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## Project 1: Road Trip

To solve the trip implemented a recursive method for finding all of the permutations of the indexes of the cities and then validates and checks each permutation as they are instantiated.

As the starting city's positions are static I remove the index for that city from the array that is sent to be permuted. With each permutation that is created I then send it to a method which will calculate the distance for the path. The starting city and the permutation are combined into an array which is first sent out to check whether the path is valid. The validator method checks whether all consecutive cities has a path between them by making sure the adjacency list value for the two cities is not -1. If this test is passed, another test is run to make sure the special order cities (If applicable) are in the correct order. If both tests pass, the distances for the path are summed and compared to the current shortest distance, if the new distance is shorter, the path and distance are updated.

The implementation should function as specified by the documentation. My message for having the Special Order city in the wrong position could be made more efficient with a pre-permutation check however I had concerns about the setup. The Special Order function is heavily dependent on there being either two cities or "none" so if by chance there are any tests with greater than 2 cities that inspection will fail. The number of cities checked doesn't matter for this implementation.

Test runs with associated Text File:

```
V:\Meyerovich TripPlanner>Java TripPlanner TSCities.txt Hartford
```

The shortest path from Hartford is:

Hartford -330mi-> Annapolis -134mi-> Richmond -521mi-> Atlanta -524mi-> Baton\_Rouge -435mi-> Austin -1006mi-> Pheonix -757mi-> Sacremento -649mi-> Salt\_Lake\_City -521mi-> Denver -1879mi-> Hartford Total Distance: 6756 miles.

```
V:\Meyerovich TripPlanner>Java TripPlanner TSCities.txt Sacramento
```

Starting in Sacramento violates the special order.

```
V:\Meyerovich TripPlanner>Java TripPlanner TSCities.txt Baton_Rouge
```

The shortest path from Baton\_Rouge is:

Baton\_Rouge -435mi-> Austin -1006mi-> Pheonix -757mi-> Sacremento -649mi-> Salt\_Lake\_City -521mi-> Denver -1879mi-> Hartford -330mi-> Annapolis -134mi-> Richmond -521mi-> Atlanta -524mi-> Baton\_Rouge Total Distance: 6756 miles.

```
V:\Meyerovich TripPlanner>Java TripPlanner TSCities.txt Denver
```

The shortest path from Denver is:

Denver -1879mi-> Hartford -330mi-> Annapolis -134mi-> Richmond -521mi-> Atlanta -524mi-> Baton\_Rouge -435mi-> Austin -1006mi-> Pheonix -757mi-> Sacremento -649mi-> Salt\_Lake\_City -521mi-> Denver Total Distance: 6756 miles.

```
V:\Meyerovich TripPlanner>
```