Problem 1(50pt): Color Binary Search Tree

Consider the binary search tree class from Homework 5 and introduce a `color` attribute to tree node class. Each node will have a color, either black ('b') or red ('r'). The new class is named `ColorBST`. `ColorBST` still has `TreeNode` as its private nested class. Implement the following member functions to determine if a tree satisfies red-black tree properties.

- `void insert(T data, char c)`: inserts a node to a BST tree and assigns 'r' to `c` by default and throws a `logic_error` if `c` is neither 'b' nor 'r'.
- `bool BlackRoot()` returns true if the tree has a black root
- `bool NoDoubleRed()` returns true if the tree has no double-red nodes
- `bool BlackDepth()` returns true if the black depth property is preserved

Problem 2(50pt): Dijkstra algorithm of a directed graph

Implement Dijkstra's method to a directed weighted graph. The graphs are represented with adjacency matrices. You can assume all weights are positive integers and are less than 10000. For entry `map[i][j]=10`, it represents the edge from Node `i` to Node `j` has a weight 10.

Implement the following function:

`int dijkstra(vector<vector<int> > map, size_t origin, size_t target)`,

where

- `map` is an adjacency matrix
- `size_t origin` index of starting node
- `size_t target` index of destination node
- if a path exists, `dijkstra` returns the weight sum of the shortest path
- if a path does not exist, `dijkstra` returns a special value -1
- the function also prints either all shortest paths or 'No path found' to the console

A `main.cpp` is given to show how this function will be used. The output looks like:

```
0-1-2
0-2
No path found
Shortest path from 0 to 2 is 2
Shortest path from 2 to 0 is -1
```

Instructions:

- Your code will be graded based on correctness, efficiency, clearness, and practices. For this homework, the only library header files you are allowed to use are:
  - iostream, iomanip
  - string
  - stdexcept
  - set, vector
- (5pt) Put all of your code, including code from two problems, in one file, named `colortree.h` and submitted it to CCLE. Do not include `int main` function in your code. Add description of this file in the beginning to show your ownership. A sample description may look like:

```
/*
    PIC 10C Homework 1, Heap.h
    Purpose: Define a template heap class
    Author: John Doe
    Date: 01/01/2021
*/
```

- (5pt) Good coding practice includes commenting your code, using descriptive variable/function names, using efficient algorithms, etc. Coding practice part will be graded by three levels: 0, 5.
- (45pt) Implement `ColorBST` class as instructed above.
- (45pt) Implement `dijkstra` function as instructed above.
- The official grading compiler is Visual Studio 2019 and you may lose majority of points if your code does not compile. If you don't have VS2019 installed in your computer, you are welcome to check your homework using virtual machines before submission. Please only check your homework after it has satisfying results on your local computer. Manually log out your account after using the machine.