Project 1: Shortest Path Problem

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Briefly explain the main components of your algorithm.

The A* algorithm is a popular search algorithm for finding the shortest path between two nodes in a graph. The main components of this algorithm are as follows:

1. Start and End Nodes: The algorithm starts from a designated start node and ends at a designated end node.
2. Open and Closed Sets: The algorithm maintains two sets, the open set, and the closed set. The open set is a priority queue that stores the nodes that have been discovered but not yet explored. The closed set is a list of nodes that have already been explored.
3. G-Cost and H-Cost: The g-cost is the actual cost of moving from the start node to the current node. The h-cost is the estimated cost of moving from the current node to the end node.
4. F-Cost: The f-cost is a combination of the g-cost and h-cost and represents the total estimated cost of reaching the end node from the start node through the current node.
5. Neighbors: The algorithm expands the search to the neighboring nodes of the current node and adds them to the open set if they have not been explored yet.
6. Path and Cost: The final output of the algorithm is the shortest path from the start node to the end node and the cost of that path.

The A* algorithm uses the f-cost as the priority for the nodes to be explored. The algorithm continues to explore the node with the lowest f-cost until the end node is found or there are no more nodes to explore.

Run your algorithm based on the given configurations in the following table and fill the rest of the table.

Starting node	Ending node	Weight parameter of the A* search	No. nodes generated	Cost of the path	Sequence of the nodes on the path
0	19	0.5	13	95	[0, 10, 11, 12, 13, 14, 24, 25, 15, 16, 17, 18, 19]
0	19	0	13	96	[0, 1, 2, 12, 13, 14, 24, 25, 15, 16, 17, 18, 19]
11	97	0.5	15	105	[11, 21, 31, 32, 33, 34, 44, 45, 46, 56, 66, 76, 77, 87, 97]
11	97	0.25	15	105	[11, 21, 31, 32, 33, 34, 44, 45, 46, 56, 66, 76, 77, 87, 97]
40	49	0.5	16	109	[40, 41, 51, 52, 42, 43, 44, 45, 46, 47, 37, 38, 28, 29, 39, 49]
49	40	0.5	14	101	[49, 59, 58, 48, 38, 37, 36, 35, 34, 33, 32, 31, 30, 40]
0	99	0.5	16	0	There is no path
99	0	0.5	19	138	[99, 98, 97, 87, 77, 76, 75, 65, 64, 54, 53, 52, 51, 41, 40, 30, 20, 10, 0]
99	0	0.25	19	138	[99, 98, 97, 87, 77, 76, 75, 65, 64, 54, 53, 52, 51, 41, 40, 30, 20, 10, 0]