Discrete Mathematics
Project Report

On

GRAPH THEORY - FLIGHT ROUTES

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Introduction: Problem Description

We were given a dataset of flights containing the following information :

Sr. No.	Name of Column	Datatype
1	DAY_OF_MONTH	Integer
2	OP_CARRIER	String
3	OP_CARRIER_FL_NUM	Integer
4	ORIGIN	String
5	DEST	String
6	ACTUAL_ELAPSED_TIME	Integer
7	DISTANCE	Integer
8	DISTANCE_GROUP	Integer

The problem set was divided into two parts:-

1. **To create a graph of all possible December 2017 flights between the given airports in Oregon (Eugene, Medford, Portland, Redmond) and Montana (Billings, Bozeman, Great Falls, Helena, Kalispell, Missoula) containing routes such that the sum of all distance groups had to be less than 8.**
2. **To find paths from Medford to Missoula that are the shortest, longest, and have the most connections.**

Algorithm Used

PART 1

- **Initialize variables to store paths, their distance and distance group.**
- **Read December 2017 Flights csv and store them in Pandas dataframe flights**
- **Filter the data by [DistanceGroup < 8], drop duplicates and store it in flights 3 dataframe.**
- **Store the data in a dictionary with Origin as keys and destination, distance group and distance as its values.**
    - **Storing the data in a dictionary will enable the retrieval of the elements of a dictionary by its key.**
    - **Time complexity of the retrieval will be O(1)**
- **Use depth - first search to find all the paths between Oregon and Montana**
    - **If destination_Group > = 8 then discard the route**
    - **If destination is in visited ports then discard the route**
- **If destination is in destination Ports append the existing path to the final path**
- **Calculate total distance group and total Distance of the path and store them**
- **Store ports visited, to keep a track of the visited ports in a path.**
- **Return final path**

PART 2

- **Initialize the variables to store maximum distance, minimum distance, maximum network length and their paths respectively**
- **From PART 1 calculate all paths between Oregon and Montana and store them in ans**
- **Find all paths from MFR to MSO**
- **Compare the distances of all the paths and store the maximum and minimum distance and their paths respectively.**
- **Similarly, find the maximum network length and store its path**
- **Return the paths from MFR to MSO.**
- **Return maximum distance , minimum distance, maximum network length and their respective paths**

Conclusion

Using the steps as discussed in the algorithm section of this report and the given data, we found 501 possible routes between the given airports in Oregon (Eugene, Medford, Portland, Redmond) and Montana (Billings, Bozeman, Great Falls, Helena, Kalispell, Missoula) containing routes such that the sum of all distance groups is less than 8. The actual list of routes is attached in the end of this report.

The findings of part 2 of the problem statement, to find paths from Medford to Missoula that are the shortest, longest, and have the most connections, are as follows:

```
All the paths between MFR and MSO are :
                                                  PATH  DISTANCE  DISTANCE GROUP
0              [(MFR, SEA), (SEA, SLC), (SLC, MSO)]      1477               7
1                          [(MFR, SLC), (SLC, MSO)]      1011               5
2              [(MFR, SFO), (SFO, SLC), (SLC, MSO)]      1364               7
3  [(MFR, SFO), (SFO, RNO), (RNO, SLC), (SLC, MSO)]      1379               7
4                          [(MFR, DEN), (DEN, MSO)]      1643               7
Longest path is :
[('MFR', 'DEN'), ('DEN', 'MSO')]
Maximum distance is :
1643
Shortest path is :
[('MFR', 'SLC'), ('SLC', 'MSO')]
Minimum distance is :
1011
Path with maximum network is :
[('MFR', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'MSO')]
Length of maximum network is :
4
```

Appendix

Please refer to the following pages

Code

```
import pandas as pd
import copy

class travelPath(object):

    def __init__(self):
        # initialize variables to store paths, their distance and distance group
        self.route_info = self.getRouteInfo()
        self.OregonPorts = ["PDX", "RDM", "EUG", "MFR"]
        self.MontanaPorts = ["BIL", "BZN", "GTF", "FCA", "MSO", "HLN"]
        self.FinalPath = []
        self.distanceGroup = []
        self.distance = []

    def getRouteInfo(self):
        # read December 2017 Flights csv and store them in Pandas data frame flights
        flights = pd.read_csv('../raw_data/December 2017 Flights.csv',sep=',')

        # filter the data by [DistanceGroup < 8] and name it as flights1 data frame
        flights1 = flights[flights['DISTANCE_GROUP'] < 8]

        # select data from Origin, Dest, Distance_Group, Distance columns and store
        # it in flights2 data frame
        flights2 = flights1[['ORIGIN', 'DEST', 'DISTANCE_GROUP', 'DISTANCE']]

        # drop duplicates from flights2 data frame and store it in
        # flights3 data frame
        flights3 = flights2.drop_duplicates()

        # store the data in a dictionary with Origin as keys and Dest,
        # Distance_Group and Distance as its values
        # storing the data in a dictionary will enable the retrieval of the elements
        # of a dictionary by its key
        # time complexity of the retrieval will be O(1)
        dict = {}
        for origin in flights3['ORIGIN'].values.tolist():
            if origin in dict:
                continue
            flights4 = flights3[flights3['ORIGIN'] == origin]
            flights5 = flights4[['DEST', 'DISTANCE_GROUP', 'DISTANCE']]
            dict[origin] = list(flights5.itertuples(index=False,
                                                    name='destinationInfo'))

        return dict

    # use depth - first search algorithm to find all the paths
    # between Oregon and Montana
    def visitPort(self, source, current_DG, visited_Ports, existing_Path,
                  destinationPort, totalDistance):

        route_list = self.route_info[source]
        for destinationInfo in route_list:
            # if destination_Group > = 8 then discard the route
            if (current_DG + destinationInfo.DISTANCE_GROUP) >= 8:
                continue
```

```
            # if DEST is in visited ports then discard the route
            if destinationInfo.DEST in visited_Ports:
                continue

            # calculate total distance of the path
            totalDistance = totalDistance + destinationInfo.DISTANCE

            # calculate total Distance_Group of the path
            current_DG = current_DG + destinationInfo.DISTANCE_GROUP

            # append the visited source and destination to existing_Path
            existing_Path.append((source, destinationInfo.DEST))

            # if DEST is in destinationPorts append the existing path
            #to the final path
            # calculate total Distance_Group and total Distance of the path
            # and store them
            if destinationInfo.DEST in destinationPort:
                self.FinalPath.append(copy.deepcopy(existing_Path))
                self.distanceGroup.append(current_DG)
                self.distance.append(totalDistance)

            # append ports visited to the visited_Ports
            visited_Ports.append(destinationInfo.DEST)
            self.visitPort(destinationInfo.DEST, current_DG, visited_Ports,
                           existing_Path, destinationPort, totalDistance)
            current_DG = current_DG - destinationInfo.DISTANCE_GROUP
            totalDistance = totalDistance - destinationInfo.DISTANCE
            existing_Path.pop()
            visited_Ports.pop()

    def get_info_for_source(self, sourcePort, destinationPorts):
        visited_Ports = []
        existing_Path = []
        visited_Ports.append(sourcePort)
        self.visitPort(sourcePort, 0, visited_Ports, existing_Path,
                       destinationPorts, 0)

def getAllFlightsOregonMontana():
    path = travelPath()
    for i in range(0, len(path.OregonPorts)):
        path.get_info_for_source(path.OregonPorts[i], path.MontanaPorts)

    for i in range(0, len(path.MontanaPorts)):
        path.get_info_for_source(path.MontanaPorts[i], path.OregonPorts)

    ans = []
    for i in range(0, len(path.FinalPath)):
        ans.append([i+1, path.FinalPath[i], path.distance[i], path.distanceGroup[i]])
    all_flights = pd.DataFrame(ans,
                               columns=['S.No','PATH','DISTANCE','DISTANCE GROUP'])
    all_flights.to_excel("../all_flights.xls", header=True)
    return all_flights
```

```
def getPathsMedfordMissoula(source, destination):
    # initialize variable
    minimum = float('inf')
    shortestPath = []
    maximum = 0
    longestPath = []
    maximum_network_length = 0
    longestConnection = []


    # calculate and store all paths between Oregon and Montana from PART 1
    paths = getAllFlightsOregonMontana()
    ans = []

    # from paths find all paths from MFR to MSO
    for index,row in paths.iterrows():
        if row[1][0][0] in source :
            if row[1][-1][-1] in destination:
                # if source is MFR and destination is MSO , append it to ans
                ans.append([row[1], row[2], row[3]])

                # Get the maximum distance and path with maximum distance
                if row[2] > maximum:
                    longestPath = copy.deepcopy(row[1])
                    maximum = row[2]

                # Get the minimum distance and path with minimum distance
                if row[2] < minimum:
                    shortestPath = copy.deepcopy(row[1])
                    minimum = row[2]

                # Get the maximum network length and path with maximum network
                if len(row[1]) > maximum_network_length:
                    longestConnection = copy.deepcopy(row[1])
                    maximum_network_length = len(row[1])
    flights_M2M = pd.DataFrame(ans, columns=['PATH','DISTANCE','DISTANCE GROUP'])
    finalResult = ["All the paths between MFR and MSO are : ",flights_M2M,
                   "Longest path is : ", longestPath,
                   "Maximum distance is : ", maximum,
                   "Shortest path is : ",shortestPath,
                   "Minimum distance is : ", minimum,
                   "Path with maximum network is : ",longestConnection,
                   "Length of maximum network is : ",maximum_network_length]
    return finalResult

def main():
    print(getAllFlightsOregonMontana())
    for ans in getPathsMedfordMissoula("MFR", "MSO"):
       print(ans)

main()
```

S.No	PATH	DISTANCE	DISTANCE GROUP
1	[('PDX', 'SFO'), ('SFO', 'BZN')]	1357	7
2	[('PDX', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'BZN')]	1246	7
3	[('PDX', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'BIL')]	1286	7
4	[('PDX', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'GTF')]	1362	7
5	[('PDX', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'HLN')]	1301	7
6	[('PDX', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'MSO')]	1335	7
7	[('PDX', 'SEA'), ('SEA', 'GEG'), ('GEG', 'BZN')]	682	4
8	[('PDX', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BZN')]	1165	6
9	[('PDX', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BIL')]	1205	6
10	[('PDX', 'SEA'), ('SEA', 'SLC'), ('SLC', 'FCA')]	1349	7
11	[('PDX', 'SEA'), ('SEA', 'SLC'), ('SLC', 'GTF')]	1281	6
12	[('PDX', 'SEA'), ('SEA', 'SLC'), ('SLC', 'HLN')]	1220	6
13	[('PDX', 'SEA'), ('SEA', 'SLC'), ('SLC', 'HLN'), ('HLN', 'BZN')]	1290	7
14	[('PDX', 'SEA'), ('SEA', 'SLC'), ('SLC', 'MSO')]	1254	6
15	[('PDX', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'BZN')]	1165	7
16	[('PDX', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'BIL')]	1205	7
17	[('PDX', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'GTF')]	1281	7
18	[('PDX', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'HLN')]	1220	7
19	[('PDX', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'MSO')]	1254	7
20	[('PDX', 'SEA'), ('SEA', 'BOI'), ('BOI', 'GEG'), ('GEG', 'BZN')]	1144	7
21	[('PDX', 'SEA'), ('SEA', 'BZN')]	672	4
22	[('PDX', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'BZN')]	1169	7
23	[('PDX', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'BIL')]	1209	7
24	[('PDX', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'GTF')]	1285	7
25	[('PDX', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'HLN')]	1224	7
26	[('PDX', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'MSO')]	1258	7
27	[('PDX', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'BZN')]	1229	7
28	[('PDX', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'BIL')]	1269	7
29	[('PDX', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'GTF')]	1345	7
30	[('PDX', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'HLN')]	1284	7
31	[('PDX', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'MSO')]	1318	7
32	[('PDX', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'BZN')]	1328	7
33	[('PDX', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'BIL')]	1368	7
34	[('PDX', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'GTF')]	1444	7
35	[('PDX', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'HLN')]	1383	7
36	[('PDX', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'MSO')]	1417	7
37	[('PDX', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'BZN')]	1302	7
38	[('PDX', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'BIL')]	1342	7
39	[('PDX', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'GTF')]	1418	7
40	[('PDX', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'HLN')]	1357	7
41	[('PDX', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'MSO')]	1391	7
42	[('PDX', 'SLC'), ('SLC', 'BZN')]	977	5
43	[('PDX', 'SLC'), ('SLC', 'DEN'), ('DEN', 'BIL')]	1476	7
44	[('PDX', 'SLC'), ('SLC', 'BIL')]	1017	5
45	[('PDX', 'SLC'), ('SLC', 'GJT'), ('GJT', 'DEN'), ('DEN', 'BIL')]	1513	7
46	[('PDX', 'SLC'), ('SLC', 'FCA')]	1161	6
47	[('PDX', 'SLC'), ('SLC', 'GTF')]	1093	5
48	[('PDX', 'SLC'), ('SLC', 'HLN')]	1032	5
49	[('PDX', 'SLC'), ('SLC', 'HLN'), ('HLN', 'BZN')]	1102	6
50	[('PDX', 'SLC'), ('SLC', 'MSO')]	1066	5
51	[('PDX', 'SMF'), ('SMF', 'SLC'), ('SLC', 'BZN')]	1358	7
52	[('PDX', 'SMF'), ('SMF', 'SLC'), ('SLC', 'BIL')]	1398	7
53	[('PDX', 'SMF'), ('SMF', 'SLC'), ('SLC', 'GTF')]	1474	7
54	[('PDX', 'SMF'), ('SMF', 'SLC'), ('SLC', 'HLN')]	1413	7

55	[('PDX', 'SMF'), ('SMF', 'SLC'), ('SLC', 'MSO')]	1447	7
56	[('PDX', 'SMF'), ('SMF', 'SFO'), ('SFO', 'BZN')]	1372	7
57	[('PDX', 'SMF'), ('SMF', 'GEG'), ('GEG', 'BZN')]	1457	7
58	[('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'GEG'), ('GEG', 'BZN')]	867	5
59	[('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BZN')]	1350	7
60	[('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BIL')]	1390	7
61	[('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'SLC'), ('SLC', 'GTF')]	1466	7
62	[('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'SLC'), ('SLC', 'HLN')]	1405	7
63	[('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'SLC'), ('SLC', 'MSO')]	1439	7
64	[('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'BZN')]	857	5
65	[('PDX', 'BOI'), ('BOI', 'SEA'), ('SEA', 'GEG'), ('GEG', 'BZN')]	1296	7
66	[('PDX', 'BOI'), ('BOI', 'SEA'), ('SEA', 'BZN')]	1286	7
67	[('PDX', 'BOI'), ('BOI', 'SLC'), ('SLC', 'BZN')]	981	6
68	[('PDX', 'BOI'), ('BOI', 'SLC'), ('SLC', 'BIL')]	1021	6
69	[('PDX', 'BOI'), ('BOI', 'SLC'), ('SLC', 'FCA')]	1165	7
70	[('PDX', 'BOI'), ('BOI', 'SLC'), ('SLC', 'GTF')]	1097	6
71	[('PDX', 'BOI'), ('BOI', 'SLC'), ('SLC', 'HLN')]	1036	6
72	[('PDX', 'BOI'), ('BOI', 'SLC'), ('SLC', 'HLN'), ('HLN', 'BZN')]	1106	7
73	[('PDX', 'BOI'), ('BOI', 'SLC'), ('SLC', 'MSO')]	1070	6
74	[('PDX', 'BOI'), ('BOI', 'DEN'), ('DEN', 'BIL')]	1448	7
75	[('PDX', 'BOI'), ('BOI', 'GEG'), ('GEG', 'BZN')]	960	6
76	[('PDX', 'DEN'), ('DEN', 'BIL')]	1446	6
77	[('PDX', 'DEN'), ('DEN', 'MSO')]	1670	7
78	[('PDX', 'DEN'), ('DEN', 'HLN')]	1585	7
79	[('PDX', 'DEN'), ('DEN', 'BZN')]	1515	7
80	[('PDX', 'BZN')]	554	3
81	[('PDX', 'BZN'), ('BZN', 'SLC'), ('SLC', 'BIL')]	1288	7
82	[('PDX', 'BZN'), ('BZN', 'SLC'), ('SLC', 'GTF')]	1364	7
83	[('PDX', 'BZN'), ('BZN', 'SLC'), ('SLC', 'HLN')]	1303	7
84	[('PDX', 'BZN'), ('BZN', 'SLC'), ('SLC', 'MSO')]	1337	7
85	[('RDM', 'LAX'), ('LAX', 'BZN')]	1628	7
86	[('RDM', 'SLC'), ('SLC', 'BZN')]	872	5
87	[('RDM', 'SLC'), ('SLC', 'DEN'), ('DEN', 'BIL')]	1371	7
88	[('RDM', 'SLC'), ('SLC', 'BIL')]	912	5
89	[('RDM', 'SLC'), ('SLC', 'GJT'), ('GJT', 'DEN'), ('DEN', 'BIL')]	1408	7
90	[('RDM', 'SLC'), ('SLC', 'FCA')]	1056	6
91	[('RDM', 'SLC'), ('SLC', 'GTF')]	988	5
92	[('RDM', 'SLC'), ('SLC', 'HLN')]	927	5
93	[('RDM', 'SLC'), ('SLC', 'HLN'), ('HLN', 'BZN')]	997	6
94	[('RDM', 'SLC'), ('SLC', 'MSO')]	961	5
95	[('RDM', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'BZN')]	1345	7
96	[('RDM', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'BIL')]	1385	7
97	[('RDM', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'GTF')]	1461	7
98	[('RDM', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'HLN')]	1400	7
99	[('RDM', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'MSO')]	1434	7
100	[('RDM', 'SEA'), ('SEA', 'GEG'), ('GEG', 'BZN')]	781	4
101	[('RDM', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'BZN')]	1334	7
102	[('RDM', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'BIL')]	1374	7
103	[('RDM', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'GTF')]	1450	7
104	[('RDM', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'HLN')]	1389	7
105	[('RDM', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'MSO')]	1423	7
106	[('RDM', 'SEA'), ('SEA', 'PDX'), ('PDX', 'BZN')]	911	5
107	[('RDM', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BZN')]	1264	6
108	[('RDM', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BIL')]	1304	6
109	[('RDM', 'SEA'), ('SEA', 'SLC'), ('SLC', 'FCA')]	1448	7

110	[('RDM', 'SEA'), ('SEA', 'SLC'), ('SLC', 'GTF')]	1380	6
111	[('RDM', 'SEA'), ('SEA', 'SLC'), ('SLC', 'HLN')]	1319	6
112	[('RDM', 'SEA'), ('SEA', 'SLC'), ('SLC', 'HLN'), ('HLN', 'BZN')]	1389	7
113	[('RDM', 'SEA'), ('SEA', 'SLC'), ('SLC', 'MSO')]	1353	6
114	[('RDM', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'BZN')]	1264	7
115	[('RDM', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'BIL')]	1304	7
116	[('RDM', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'GTF')]	1380	7
117	[('RDM', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'HLN')]	1319	7
118	[('RDM', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'MSO')]	1353	7
119	[('RDM', 'SEA'), ('SEA', 'BOI'), ('BOI', 'GEG'), ('GEG', 'BZN')]	1243	7
120	[('RDM', 'SEA'), ('SEA', 'BZN')]	771	4
121	[('RDM', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'BZN')]	1268	7
122	[('RDM', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'BIL')]	1308	7
123	[('RDM', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'GTF')]	1384	7
124	[('RDM', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'HLN')]	1323	7
125	[('RDM', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'MSO')]	1357	7
126	[('RDM', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'BZN')]	1427	7
127	[('RDM', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'BIL')]	1467	7
128	[('RDM', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'GTF')]	1543	7
129	[('RDM', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'HLN')]	1482	7
130	[('RDM', 'SEA'), ('SEA', 'EUG'), ('EUG', 'SLC'), ('SLC', 'MSO')]	1516	7
131	[('RDM', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'BZN')]	1401	7
132	[('RDM', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'BIL')]	1441	7
133	[('RDM', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'GTF')]	1517	7
134	[('RDM', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'HLN')]	1456	7
135	[('RDM', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'MSO')]	1490	7
136	[('RDM', 'SFO'), ('SFO', 'SLC'), ('SLC', 'BZN')]	1408	7
137	[('RDM', 'SFO'), ('SFO', 'SLC'), ('SLC', 'BIL')]	1448	7
138	[('RDM', 'SFO'), ('SFO', 'SLC'), ('SLC', 'GTF')]	1524	7
139	[('RDM', 'SFO'), ('SFO', 'SLC'), ('SLC', 'HLN')]	1463	7
140	[('RDM', 'SFO'), ('SFO', 'SLC'), ('SLC', 'MSO')]	1497	7
141	[('RDM', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'BZN')]	1423	7
142	[('RDM', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'BIL')]	1463	7
143	[('RDM', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'GTF')]	1539	7
144	[('RDM', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'HLN')]	1478	7
145	[('RDM', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'MSO')]	1512	7
146	[('RDM', 'SFO'), ('SFO', 'GEG'), ('GEG', 'BZN')]	1524	7
147	[('RDM', 'SFO'), ('SFO', 'BZN')]	1269	6
148	[('RDM', 'DEN'), ('DEN', 'BIL')]	1353	6
149	[('RDM', 'DEN'), ('DEN', 'MSO')]	1577	7
150	[('RDM', 'DEN'), ('DEN', 'HLN')]	1492	7
151	[('RDM', 'DEN'), ('DEN', 'BZN')]	1422	7
152	[('EUG', 'LAX'), ('LAX', 'BZN')]	1650	7
153	[('EUG', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'BZN')]	1351	7
154	[('EUG', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'BIL')]	1391	7
155	[('EUG', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'GTF')]	1467	7
156	[('EUG', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'HLN')]	1406	7
157	[('EUG', 'SEA'), ('SEA', 'GEG'), ('GEG', 'SLC'), ('SLC', 'MSO')]	1440	7
158	[('EUG', 'SEA'), ('SEA', 'GEG'), ('GEG', 'BZN')]	787	4
159	[('EUG', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'BZN')]	1340	7
160	[('EUG', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'BIL')]	1380	7
161	[('EUG', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'GTF')]	1456	7
162	[('EUG', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'HLN')]	1395	7
163	[('EUG', 'SEA'), ('SEA', 'PDX'), ('PDX', 'SLC'), ('SLC', 'MSO')]	1429	7
164	[('EUG', 'SEA'), ('SEA', 'PDX'), ('PDX', 'BZN')]	917	5

165	[('EUG', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BZN')]	1270	6
166	[('EUG', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BIL')]	1310	6
167	[('EUG', 'SEA'), ('SEA', 'SLC'), ('SLC', 'FCA')]	1454	7
168	[('EUG', 'SEA'), ('SEA', 'SLC'), ('SLC', 'GTF')]	1386	6
169	[('EUG', 'SEA'), ('SEA', 'SLC'), ('SLC', 'HLN')]	1325	6
170	[('EUG', 'SEA'), ('SEA', 'SLC'), ('SLC', 'HLN'), ('HLN', 'BZN')]	1395	7
171	[('EUG', 'SEA'), ('SEA', 'SLC'), ('SLC', 'MSO')]	1359	6
172	[('EUG', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'BZN')]	1270	7
173	[('EUG', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'BIL')]	1310	7
174	[('EUG', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'GTF')]	1386	7
175	[('EUG', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'HLN')]	1325	7
176	[('EUG', 'SEA'), ('SEA', 'BOI'), ('BOI', 'SLC'), ('SLC', 'MSO')]	1359	7
177	[('EUG', 'SEA'), ('SEA', 'BOI'), ('BOI', 'GEG'), ('GEG', 'BZN')]	1249	7
178	[('EUG', 'SEA'), ('SEA', 'BZN')]	777	4
179	[('EUG', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'BZN')]	1274	7
180	[('EUG', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'BIL')]	1314	7
181	[('EUG', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'GTF')]	1390	7
182	[('EUG', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'HLN')]	1329	7
183	[('EUG', 'SEA'), ('SEA', 'PSC'), ('PSC', 'SLC'), ('SLC', 'MSO')]	1363	7
184	[('EUG', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'BZN')]	1334	7
185	[('EUG', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'BIL')]	1374	7
186	[('EUG', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'GTF')]	1450	7
187	[('EUG', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'HLN')]	1389	7
188	[('EUG', 'SEA'), ('SEA', 'RDM'), ('RDM', 'SLC'), ('SLC', 'MSO')]	1423	7
189	[('EUG', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'BZN')]	1407	7
190	[('EUG', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'BIL')]	1447	7
191	[('EUG', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'GTF')]	1523	7
192	[('EUG', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'HLN')]	1462	7
193	[('EUG', 'SEA'), ('SEA', 'JAC'), ('JAC', 'SLC'), ('SLC', 'MSO')]	1496	7
194	[('EUG', 'SFO'), ('SFO', 'SLC'), ('SLC', 'BZN')]	1397	7
195	[('EUG', 'SFO'), ('SFO', 'SLC'), ('SLC', 'BIL')]	1437	7
196	[('EUG', 'SFO'), ('SFO', 'SLC'), ('SLC', 'GTF')]	1513	7
197	[('EUG', 'SFO'), ('SFO', 'SLC'), ('SLC', 'HLN')]	1452	7
198	[('EUG', 'SFO'), ('SFO', 'SLC'), ('SLC', 'MSO')]	1486	7
199	[('EUG', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'BZN')]	1412	7
200	[('EUG', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'BIL')]	1452	7
201	[('EUG', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'GTF')]	1528	7
202	[('EUG', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'HLN')]	1467	7
203	[('EUG', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'MSO')]	1501	7
204	[('EUG', 'SFO'), ('SFO', 'GEG'), ('GEG', 'BZN')]	1513	7
205	[('EUG', 'SFO'), ('SFO', 'BZN')]	1258	6
206	[('EUG', 'DEN'), ('DEN', 'BIL')]	1451	6
207	[('EUG', 'DEN'), ('DEN', 'MSO')]	1675	7
208	[('EUG', 'DEN'), ('DEN', 'HLN')]	1590	7
209	[('EUG', 'DEN'), ('DEN', 'BZN')]	1520	7
210	[('EUG', 'SLC'), ('SLC', 'BZN')]	965	5
211	[('EUG', 'SLC'), ('SLC', 'DEN'), ('DEN', 'BIL')]	1464	7
212	[('EUG', 'SLC'), ('SLC', 'BIL')]	1005	5
213	[('EUG', 'SLC'), ('SLC', 'GJT'), ('GJT', 'DEN'), ('DEN', 'BIL')]	1501	7
214	[('EUG', 'SLC'), ('SLC', 'FCA')]	1149	6
215	[('EUG', 'SLC'), ('SLC', 'GTF')]	1081	5
216	[('EUG', 'SLC'), ('SLC', 'HLN')]	1020	5
217	[('EUG', 'SLC'), ('SLC', 'HLN'), ('HLN', 'BZN')]	1090	6
218	[('EUG', 'SLC'), ('SLC', 'MSO')]	1054	5
219	[('MFR', 'LAX'), ('LAX', 'BZN')]	1532	7

220	[('MFR', 'SEA'), ('SEA', 'GEG'), ('GEG', 'BZN')]	905	5
221	[('MFR', 'SEA'), ('SEA', 'PDX'), ('PDX', 'BZN')]	1035	6
222	[('MFR', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BZN')]	1388	7
223	[('MFR', 'SEA'), ('SEA', 'SLC'), ('SLC', 'BIL')]	1428	7
224	[('MFR', 'SEA'), ('SEA', 'SLC'), ('SLC', 'GTF')]	1504	7
225	[('MFR', 'SEA'), ('SEA', 'SLC'), ('SLC', 'HLN')]	1443	7
226	[('MFR', 'SEA'), ('SEA', 'SLC'), ('SLC', 'MSO')]	1477	7
227	[('MFR', 'SEA'), ('SEA', 'BZN')]	895	5
228	[('MFR', 'SLC'), ('SLC', 'BZN')]	922	5
229	[('MFR', 'SLC'), ('SLC', 'DEN'), ('DEN', 'BIL')]	1421	7
230	[('MFR', 'SLC'), ('SLC', 'BIL')]	962	5
231	[('MFR', 'SLC'), ('SLC', 'GJT'), ('GJT', 'DEN'), ('DEN', 'BIL')]	1458	7
232	[('MFR', 'SLC'), ('SLC', 'FCA')]	1106	6
233	[('MFR', 'SLC'), ('SLC', 'GTF')]	1038	5
234	[('MFR', 'SLC'), ('SLC', 'HLN')]	977	5
235	[('MFR', 'SLC'), ('SLC', 'HLN'), ('HLN', 'BZN')]	1047	6
236	[('MFR', 'SLC'), ('SLC', 'MSO')]	1011	5
237	[('MFR', 'SFO'), ('SFO', 'SLC'), ('SLC', 'BZN')]	1275	7
238	[('MFR', 'SFO'), ('SFO', 'SLC'), ('SLC', 'BIL')]	1315	7
239	[('MFR', 'SFO'), ('SFO', 'SLC'), ('SLC', 'GTF')]	1391	7
240	[('MFR', 'SFO'), ('SFO', 'SLC'), ('SLC', 'HLN')]	1330	7
241	[('MFR', 'SFO'), ('SFO', 'SLC'), ('SLC', 'MSO')]	1364	7
242	[('MFR', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'BZN')]	1290	7
243	[('MFR', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'BIL')]	1330	7
244	[('MFR', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'GTF')]	1406	7
245	[('MFR', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'HLN')]	1345	7
246	[('MFR', 'SFO'), ('SFO', 'RNO'), ('RNO', 'SLC'), ('SLC', 'MSO')]	1379	7
247	[('MFR', 'SFO'), ('SFO', 'GEG'), ('GEG', 'BZN')]	1391	7
248	[('MFR', 'SFO'), ('SFO', 'BZN')]	1136	6
249	[('MFR', 'DEN'), ('DEN', 'BIL')]	1419	6
250	[('MFR', 'DEN'), ('DEN', 'MSO')]	1643	7
251	[('MFR', 'DEN'), ('DEN', 'HLN')]	1558	7
252	[('MFR', 'DEN'), ('DEN', 'BZN')]	1488	7
253	[('MFR', 'ACV'), ('ACV', 'SFO'), ('SFO', 'BZN')]	1173	7
254	[('BIL', 'SLC'), ('SLC', 'SEA'), ('SEA', 'PDX')]	1205	6
255	[('BIL', 'SLC'), ('SLC', 'SEA'), ('SEA', 'MFR')]	1428	7
256	[('BIL', 'SLC'), ('SLC', 'SEA'), ('SEA', 'RDM')]	1304	6
257	[('BIL', 'SLC'), ('SLC', 'SEA'), ('SEA', 'EUG')]	1310	6
258	[('BIL', 'SLC'), ('SLC', 'PDX')]	1017	5
259	[('BIL', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'RDM')]	1374	7
260	[('BIL', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'EUG')]	1380	7
261	[('BIL', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'RDM')]	1463	7
262	[('BIL', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'MFR')]	1330	7
263	[('BIL', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'EUG')]	1452	7
264	[('BIL', 'SLC'), ('SLC', 'BZN'), ('BZN', 'PDX')]	1288	7
265	[('BIL', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'PDX')]	1342	7
266	[('BIL', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'RDM')]	1441	7
267	[('BIL', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'EUG')]	1447	7
268	[('BIL', 'SLC'), ('SLC', 'SFO'), ('SFO', 'RDM')]	1448	7
269	[('BIL', 'SLC'), ('SLC', 'SFO'), ('SFO', 'MFR')]	1315	7
270	[('BIL', 'SLC'), ('SLC', 'SFO'), ('SFO', 'EUG')]	1437	7
271	[('BIL', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'PDX')]	1205	7
272	[('BIL', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'RDM')]	1304	7
273	[('BIL', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'EUG')]	1310	7
274	[('BIL', 'SLC'), ('SLC', 'BOI'), ('BOI', 'PDX')]	1021	6

275	[('BIL', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'PDX')]	1286	7
276	[('BIL', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'RDM')]	1385	7
277	[('BIL', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'EUG')]	1391	7
278	[('BIL', 'SLC'), ('SLC', 'SMF'), ('SMF', 'PDX')]	1398	7
279	[('BIL', 'SLC'), ('SLC', 'MFR')]	962	5
280	[('BIL', 'SLC'), ('SLC', 'RDM')]	912	5
281	[('BIL', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'PDX')]	1269	7
282	[('BIL', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'EUG')]	1374	7
283	[('BIL', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'PDX')]	1209	7
284	[('BIL', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'RDM')]	1308	7
285	[('BIL', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'EUG')]	1314	7
286	[('BIL', 'SLC'), ('SLC', 'EUG')]	1005	5
287	[('BIL', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'PDX')]	1368	7
288	[('BIL', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'RDM')]	1467	7
289	[('BIL', 'DEN'), ('DEN', 'SLC'), ('SLC', 'PDX')]	1476	7
290	[('BIL', 'DEN'), ('DEN', 'SLC'), ('SLC', 'MFR')]	1421	7
291	[('BIL', 'DEN'), ('DEN', 'SLC'), ('SLC', 'RDM')]	1371	7
292	[('BIL', 'DEN'), ('DEN', 'SLC'), ('SLC', 'EUG')]	1464	7
293	[('BIL', 'DEN'), ('DEN', 'MFR')]	1419	6
294	[('BIL', 'DEN'), ('DEN', 'BOI'), ('BOI', 'PDX')]	1448	7
295	[('BIL', 'DEN'), ('DEN', 'PDX')]	1446	6
296	[('BIL', 'DEN'), ('DEN', 'EUG')]	1451	6
297	[('BIL', 'DEN'), ('DEN', 'RDM')]	1353	6
298	[('BIL', 'DEN'), ('DEN', 'GJT'), ('GJT', 'SLC'), ('SLC', 'PDX')]	1513	7
299	[('BIL', 'DEN'), ('DEN', 'GJT'), ('GJT', 'SLC'), ('SLC', 'MFR')]	1458	7
300	[('BIL', 'DEN'), ('DEN', 'GJT'), ('GJT', 'SLC'), ('SLC', 'RDM')]	1408	7
301	[('BIL', 'DEN'), ('DEN', 'GJT'), ('GJT', 'SLC'), ('SLC', 'EUG')]	1501	7
302	[('BZN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'PDX')]	1165	6
303	[('BZN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'MFR')]	1388	7
304	[('BZN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'RDM')]	1264	6
305	[('BZN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'EUG')]	1270	6
306	[('BZN', 'SLC'), ('SLC', 'PDX')]	977	5
307	[('BZN', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'RDM')]	1334	7
308	[('BZN', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'EUG')]	1340	7
309	[('BZN', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'RDM')]	1423	7
310	[('BZN', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'MFR')]	1290	7
311	[('BZN', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'EUG')]	1412	7
312	[('BZN', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'PDX')]	1302	7
313	[('BZN', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'RDM')]	1401	7
314	[('BZN', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'EUG')]	1407	7
315	[('BZN', 'SLC'), ('SLC', 'SFO'), ('SFO', 'RDM')]	1408	7
316	[('BZN', 'SLC'), ('SLC', 'SFO'), ('SFO', 'MFR')]	1275	7
317	[('BZN', 'SLC'), ('SLC', 'SFO'), ('SFO', 'EUG')]	1397	7
318	[('BZN', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'PDX')]	1165	7
319	[('BZN', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'RDM')]	1264	7
320	[('BZN', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'EUG')]	1270	7
321	[('BZN', 'SLC'), ('SLC', 'BOI'), ('BOI', 'PDX')]	981	6
322	[('BZN', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'PDX')]	1246	7
323	[('BZN', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'RDM')]	1345	7
324	[('BZN', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'EUG')]	1351	7
325	[('BZN', 'SLC'), ('SLC', 'SMF'), ('SMF', 'PDX')]	1358	7
326	[('BZN', 'SLC'), ('SLC', 'MFR')]	922	5
327	[('BZN', 'SLC'), ('SLC', 'RDM')]	872	5
328	[('BZN', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'PDX')]	1229	7
329	[('BZN', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'EUG')]	1334	7

330	[('BZN', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'PDX')]	1169	7
331	[('BZN', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'RDM')]	1268	7
332	[('BZN', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'EUG')]	1274	7
333	[('BZN', 'SLC'), ('SLC', 'EUG')]	965	5
334	[('BZN', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'PDX')]	1328	7
335	[('BZN', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'RDM')]	1427	7
336	[('BZN', 'SEA'), ('SEA', 'PDX')]	672	4
337	[('BZN', 'SEA'), ('SEA', 'BOI'), ('BOI', 'PDX')]	1286	7
338	[('BZN', 'SEA'), ('SEA', 'MFR')]	895	5
339	[('BZN', 'SEA'), ('SEA', 'RDM')]	771	4
340	[('BZN', 'SEA'), ('SEA', 'EUG')]	777	4
341	[('BZN', 'DEN'), ('DEN', 'MFR')]	1488	7
342	[('BZN', 'DEN'), ('DEN', 'PDX')]	1515	7
343	[('BZN', 'DEN'), ('DEN', 'EUG')]	1520	7
344	[('BZN', 'DEN'), ('DEN', 'RDM')]	1422	7
345	[('BZN', 'PDX')]	554	3
346	[('BZN', 'PDX'), ('PDX', 'SEA'), ('SEA', 'MFR')]	1035	6
347	[('BZN', 'PDX'), ('PDX', 'SEA'), ('SEA', 'RDM')]	911	5
348	[('BZN', 'PDX'), ('PDX', 'SEA'), ('SEA', 'EUG')]	917	5
349	[('BZN', 'PDX'), ('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'MFR')]	1220	7
350	[('BZN', 'PDX'), ('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'RDM')]	1096	6
351	[('BZN', 'PDX'), ('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'EUG')]	1102	6
352	[('BZN', 'SFO'), ('SFO', 'PDX')]	1357	7
353	[('BZN', 'SFO'), ('SFO', 'SMF'), ('SMF', 'PDX')]	1372	7
354	[('BZN', 'SFO'), ('SFO', 'RDM')]	1269	6
355	[('BZN', 'SFO'), ('SFO', 'MFR')]	1136	6
356	[('BZN', 'SFO'), ('SFO', 'EUG')]	1258	6
357	[('BZN', 'LAX'), ('LAX', 'EUG')]	1650	7
358	[('BZN', 'LAX'), ('LAX', 'MFR')]	1532	7
359	[('BZN', 'LAX'), ('LAX', 'RDM')]	1628	7
360	[('GTF', 'SLC'), ('SLC', 'SEA'), ('SEA', 'PDX')]	1281	6
361	[('GTF', 'SLC'), ('SLC', 'SEA'), ('SEA', 'MFR')]	1504	7
362	[('GTF', 'SLC'), ('SLC', 'SEA'), ('SEA', 'RDM')]	1380	6
363	[('GTF', 'SLC'), ('SLC', 'SEA'), ('SEA', 'EUG')]	1386	6
364	[('GTF', 'SLC'), ('SLC', 'PDX')]	1093	5
365	[('GTF', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'RDM')]	1450	7
366	[('GTF', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'EUG')]	1456	7
367	[('GTF', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'RDM')]	1539	7
368	[('GTF', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'MFR')]	1406	7
369	[('GTF', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'EUG')]	1528	7
370	[('GTF', 'SLC'), ('SLC', 'BZN'), ('BZN', 'PDX')]	1364	7
371	[('GTF', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'PDX')]	1418	7
372	[('GTF', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'RDM')]	1517	7
373	[('GTF', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'EUG')]	1523	7
374	[('GTF', 'SLC'), ('SLC', 'SFO'), ('SFO', 'RDM')]	1524	7
375	[('GTF', 'SLC'), ('SLC', 'SFO'), ('SFO', 'MFR')]	1391	7
376	[('GTF', 'SLC'), ('SLC', 'SFO'), ('SFO', 'EUG')]	1513	7
377	[('GTF', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'PDX')]	1281	7
378	[('GTF', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'RDM')]	1380	7
379	[('GTF', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'EUG')]	1386	7
380	[('GTF', 'SLC'), ('SLC', 'BOI'), ('BOI', 'PDX')]	1097	6
381	[('GTF', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'PDX')]	1362	7
382	[('GTF', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'RDM')]	1461	7
383	[('GTF', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'EUG')]	1467	7
384	[('GTF', 'SLC'), ('SLC', 'SMF'), ('SMF', 'PDX')]	1474	7

385	[('GTF', 'SLC'), ('SLC', 'MFR')]	1038	5
386	[('GTF', 'SLC'), ('SLC', 'RDM')]	988	5
387	[('GTF', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'PDX')]	1345	7
388	[('GTF', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'EUG')]	1450	7
389	[('GTF', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'PDX')]	1285	7
390	[('GTF', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'RDM')]	1384	7
391	[('GTF', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'EUG')]	1390	7
392	[('GTF', 'SLC'), ('SLC', 'EUG')]	1081	5
393	[('GTF', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'PDX')]	1444	7
394	[('GTF', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'RDM')]	1543	7
395	[('FCA', 'SLC'), ('SLC', 'SEA'), ('SEA', 'PDX')]	1349	7
396	[('FCA', 'SLC'), ('SLC', 'SEA'), ('SEA', 'RDM')]	1448	7
397	[('FCA', 'SLC'), ('SLC', 'SEA'), ('SEA', 'EUG')]	1454	7
398	[('FCA', 'SLC'), ('SLC', 'PDX')]	1161	6
399	[('FCA', 'SLC'), ('SLC', 'BOI'), ('BOI', 'PDX')]	1165	7
400	[('FCA', 'SLC'), ('SLC', 'MFR')]	1106	6
401	[('FCA', 'SLC'), ('SLC', 'RDM')]	1056	6
402	[('FCA', 'SLC'), ('SLC', 'EUG')]	1149	6
403	[('MSO', 'SLC'), ('SLC', 'SEA'), ('SEA', 'PDX')]	1254	6
404	[('MSO', 'SLC'), ('SLC', 'SEA'), ('SEA', 'MFR')]	1477	7
405	[('MSO', 'SLC'), ('SLC', 'SEA'), ('SEA', 'RDM')]	1353	6
406	[('MSO', 'SLC'), ('SLC', 'SEA'), ('SEA', 'EUG')]	1359	6
407	[('MSO', 'SLC'), ('SLC', 'PDX')]	1066	5
408	[('MSO', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'RDM')]	1423	7
409	[('MSO', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'EUG')]	1429	7
410	[('MSO', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'RDM')]	1512	7
411	[('MSO', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'MFR')]	1379	7
412	[('MSO', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'EUG')]	1501	7
413	[('MSO', 'SLC'), ('SLC', 'BZN'), ('BZN', 'PDX')]	1337	7
414	[('MSO', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'PDX')]	1391	7
415	[('MSO', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'RDM')]	1490	7
416	[('MSO', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'EUG')]	1496	7
417	[('MSO', 'SLC'), ('SLC', 'SFO'), ('SFO', 'RDM')]	1497	7
418	[('MSO', 'SLC'), ('SLC', 'SFO'), ('SFO', 'MFR')]	1364	7
419	[('MSO', 'SLC'), ('SLC', 'SFO'), ('SFO', 'EUG')]	1486	7
420	[('MSO', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'PDX')]	1254	7
421	[('MSO', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'RDM')]	1353	7
422	[('MSO', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'EUG')]	1359	7
423	[('MSO', 'SLC'), ('SLC', 'BOI'), ('BOI', 'PDX')]	1070	6
424	[('MSO', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'PDX')]	1335	7
425	[('MSO', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'RDM')]	1434	7
426	[('MSO', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'EUG')]	1440	7
427	[('MSO', 'SLC'), ('SLC', 'SMF'), ('SMF', 'PDX')]	1447	7
428	[('MSO', 'SLC'), ('SLC', 'MFR')]	1011	5
429	[('MSO', 'SLC'), ('SLC', 'RDM')]	961	5
430	[('MSO', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'PDX')]	1318	7
431	[('MSO', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'EUG')]	1423	7
432	[('MSO', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'PDX')]	1258	7
433	[('MSO', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'RDM')]	1357	7
434	[('MSO', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'EUG')]	1363	7
435	[('MSO', 'SLC'), ('SLC', 'EUG')]	1054	5
436	[('MSO', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'PDX')]	1417	7
437	[('MSO', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'RDM')]	1516	7
438	[('MSO', 'DEN'), ('DEN', 'MFR')]	1643	7
439	[('MSO', 'DEN'), ('DEN', 'PDX')]	1670	7

440	[('MSO', 'DEN'), ('DEN', 'EUG')]	1675	7
441	[('MSO', 'DEN'), ('DEN', 'RDM')]	1577	7
442	[('HLN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'PDX')]	1220	6
443	[('HLN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'MFR')]	1443	7
444	[('HLN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'RDM')]	1319	6
445	[('HLN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'EUG')]	1325	6
446	[('HLN', 'SLC'), ('SLC', 'PDX')]	1032	5
447	[('HLN', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'RDM')]	1389	7
448	[('HLN', 'SLC'), ('SLC', 'PDX'), ('PDX', 'SEA'), ('SEA', 'EUG')]	1395	7
449	[('HLN', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'RDM')]	1478	7
450	[('HLN', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'MFR')]	1345	7
451	[('HLN', 'SLC'), ('SLC', 'RNO'), ('RNO', 'SFO'), ('SFO', 'EUG')]	1467	7
452	[('HLN', 'SLC'), ('SLC', 'BZN'), ('BZN', 'PDX')]	1303	7
453	[('HLN', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'PDX')]	1357	7
454	[('HLN', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'RDM')]	1456	7
455	[('HLN', 'SLC'), ('SLC', 'JAC'), ('JAC', 'SEA'), ('SEA', 'EUG')]	1462	7
456	[('HLN', 'SLC'), ('SLC', 'SFO'), ('SFO', 'RDM')]	1463	7
457	[('HLN', 'SLC'), ('SLC', 'SFO'), ('SFO', 'MFR')]	1330	7
458	[('HLN', 'SLC'), ('SLC', 'SFO'), ('SFO', 'EUG')]	1452	7
459	[('HLN', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'PDX')]	1220	7
460	[('HLN', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'RDM')]	1319	7
461	[('HLN', 'SLC'), ('SLC', 'BOI'), ('BOI', 'SEA'), ('SEA', 'EUG')]	1325	7
462	[('HLN', 'SLC'), ('SLC', 'BOI'), ('BOI', 'PDX')]	1036	6
463	[('HLN', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'PDX')]	1301	7
464	[('HLN', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'RDM')]	1400	7
465	[('HLN', 'SLC'), ('SLC', 'GEG'), ('GEG', 'SEA'), ('SEA', 'EUG')]	1406	7
466	[('HLN', 'SLC'), ('SLC', 'SMF'), ('SMF', 'PDX')]	1413	7
467	[('HLN', 'SLC'), ('SLC', 'MFR')]	977	5
468	[('HLN', 'SLC'), ('SLC', 'RDM')]	927	5
469	[('HLN', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'PDX')]	1284	7
470	[('HLN', 'SLC'), ('SLC', 'RDM'), ('RDM', 'SEA'), ('SEA', 'EUG')]	1389	7
471	[('HLN', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'PDX')]	1224	7
472	[('HLN', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'RDM')]	1323	7
473	[('HLN', 'SLC'), ('SLC', 'PSC'), ('PSC', 'SEA'), ('SEA', 'EUG')]	1329	7
474	[('HLN', 'SLC'), ('SLC', 'EUG')]	1020	5
475	[('HLN', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'PDX')]	1383	7
476	[('HLN', 'SLC'), ('SLC', 'EUG'), ('EUG', 'SEA'), ('SEA', 'RDM')]	1482	7
477	[('HLN', 'DEN'), ('DEN', 'MFR')]	1558	7
478	[('HLN', 'DEN'), ('DEN', 'PDX')]	1585	7
479	[('HLN', 'DEN'), ('DEN', 'EUG')]	1590	7
480	[('HLN', 'DEN'), ('DEN', 'RDM')]	1492	7
481	[('HLN', 'BZN'), ('BZN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'PDX')]	1235	7
482	[('HLN', 'BZN'), ('BZN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'RDM')]	1334	7
483	[('HLN', 'BZN'), ('BZN', 'SLC'), ('SLC', 'SEA'), ('SEA', 'EUG')]	1340	7
484	[('HLN', 'BZN'), ('BZN', 'SLC'), ('SLC', 'PDX')]	1047	6
485	[('HLN', 'BZN'), ('BZN', 'SLC'), ('SLC', 'BOI'), ('BOI', 'PDX')]	1051	7
486	[('HLN', 'BZN'), ('BZN', 'SLC'), ('SLC', 'MFR')]	992	6
487	[('HLN', 'BZN'), ('BZN', 'SLC'), ('SLC', 'RDM')]	942	6
488	[('HLN', 'BZN'), ('BZN', 'SLC'), ('SLC', 'EUG')]	1035	6
489	[('HLN', 'BZN'), ('BZN', 'SEA'), ('SEA', 'PDX')]	742	5
490	[('HLN', 'BZN'), ('BZN', 'SEA'), ('SEA', 'MFR')]	965	6
491	[('HLN', 'BZN'), ('BZN', 'SEA'), ('SEA', 'RDM')]	841	5
492	[('HLN', 'BZN'), ('BZN', 'SEA'), ('SEA', 'EUG')]	847	5
493	[('HLN', 'BZN'), ('BZN', 'PDX')]	624	4
494	[('HLN', 'BZN'), ('BZN', 'PDX'), ('PDX', 'SEA'), ('SEA', 'MFR')]	1105	7

495	[('HLN', 'BZN'), ('BZN', 'PDX'), ('PDX', 'SEA'), ('SEA', 'RDM')]	981	6
496	[('HLN', 'BZN'), ('BZN', 'PDX'), ('PDX', 'SEA'), ('SEA', 'EUG')]	987	6
497	[('HLN', 'BZN'), ('BZN', 'PDX'), ('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'RDM')]	1166	7
498	[('HLN', 'BZN'), ('BZN', 'PDX'), ('PDX', 'BLI'), ('BLI', 'SEA'), ('SEA', 'EUG')]	1172	7
499	[('HLN', 'BZN'), ('BZN', 'SFO'), ('SFO', 'RDM')]	1339	7
500	[('HLN', 'BZN'), ('BZN', 'SFO'), ('SFO', 'MFR')]	1206	7
501	[('HLN', 'BZN'), ('BZN', 'SFO'), ('SFO', 'EUG')]	1328	7