A* admissible heuristic:-

For each node, I have chosen the distance of the nearest node in its adjacency list as its Heuristic.
This heuristic is admissible because it always underestimates the actual cost to reach the goal from any given node. This is because by choosing the distance to the nearest node in the adjacency list.

A* Inadmissible heuristic:-

For each node, I have chosen the distance of the farthest node in its adjacency list as its Heuristic.
This heuristic is inadmissible because it overestimates the actual cost to reach the goal. The square of the distance to the farthest neighbor in the adjacency list will generally be greater than the actual distance to the goal. This overestimation can lead to A* making suboptimal choices during the search process, potentially resulting in a non-optimal solution.

Comparison of both algorithms:-

A* Admissible Heuristic:

Completeness: A* with an admissible heuristic is guaranteed to find the optimal solution if one exists, as long as the heuristic is admissible (it never overestimates the true cost).

Optimality: This will be guaranteed to return the shortest path, as it always explores nodes with the lowest f(n) value, where f(n) is the sum of the cost to reach a node (g(n)) and the estimated cost from that node to the goal (h(n)). The heuristic being admissible ensures that h(n) is always a lower bound on the actual cost.

In the worst case, it can explore a large number of nodes, making it less efficient when the heuristic is not very informative.

A* Inadmissible Heuristic:

Completeness: A* with an inadmissible heuristic is not guaranteed to find the optimal solution. It may return a suboptimal solution in some cases.

Optimality: Because the heuristic is inadmissible, it can overestimate the cost to reach the goal, leading A* to explore nodes that might not be on the optimal path. This can result in suboptimal solutions.
It may explore more nodes than necessary due to the heuristic's overestimation, making it less efficient in practice.

1. Pune to Delhi:

```
Using A* Admissible:-
Shortest route from Pune to Delhi:
Pune -> Indore -> Jaipur -> Delhi
Total distance: 1291 kilometers
Number of nodes visited:  34

Using A* Inadmissible:-
Shortest route from Pune to Delhi:
Pune -> Agra -> Delhi
Total distance: 1414 kilometers
Number of nodes visited:  24
```

The number of nodes visited in Inadmissible is 24 and in Admissible is 34 and also the distance in Inadmissible is greater than admissible which simply means that the Inadmissible algorithm is expanding fewer nodes than the admissible algorithm.

2. Baroda to Calcutta:

```
Using A* Admissible:-
Shortest route from Baroda to Calcutta:
Baroda -> Ahmedabad -> Jamshedpur -> Calcutta
Total distance: 1612 kilometers
Number of nodes visited:  221

Using A* Inadmissible:-
Shortest route from Baroda to Calcutta:
Baroda -> Calcutta
Total distance: 1937 kilometers
Number of nodes visited:  187
```

The number of nodes visited in Inadmissible is 187 and in Admissible is 221 also the distance of Inadmissible is greater than admissible which simply means that the Inadmissible algorithm is expanding fewer nodes than the admissible algorithm.