

```
In [6]: import findspark
findspark.init()
findspark.find()
```

```
Out[6]: 'C:\\\\Users\\\\Admin\\\\anaconda3\\\\envs\\\\SparkEnvironment\\\\Lib\\\\site-packages\\\\pyspark'
```

```
In [4]: from pyspark.sql import SparkSession
from pyspark.sql.types import *

spark =(
    SparkSession
        .builder
        .appName("RDDApp")
        .master("local[4]")
        .getOrCreate()
)
```

```
In [5]: from pyspark.sql import SparkSession
from pyspark.sql.types import *

spark =(
    SparkSession
        .builder
        .appName("RDDApp")
        .master("local[4]")
        .getOrCreate()
)
```

```
In [7]: spark
```

```
Out[7]: SparkSession - in-memory
```

SparkContext

[Spark UI](#)

Version	v3.5.0
Master	local[*]
AppName	Test

```
In [8]: numberRdd = sc.parallelize([1,2,3,4,5])
```

```
NameError Traceback (most recent call last)
Cell In[8], line 1
----> 1 numberRdd = sc.parallelize([1,2,3,4,5])

NameError: name 'sc' is not defined
```

```
In [12]: sc = spark.sparkContext
numberRdd = sc.parallelize([1,2,3,4,5])
```

```
In [10]: numberRdd.getNumPartitions()
```

```
NameError Traceback (most recent call last)
Cell In[10], line 1
----> 1 numberRdd.getNumPartitions()

NameError: name 'numberRdd' is not defined
```

```
In [11]: output = numberRdd.collect()
print(output)
numberRdd.take(2)
```

```
NameError Traceback (most recent call last)
Cell In[11], line 1
----> 1 output = numberRdd.collect()
      2 print(output)

NameError: name 'numberRdd' is not defined
```

```
In [13]: sc = spark.sparkContext
numberRdd = sc.parallelize([1,2,3,4,5])
```

```
In [14]: spark
```

```
Out[14]: SparkSession - in-memory
```

SparkContext

Spark UI

Version	v3.5.0
Master	local[*]
AppName	Test

```
In [17]: sc = spark.sparkContext
employeeRdd = sc.parallelize(
    [1,"abc",1000],
    [2,"xyz",2000],
    [3,"mnp",3000],
    [4,"obc",4000],
)
employeeRdd.first()
```

```

-----
```

TypeError Traceback (most recent call last)

Cell In[17], line 2

```

  1 sc = spark.sparkContext
  2 employeeRdd = sc.parallelize(
  3     [1, "abc", 1000],
  4     [2, "xyz", 2000],
  5     [3, "mnp", 3000],
  6     [4, "obc", 4000],
  7 )
  8 employeeRdd.first()
```

TypeError: SparkContext.parallelize() takes from 2 to 3 positional arguments but 5 were given

In [18]: taxiZoneRdd = sc.textFile("C:\\DataFiles\\TaxiZones.csv")

In [19]: taxiZoneRdd.take(10)

Out[19]: ['1,EWR,Newark Airport,EWR',
 '2,Queens,Jamaica Bay,Boro Zone',
 '3,Bronx,Allerton/Pelham Gardens,Boro Zone',
 '4,Manhattan,Alphabet City,Yellow Zone',
 '5,Staten Island,Arden Heights,Boro Zone',
 '6,Staten Island,Arrochar/Fort Wadsworth,Boro Zone',
 '7,Queens,Astoria,Boro Zone',
 '8,Queens,Astoria Park,Boro Zone',
 '9,Queens,Auburndale,Boro Zone',
 '10,Queens,Baisley Park,Boro Zone']

In [20]: numberRdd = sc.parallelize([1,2,3,4,5])

In [21]: numberRdd.getNumPartitions()

Out[21]: 4

In [22]: output = numberRdd.collect()

In [23]: print(output)

[1, 2, 3, 4, 5]

In [24]: numberRdd.take(2)

Out[24]: [1, 2]

In [25]: output = numberRdd.collect()
 print(output)

[1, 2, 3, 4, 5]

In [26]: taxiZoneRdd.getNumPartitions()

Out[26]: 2

```
In [27]: taxiZoneRdd = sc.textFile("C:\DataFiles\TaxiZones.csv",4)
taxiZoneRdd.getNumPartitions()
```

Out[27]: 4

```
In [28]: taxiZonewithColsRdd = (taxiZoneRdd.map(lambda zone: zone.split(",")))
taxiZonewithColsRdd.take(5)
```

Out[28]: `[['1', 'EWR', 'Newark Airport', 'EWR'],
 ['2', 'Queens', 'Jamaica Bay', 'Boro Zone'],
 ['3', 'Bronx', 'Allerton/Pelham Gardens', 'Boro Zone'],
 ['4', 'Manhattan', 'Alphabet City', 'Yellow Zone'],
 ['5', 'Staten Island', 'Arden Heights', 'Boro Zone']]`

```
In [29]: taxiZonewithColsRdd.take(10)
```

Out[29]: `[['1', 'EWR', 'Newark Airport', 'EWR'],
 ['2', 'Queens', 'Jamaica Bay', 'Boro Zone'],
 ['3', 'Bronx', 'Allerton/Pelham Gardens', 'Boro Zone'],
 ['4', 'Manhattan', 'Alphabet City', 'Yellow Zone'],
 ['5', 'Staten Island', 'Arden Heights', 'Boro Zone'],
 ['6', 'Staten Island', 'Arrochar/Fort Wadsworth', 'Boro Zone'],
 ['7', 'Queens', 'Astoria', 'Boro Zone'],
 ['8', 'Queens', 'Astoria Park', 'Boro Zone'],
 ['9', 'Queens', 'Auburndale', 'Boro Zone'],
 ['10', 'Queens', 'Baisley Park', 'Boro Zone']]`

```
In [31]: filteredZoneRdd = (taxiZonewithColsRdd
  .filter(lambda c: zoneRow[1] == "Manhattan" and zoneRow[2].lower().startswith("cent")))
```

```
In [32]: filteredZoneRdd.take(5)
```

Out[32]: `[['41', 'Manhattan', 'Central Harlem', 'Boro Zone'],
 ['42', 'Manhattan', 'Central Harlem North', 'Boro Zone'],
 ['43', 'Manhattan', 'Central Park', 'Yellow Zone']]`

```
In [33]: filteredZoneRdd.take(5)
```

Out[33]: `[['41', 'Manhattan', 'Central Harlem', 'Boro Zone'],
 ['42', 'Manhattan', 'Central Harlem North', 'Boro Zone'],
 ['43', 'Manhattan', 'Central Park', 'Yellow Zone']]`

```
In [34]: import math
numberRdd = sc.parallelize([2,3,4,5,6])

numberWithSquareRootRdd = (numberRdd.map(lambda num: (num, math.sqrt(num))))
numberWithSquareRootRdd.collect()
```

Out[34]: `[(2, 1.4142135623730951),
 (3, 1.7320508075688772),
 (4, 2.0),
 (5, 2.23606797749979),
 (6, 2.449489742783178)]`

```
In [37]: taxiZonewithColsMapRdd =(taxiZonewithColsRdd.map(lambda zoneRow:(zoneRow[0],zoneRow[1]))).collect()
```

```
Out[37]: [(1, [1, 'EWR', 'Newark Airport', 'EWR']),  
 (2, [2, 'Queens', 'Jamaica Bay', 'Boro Zone']),  
 (3, [3, 'Bronx', 'Allerton/Pelham Gardens', 'Boro Zone']),  
 (4, [4, 'Manhattan', 'Alphabet City', 'Yellow Zone']),  
 (5, [5, 'Staten Island', 'Arden Heights', 'Boro Zone']),  
 (6, [6, 'Staten Island', 'Arrochar/Fort Wadsworth', 'Boro Zone']),  
 (7, [7, 'Queens', 'Astoria', 'Boro Zone']),  
 (8, [8, 'Queens', 'Astoria Park', 'Boro Zone']),  
 (9, [9, 'Queens', 'Auburndale', 'Boro Zone']),  
 (10, [10, 'Queens', 'Baisley Park', 'Boro Zone']),  
 (11, [11, 'Brooklyn', 'Bath Beach', 'Boro Zone']),  
 (12, [12, 'Manhattan', 'Battery Park', 'Yellow Zone']),  
 (13, [13, 'Manhattan', 'Battery Park City', 'Yellow Zone']),  
 (14, [14, 'Brooklyn', 'Bay Ridge', 'Boro Zone']),  
 (15, [15, 'Queens', 'Bay Terrace/Fort Totten', 'Boro Zone']),  
 (16, [16, 'Queens', 'Bayside', 'Boro Zone']),  
 (17, [17, 'Brooklyn', 'Bedford', 'Boro Zone']),  
 (18, [18, 'Bronx', 'Bedford Park', 'Boro Zone']),  
 (19, [19, 'Queens', 'Bellerose', 'Boro Zone']),  
 (20, [20, 'Bronx', 'Belmont', 'Boro Zone']),  
 (21, [21, 'Brooklyn', 'Bensonhurst East', 'Boro Zone']),  
 (22, [22, 'Brooklyn', 'Bensonhurst West', 'Boro Zone']),  
 (23, [23, 'Staten Island', 'Bloomfield/Emerson Hill', 'Boro Zone']),  
 (24, [24, 'Manhattan', 'Bloomingdale', 'Yellow Zone']),  
 (25, [25, 'Brooklyn', 'Boerum Hill', 'Boro Zone']),  
 (26, [26, 'Brooklyn', 'Borough Park', 'Boro Zone']),  
 (27, [27, 'Queens', 'Breezy Point/Fort Tilden/Riis Beach', 'Boro Zone']),  
 (28, [28, 'Queens', 'Briarwood/Jamaica Hills', 'Boro Zone']),  
 (29, [29, 'Brooklyn', 'Brighton Beach', 'Boro Zone']),  
 (30, [30, 'Queens', 'Broad Channel', 'Boro Zone']),  
 (31, [31, 'Bronx', 'Bronx Park', 'Boro Zone']),  
 (32, [32, 'Bronx', 'Bronxdale', 'Boro Zone']),  
 (33, [33, 'Brooklyn', 'Brooklyn Heights', 'Boro Zone']),  
 (34, [34, 'Brooklyn', 'Brooklyn Navy Yard', 'Boro Zone']),  
 (35, [35, 'Brooklyn', 'Brownsville', 'Boro Zone']),  
 (36, [36, 'Brooklyn', 'Bushwick North', 'Boro Zone']),  
 (37, [37, 'Brooklyn', 'Bushwick South', 'Boro Zone']),  
 (38, [38, 'Queens', 'Cambria Heights', 'Boro Zone']),  
 (39, [39, 'Brooklyn', 'Canarsie', 'Boro Zone']),  
 (40, [40, 'Brooklyn', 'Carroll Gardens', 'Boro Zone']),  
 (41, [41, 'Manhattan', 'Central Harlem', 'Boro Zone']),  
 (42, [42, 'Manhattan', 'Central Harlem North', 'Boro Zone']),  
 (43, [43, 'Manhattan', 'Central Park', 'Yellow Zone']),  
 (44, [44, 'Staten Island', 'Charleston/Tottenville', 'Boro Zone']),  
 (45, [45, 'Manhattan', 'Chinatown', 'Yellow Zone']),  
 (46, [46, 'Bronx', 'City Island', 'Boro Zone']),  
 (47, [47, 'Bronx', 'Claremont/Bathgate', 'Boro Zone']),  
 (48, [48, 'Manhattan', 'Clinton East', 'Yellow Zone']),  
 (49, [49, 'Brooklyn', 'Clinton Hill', 'Boro Zone']),  
 (50, [50, 'Manhattan', 'Clinton West', 'Yellow Zone']),  
 (51, [51, 'Bronx', 'Co-Op City', 'Boro Zone']),  
 (52, [52, 'Brooklyn', 'Cobble Hill', 'Boro Zone']),  
 (53, [53, 'Queens', 'College Point', 'Boro Zone']),  
 (54, [54, 'Brooklyn', 'Columbia Street', 'Boro Zone']),  
 (55, [55, 'Brooklyn', 'Coney Island', 'Boro Zone']),  
 (56, [56, 'Queens', 'Corona', 'Boro Zone'])]
```

```
('57', ['57', 'Queens', 'Corona', 'Boro Zone']),  
('58', ['58', 'Bronx', 'Country Club', 'Boro Zone']),  
('59', ['59', 'Bronx', 'Crotona Park', 'Boro Zone']),  
('60', ['60', 'Bronx', 'Crotona Park East', 'Boro Zone']),  
('61', ['61', 'Brooklyn', 'Crown Heights North', 'Boro Zone']),  
('62', ['62', 'Brooklyn', 'Crown Heights South', 'Boro Zone']),  
('63', ['63', 'Brooklyn', 'Cypress Hills', 'Boro Zone']),  
('64', ['64', 'Queens', 'Douglaston', 'Boro Zone']),  
('65', ['65', 'Brooklyn', 'Downtown Brooklyn/MetroTech', 'Boro Zone']),  
('66', ['66', 'Brooklyn', 'DUMBO/Vinegar Hill', 'Boro Zone']),  
('67', ['67', 'Brooklyn', 'Dyker Heights', 'Boro Zone']),  
('68', ['68', 'Manhattan', 'East Chelsea', 'Yellow Zone']),  
('69', ['69', 'Bronx', 'East Concourse/Concourse Village', 'Boro Zone']),  
('70', ['70', 'Queens', 'East Elmhurst', 'Boro Zone']),  
('71', ['71', 'Brooklyn', 'East Flatbush/Farragut', 'Boro Zone']),  
('72', ['72', 'Brooklyn', 'East Flatbush/Remsen Village', 'Boro Zone']),  
('73', ['73', 'Queens', 'East Flushing', 'Boro Zone']),  
('74', ['74', 'Manhattan', 'East Harlem North', 'Boro Zone']),  
('75', ['75', 'Manhattan', 'East Harlem South', 'Boro Zone']),  
('76', ['76', 'Brooklyn', 'East New York', 'Boro Zone']),  
('77', ['77', 'Brooklyn', 'East New York/Pennsylvania Avenue', 'Boro Zone']),  
('78', ['78', 'Bronx', 'East Tremont', 'Boro Zone']),  
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('80', ['80', 'Brooklyn', 'East Williamsburg', 'Boro Zone']),  
('81', ['81', 'Bronx', 'Eastchester', 'Boro Zone']),  
('82', ['82', 'Queens', 'Elmhurst', 'Boro Zone']),  
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('85', ['85', 'Brooklyn', 'Erasmus', 'Boro Zone']),  
('86', ['86', 'Queens', 'Far Rockaway', 'Boro Zone']),  
('87', ['87', 'Manhattan', 'Financial District North', 'Yellow Zone']),  
('88', ['88', 'Manhattan', 'Financial District South', 'Yellow Zone']),  
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('93', ['93', 'Queens', 'Flushing Meadows-Corona Park', 'Boro Zone']),  
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('96', ['96', 'Queens', 'Forest Park/Highland Park', 'Boro Zone']),  
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('98', ['98', 'Queens', 'Fresh Meadows', 'Boro Zone']),  
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        "Governor's Island/Ellis Island/Liberty Island",  
        'Yellow Zone']),  
('104',  
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        'Manhattan',  
        "Governor's Island/Ellis Island/Liberty Island",
```

```
'Yellow Zone']),  
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'Manhattan',  
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'Yellow Zone']),  
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('110', ['110', 'Staten Island', 'Great Kills Park', 'Boro Zone']),  
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('114', ['114', 'Manhattan', 'Greenwich Village South', 'Yellow Zone']),  
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('122', ['122', 'Queens', 'Hollis', 'Boro Zone']),  
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('124', ['124', 'Queens', 'Howard Beach', 'Boro Zone']),  
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('126', ['126', 'Bronx', 'Hunts Point', 'Boro Zone']),  
('127', ['127', 'Manhattan', 'Inwood', 'Boro Zone']),  
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('130', ['130', 'Queens', 'Jamaica', 'Boro Zone']),  
('131', ['131', 'Queens', 'Jamaica Estates', 'Boro Zone']),  
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('149', ['149', 'Brooklyn', 'Madison', 'Boro Zone']),  
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('153', ['153', 'Manhattan', 'Marble Hill', 'Boro Zone']),  
('154', ['154', 'Brooklyn', 'Marine Park/Floyd Bennett Field', 'Boro Zone']),  
('155', ['155', 'Brooklyn', 'Marine Park/Mill Basin', 'Boro Zone']),
```

```
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('162', ['162', 'Manhattan', 'Midtown East', 'Yellow Zone']),  
('163', ['163', 'Manhattan', 'Midtown North', 'Yellow Zone']),  
('164', ['164', 'Manhattan', 'Midtown South', 'Yellow Zone']),  
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('169', ['169', 'Bronx', 'Mount Hope', 'Boro Zone']),  
('170', ['170', 'Manhattan', 'Murray Hill', 'Yellow Zone']),  
('171', ['171', 'Queens', 'Murray Hill-Queens', 'Boro Zone']),  
('172', ['172', 'Staten Island', 'New Dorp/Midland Beach', 'Boro Zone']),  
('173', ['173', 'Queens', 'North Corona', 'Boro Zone']),  
('174', ['174', 'Bronx', 'Norwood', 'Boro Zone']),  
('175', ['175', 'Queens', 'Oakland Gardens', 'Boro Zone']),  
('176', ['176', 'Staten Island', 'Oakwood', 'Boro Zone']),  
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('178', ['178', 'Brooklyn', 'Ocean Parkway South', 'Boro Zone']),  
('179', ['179', 'Queens', 'Old Astoria', 'Boro Zone']),  
('180', ['180', 'Queens', 'Ozone Park', 'Boro Zone']),  
('181', ['181', 'Brooklyn', 'Park Slope', 'Boro Zone']),  
('182', ['182', 'Bronx', 'Parkchester', 'Boro Zone']),  
('183', ['183', 'Bronx', 'Pelham Bay', 'Boro Zone']),  
('184', ['184', 'Bronx', 'Pelham Bay Park', 'Boro Zone']),  
('185', ['185', 'Bronx', 'Pelham Parkway', 'Boro Zone']),  
('186', ['186', 'Manhattan', 'Penn Station/Madison Sq West', 'Yellow Zone']),  
('187', ['187', 'Staten Island', 'Port Richmond', 'Boro Zone']),  
('188', ['188', 'Brooklyn', 'Prospect-Lefferts Gardens', 'Boro Zone']),  
('189', ['189', 'Brooklyn', 'Prospect Heights', 'Boro Zone']),  
('190', ['190', 'Brooklyn', 'Prospect Park', 'Boro Zone']),  
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('192', ['192', 'Queens', 'Queensboro Hill', 'Boro Zone']),  
('193', ['193', 'Queens', 'Queensbridge/Ravenswood', 'Boro Zone']),  
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('195', ['195', 'Brooklyn', 'Red Hook', 'Boro Zone']),  
('196', ['196', 'Queens', 'Rego Park', 'Boro Zone']),  
('197', ['197', 'Queens', 'Richmond Hill', 'Boro Zone']),  
('198', ['198', 'Queens', 'Ridgewood', 'Boro Zone']),  
('199', ['199', 'Bronx', 'Rikers Island', 'Boro Zone']),  
('200', ['200', 'Bronx', 'Riverdale/North Riverdale/Fieldston', 'Boro Zone']),  
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('202', ['202', 'Manhattan', 'Roosevelt Island', 'Boro Zone']),  
('203', ['203', 'Queens', 'Rosedale', 'Boro Zone']),  
('204', ['204', 'Staten Island', 'Rossville/Woodrow', 'Boro Zone']),  
('205', ['205', 'Queens', 'Saint Albans', 'Boro Zone']),  
('206', ['206', 'Staten Island', 'Saint George/New Brighton', 'Boro Zone']),  
('207', ['207', 'Queens', 'Saint Michaels Cemetery/Woodside', 'Boro Zone']),  
('208', ['208', 'Bronx', 'Schuylerville/Edgewater Park', 'Boro Zone']),  
('209', ['209', 'Manhattan', 'Seaport', 'Yellow Zone']),  
('210', ['210', 'Brooklyn', 'Sheepshead Bay', 'Boro Zone']),  
('211', ['211', 'Manhattan', 'SoHo', 'Yellow Zone']),
```

```
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('213', ['213', 'Bronx', 'Soundview/Castle Hill', 'Boro Zone']),  
('214', ['214', 'Staten Island', 'South Beach/Dongan Hills', 'Boro Zone']),  
('215', ['215', 'Queens', 'South Jamaica', 'Boro Zone']),  
('216', ['216', 'Queens', 'South Ozone Park', 'Boro Zone']),  
('217', ['217', 'Brooklyn', 'South Williamsburg', 'Boro Zone']),  
('218', ['218', 'Queens', 'Springfield Gardens North', 'Boro Zone']),  
('219', ['219', 'Queens', 'Springfield Gardens South', 'Boro Zone']),  
('220', ['220', 'Bronx', 'Spuyten Duyvil/Kingsbridge', 'Boro Zone']),  
('221', ['221', 'Staten Island', 'Stapleton', 'Boro Zone']),  
('222', ['222', 'Brooklyn', 'Starrett City', 'Boro Zone']),  
('223', ['223', 'Queens', 'Steinway', 'Boro Zone']),  
('224',  
    ['224', 'Manhattan', 'Stuy Town/Peter Cooper Village', 'Yellow Zone']),  
('225', ['225', 'Brooklyn', 'Stuyvesant Heights', 'Boro Zone']),  
('226', ['226', 'Queens', 'Sunnyside', 'Boro Zone']),  
('227', ['227', 'Brooklyn', 'Sunset Park East', 'Boro Zone']),  
('228', ['228', 'Brooklyn', 'Sunset Park West', 'Boro Zone']),  
('229', ['229', 'Manhattan', 'Sutton Place/Turtle Bay North', 'Yellow Zone']),  
('230', ['230', 'Manhattan', 'Times Sq/Theatre District', 'Yellow Zone']),  
('231', ['231', 'Manhattan', 'TriBeCa/Civic Center', 'Yellow Zone']),  
('232', ['232', 'Manhattan', 'Two Bridges/Seward Park', 'Yellow Zone']),  
('233', ['233', 'Manhattan', 'UN/Turtle Bay South', 'Yellow Zone']),  
('234', ['234', 'Manhattan', 'Union Sq', 'Yellow Zone']),  
('235', ['235', 'Bronx', 'University Heights/Morris Heights', 'Boro Zone']),  
('236', ['236', 'Manhattan', 'Upper East Side North', 'Yellow Zone']),  
('237', ['237', 'Manhattan', 'Upper East Side South', 'Yellow Zone']),  
('238', ['238', 'Manhattan', 'Upper West Side North', 'Yellow Zone']),  
('239', ['239', 'Manhattan', 'Upper West Side South', 'Yellow Zone']),  
('240', ['240', 'Bronx', 'Van Cortlandt Park', 'Boro Zone']),  
('241', ['241', 'Bronx', 'Van Cortlandt Village', 'Boro Zone']),  
('242', ['242', 'Bronx', 'Van Nest/Morris Park', 'Boro Zone']),  
('243', ['243', 'Manhattan', 'Washington Heights North', 'Boro Zone']),  
('244', ['244', 'Manhattan', 'Washington Heights South', 'Boro Zone']),  
('245', ['245', 'Staten Island', 'West Brighton', 'Boro Zone']),  
('246', ['246', 'Manhattan', 'West Chelsea/Hudson Yards', 'Yellow Zone']),  
('247', ['247', 'Bronx', 'West Concourse', 'Boro Zone']),  
('248', ['248', 'Bronx', 'West Farms/Bronx River', 'Boro Zone']),  
('249', ['249', 'Manhattan', 'West Village', 'Yellow Zone']),  
('250', ['250', 'Bronx', 'Westchester Village/Unionport', 'Boro Zone']),  
('251', ['251', 'Staten Island', 'Westerleigh', 'Boro Zone']),  
('252', ['252', 'Queens', 'Whitestone', 'Boro Zone']),  
('253', ['253', 'Queens', 'Willets Point', 'Boro Zone']),  
('254', ['254', 'Bronx', 'Williamsbridge/Olinville', 'Boro Zone']),  
('255', ['255', 'Brooklyn', 'Williamsburg (North Side)', 'Boro Zone']),  
('256', ['256', 'Brooklyn', 'Williamsburg (South Side)', 'Boro Zone']),  
('257', ['257', 'Brooklyn', 'Windsor Terrace', 'Boro Zone']),  
('258', ['258', 'Queens', 'Woodhaven', 'Boro Zone']),  
('259', ['259', 'Bronx', 'Woodlawn/Wakefield', 'Boro Zone']),  
('260', ['260', 'Queens', 'Woodside', 'Boro Zone']),  
('261', ['261', 'Manhattan', 'World Trade Center', 'Yellow Zone']),  
('262', ['262', 'Manhattan', 'Yorkville East', 'Yellow Zone']),  
('263', ['263', 'Manhattan', 'Yorkville West', 'Yellow Zone']),  
('264', ['264', 'Unknown', 'NV', 'N/A']),  
('265', ['265', 'Unknown', 'NA', 'N/A'])]
```

```
In [38]: taxiZonewithColsMapRdd =(taxiZonewithColsRdd.map(lambda zone:(zone[0],zone) ))
taxiZonewithColsMapRdd.collect()
```

```
Out[38]: [(1, [1, 'EWR', 'Newark Airport', 'EWR']),  
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 (3, [3, 'Bronx', 'Allerton/Pelham Gardens', 'Boro Zone']),  
 (4, [4, 'Manhattan', 'Alphabet City', 'Yellow Zone']),  
 (5, [5, 'Staten Island', 'Arden Heights', 'Boro Zone']),  
 (6, [6, 'Staten Island', 'Arrochar/Fort Wadsworth', 'Boro Zone']),  
 (7, [7, 'Queens', 'Astoria', 'Boro Zone']),  
 (8, [8, 'Queens', 'Astoria Park', 'Boro Zone']),  
 (9, [9, 'Queens', 'Auburndale', 'Boro Zone']),  
 (10, [10, 'Queens', 'Baisley Park', 'Boro Zone']),  
 (11, [11, 'Brooklyn', 'Bath Beach', 'Boro Zone']),  
 (12, [12, 'Manhattan', 'Battery Park', 'Yellow Zone']),  
 (13, [13, 'Manhattan', 'Battery Park City', 'Yellow Zone']),  
 (14, [14, 'Brooklyn', 'Bay Ridge', 'Boro Zone']),  
 (15, [15, 'Queens', 'Bay Terrace/Fort Totten', 'Boro Zone']),  
 (16, [16, 'Queens', 'Bayside', 'Boro Zone']),  
 (17, [17, 'Brooklyn', 'Bedford', 'Boro Zone']),  
 (18, [18, 'Bronx', 'Bedford Park', 'Boro Zone']),  
 (19, [19, 'Queens', 'Bellerose', 'Boro Zone']),  
 (20, [20, 'Bronx', 'Belmont', 'Boro Zone']),  
 (21, [21, 'Brooklyn', 'Bensonhurst East', 'Boro Zone']),  
 (22, [22, 'Brooklyn', 'Bensonhurst West', 'Boro Zone']),  
 (23, [23, 'Staten Island', 'Bloomfield/Emerson Hill', 'Boro Zone']),  
 (24, [24, 'Manhattan', 'Bloomingdale', 'Yellow Zone']),  
 (25, [25, 'Brooklyn', 'Boerum Hill', 'Boro Zone']),  
 (26, [26, 'Brooklyn', 'Borough Park', 'Boro Zone']),  
 (27, [27, 'Queens', 'Breezy Point/Fort Tilden/Riis Beach', 'Boro Zone']),  
 (28, [28, 'Queens', 'Briarwood/Jamaica Hills', 'Boro Zone']),  
 (29, [29, 'Brooklyn', 'Brighton Beach', 'Boro Zone']),  
 (30, [30, 'Queens', 'Broad Channel', 'Boro Zone']),  
 (31, [31, 'Bronx', 'Bronx Park', 'Boro Zone']),  
 (32, [32, 'Bronx', 'Bronxdale', 'Boro Zone']),  
 (33, [33, 'Brooklyn', 'Brooklyn Heights', 'Boro Zone']),  
 (34, [34, 'Brooklyn', 'Brooklyn Navy Yard', 'Boro Zone']),  
 (35, [35, 'Brooklyn', 'Brownsville', 'Boro Zone']),  
 (36, [36, 'Brooklyn', 'Bushwick North', 'Boro Zone']),  
 (37, [37, 'Brooklyn', 'Bushwick South', 'Boro Zone']),  
 (38, [38, 'Queens', 'Cambria Heights', 'Boro Zone']),  
 (39, [39, 'Brooklyn', 'Canarsie', 'Boro Zone']),  
 (40, [40, 'Brooklyn', 'Carroll Gardens', 'Boro Zone']),  
 (41, [41, 'Manhattan', 'Central Harlem', 'Boro Zone']),  
 (42, [42, 'Manhattan', 'Central Harlem North', 'Boro Zone']),  
 (43, [43, 'Manhattan', 'Central Park', 'Yellow Zone']),  
 (44, [44, 'Staten Island', 'Charleston/Tottenville', 'Boro Zone']),  
 (45, [45, 'Manhattan', 'Chinatown', 'Yellow Zone']),  
 (46, [46, 'Bronx', 'City Island', 'Boro Zone']),  
 (47, [47, 'Bronx', 'Claremont/Bathgate', 'Boro Zone']),  
 (48, [48, 'Manhattan', 'Clinton East', 'Yellow Zone']),  
 (49, [49, 'Brooklyn', 'Clinton Hill', 'Boro Zone']),  
 (50, [50, 'Manhattan', 'Clinton West', 'Yellow Zone']),  
 (51, [51, 'Bronx', 'Co-Op City', 'Boro Zone']),  
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 (53, [53, 'Queens', 'College Point', 'Boro Zone']),  
 (54, [54, 'Brooklyn', 'Columbia Street', 'Boro Zone']),  
 (55, [55, 'Brooklyn', 'Coney Island', 'Boro Zone']),  
 (56, [56, 'Queens', 'Corona', 'Boro Zone'])]
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('58', ['58', 'Bronx', 'Country Club', 'Boro Zone']),  
('59', ['59', 'Bronx', 'Crotona Park', 'Boro Zone']),  
('60', ['60', 'Bronx', 'Crotona Park East', 'Boro Zone']),  
('61', ['61', 'Brooklyn', 'Crown Heights North', 'Boro Zone']),  
('62', ['62', 'Brooklyn', 'Crown Heights South', 'Boro Zone']),  
('63', ['63', 'Brooklyn', 'Cypress Hills', 'Boro Zone']),  
('64', ['64', 'Queens', 'Douglaston', 'Boro Zone']),  
('65', ['65', 'Brooklyn', 'Downtown Brooklyn/MetroTech', 'Boro Zone']),  
('66', ['66', 'Brooklyn', 'DUMBO/Vinegar Hill', 'Boro Zone']),  
('67', ['67', 'Brooklyn', 'Dyker Heights', 'Boro Zone']),  
('68', ['68', 'Manhattan', 'East Chelsea', 'Yellow Zone']),  
('69', ['69', 'Bronx', 'East Concourse/Concourse Village', 'Boro Zone']),  
('70', ['70', 'Queens', 'East Elmhurst', 'Boro Zone']),  
('71', ['71', 'Brooklyn', 'East Flatbush/Farragut', 'Boro Zone']),  
('72', ['72', 'Brooklyn', 'East Flatbush/Remsen Village', 'Boro Zone']),  
('73', ['73', 'Queens', 'East Flushing', 'Boro Zone']),  
('74', ['74', 'Manhattan', 'East Harlem North', 'Boro Zone']),  
('75', ['75', 'Manhattan', 'East Harlem South', 'Boro Zone']),  
('76', ['76', 'Brooklyn', 'East New York', 'Boro Zone']),  
('77', ['77', 'Brooklyn', 'East New York/Pennsylvania Avenue', 'Boro Zone']),  
('78', ['78', 'Bronx', 'East Tremont', 'Boro Zone']),  
('79', ['79', 'Manhattan', 'East Village', 'Yellow Zone']),  
('80', ['80', 'Brooklyn', 'East Williamsburg', 'Boro Zone']),  
('81', ['81', 'Bronx', 'Eastchester', 'Boro Zone']),  
('82', ['82', 'Queens', 'Elmhurst', 'Boro Zone']),  
('83', ['83', 'Queens', 'Elmhurst/Maspeth', 'Boro Zone']),  
('84',  
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('85', ['85', 'Brooklyn', 'Erasmus', 'Boro Zone']),  
('86', ['86', 'Queens', 'Far Rockaway', 'Boro Zone']),  
('87', ['87', 'Manhattan', 'Financial District North', 'Yellow Zone']),  
('88', ['88', 'Manhattan', 'Financial District South', 'Yellow Zone']),  
('89', ['89', 'Brooklyn', 'Flatbush/Ditmas Park', 'Boro Zone']),  
('90', ['90', 'Manhattan', 'Flatiron', 'Yellow Zone']),  
('91', ['91', 'Brooklyn', 'Flatlands', 'Boro Zone']),  
('92', ['92', 'Queens', 'Flushing', 'Boro Zone']),  
('93', ['93', 'Queens', 'Flushing Meadows-Corona Park', 'Boro Zone']),  
('94', ['94', 'Bronx', 'Fordham South', 'Boro Zone']),  
('95', ['95', 'Queens', 'Forest Hills', 'Boro Zone']),  
('96', ['96', 'Queens', 'Forest Park/Highland Park', 'Boro Zone']),  
('97', ['97', 'Brooklyn', 'Fort Greene', 'Boro Zone']),  
('98', ['98', 'Queens', 'Fresh Meadows', 'Boro Zone']),  
('99', ['99', 'Staten Island', 'Freshkills Park', 'Boro Zone']),  
('100', ['100', 'Manhattan', 'Garment District', 'Yellow Zone']),  
('101', ['101', 'Queens', 'Glen Oaks', 'Boro Zone']),  
('102', ['102', 'Queens', 'Glendale', 'Boro Zone']),  
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        'Yellow Zone']),  
('104',  
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        'Manhattan',  
        "Governor's Island/Ellis Island/Liberty Island",
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'Yellow Zone']),  
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('107', ['107', 'Manhattan', 'Gramercy', 'Yellow Zone']),  
('108', ['108', 'Brooklyn', 'Gravesend', 'Boro Zone']),  
('109', ['109', 'Staten Island', 'Great Kills', 'Boro Zone']),  
('110', ['110', 'Staten Island', 'Great Kills Park', 'Boro Zone']),  
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('114', ['114', 'Manhattan', 'Greenwich Village South', 'Yellow Zone']),  
('115', ['115', 'Staten Island', 'Grymes Hill/Clifton', 'Boro Zone']),  
('116', ['116', 'Manhattan', 'Hamilton Heights', 'Boro Zone']),  
('117', ['117', 'Queens', 'Hammels/Arverne', 'Boro Zone']),  
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('119', ['119', 'Bronx', 'Highbridge', 'Boro Zone']),  
('120', ['120', 'Manhattan', 'Highbridge Park', 'Boro Zone']),  
('121', ['121', 'Queens', 'Hillcrest/Pomonok', 'Boro Zone']),  
('122', ['122', 'Queens', 'Hollis', 'Boro Zone']),  
('123', ['123', 'Brooklyn', 'Homecrest', 'Boro Zone']),  
('124', ['124', 'Queens', 'Howard Beach', 'Boro Zone']),  
('125', ['125', 'Manhattan', 'Hudson Sq', 'Yellow Zone']),  
('126', ['126', 'Bronx', 'Hunts Point', 'Boro Zone']),  
('127', ['127', 'Manhattan', 'Inwood', 'Boro Zone']),  
('128', ['128', 'Manhattan', 'Inwood Hill Park', 'Boro Zone']),  
('129', ['129', 'Queens', 'Jackson Heights', 'Boro Zone']),  
('130', ['130', 'Queens', 'Jamaica', 'Boro Zone']),  
('131', ['131', 'Queens', 'Jamaica Estates', 'Boro Zone']),  
('132', ['132', 'Queens', 'JFK Airport', 'Airports']),  
('133', ['133', 'Brooklyn', 'Kensington', 'Boro Zone']),  
('134', ['134', 'Queens', 'Kew Gardens', 'Boro Zone']),  
('135', ['135', 'Queens', 'Kew Gardens Hills', 'Boro Zone']),  
('136', ['136', 'Bronx', 'Kingsbridge Heights', 'Boro Zone']),  
('137', ['137', 'Manhattan', 'Kips Bay', 'Yellow Zone']),  
('138', ['138', 'Queens', 'LaGuardia Airport', 'Airports']),  
('139', ['139', 'Queens', 'Laurelton', 'Boro Zone']),  
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('143', ['143', 'Manhattan', 'Lincoln Square West', 'Yellow Zone']),  
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('153', ['153', 'Manhattan', 'Marble Hill', 'Boro Zone']),  
('154', ['154', 'Brooklyn', 'Marine Park/Floyd Bennett Field', 'Boro Zone']),  
('155', ['155', 'Brooklyn', 'Marine Park/Mill Basin', 'Boro Zone']),
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('157', ['157', 'Queens', 'Maspeth', 'Boro Zone']),  
('158', ['158', 'Manhattan', 'Meatpacking/West Village West', 'Yellow Zone']),  
('159', ['159', 'Bronx', 'Melrose South', 'Boro Zone']),  
('160', ['160', 'Queens', 'Middle Village', 'Boro Zone']),  
('161', ['161', 'Manhattan', 'Midtown Center', 'Yellow Zone']),  
('162', ['162', 'Manhattan', 'Midtown East', 'Yellow Zone']),  
('163', ['163', 'Manhattan', 'Midtown North', 'Yellow Zone']),  
('164', ['164', 'Manhattan', 'Midtown South', 'Yellow Zone']),  
('165', ['165', 'Brooklyn', 'Midwood', 'Boro Zone']),  
('166', ['166', 'Manhattan', 'Morningside Heights', 'Boro Zone']),  
('167', ['167', 'Bronx', 'Morrisania/Melrose', 'Boro Zone']),  
('168', ['168', 'Bronx', 'Mott Haven/Port Morris', 'Boro Zone']),  
('169', ['169', 'Bronx', 'Mount Hope', 'Boro Zone']),  
('170', ['170', 'Manhattan', 'Murray Hill', 'Yellow Zone']),  
('171', ['171', 'Queens', 'Murray Hill-Queens', 'Boro Zone']),  
('172', ['172', 'Staten Island', 'New Dorp/Midland Beach', 'Boro Zone']),  
('173', ['173', 'Queens', 'North Corona', 'Boro Zone']),  
('174', ['174', 'Bronx', 'Norwood', 'Boro Zone']),  
('175', ['175', 'Queens', 'Oakland Gardens', 'Boro Zone']),  
('176', ['176', 'Staten Island', 'Oakwood', 'Boro Zone']),  
('177', ['177', 'Brooklyn', 'Ocean Hill', 'Boro Zone']),  
('178', ['178', 'Brooklyn', 'Ocean Parkway South', 'Boro Zone']),  
('179', ['179', 'Queens', 'Old Astoria', 'Boro Zone']),  
('180', ['180', 'Queens', 'Ozone Park', 'Boro Zone']),  
('181', ['181', 'Brooklyn', 'Park Slope', 'Boro Zone']),  
('182', ['182', 'Bronx', 'Parkchester', 'Boro Zone']),  
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('184', ['184', 'Bronx', 'Pelham Bay Park', 'Boro Zone']),  
('185', ['185', 'Bronx', 'Pelham Parkway', 'Boro Zone']),  
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('189', ['189', 'Brooklyn', 'Prospect Heights', 'Boro Zone']),  
('190', ['190', 'Brooklyn', 'Prospect Park', 'Boro Zone']),  
('191', ['191', 'Queens', 'Queens Village', 'Boro Zone']),  
('192', ['192', 'Queens', 'Queensboro Hill', 'Boro Zone']),  
('193', ['193', 'Queens', 'Queensbridge/Ravenswood', 'Boro Zone']),  
('194', ['194', 'Manhattan', 'Randalls Island', 'Yellow Zone']),  
('195', ['195', 'Brooklyn', 'Red Hook', 'Boro Zone']),  
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('197', ['197', 'Queens', 'Richmond Hill', 'Boro Zone']),  
('198', ['198', 'Queens', 'Ridgewood', 'Boro Zone']),  
('199', ['199', 'Bronx', 'Rikers Island', 'Boro Zone']),  
('200', ['200', 'Bronx', 'Riverdale/North Riverdale/Fieldston', 'Boro Zone']),  
('201', ['201', 'Queens', 'Rockaway Park', 'Boro Zone']),  
('202', ['202', 'Manhattan', 'Roosevelt Island', 'Boro Zone']),  
('203', ['203', 'Queens', 'Rosedale', 'Boro Zone']),  
('204', ['204', 'Staten Island', 'Rossville/Woodrow', 'Boro Zone']),  
('205', ['205', 'Queens', 'Saint Albans', 'Boro Zone']),  
('206', ['206', 'Staten Island', 'Saint George/New Brighton', 'Boro Zone']),  
('207', ['207', 'Queens', 'Saint Michaels Cemetery/Woodside', 'Boro Zone']),  
('208', ['208', 'Bronx', 'Schuylerville/Edgewater Park', 'Boro Zone']),  
('209', ['209', 'Manhattan', 'Seaport', 'Yellow Zone']),  
('210', ['210', 'Brooklyn', 'Sheepshead Bay', 'Boro Zone']),  
('211', ['211', 'Manhattan', 'SoHo', 'Yellow Zone']),
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('213', ['213', 'Bronx', 'Soundview/Castle Hill', 'Boro Zone']),  
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('215', ['215', 'Queens', 'South Jamaica', 'Boro Zone']),  
('216', ['216', 'Queens', 'South Ozone Park', 'Boro Zone']),  
('217', ['217', 'Brooklyn', 'South Williamsburg', 'Boro Zone']),  
('218', ['218', 'Queens', 'Springfield Gardens North', 'Boro Zone']),  
('219', ['219', 'Queens', 'Springfield Gardens South', 'Boro Zone']),  
('220', ['220', 'Bronx', 'Spuyten Duyvil/Kingsbridge', 'Boro Zone']),  
('221', ['221', 'Staten Island', 'Stapleton', 'Boro Zone']),  
('222', ['222', 'Brooklyn', 'Starrett City', 'Boro Zone']),  
('223', ['223', 'Queens', 'Steinway', 'Boro Zone']),  
('224',  
    ['224', 'Manhattan', 'Stuy Town/Peter Cooper Village', 'Yellow Zone']),  
('225', ['225', 'Brooklyn', 'Stuyvesant Heights', 'Boro Zone']),  
('226', ['226', 'Queens', 'Sunnyside', 'Boro Zone']),  
('227', ['227', 'Brooklyn', 'Sunset Park East', 'Boro Zone']),  
('228', ['228', 'Brooklyn', 'Sunset Park West', 'Boro Zone']),  
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('231', ['231', 'Manhattan', 'TriBeCa/Civic Center', 'Yellow Zone']),  
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('237', ['237', 'Manhattan', 'Upper East Side South', 'Yellow Zone']),  
('238', ['238', 'Manhattan', 'Upper West Side North', 'Yellow Zone']),  
('239', ['239', 'Manhattan', 'Upper West Side South', 'Yellow Zone']),  
('240', ['240', 'Bronx', 'Van Cortlandt Park', 'Boro Zone']),  
('241', ['241', 'Bronx', 'Van Cortlandt Village', 'Boro Zone']),  
('242', ['242', 'Bronx', 'Van Nest/Morris Park', 'Boro Zone']),  
('243', ['243', 'Manhattan', 'Washington Heights North', 'Boro Zone']),  
('244', ['244', 'Manhattan', 'Washington Heights South', 'Boro Zone']),  
('245', ['245', 'Staten Island', 'West Brighton', 'Boro Zone']),  
('246', ['246', 'Manhattan', 'West Chelsea/Hudson Yards', 'Yellow Zone']),  
('247', ['247', 'Bronx', 'West Concourse', 'Boro Zone']),  
('248', ['248', 'Bronx', 'West Farms/Bronx River', 'Boro Zone']),  
('249', ['249', 'Manhattan', 'West Village', 'Yellow Zone']),  
('250', ['250', 'Bronx', 'Westchester Village/Unionport', 'Boro Zone']),  
('251', ['251', 'Staten Island', 'Westerleigh', 'Boro Zone']),  
('252', ['252', 'Queens', 'Whitestone', 'Boro Zone']),  
('253', ['253', 'Queens', 'Willets Point', 'Boro Zone']),  
('254', ['254', 'Bronx', 'Williamsbridge/Olinville', 'Boro Zone']),  
('255', ['255', 'Brooklyn', 'Williamsburg (North Side)', 'Boro Zone']),  
('256', ['256', 'Brooklyn', 'Williamsburg (South Side)', 'Boro Zone']),  
('257', ['257', 'Brooklyn', 'Windsor Terrace', 'Boro Zone']),  
('258', ['258', 'Queens', 'Woodhaven', 'Boro Zone']),  
('259', ['259', 'Bronx', 'Woodlawn/Wakefield', 'Boro Zone']),  
('260', ['260', 'Queens', 'Woodside', 'Boro Zone']),  
('261', ['261', 'Manhattan', 'World Trade Center', 'Yellow Zone']),  
('262', ['262', 'Manhattan', 'Yorkville East', 'Yellow Zone']),  
('263', ['263', 'Manhattan', 'Yorkville West', 'Yellow Zone']),  
('264', ['264', 'Unknown', 'NV', 'N/A']),  
('265', ['265', 'Unknown', 'NA', 'N/A'])]
```

```
In [39]: taxiZonewithColsMapRdd =(taxiZonewithColsRdd.map(lambda zone:(zone[0],zone[3])) )  
taxiZonewithColsMapRdd.collect()
```

```
Out[39]: [('1', 'EWR'),  
          ('2', 'Boro Zone'),  
          ('3', 'Boro Zone'),  
          ('4', 'Yellow Zone'),  
          ('5', 'Boro Zone'),  
          ('6', 'Boro Zone'),  
          ('7', 'Boro Zone'),  
          ('8', 'Boro Zone'),  
          ('9', 'Boro Zone'),  
          ('10', 'Boro Zone'),  
          ('11', 'Boro Zone'),  
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```

```
In [40]: taxiZonepairRdd =(taxiZonewithColsRdd.map(lambda zoneRow:(zoneRow[1],1) ))
taxiZonepairRdd.take(10)
```

```
Out[40]: [('EWR', 1),
('Queens', 1),
('Bronx', 1),
('Manhattan', 1),
('Staten Island', 1),
('Staten Island', 1),
('Queens', 1),
('Queens', 1),
('Queens', 1),
('Queens', 1)]
```

```
In [41]: boroughCountRdd = (taxiZonepairRdd.reduceByKey(lambda value1,value2:value1+value2))
boroughCountRdd.collect()
```

```
Out[41]: [('Queens', 69),
           ('Manhattan', 69),
           ('Staten Island', 20),
           ('Brooklyn', 61),
           ('Bronx', 43),
           ('Unknown', 2),
           ('EWR', 1)]
```

```
In [44]: (taxiZonepairRdd.distinct().collect())
```

```
Out[44]: [('Queens', 1),
           ('Manhattan', 1),
           ('Staten Island', 1),
           ('Brooklyn', 1),
           ('EWR', 1),
           ('Bronx', 1),
           ('Unknown', 1)]
```

```
In [ ]:
```