

# lec11and12

September 27, 2021

```
[1]: from datascience import *
import numpy as np

%matplotlib inline
import matplotlib.pyplot as plots
plots.style.use('fivethirtyeight')
```

## 0.1 Join Example

```
[2]: drinks = Table(['Drink', 'Cafe', 'Price']).with_rows([
    ['Milk Tea', 'Tea One', 4],
    ['Espresso', 'Nefeli', 2],
    ['Coffee', 'Nefeli', 3],
    ['Espresso', "Abe's", 2]
])
```

```
[3]: drinks
```

```
[3]: Drink    | Cafe    | Price
Milk Tea | Tea One | 4
Espresso | Nefeli  | 2
Coffee   | Nefeli  | 3
Espresso | Abe's   | 2
```

```
[4]: discounts = Table().with_columns(
    'Coupon % off', make_array(5, 50, 25),
    'Location', make_array('Tea One', 'Nefeli', 'Tea One')
)
```

```
[5]: discounts
```

```
[5]: Coupon % off | Location
5      | Tea One
50     | Nefeli
25     | Tea One
```

```
[6]: # Link (join) drinks with discounts
combined = drinks.join('Cafe', discounts, 'Location')
```

```
[7]: combined
```

```
[7]: Cafe      | Drink      | Price | Coupon % off
Nefeli   | Espresso   | 2      | 50
Nefeli   | Coffee     | 3      | 50
Tea One  | Milk Tea   | 4      | 5
Tea One  | Milk Tea   | 4      | 25
```

```
[8]: #Compute discounted prices
discounted_prices = combined.column('Price') * (1 - combined.column('Coupon % off')/100)

discounted_drinks = combined.with_column(
    'Discounted price', discounted_prices
)
```

```
[9]: discounted_drinks
```

```
[9]: Cafe      | Drink      | Price | Coupon % off | Discounted price
Nefeli   | Espresso   | 2      | 50              | 1
Nefeli   | Coffee     | 3      | 50              | 1.5
Tea One  | Milk Tea   | 4      | 5              | 3.8
Tea One  | Milk Tea   | 4      | 25             | 3
```

```
[10]: # Find least expensive discounted drink
# for each cafe with discounted drinks
```

```
[11]: #Incorrect, e.g. Coffee is first alphabetically
discounted_drinks.group('Cafe', min)
```

```
[11]: Cafe      | Drink min | Price min | Coupon % off min | Discounted price min
Nefeli   | Coffee    | 2          | 50                | 1
Tea One  | Milk Tea  | 4          | 5                 | 3
```

```
[12]: # Correct

discounted_drinks.sort('Discounted price').sort('Cafe', distinct=True) #
    ↪Correct, Espresso is cheaper
```

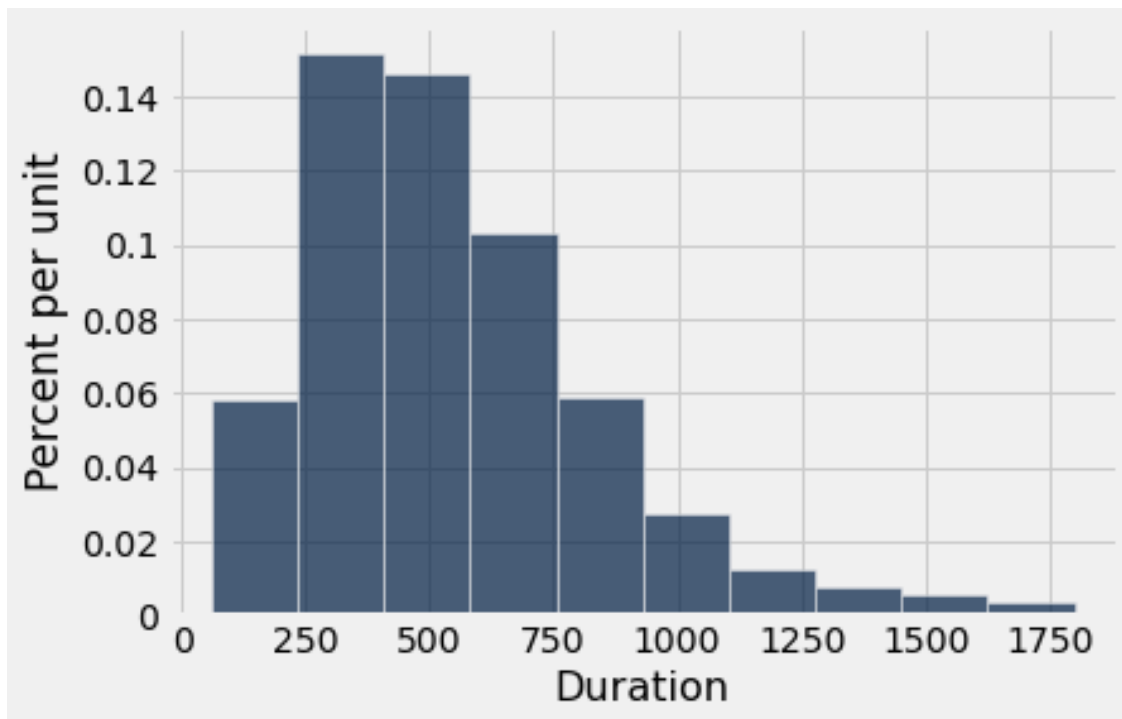
```
[12]: Cafe      | Drink      | Price | Coupon % off | Discounted price
Nefeli   | Espresso   | 2      | 50              | 1
Tea One  | Milk Tea   | 4      | 25             | 3
```

## 0.2 Bikes

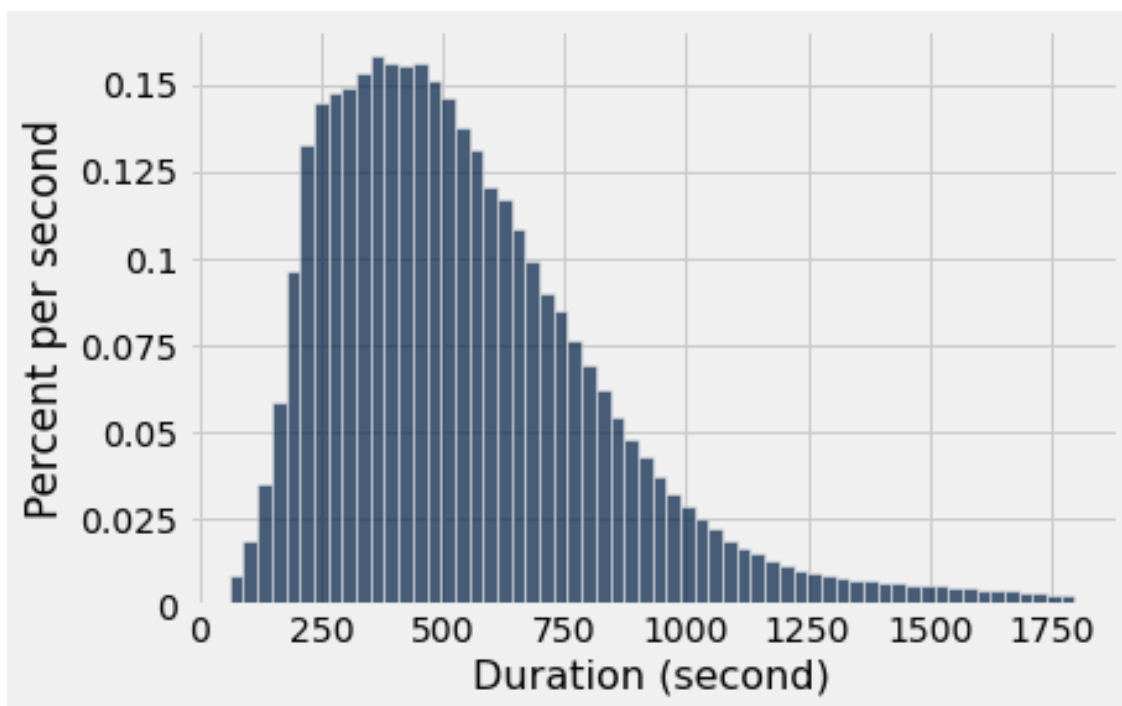
```
[13]: trips = Table.read_table('trip.csv')
trips
```

```
[13]: Trip ID | Duration | Start Date      | Start Station
      | Start Terminal | End Date        | End Station
      | End Terminal | Bike # | Subscriber Type | Zip Code
913460 | 765      | 8/31/2015 23:26 | Harry Bridges Plaza (Ferry Building)
      | 50         | 8/31/2015 23:39 | San Francisco Caltrain (Townsend at 4th)
      | 70         | 288      | Subscriber      | 2139
913459 | 1036     | 8/31/2015 23:11 | San Antonio Shopping Center
      | 31         | 8/31/2015 23:28 | Mountain View City Hall
      | 27         | 35       | Subscriber      | 95032
913455 | 307      | 8/31/2015 23:13 | Post at Kearny
      | 47         | 8/31/2015 23:18 | 2nd at South Park
      | 64         | 468      | Subscriber      | 94107
913454 | 409      | 8/31/2015 23:10 | San Jose City Hall
      | 10         | 8/31/2015 23:17 | San Salvador at 1st
      | 8          | 68       | Subscriber      | 95113
913453 | 789      | 8/31/2015 23:09 | Embarcadero at Folsom
      | 51         | 8/31/2015 23:22 | Embarcadero at Sansome
      | 60         | 487      | Customer        | 9069
913452 | 293      | 8/31/2015 23:07 | Yerba Buena Center of the Arts (3rd @
Howard) | 68         | 8/31/2015 23:12 | San Francisco Caltrain (Townsend at
4th)    | 70         | 538      | Subscriber      | 94118
913451 | 896      | 8/31/2015 23:07 | Embarcadero at Folsom
      | 51         | 8/31/2015 23:22 | Embarcadero at Sansome
      | 60         | 363      | Customer        | 92562
913450 | 255      | 8/31/2015 22:16 | Embarcadero at Sansome
      | 60         | 8/31/2015 22:20 | Steuart at Market
      | 74         | 470      | Subscriber      | 94111
913449 | 126      | 8/31/2015 22:12 | Beale at Market
      | 56         | 8/31/2015 22:15 | Temporary Transbay Terminal (Howard at
Beale) | 55         | 439      | Subscriber      | 94130
913448 | 932      | 8/31/2015 21:57 | Post at Kearny
      | 47         | 8/31/2015 22:12 | South Van Ness at Market
      | 66         | 472      | Subscriber      | 94702
... (354142 rows omitted)
```

```
[14]: trips = trips.where('Duration', are.below(1800))
trips.hist('Duration')
```



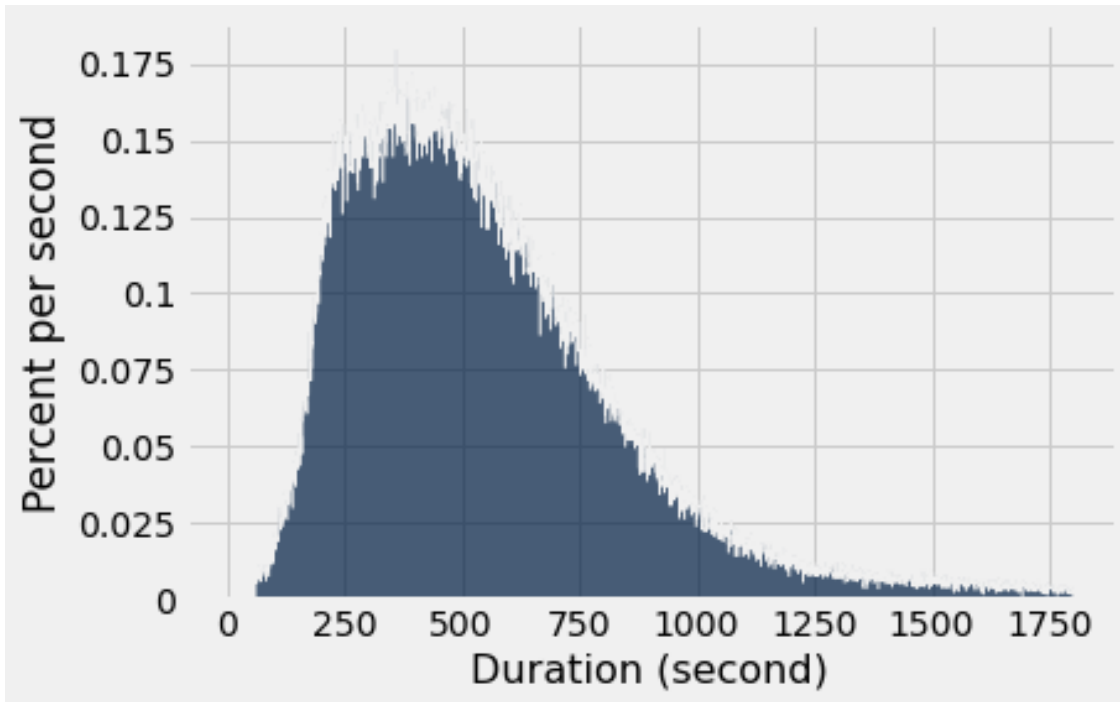
```
[15]: trips.hist('Duration', bins=60, unit='second')
```



```
[16]: (550-250) * 0.15
```

```
[16]: 45.0
```

```
[17]: trips.hist('Duration', bins=np.arange(1801), unit='second')
```



```
[18]: starts = trips.group('Start Station').sort('count', descending=True)
starts
```

```
[18]: Start Station | count
San Francisco Caltrain (Townsend at 4th) | 25858
San Francisco Caltrain 2 (330 Townsend) | 21523
Harry Bridges Plaza (Ferry Building) | 15543
Temporary Transbay Terminal (Howard at Beale) | 14298
2nd at Townsend | 13674
Townsend at 7th | 13579
Steuart at Market | 13215
Embarcadero at Sansome | 12842
Market at 10th | 11523
Market at Sansome | 11023
... (60 rows omitted)
```

```
[19]: trips.pivot('Start Station', 'End Station')
```

C:\Users\schoend\Anaconda3\lib\site-packages\datascience\tables.py:920:

VisibleDeprecationWarning: Creating an ndarray from ragged nested sequences (which is a list-or-tuple of lists-or-tuples-or ndarrays with different lengths or shapes) is deprecated. If you meant to do this, you must specify 'dtype=object' when creating the ndarray  
 values = np.array(tuple(values))

[19]: End Station | 2nd at Folsom | 2nd at South Park | 2nd at  
 Townsend | 5th at Howard | Adobe on Almaden | Arena Green / SAP Center | Beale  
 at Market | Broadway St at Battery St | California Ave Caltrain Station | Castro  
 Street and El Camino Real | Civic Center BART (7th at Market) | Clay at Battery  
 | Commercial at Montgomery | Cowper at University | Davis at Jackson |  
 Embarcadero at Bryant | Embarcadero at Folsom | Embarcadero at Sansome |  
 Embarcadero at Vallejo | Evelyn Park and Ride | Franklin at Maple | Golden Gate  
 at Polk | Grant Avenue at Columbus Avenue | Harry Bridges Plaza (Ferry Building)  
 | Howard at 2nd | Japantown | MLK Library | Market at 10th | Market at 4th |  
 Market at Sansome | Mechanics Plaza (Market at Battery) | Mezes Park | Mountain  
 View Caltrain Station | Mountain View City Hall | Palo Alto Caltrain Station |  
 Park at Olive | Paseo de San Antonio | Post at Kearny | Powell Street BART |  
 Powell at Post (Union Square) | Redwood City Caltrain Station | Redwood City  
 Medical Center | Redwood City Public Library | Rengstorff Avenue / California  
 Street | Ryland Park | SJSU - San Salvador at 9th | SJSU 4th at San Carlos | San  
 Antonio Caltrain Station | San Antonio Shopping Center | San Francisco Caltrain  
 (Townsend at 4th) | San Francisco Caltrain 2 (330 Townsend) | San Francisco City  
 Hall | San Jose City Hall | San Jose Civic Center | San Jose Diridon Caltrain  
 Station | San Mateo County Center | San Pedro Square | San Salvador at 1st |  
 Santa Clara County Civic Center | Santa Clara at Almaden | South Van Ness at  
 Market | Spear at Folsom | St James Park | Stanford in Redwood City | Steuart at  
 Market | Temporary Transbay Terminal (Howard at Beale) | Townsend at 7th |  
 University and Emerson | Washington at Kearny | Yerba Buena Center of the Arts  
 (3rd @ Howard)

2nd at Folsom			54		190		554
107	0		0			40	
21		0				0	
44			78		54		
0	9		77			32	
41	14			0			0
11	30				416		
53	0	0	169		114		302
33			0	0			
0		0			0		0
60	121		88				0
0		0			0		
0	0		0			0	
0		694					445
21	0		0			0	
0	0		0			0	
0	38			57		0	

0		39		237		
342	0		17		31	
2nd at South Park		295	164		71	
180	0	0		208		
85		0		0		
112			87	160		
0	37		56		178	
83	116		0		0	
57	73			574		
500	0	0	139	199		
1633	119			0	0	
0		0		0	0	
299	84		113		0	
0		0		0		
0	0		0		0	
0		559			480	
48	0		0		0	
0	0		0		0	
0	66		152		0	
0	374		429			
143	0		63		209	
2nd at Townsend		437	151		185	
92	0	0		608		
350		0		0		
80		329	168			
0	386	361		658		
506	254	0			0	
27	315		2607			
295	0	0	110	225	845	
177		0	0			
0	0		0		0	
120	100	141			0	
0		0		0		
0	0		0		0	
0		905			299	
14	0	0		0		
0	0	0		0		
0	72		508		0	
0	2349		784			
417	0	57		166		
5th at Howard		113	177		148	
83	0	0		59		
130		0		0		
203		76	129			
0	30	57		49		
166	54		0		0	
85	78		371			

478	0	0	303	158	168
90			0	0	
0		0		0	0
93	183		169		0
0		0		0	
0	0		0		0
0		690			1859
48		0	0		0
0		0	0		0
0		116		102	0
0		182	750		
200	0		43		267
Adobe on Almaden		0	0		0
0	11		4		0
0		0			0
0			0	0	
0		0	0		0
0		0		0	0
0		0		0	
0	17	7	0	0	0
0			0	0	
0		0		0	25
0	0		0		0
0		0		0	
7	7		16		0
0		0			0
0		19	23		265
0		20	4		5
10		0		0	14
0		0	0		
0	0		0		0
Arena Green / SAP Center		0	0		0
0	7		64		0
0		0			0
0			0	0	
0		0	0		0
0		0		0	0
0	16	5	0	0	0
0			0	0	
0		0		0	21
0	0		0		0
0		0		0	
24	3		7		0
0		0			0
0		6	20		7
0		56	12		38



259		0		0		13
0		0		0		
0	0			0		0
Beale at Market		127		79		183
59	0	0			59	
661		0			0	
201		75		101		
0	247		178		38	
590	165		0		0	
54	435			57		
72	0	0	286	236	163	
26		0	0			
0	0			0	0	
49	227		179		0	
0		0		0		
0	0		0		0	
0		640			269	
25	0		0		0	
0	0		0		0	
0	243		128		0	
0	16		167			
35	0		64		45	
Broadway St at Battery St		67		89		279
119	0	0			1022	
110		0			0	
62		283		226		
0	191		198		79	
231	35		0		0	
5	70			168		
49	0	0	32	97	341	
214		0	0			
0	0		0		0	
169	71		218		0	
0		0		0		
0	0		0		0	
0		685			438	
7	0		0		0	
0	0		0		0	
0	18		106		0	
0	344		748			
50	0		79		47	
California Ave Caltrain Station	0		0		0	
0	0	0			0	
0	38				1	
0		0		0		
29	0		0		0	
0	0		0		0	

```

| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 1          | 0
| 0          | 0          | 192        | 0          | 40         | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 6          | 0
| 0          | 0          | 0          | 0          | 0          | 17
| 10         | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 57         | 0          | 0          | 0          | 0
Castro Street and El Camino Real | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 30         | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 14         | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 931        | 0
| 34         | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 7          | 0
| 0          | 0          | 0          | 0          | 0          | 4
| 12         | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
| 0          | 0          | 0          | 0          | 0          | 0
... (60 rows omitted)

```

```
[20]: duration = trips.select('Start Station', 'End Station', 'Duration')
duration
```

```

[20]: Start Station          | End Station
      | Duration
Harry Bridges Plaza (Ferry Building) | San Francisco Caltrain (Townsend
at 4th) | 765
San Antonio Shopping Center          | Mountain View City Hall
| 1036
Post at Kearny                      | 2nd at South Park
| 307
San Jose City Hall                  | San Salvador at 1st
| 409

```

Embarcadero at Folsom		Embarcadero at Sansome
789		
Yerba Buena Center of the Arts (3rd @ Howard) at 4th		San Francisco Caltrain (Townsend)
293		
Embarcadero at Folsom		Embarcadero at Sansome
896		
Embarcadero at Sansome		Steuart at Market
255		
Beale at Market		Temporary Transbay Terminal
(Howard at Beale)		126
Post at Kearny		South Van Ness at Market
932		
... (338333 rows omitted)		

```
[21]: shortest = duration.group(['Start Station', 'End Station'], min)
      shortest
```

```
[21]: Start Station | End Station | Duration min
      2nd at Folsom | 2nd at Folsom | 61
      2nd at Folsom | 2nd at South Park | 61
      2nd at Folsom | 2nd at Townsend | 137
      2nd at Folsom | 5th at Howard | 215
      2nd at Folsom | Beale at Market | 219
      2nd at Folsom | Broadway St at Battery St | 351
      2nd at Folsom | Civic Center BART (7th at Market) | 456
      2nd at Folsom | Clay at Battery | 272
      2nd at Folsom | Commercial at Montgomery | 275
      2nd at Folsom | Davis at Jackson | 396
      ... (1619 rows omitted)
```

```
[22]: from_cc = shortest.where('Start Station', are.containing('Civic Center BART')).
      ↪sort('Duration min')
      from_cc
```

```
[22]: Start Station | End Station | Duration
      min
      Civic Center BART (7th at Market) | Civic Center BART (7th at Market) | 60
      Civic Center BART (7th at Market) | Powell Street BART | 97
      Civic Center BART (7th at Market) | Market at 10th | 104
      Civic Center BART (7th at Market) | Golden Gate at Polk | 141
      Civic Center BART (7th at Market) | San Francisco City Hall | 151
      Civic Center BART (7th at Market) | Market at 4th | 164
      Civic Center BART (7th at Market) | 5th at Howard | 179
      Civic Center BART (7th at Market) | South Van Ness at Market | 199
      Civic Center BART (7th at Market) | Market at Sansome | 254
      Civic Center BART (7th at Market) | Powell at Post (Union Square) | 254
      ... (25 rows omitted)
```

### 0.3 Maps

```
[23]: t = Table().with_columns([
        'lat', [37.8, 38, 37.9],
        'lon', [-122, -122.1, -121.9],
        'labels', ['one', 'two', 'three'],
    ])
Marker.map_table(t.select('lat', 'lon', 'labels'))
```

```
[23]: <datascience.maps.Map at 0x1e4216cc4c0>
```

```
[24]: t = Table().with_columns([
        'lat', [36.1540, 36.1540],
        'lon', [-95.9928, -95.9461], 'color', ['red', 'green'],
        'labels', ['Tulsa', 'TU'],
    ])
Marker.map_table(t.select('lat', 'lon', 'labels'))
```

```
[24]: <datascience.maps.Map at 0x1e426fd3b80>
```

```
[25]: t = Table().with_columns([
        'lat', [36.1540, 36.1540],
        'lon', [-95.9928, -95.9461],
        'labels', ['Tulsa', 'TU'],
    ])
Circle.map_table(t.select('lat', 'lon', 'labels'), color='green', area=1000)
```

```
[25]: <datascience.maps.Map at 0x1e452eea370>
```

```
[26]: stations = Table.read_table('station.csv')
stations = stations.relabeled('name', 'labels')
stations
```

```
[26]: station_id | labels | lat | long | dockcount
      | landmark | installation
2      | San Jose Diridon Caltrain Station | 37.3297 | -121.902 | 27
      | San Jose | 8/6/2013
3      | San Jose Civic Center | 37.3307 | -121.889 | 15
      | San Jose | 8/5/2013
4      | Santa Clara at Almaden | 37.334 | -121.895 | 11
      | San Jose | 8/6/2013
5      | Adobe on Almaden | 37.3314 | -121.893 | 19
      | San Jose | 8/5/2013
6      | San Pedro Square | 37.3367 | -121.894 | 15
      | San Jose | 8/7/2013
7      | Paseo de San Antonio | 37.3338 | -121.887 | 15
      | San Jose | 8/7/2013
```

8	San Salvador at 1st	37.3302   -121.886   15
San Jose	8/5/2013	
9	Japantown	37.3487   -121.895   15
San Jose	8/5/2013	
10	San Jose City Hall	37.3374   -121.887   15
San Jose	8/6/2013	
11	MLK Library	37.3359   -121.886   19
San Jose	8/6/2013	

... (60 rows omitted)

```
[27]: Marker.map_table(stations.select('lat', 'long', 'labels'))
```

```
[27]: <datascience.maps.Map at 0x1e4212c3040>
```

```
[28]: sf = stations.where('landmark', 'San Francisco')
Circle.map_table(sf.select('lat', 'long', 'labels'), color='green', area=150)
```

```
[28]: <datascience.maps.Map at 0x1e4499c3fd0>
```

```
[29]: colors = stations.group('landmark').with_column(
    'color', make_array('blue', 'red', 'green', 'orange', 'purple'))
colors
```

```
[29]: landmark      | count | color
Mountain View | 7      | blue
Palo Alto      | 5      | red
Redwood City   | 7      | green
San Francisco  | 35     | orange
San Jose       | 16     | purple
```

```
[30]: colored = stations.join('landmark', colors).select('lat', 'long', 'labels',
    ↪ 'color')
Marker.map_table(colored)
```

```
[30]: <datascience.maps.Map at 0x1e44a0b9a60>
```

```
[31]: station_starts = stations.join('labels', starts, 'Start Station')
station_starts
```

```
[31]: labels              | station_id | lat      | long      | dockcount |
landmark      | installation | count
2nd at Folsom      | 62          | 37.7853 | -122.396 | 19         |
San Francisco | 8/22/2013   | 7841
2nd at South Park  | 64          | 37.7823 | -122.393 | 15         |
San Francisco | 8/22/2013   | 9274
2nd at Townsend    | 61          | 37.7805 | -122.39  | 27         |
San Francisco | 8/22/2013   | 13674
```

5th at Howard	57	37.7818   -122.405   15	
San Francisco   8/21/2013	7394		
Adobe on Almaden	5	37.3314   -121.893   19	
San Jose   8/5/2013	522		
Arena Green / SAP Center	14	37.3327   -121.9   19	
San Jose   8/5/2013	590		
Beale at Market	56	37.7923   -122.397   19	
San Francisco   8/20/2013	8135		
Broadway St at Battery St	82	37.7985   -122.401   15	
San Francisco   1/22/2014	7460		
California Ave Caltrain Station	36	37.4291   -122.143   15	
Palo Alto   8/14/2013	300		
Castro Street and El Camino Real	32	37.386   -122.084   11	
Mountain View   12/31/2013	1137		

... (58 rows omitted)

```
[32]: Marker.map_table(stations.select('lat', 'long', 'labels'))
```

```
[32]: <datascience.maps.Map at 0x1e449a24430>
```

```
[33]: Circle.map_table(stations.select('lat', 'long', 'labels'), area=1000,
    ↪color='green')
```

```
[33]: <datascience.maps.Map at 0x1e44a3cfb50>
```

```
[34]: trip = trips.where('Duration', are.below(1800)).select(3, 6, 1).relabelled(0,
    ↪'Start').relabelled(1, 'End')
```

```
[35]: starts = trip.group('Start').sort('count', descending=True)
starts
```

Start	count
San Francisco Caltrain (Townsend at 4th)	25858
San Francisco Caltrain 2 (330 Townsend)	21523
Harry Bridges Plaza (Ferry Building)	15543
Temporary Transbay Terminal (Howard at Beale)	14298
2nd at Townsend	13674
Townsend at 7th	13579
Steuart at Market	13215
Embarcadero at Sansome	12842
Market at 10th	11523
Market at Sansome	11023

... (60 rows omitted)

```
[36]: station_starts = stations.join('labels', starts, 'Start')
station_starts
```

```
[36]: labels | station_id | lat | long | dockcount |
landmark | installation | count
2nd at Folsom | | 62 | 37.7853 | -122.396 | 19 |
San Francisco | 8/22/2013 | 7841
2nd at South Park | | 64 | 37.7823 | -122.393 | 15 |
San Francisco | 8/22/2013 | 9274
2nd at Townsend | | 61 | 37.7805 | -122.39 | 27 |
San Francisco | 8/22/2013 | 13674
5th at Howard | | 57 | 37.7818 | -122.405 | 15 |
San Francisco | 8/21/2013 | 7394
Adobe on Almaden | | 5 | 37.3314 | -121.893 | 19 |
San Jose | 8/5/2013 | 522
Arena Green / SAP Center | | 14 | 37.3327 | -121.9 | 19 |
San Jose | 8/5/2013 | 590
Beale at Market | | 56 | 37.7923 | -122.397 | 19 |
San Francisco | 8/20/2013 | 8135
Broadway St at Battery St | | 82 | 37.7985 | -122.401 | 15 |
San Francisco | 1/22/2014 | 7460
California Ave Caltrain Station | | 36 | 37.4291 | -122.143 | 15 |
Palo Alto | 8/14/2013 | 300
Castro Street and El Camino Real | | 32 | 37.386 | -122.084 | 11 |
Mountain View | 12/31/2013 | 1137
... (58 rows omitted)
```

```
[37]: landmarks = stations.group('landmark')
landmarks
```

```
[37]: landmark | count
Mountain View | 7
Palo Alto | 5
Redwood City | 7
San Francisco | 35
San Jose | 16
```

```
[38]: landmarks = landmarks.with_column(
    'color',
    make_array('blue', 'red', 'yellow', 'orange', 'purple')
)
landmarks
```

```
[38]: landmark | count | color
Mountain View | 7 | blue
Palo Alto | 5 | red
Redwood City | 7 | yellow
San Francisco | 35 | orange
San Jose | 16 | purple
```

```
[39]: station_starts = station_starts.join('landmark', landmarks.drop('count'))
station_starts
```

```
[39]: landmark      | labels                                | station_id | lat      |
long      | dockcount | installation | count | color
Mountain View | Castro Street and El Camino Real    | 32          | 37.386   |
-122.084 | 11          | 12/31/2013   | 1137 | blue
Mountain View | Evelyn Park and Ride                | 30          | 37.3903  |
-122.067 | 15          | 8/16/2013    | 905  | blue
Mountain View | Mountain View Caltrain Station      | 28          | 37.3944  |
-122.077 | 23          | 8/15/2013    | 3353 | blue
Mountain View | Mountain View City Hall             | 27          | 37.3892  |
-122.082 | 15          | 8/16/2013    | 1487 | blue
Mountain View | Rengstorff Avenue / California Street | 33          | 37.4002  |
-122.099 | 15          | 8/16/2013    | 458  | blue
Mountain View | San Antonio Caltrain Station        | 29          | 37.4069  |
-122.107 | 23          | 8/15/2013    | 977  | blue
Mountain View | San Antonio Shopping Center         | 31          | 37.4004  |
-122.108 | 15          | 12/31/2013   | 1020 | blue
Palo Alto     | California Ave Caltrain Station      | 36          | 37.4291  |
-122.143 | 15          | 8/14/2013    | 300  | red
Palo Alto     | Cowper at University                | 37          | 37.4486  |
-122.16   | 11          | 8/14/2013    | 503  | red
Palo Alto     | Palo Alto Caltrain Station          | 34          | 37.444   |
-122.165 | 23          | 8/14/2013    | 886  | red
... (58 rows omitted)
```

```
[40]: station_starts = station_starts.with_column(
      'circle size',
      station_starts.column('count') * .5
    )
station_starts
```

```
[40]: landmark      | labels                                | station_id | lat      |
long      | dockcount | installation | count | color | circle size
Mountain View | Castro Street and El Camino Real    | 32          | 37.386   |
-122.084 | 11          | 12/31/2013   | 1137 | blue | 568.5
Mountain View | Evelyn Park and Ride                | 30          | 37.3903  |
-122.067 | 15          | 8/16/2013    | 905  | blue | 452.5
Mountain View | Mountain View Caltrain Station      | 28          | 37.3944  |
-122.077 | 23          | 8/15/2013    | 3353 | blue | 1676.5
Mountain View | Mountain View City Hall             | 27          | 37.3892  |
-122.082 | 15          | 8/16/2013    | 1487 | blue | 743.5
Mountain View | Rengstorff Avenue / California Street | 33          | 37.4002  |
-122.099 | 15          | 8/16/2013    | 458  | blue | 229
Mountain View | San Antonio Caltrain Station        | 29          | 37.4069  |
-122.107 | 23          | 8/15/2013    | 977  | blue | 488.5
```



Mountain View		San Antonio Shopping Center			31			37.4004	
-122.108		15			12/31/2013			1020	
					blue			510	
Palo Alto			California Ave Caltrain Station			36			37.4291
-122.143		15			8/14/2013			300	
					red			150	
Palo Alto			Cowper at University			37			37.4486
-122.16		11			8/14/2013			503	
					red			251.5	
Palo Alto			Palo Alto Caltrain Station			34			37.444
-122.165		23			8/14/2013			886	
					red			443	

... (58 rows omitted)

```
[41]: Circle.map_table(station_starts.select('lat', 'long', 'labels'))
```

```
[41]: <datascience.maps.Map at 0x1e4409e2b80>
```

```
[42]: Circle.map_table(station_starts.select('lat', 'long', 'labels', 'color', 'circle size').relabelled('circle size', 'area'))
```

```
[42]: <datascience.maps.Map at 0x1e44a6fbe80>
```

```
[ ]:
```

```
[ ]:
```