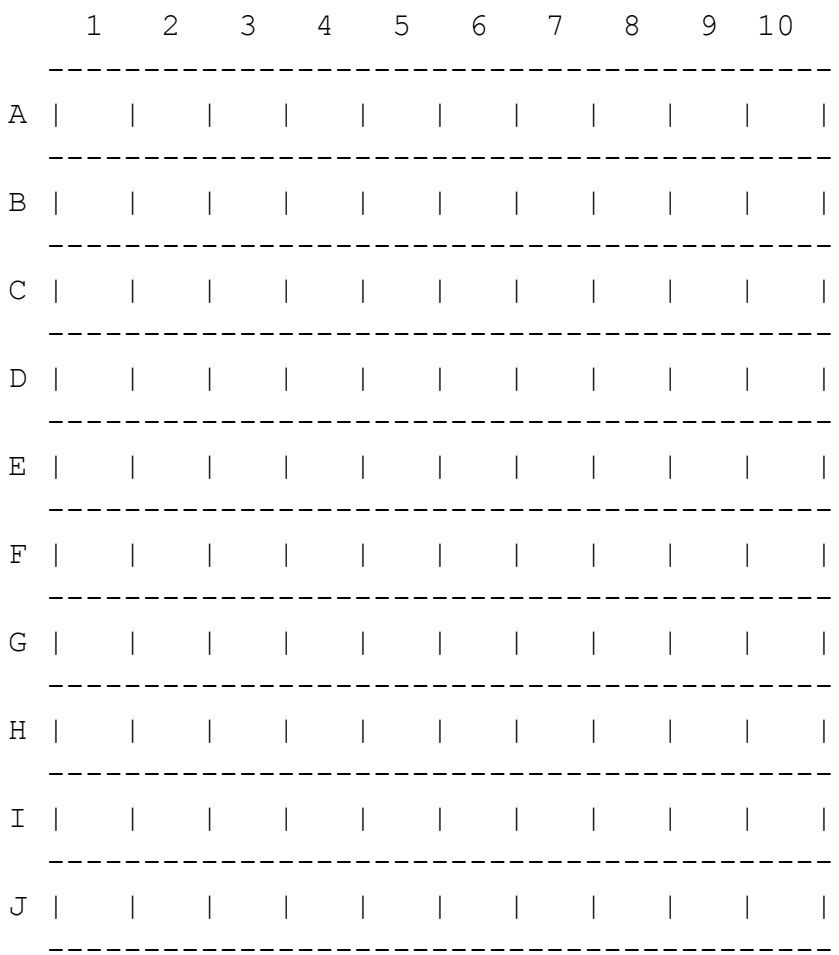
Final Project - Battleship

For your final project, you will be writing your own code to simulate the game battleship. More details will be forthcoming, but for today, you will have to write the function definition of the displayBoards function, which shows your board and your enemy's board, in the following style:



The two boards should appear side by side.

void displayBoards(char [][10], char [][10]);

Note:When you display the board, you are also displaying the contents of the 2D arrays, even though initially they will be empty.

For your final project, you will be writing your own code to simulate the game battleship. This project will require you to use most of the concepts we have learned in the course.

Your program should have the following:

- Global constants storing the size of each of the 5 ships
- Global constant storing the size of the fleet
- A struct named Point, storing two ints that will have the row and column index of a particular cell in the grid
- A struct named Ship, that will store at least 4 variables.
    - The name of the ship
    - The size of the ship
    - The current hitcount of the ship
    - A vector of Point structs that will store the indices of each of the cells in the grid the ship occupies.
- A struct named PlayerBoard that
    - Stores the 10 x 10 board (char) for one player
    - Stores an array of Ship structs of size FLEET_SIZE
- An initFleet function that takes in a PlayerBoard object as a parameter and initializes the board and all the ships in the fleet with the appropriate information. For example, the name and size of the ship should be initialized within the function.
- A boardSetup function that takes in two PlayerBoard objects by reference, and calls the placeShip function for each ship in the fleet. After each ship is placed on the board the boards should be displayed.
- A placeShip function that takes in a PlayerBoard object by reference and an int variable that stores the index of the ship that is currently being placed, and places the ship onto the board. The placeShip function calls the getValidShipInfo function to determine which spots on the board the ship will occupy.
- A getValidShipInfo function that takes in four parameters by reference, two ints holding the row and the column of the starting coordinates of the ship, a char that will hold the orientation of the ship (horizontal or vertical), and the PlayerBoard. The function will also take a fifth argument by value which is the index of the ship being placed. The function will prompt the user for the starting row and column coordinates of the ship which the user will enter as: letter number. These will then need to be converted to the proper row and column index of the array. The function will also prompt the user for the horizontal or vertical orientation of the ship. The function will be responsible for performing the error checking so that a valid ship placement is received from the user. The function will also call the function spaceOccupied to determine if any of the spaces the ship would take up if placed on the board are currently occupied.
- A spaceOccupied function that takes in the PlayerBoard object, an int for the row and col placement of the ship, a character for the orientation, and the ship size. This function returns true if the placement of the ship would overlap an already existing ship placement or false if the space is not occupied.

- Your program should have the option to play against another player or against the computer. The computer should make intelligent moves. This means that once the computer gets a hit, in subsequent turns it should try to attack the surrounding positions until it sinks the ship. Below is a link that describes different strategies with increasing levels of sophistication.

  http://www.datagenetics.com/blog/december32011/index.html

The rest of your implementation is up to you. Notice in the sample file you will have to do some input validation.

#	Class of ship	Size
1	Carrier	5
2	Battleship	4
3	Cruiser	3
4	Submarine	3
5	Destroyer	2

Milestones:

- November 23, 2024 - complete displayBoards function
- November 25, 2024 - complete initFleet function and complete placeShip function - does not need to validate the input yet - can assume the input is valid
- November 27, 2024 - complete the getValidShipInfo function and complete the spaceOccupied function
- November 30, 2024 - program should be able to make attacks, show hits and misses
- December 2, 2024 - program should be able to display the name of the ship that was sunk and who the winner was
- December 4, 2024 - program should be able to able to play against a computer playing randomly
- December 6, 2024 - program should be complete being able to play against a computer playing intelligently

Submission:

You should have 4 files for this project:

- header.h
- main.cpp
- functions.cpp
- input.txt

Additionally, you need to create a file with all of the input your program needs to run to completion.

You will submit and demo this assignment to the instructor on December 6, 2024. You only have 5 minutes to demo your assignment to me.