Instructor: Dr. Hajra Waheed	Assignment-01	Artificial Intelligence

You MUST NOT PALAGRIZE as it will lead to zero in this Assignment

<u>Total Marks: 80 + 20 = 100</u>

Task 1: Solve the 8-Puzzle problem using the following Search Techniques:

1. Uniform Cost Search: $f(n)=g(n)$
2. Greedy Best-First Search: $f(n)=h1(n)$ and $f(n)=h2(n)$
3. A* Search $f(n)=g(n)+h1(n)$ and $f(n)=g(n)+h2(n)$

Implement following Heuristic Functions:

1. Manhattan Distance $h1(n)$
2. Number of Misplaced Tiles $h2(n)$

Input: *Take input from the user (initial state and Goal State)

Enter Initial State:

1   2   4

3   -1   2

8   6   7

Enter Goal State:

-1 1   2

3   4   5

6   7 8

Task 2: (5+15)

a) Describe a state space in which iterative deepening search performs much worse than depth-first search (for example, O(n2) vs. O(n))

b) A basic wooden railway set contains the pieces shown in Figure 1. The task is to connect these pieces into a railway that has no overlapping tracks and no loose ends where a train could run off onto the floor.

    a. Suppose that the pieces fit together exactly with no slack. Give a precise formulation of the task as a search problem.

    b. Identify a suitable uninformed search algorithm for this task and explain your choice.

    c. Explain why removing any one of the "fork" pieces makes the problem unsolvable
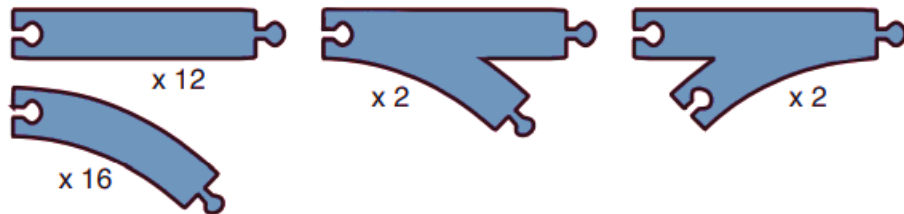

x 12

x 2

x 2

x 16

Figure 1: The track pieces in a wooden railway set; each is labeled with the number of copies in the set. Note that curved pieces and "fork" pieces ("switches" or "points") can be flipped over so they can curve in either direction. Each curve subtends 45 degrees.