Circular Tour GFG

Problem Statement: Given an array of petrol pumps where each petrol pump has a certain amount of petrol and a distance to the next petrol pump, you need to find the starting petrol pump from which you can complete a circular tour.

Approach 1: Brute Force approach to find the starting point for a circular tour.

- In this approach, we use brute force to check each petrol pump as a potential starting point.
- We iterate through all pumps and, for each pump, check if it can complete the circular tour.
- If a starting point is found that can complete the tour, we return that index; otherwise, we return -1.

Time Complexity: O(n^2) where n is the number of petrol pumps.

Space Complexity: O(1)

Approach 2: Optimized approach to find the starting point for a circular tour.

- This approach optimizes the solution by keeping track of the balance of petrol and deficit while traversing the pumps.
- If the balance becomes negative at any point, it means the current starting point cannot complete the tour, so we try the next pump as a starting point.
- We accumulate the deficit and continue to check for a valid starting point.
- If the total balance plus the deficit becomes non-negative, we return the starting point; otherwise, we return -1.

Time Complexity: O(n) where n is the number of petrol pumps.

Space Complexity: O(1)

Approach 3: Queue-based approach to find the starting point for a circular tour.

- This approach is similar to the optimized approach but also uses a queue to keep track of potential starting points.
- Whenever the balance becomes negative, we clear the queue and start searching for a new starting point.
- If a valid starting point is found, we return that index; otherwise, we return -1.

Time Complexity: O(n) where n is the number of petrol pumps.

Space Complexity: O(n) in the worst case, when all pumps are potential starting points.