CS124 – Project 11 – Sudoku Design

Function Name: main

Description of Function: Entry point for the Sudoku Game. Will load the game, display the instructions and the board, and then maintain a loop to respond to selections from the prompt function:

- ? – Display the instructions
- D – Display the board
- E – Edit a square on the board
- S – Show all possible values for a square on the board
- Q – Save the game to a file and quit

Functions Called: loadGame, displayInstructions, displayBoard, prompt, editSquare, showValues, saveGame

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
	int	return	Error (if any) sent back to the operating system.

Function Name: loadGame

Description of Function: Prompt the user for a filename and then populate the board array with the values from the file. If there was an error reading the file, then an error message is printed and the function will return false.

Functions Called: N/A

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
board	int[][9]	Pass by Reference	The full Sudoku board
size	int	Pass by Value	The dimension of the board.
	bool	Return	True = Success False = Failure

Function Name: displayInstructions

Description of Function: Display the instructions (per the Project Description)

Functions Called: N/A

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
N/A			

Function Name: displayBoard

Description of Function: Display the contents of the Sudoku board array with the proper formatting as required for a Sudoku board. The first row will contain the grid letters A through I. Each subsequent row will start the grid numbers 1 through 9. When displaying the board, lines need to be drawn (per the Project Description).

Functions Called: N/A

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
board	int[][9]	Pass by Reference	The full Sudoku board
size	int	Pass by Value	The dimension of the board.

Function Name: editSquare

Description of Function: The user is prompted for a coordinate in the format [ALPHA][NUMBER] where [ALPHA] is a capital letter from A to I and [NUMBER] is a number from 1 to 9. The coordinate is converted to the appropriate array index for the Sudoku board. If the Sudoku board already has a number at the coordinate provided, then an error is displayed. The user is prompted for the value to put in the coordinate. If the value breaks one or more of the Sudoku rules, then an error message is displayed. If the value passes all of the Sudoku rules, then the value is stored in the board array.

Functions Called: convertCoordinate, testBoard

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
board	int[][9]	Pass by Reference	The full Sudoku board
size	int	Pass by Value	The dimension of the board.

Function Name: showValues

Description of Function: The user is prompted for a coordinate in the format [ALPHA][NUMBER] where [ALPHA] is a capital letter from A to I and [NUMBER] is a number from 1 to 9. The coordinate is converted to the appropriate array index for the Sudoku board. If the Sudoku board already has a number at the coordinate provided, then an error is displayed. The function then identifies all possible values for that coordinate that will pass all of the Sudoku rules. These numbers are displayed to the user.

Functions Called: convertCoordinate, testBoard

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
board	int[][9]	Pass by Reference	The full Sudoku board
size	int	Pass by Value	The dimension of the board.

Function Name: saveGame

Description of Function: Prompt the user for a filename and then populate that file with the contents of the board array. The format should match the format of the input file used by the loadGame function.

Functions Called:

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
board	int[][9]	Pass by Reference	The full Sudoku board
size	int	Pass by Value	The dimension of the board.

Function Name: prompt

Description of Function: Display the menu prompt "> " and then return the selection made by the user.

Functions Called: N/A

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
	char	Return	The menu selection made by the user.

Function Name: convertCoordinate

Description of Function: Convert a 2-character coordinate in the format of [ALPHA][NUMBER] where [ALPHA] is a capital letter from A to I and [NUMBER] is a number 1 to 9. Mapping:

ALPHA A = Array Col Index 0

ALPHA I = Array Col Index 8

NUMBER 1 = Array Row Index 0

NUMBER 9 = Array Row Index 8

Functions Called: N/A

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
coordinate	char[]	Pass by Reference	The coordinate provided by the user.
row	int	Pass by Reference	The array row index.
col	int	Pass by Reference	The array column index.

Function Name: testBoard

Description of Function: This function will test if a value can be put into the Sudoku puzzle without violating the rules of Sudoku (row rule, column rule, and square rule).

Functions Called: testRow, testCol, testSquare

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
board	int[][9]	Pass by Reference	The full Sudoku board
size	int	Pass by Value	The dimension of the board.
row	int	Pass by Value	The row position to test the value against the Sudoku rules.
col	int	Pass by Value	The column position to test the value against the Sudoku rules.
value	int	Pass by Value	The value to test in the row/col coordinate.
	bool	Return	True = Passes all Sudoku rules False = Fails one or more of the Sudoku rules.

Function Name: testRow

Description of Function: Test if the value will violate the Sudoku Row Rule for the specified row. The Row Rule says that each number 1 through 9 can exist only once in each row of the board.

Functions Called: N/A

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
board	int[][9]	Pass by Reference	The full Sudoku board
size	int	Pass by Value	The dimension of the board.
row	int	Pass by Value	The row position to test the value against the rule
value	int	Pass by Value	The value to test.
	bool	Return	True = Passes the Row Rule False = Fails the Row Rule

Function Name: testColumn

Description of Function: Test if the value will violate the Sudoku Column Rule for the specified column. The Column Rule says that each number 1 through 9 can exist only once in each column of the board.

Functions Called: N/A

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
board	int[][9]	Pass by Reference	The full Sudoku board
size	int	Pass by Value	The dimension of the board.
col	int	Pass by Value	The column position to test the value against the rule
value	int	Pass by Value	The value to test.
	bool	Return	True = Passes the Column Rule False = Fails the Column Rule

Function Name: testSquare

Description of Function: Test if the value will violate the Sudoku Square Rule for a 3x3 square starting at the specified row and column. The Square Rule says that each number 1 through 9 can exist only once is each 3x3 square on the board.

Functions Called: N/A

Parameter	Data Type	Return, Pass by Value, Pass by Reference	Description
board	int[][9]	Pass by Reference	The full Sudoku board
size	int	Pass by Value	The dimension of the board.
row	int	Pass by Value	The row position to test the value against the rule.
col	int	Pass by Value	The column position to test the value against the rule.
value	int	Pass by Value	The value to test.
	bool	Return	True = Passes the Square Rule False = Fails the Square Rule