Note: Use the programming language of your choice.

Part (I) $A^\star$, 8-puzzle [50 marks]

Implement the $A^\star$ algorithm for the 8-puzzle, with heuristics h_1 and h_2, as seen in class.

Generate randomly 100 reachable states of the 8-puzzle, solve them with h_1 and h_2 and record in a table the number of steps to find the solution, and the number of nodes expanded by $A^\star$ in each case.

Find a third heuristic (h_3) for the 8-puzzle from the literature and repeat the above, to complete the table. Based on the table, comment on the performance of the 3 heuristics h_1, h_2, h_3.

Part (II) $A^\star$, 15-puzzle [50 marks]

Implement the $A^\star$ algorithm for the 15-puzzle, with heuristics h_1 and h_2, as seen in class.

Generate randomly 100 reachable states of the 15-puzzle, solve them with h_1 and h_2 and record in a table the number of steps to find the solution, and the number of nodes expanded by $A^\star$ in each case.

Find a third heuristic (h_3) for the 15-puzzle from the literature and repeat the above, to complete the table. Based on the table, comment on the performance of the 3 heuristics h_1, h_2, h_3.

Part (III) $A^\star$, 24-puzzle [bonus marks]

Implement the $A^\star$ algorithm for the 24-puzzle, with heuristics h_1 and h_2, as seen in class.

Generate randomly 100 reachable states of the 24-puzzle, solve them with h_1 and h_2 and record in a table the number of steps to find the solution, and the number of nodes expanded by $A^\star$ in each case.

Find a third heuristic (h_3) for the 24-puzzle from the literature and repeat the above, to complete the table. Based on the table, comment on the performance of the 3 heuristics h_1, h_2, h_3.