# Test Description

**Test Name or ID**: BlackBoxUnit-AddRoute

**Test Type**: Black box

**Description**: To verify the functionality of the "addRoute" function, which adds a route to the map by updating the corresponding squares with the given route symbol

**Setup:** Provide the following parameters

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| Parameter | Member Variables | Description |
| const struct Map\* | int squares[MAP\_ROWS][MAP\_COLS]; | the squares that are buildings and the squares that are not |
| int numRows; | the number of rows of the map |
| int numCols; | represents the number of columns of the map |
| const struct Route\* | struct Point points[MAX\_ROUTE]; | the row-column position of a square on a map. It is comprised of 2 member variables: char row; char col |
| int numPoints; | the total number of points of the route |
| char routeSymbol; | the character that represents this route variable |

**Test Function**:

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| --- | --- |
| Name | Description |
| addRoute | This function adds the “route” to the “map”, by storing the “routeSymbol” to the corresponding “squares” variable.  First, it should make a copy of the “map” variable in the function locally, i.e. “results”, by looping all the values in the “map” parallel array.  Second, it should loop through the “points” parallel array and add the “routeSymbol” to the corresponding “results” parallel array.  Finally, it should return the “results” local variable. |

This function adds the “route” to the “map”, by storing the “routeSymbol” to the corresponding “squares” variable.

First, it should make a copy of the “map” variable in the function locally, i.e. “results”, by looping all the values in the “map” parallel array.

Second, it should loop through the “points” parallel array and add the “routeSymbol” to the corresponding “results” parallel array.

Finally, it should return the “results” local variable.

**Test Scenarios:**

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| --- | --- | --- | --- | --- |
| Description | Test Data | Expected Result | Actual Result | Pass/Fail |
| Map,  Valid Route Points with Symbol as Letter | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 0, 1 } } * numPoints: 2 * routeSymbol: 'A' | Copy of the map with the route symbols added at the specified points |  |  |
| Empty Map | Map:   * squares: { { 0 } } * numRows: 0 * numCols: 0   Route:   * points: { { 0, 0 }, { 0, 1 } } * numPoints: 2 * routeSymbol: 'A' | Error |  |  |
| Empty Map,  Empty Route | Map:   * squares: { { 0 } } * numRows: 0 * numCols: 0   Route:   * points: {} * numPoints: 0 * routeSymbol: ' ' | Error |  |  |
| Map without Buildings | Map:   * squares: { { 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 0, 1 } } * numPoints: 2 * routeSymbol: 'A' | Copy of the map with the route symbols added at the specified points |  |  |
| Null Map | Map:   * NULL   Route:   * points: { { 0, 0 }, { 0, 1 } } * numPoints: 2 * routeSymbol: 'A' | Error |  |  |
| Empty Route | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: {} * numPoints: 0 * routeSymbol: '' | Copy of the map with no changes |  |  |
| Route with One Point | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 } } * numPoints: 1 * routeSymbol: 'A' | Copy of the map with the special character symbol added at the specified points |  |  |
| Null Route | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * NULL | Error  or  Copy of the map with no changes |  |  |
| Route with MAX\_ROUTE -1 | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 0, 1 }, ...MAX\_ROUTE-1} * numPoints: MAX\_ROUTE-1 * routeSymbol: 'A' | Copy of the map with the route symbols added at the specified points |  |  |
| Route with MAX\_ROUTE | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 0, 1 }, ...MAX\_ROUTE} * numPoints: MAX\_ROUTE * routeSymbol: 'A' | Copy of the map with the route symbols added at the specified points |  |  |
| Route with MAX\_ROUTE +1 | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 0, 1 }, ...MAX\_ROUTE+1} * numPoints: MAX\_ROUTE+1 * routeSymbol: 'A' | Error |  |  |
| Route Points on Map Boundaries | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 0, 1 } } * numPoints: 2 * routeSymbol: 'A' | Copy of the map with the route symbols added at the specified points |  |  |
| Route Points Outside Map Boundaries | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 100, 100 } } * numPoints: 1 * routeSymbol: 'A' | Error |  |  |
| Negative Route Points | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { -1, -1 } } * numPoints: 1 * routeSymbol: 'A' | Error |  |  |
| Route Overlapping with Buildings | Map:   * squares: { { 1, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 1, 1 } } * numPoints: 2 * routeSymbol: 'A' | Error |  |  |
| Route Symbol as Special Character | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 1, 1 } } * numPoints: 2 * routeSymbol: '\*' | Copy of the map with the special character symbol added at the specified points |  |  |
| Route Symbol as Number | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 1, 1 } } * numPoints: 2 * routeSymbol: 1 | Copy of the map with the number symbol added at the specified points |  |  |
| Route Symbol as Empty Character (space) | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 1, 1 } } * numPoints: 2 * routeSymbol: ' ' | Copy of the map with the empty character symbol added at the specified points |  |  |
| Route Symbol as ‘\0’(Null) | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 1, 1 } } * numPoints: 2 * routeSymbol: '\0' | Error  or  Copy of the map with the empty character symbol added at the specified points |  |  |
| Route Symbol as ‘\n’(New Line) | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 1, 1 } } * numPoints: 2 * routeSymbol: '\n' | Error  or  Copy of the map with the empty character symbol added at the specified points |  |  |
| Route Symbol as ‘\t’(Tab) | Map:   * squares: { { 0, 0 }, { 1, 0 } } * numRows: 2 * numCols: 2   Route:   * points: { { 0, 0 }, { 1, 1 } } * numPoints: 2 * routeSymbol: '\t' | Error  or  Copy of the map with the empty character symbol added at the specified points |  |  |

**Bugs Found**:

Description of each bug found above and how to reproduce it.