Trail of Primes

Write a program to find the shortest path from one four-digit prime number to another by changing a single digit at a time. Given two four-digit prime numbers, suppose 1033 and 8179, find a path from 1033 to 8179 by altering only digit each step, such that every number that we get after changing a digit is prime.
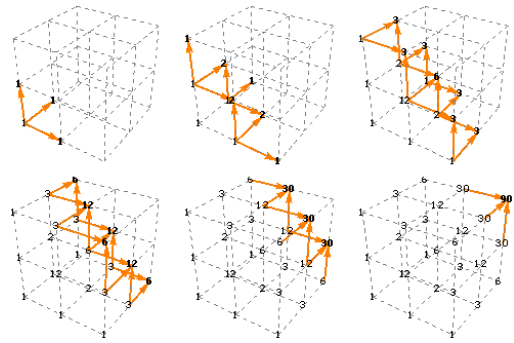
For example, a solution for 1033 to 8179 is: 1033, 1031, 1051, 1151, 1171, 8171, 8179 (6 steps from 1033).

Sample input/output:

```
Input  : 1033 8179
Output : 6

Input  : 1373 8017
Output : 7

Input  : 1033 1033
Output : 0
```


A three-dimensional shortest path traversal

Suggested approach:

- Generate a list of all the necessary four-digit primes.

- Build an adjacency list (a graph).

    o   Vertices will be prime numbers; edges will be primes that differ by one digit from the vertex.

    o   It would be easiest to build a graph where the index of the array corresponds to a particular prime number. Using an <u>ArrayList</u> would require you to map (or search for) the indexes of the corresponding prime numbers in the list, as e.g. prime 1009 would be at index 0.

        ▪   This is a slightly wasteful approach (from a storage standpoint), but easier. If this bothers you, feel free to use other data structures at your own risk.

- Run a BFS on the graph to find the "path" from one number to another, beginning with the starting prime and continuing to the goal (or until it's obvious no path exists). Note that there may be multiple paths from the starting number to the goal; you can output the first encountered.

- You need some way of remembering the number of primes that lead from the start to the end (such that you can track how many steps it took). You'll need an appropriate data structure for this.
  Optional: using one additional data structure, output the sequence of primes that lead to the goal.

Craziness: Does this program seem similar to anything you've done before? Finding a "path" from one number/String to another, altering only one digit/character at a time? (Answer in white font below.)