

## Programming Project 1

### Solving 8-puzzle using A\* search algorithm

*Note:* You can work alone or in a team of THREE max

You are to implement A\* search algorithm and apply it to 8-puzzle problem, using any programming language of your choice.

In addition to coding of A\* search algorithm, provide state space representation, operators,  $g$  (cost) and two heuristic functions of the 8-puzzle problem. Your program should accept initial and goal states from user and will compute the best path. You will turn in the following as **hard copy** directly to me in the class, in addition to submitting everything in canvas:

- A report covering 8-puzzle problem formulation, program structure, global variables, functions and procedures, etc. [10 points]
- Analyze six input/output cases:
  - For each input/output sample, for each heuristic report the following: (1) The solution path from initial state to goal state (2) the number of nodes generated, and (3) the number of nodes expanded.
    - For each heuristic  $(6 \times (1.5 + 1.5 + 1.5)) = 27$  points
    - Total 54 points  $[27 + 27]$
  - Summarize the results in a table. [6 points]
- Error free source code with adequate inline documentation.
- Quality of the report and code (e.g. taking user input) [5 points]

### Sample initial and goal states:

Initial state:	Goal State:
1 2 3	1 2 3
7 4 5	8 6 4
6 8 0	7 5 0

Initial state:	Goal State:
2 8 1	3 2 1
3 4 6	8 0 4
7 5 0	7 5 6

Initial state:	Goal State:
7 2 4	1 2 3
5 6	4 5 6
8 3 1	7 8