Item 1: DFS Performance

number of states expanded: This means how many of the nodes we have visited. It affects the **total time** to reach the final state.

the length of the solution path found: It means the final solution path's quality. The shorter the path is, the better the solution is.

MAX_OPEN_LENGTH: It means the max length of "open" stack/queue in search process. It affects the **max memory use** to reach the final state.

Item 4: Alternative Search Methods for the Towers of Hanoi

Algorithm Name	Length of solution path	Number of nodes expanded	MAX_OPEN_LENGTH
DFS	40	40	7
Breadth-FS	15	70	16
IDDFS	15	440	7

Item 5: Blind Search on My A2 Problem Formulations

Fox, Farmer, etc.

Algorithm Name	Length of solution path	Number of nodes expanded	MAX_OPEN_LENGTH
DFS	7	9	3
Breadth-FS	7	9	2
IDDFS	7	43	3

Find the Number

Algorithm Name	Length of solution path	Number of nodes expanded	MAX_OPEN_LENGTH
DFS	12	14	18
Breadth-FS	4	97	194
IDDFS	4	131	11

Item 8: Heuristics for the Eight Puzzle

h_euclidean

	Permutation	Success	Nodes Expanded	Abort
puzzle10a	h_euclidean	Y	43	N
puzzle12a	h_euclidean	Y	19	N
puzzle14a	h_euclidean	Y	137	N
puzzle16a	h_euclidean	Y	263	N

h_hamming

	Permutation	Success	Nodes Expanded	Abort
puzzle10a	h_hamming	Y	45	N
puzzle12a	h_hamming	Y	624	N
puzzle14a	h_hamming	Y	685	N
puzzle16a	h_hamming	Y	384	N

h_mahattan

	Permutation	Success	Nodes Expanded	Abort
puzzle10a	h_mahattan	Y	46	N
puzzle12a	h_mahattan	Y	18	N
puzzle14a	h_mahattan	Y	391	N
puzzle16a	h_mahattan	Y	168	N

h_custom

	Permutation	Success	Nodes Expanded	Abort
puzzle10a	h_custom	Y	354	N

puzzle12a	h_custom	N	TIME-OUT	Y
puzzle14a	h_custom	N	TIME-OUT	Y
puzzle16a	h_custom	N	TIME-OUT	Y

Item 9: Evaluating my Custom Heuristic.

a) My heuristic is based on the position of 0 and calculate its manhattan distance to the correct position. It is similar to h_manhatton, but it only calculate the tile 0 (empty hole).
b) It does not outperform any of the given heuristics.
c) My custom heuristic costs more than h_manhattan since it is dominated by it. Meanwhile, the h_manhattan dominates the h_hamming, so both these two dominates my custom heuristic.
   Although is not clearly dominated by the euclidean heuristic, we can still say it is not that good since even the state with only 1 step away from the goal, the heuristic number is still the same as a random state with the hole luckily be at the neighbour position to the goal.