

Write a program which performs a-star search to find the solution to any given board position for 15 puzzle using two types of heuristics:

1. Number of misplaced tiles

2. Manhattan Distance

Input

The input should be given in form of sequence of numbered tiles for initial board configuration, '0' indicating the empty space (see example below)

Output

1. Moves

2. Number of Nodes expanded

3. Time Taken

4. Memory Used