In [1]:
```
import numpy as np
import pandas as pd
```

In [2]:
```
weather = pd.read_csv("weather.csv")
weather.head()
```

Out[2]:

	year	month	element	day1	day2	day3	day4	day5	day6	day7	...	day22	day23	day24	day
0	2018	1	max	17.573016	19.796815	22.412495	17.813163	20.165825	17.060539	22.736134	...	22.629226	19.013674	17.831558	17.0183
1	2018	1	min	22.725760	21.007865	17.730792	18.045290	20.766734	18.656651	22.607481	...	21.163491	17.371653	17.194530	18.9641
2	2018	2	max	19.015120	19.261805	17.510713	21.080425	17.915749	19.082145	18.056023	...	21.254968	20.346324	20.036019	22.9267
3	2018	2	min	18.653843	22.818600	21.842673	21.958159	22.523078	18.535469	19.636158	...	19.711974	20.586232	18.780840	20.0656
4	2018	3	max	20.741115	19.704016	17.039811	20.703908	22.714125	17.205000	19.079503	...	19.528963	19.563689	22.658997	22.4463

5 rows × 34 columns

In [3]:
```
weather.shape
```

Out[3]:
```
(22, 34)
```

In [ ]:

In [6]:

```
pd.melt(weather, ['year', 'month', 'element']).head()
```

Out[6]:

	year	month	element	variable	value
0	2018	1	max	day1	17.573016
1	2018	1	min	day1	22.725760
2	2018	2	max	day1	19.015120
3	2018	2	min	day1	18.653843
4	2018	3	max	day1	20.741115

In [11]:

```
weather_melt = pd.melt(weather,
                       id_vars = ['year', 'month', 'element'],
                       var_name= 'day',
                       value_name='temp')

weather_melt.head()
```

Out[11]:

	year	month	element	day	temp
0	2018	1	max	day1	17.573016
1	2018	1	min	day1	22.725760
2	2018	2	max	day1	19.015120
3	2018	2	min	day1	18.653843
4	2018	3	max	day1	20.741115

In [12]:

```
weather_melt.shape
```

Out[12]:

```
(682, 5)
```

```
In [13]: weather_melt.head()
```

```
Out[13]:
     year  month  element   day       temp
  0  2018      1      max  day1  17.573016
  1  2018      1      min  day1  22.725760
  2  2018      2      max  day1  19.015120
  3  2018      2      min  day1  18.653843
  4  2018      3      max  day1  20.741115
```

```
In [14]: weather_tidy = pd.pivot_table(weather_melt,
                                       index=['year' , 'month', 'day'],
                                       columns=['element'],
                                       values='temp', dropna=False)
         weather_tidy
```

Out[14]:

		element	**max**	**min**
year	**month**	**day**		
2018	**1**	**day1**	17.573016	22.725760
		day10	19.067288	19.931129
		day11	19.361002	22.598325
		day12	20.982134	17.715137
		day13	21.668005	17.940334
	...	**...**	...	...
	12	**day5**	21.375349	20.865535
		day6	17.992885	20.310116
		day7	19.683359	20.531823
		day8	20.477046	19.310346
		day9	20.210640	22.820992

341 rows × 2 columns

```
In [16]: weather_tidy.loc[(2018, 1, 'day11')]
```

```
Out[16]: element
         max    19.361002
         min    22.598325
         Name: (2018, 1, day11), dtype: float64
```

In [15]:
```
weather_tidy.iloc[2, :]
```

Out[15]:
```
element
max    19.361002
min    22.598325
Name: (2018, 1, day11), dtype: float64
```

In [17]:
```
weather_tidy = weather_tidy.reset_index()
weather_tidy
```

Out[17]:

element	year	month	day	max	min
0	2018	1	day1	17.573016	22.725760
1	2018	1	day10	19.067288	19.931129
2	2018	1	day11	19.361002	22.598325
3	2018	1	day12	20.982134	17.715137
4	2018	1	day13	21.668005	17.940334
...	...	...	...	...	...
336	2018	12	day5	21.375349	20.865535
337	2018	12	day6	17.992885	20.310116
338	2018	12	day7	19.683359	20.531823
339	2018	12	day8	20.477046	19.310346
340	2018	12	day9	20.210640	22.820992

341 rows × 5 columns

In [19]:

```
weather_tidy['day'].apply(lambda x : x[3:])
```

Out[19]:

```
0       1
1      10
2      11
3      12
4      13
       ..
336     5
337     6
338     7
339     8
340     9
Name: day, Length: 341, dtype: object
```

In [22]:

```
weather_tidy['day'] =  weather_tidy['day'].apply(lambda x : x.split('day')[-1], )
```

In [23]:

```
weather_tidy
```

Out[23]:

element	year	month	day	max	min
0	2018	1	1	17.573016	22.725760
1	2018	1	10	19.067288	19.931129
2	2018	1	11	19.361002	22.598325
3	2018	1	12	20.982134	17.715137
4	2018	1	13	21.668005	17.940334
...	...	...	...	...	...
336	2018	12	5	21.375349	20.865535
337	2018	12	6	17.992885	20.310116
338	2018	12	7	19.683359	20.531823
339	2018	12	8	20.477046	19.310346
340	2018	12	9	20.210640	22.820992

341 rows × 5 columns

In [ ]:

In [26]:

```
flights = pd.read_csv('https://raw.githubusercontent.com/mwaskom/seaborn-data/master/flights.csv')
flights.shape
```

Out[26]:

```
(144, 3)
```

In [27]:

```
flights.head()
```

Out[27]:

	year	month	passengers
0	1949	January	112
1	1949	February	118
2	1949	March	132
3	1949	April	129
4	1949	May	121

In [31]:

```
a = pd.pivot_table(flights, index=['year'], columns=['month'], values='passengers', dropna=False).reset_index()
a
```

Out[31]:

month	year	April	August	December	February	January	July	June	March	May	November	October	September
0	1949	129	148	118	118	112	148	135	132	121	104	119	136
1	1950	135	170	140	126	115	170	149	141	125	114	133	158
2	1951	163	199	166	150	145	199	178	178	172	146	162	184
3	1952	181	242	194	180	171	230	218	193	183	172	191	209
4	1953	235	272	201	196	196	264	243	236	229	180	211	237
5	1954	227	293	229	188	204	302	264	235	234	203	229	259
6	1955	269	347	278	233	242	364	315	267	270	237	274	312
7	1956	313	405	306	277	284	413	374	317	318	271	306	355
8	1957	348	467	336	301	315	465	422	356	355	305	347	404
9	1958	348	505	337	318	340	491	435	362	363	310	359	404
10	1959	396	559	405	342	360	548	472	406	420	362	407	463
11	1960	461	606	432	391	417	622	535	419	472	390	461	508

```
In [ ]:
```

```
In [33]: a
```

Out[33]:

month	year	April	August	December	February	January	July	June	March	May	November	October	September
0	1949	129	148	118	118	112	148	135	132	121	104	119	136
1	1950	135	170	140	126	115	170	149	141	125	114	133	158
2	1951	163	199	166	150	145	199	178	178	172	146	162	184
3	1952	181	242	194	180	171	230	218	193	183	172	191	209
4	1953	235	272	201	196	196	264	243	236	229	180	211	237
5	1954	227	293	229	188	204	302	264	235	234	203	229	259
6	1955	269	347	278	233	242	364	315	267	270	237	274	312
7	1956	313	405	306	277	284	413	374	317	318	271	306	355
8	1957	348	467	336	301	315	465	422	356	355	305	347	404
9	1958	348	505	337	318	340	491	435	362	363	310	359	404
10	1959	396	559	405	342	360	548	472	406	420	362	407	463
11	1960	461	606	432	391	417	622	535	419	472	390	461	508

```
In [36]: a = pd.melt(a, id_vars=['year'], var_name='MONTH', value_name='PASSANGER')
         a
```

```
Out[36]:
         year      MONTH  PASSANGER
    0    1949      April        129
    1    1950      April        135
    2    1951      April        163
    3    1952      April        181
    4    1953      April        235
  ...     ...        ...        ...
  139    1956  September        355
  140    1957  September        404
  141    1958  September        404
  142    1959  September        463
  143    1960  September        508

144 rows × 3 columns
```

In [39]:

```
a.sort_values('PASSANGER')
```

Out[39]:

	year	MONTH	PASSANGER
108	1949	November	104
48	1949	January	112
109	1950	November	114
49	1950	January	115
36	1949	February	118
...	...	...	...
83	1960	June	535
70	1959	July	548
22	1959	August	559
23	1960	August	606
71	1960	July	622

144 rows × 3 columns

In [ ]:

```

```

In [41]:

```
weather_tidy.head()
```

Out[41]:

element	year	month	day	max	min
0	2018	1	1	17.573016	22.725760
1	2018	1	10	19.067288	19.931129
2	2018	1	11	19.361002	22.598325
3	2018	1	12	20.982134	17.715137
4	2018	1	13	21.668005	17.940334

In [47]:

```
pd.cut(weather_tidy['max'], bins =5)
```

Out[47]:

```
0        (16.996, 18.19]
1        (18.19, 19.377]
2        (18.19, 19.377]
3       (20.565, 21.753]
4       (20.565, 21.753]
              ...
336     (20.565, 21.753]
337      (16.996, 18.19]
338     (19.377, 20.565]
339     (19.377, 20.565]
340     (19.377, 20.565]
Name: max, Length: 341, dtype: category
Categories (5, interval[float64]): [(16.996, 18.19] < (18.19, 19.377] < (19.377, 20.565] < (20.565, 21.753] <
(21.753, 22.94]]
In [50]: pd.cut(weather_tidy['max'], bins =[10, 13, 15, 19, 24, 30], ).value_counts()
```

```
Out[50]: (19, 24]    245
         (15, 19]     96
         (10, 13]      0
         (13, 15]      0
         (24, 30]      0
         Name: max, dtype: int64
```

```
In [52]: weather_tidy['max_bucket'] = pd.cut(weather_tidy['max'], bins =[10, 13, 15, 19, 24, 30, 1000])
```

```
In [53]: weather_tidy
```

Out[53]:

element	year	month	day	max	min	max_bucket
0	2018	1	1	17.573016	22.725760	(15, 19]
1	2018	1	10	19.067288	19.931129	(19, 24]
2	2018	1	11	19.361002	22.598325	(19, 24]
3	2018	1	12	20.982134	17.715137	(19, 24]
4	2018	1	13	21.668005	17.940334	(19, 24]
...	...	...	...	...	...	...
336	2018	12	5	21.375349	20.865535	(19, 24]
337	2018	12	6	17.992885	20.310116	(15, 19]
338	2018	12	7	19.683359	20.531823	(19, 24]
339	2018	12	8	20.477046	19.310346	(19, 24]
340	2018	12	9	20.210640	22.820992	(19, 24]

341 rows × 6 columns

In [ ]:

write a .csv

In [60]:

```
weather_tidy.to_csv('result.csv', index=False)
```

In [58]:

```
pd.read_csv('result.csv')
```

Out[58]:

	year	month	day	max	min	max_bucket
0	2018	1	1	17.573016	22.725760	(15, 19]
1	2018	1	10	19.067288	19.931129	(19, 24]
2	2018	1	11	19.361002	22.598325	(19, 24]
3	2018	1	12	20.982134	17.715137	(19, 24]
4	2018	1	13	21.668005	17.940334	(19, 24]
...	...	...	...	...	...	...
336	2018	12	5	21.375349	20.865535	(19, 24]
337	2018	12	6	17.992885	20.310116	(15, 19]
338	2018	12	7	19.683359	20.531823	(19, 24]
339	2018	12	8	20.477046	19.310346	(19, 24]
340	2018	12	9	20.210640	22.820992	(19, 24]

341 rows × 6 columns

In [ ]:

Uber Trip Analysis

In [ ]:

```

```

In [61]:

```
data = pd.read_csv("UberData.csv")
data.head()
```

Out[61]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	PURPOSE*
0	1/1/2016 21:11	1/1/2016 21:17	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain
1	1/2/2016 1:25	1/2/2016 1:37	Business	Fort Pierce	Fort Pierce	5.0	NaN
2	1/2/2016 20:25	1/2/2016 20:38	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies
3	1/5/2016 17:31	1/5/2016 17:45	Business	Fort Pierce	Fort Pierce	4.7	Meeting
4	1/6/2016 14:42	1/6/2016 15:49	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit

In [62]:

```
data.shape
```

Out[62]:

```
(1156, 7)
```

In [63]:

```
data.tail()
```

Out[63]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	PURPOSE*
1151	12/31/2016 13:24	12/31/2016 13:42	Business	Kar?chi	Unknown Location	3.9	Temporary Site
1152	12/31/2016 15:03	12/31/2016 15:38	Business	Unknown Location	Unknown Location	16.2	Meeting
1153	12/31/2016 21:32	12/31/2016 21:50	Business	Katunayake	Gampaha	6.4	Temporary Site
1154	12/31/2016 22:08	12/31/2016 23:51	Business	Gampaha	Ilukwatta	48.2	Temporary Site
1155	Totals	NaN	NaN	NaN	NaN	12204.7	NaN

In [65]:

```
data.drop(1155, inplace = True)
```

In [66]:

```
data.tail()
```

Out[66]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	PURPOSE*
1150	12/31/2016 1:07	12/31/2016 1:14	Business	Kar?chi	Kar?chi	0.7	Meeting
1151	12/31/2016 13:24	12/31/2016 13:42	Business	Kar?chi	Unknown Location	3.9	Temporary Site
1152	12/31/2016 15:03	12/31/2016 15:38	Business	Unknown Location	Unknown Location	16.2	Meeting
1153	12/31/2016 21:32	12/31/2016 21:50	Business	Katunayake	Gampaha	6.4	Temporary Site
1154	12/31/2016 22:08	12/31/2016 23:51	Business	Gampaha	Ilukwatta	48.2	Temporary Site

In [ ]:

```

```

In [68]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1155 entries, 0 to 1154
Data columns (total 7 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   START_DATE*  1155 non-null   object 
 1   END_DATE*    1155 non-null   object 
 2   CATEGORY*    1155 non-null   object 
 3   START*       1155 non-null   object 
 4   STOP*        1155 non-null   object 
 5   MILES*       1155 non-null   float64
 6   PURPOSE*     653 non-null    object 
dtypes: float64(1), object(6)
memory usage: 72.2+ KB
```

In [69]:
```
data.isna().sum()
```

Out[69]:
```
START_DATE*       0
END_DATE*         0
CATEGORY*         0
START*            0
STOP*             0
MILES*            0
PURPOSE*        502
dtype: int64
```

In [70]:
```
data.columns
```

Out[70]:
```
Index(['START_DATE*', 'END_DATE*', 'CATEGORY*', 'START*', 'STOP*', 'MILES*',
       'PURPOSE*'],
      dtype='object')
```

In [71]:
```
data.head()
```

Out[71]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	PURPOSE*
0	1/1/2016 21:11	1/1/2016 21:17	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain
1	1/2/2016 1:25	1/2/2016 1:37	Business	Fort Pierce	Fort Pierce	5.0	NaN
2	1/2/2016 20:25	1/2/2016 20:38	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies
3	1/5/2016 17:31	1/5/2016 17:45	Business	Fort Pierce	Fort Pierce	4.7	Meeting
4	1/6/2016 14:42	1/6/2016 15:49	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit

In [ ]:
```
# data.columns = ['START_DATE', 'END_DATE', 'CATEGORY', 'START', 'STOP', 'MILES','PURPOSE']
```

In [75]:
```
data.columns = [x.replace("*", '') for x in data.columns]
```

In [76]:
```
data.head()
```

Out[76]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE
0	1/1/2016 21:11	1/1/2016 21:17	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain
1	1/2/2016 1:25	1/2/2016 1:37	Business	Fort Pierce	Fort Pierce	5.0	NaN
2	1/2/2016 20:25	1/2/2016 20:38	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies
3	1/5/2016 17:31	1/5/2016 17:45	Business	Fort Pierce	Fort Pierce	4.7	Meeting
4	1/6/2016 14:42	1/6/2016 15:49	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit

In [79]:
```
# data.columns = list(map(lambda x : x[:-1], data.columns))
```

In [85]:
```
data['STOP'].str.len()
```

Out[85]:
```
0        11
1        11
2        11
3        11
4        15
         ..
1150      7
1151     16
1152     16
1153      7
1154      9
Name: STOP, Length: 1155, dtype: int64
```

In [87]:

```
data['STOP'].str.upper()
```

Out[87]:

```
0             FORT PIERCE
1             FORT PIERCE
2             FORT PIERCE
3             FORT PIERCE
4         WEST PALM BEACH
              ...        
1150              KAR?CHI
1151     UNKNOWN LOCATION
1152     UNKNOWN LOCATION
1153              GAMPAHA
1154            ILUKWATTA
Name: STOP, Length: 1155, dtype: object
```

In [88]:

```
data['STOP'].str.split()
```

Out[88]:

```
0             [Fort, Pierce]
1             [Fort, Pierce]
2             [Fort, Pierce]
3             [Fort, Pierce]
4        [West, Palm, Beach]
               ...           
1150               [Kar?chi]
1151     [Unknown, Location]
1152     [Unknown, Location]
1153               [Gampaha]
1154             [Ilukwatta]
Name: STOP, Length: 1155, dtype: object
```

```
In [81]: data['STOP'].apply(lambda x: len(x))
```

```
Out[81]: 0        11
         1        11
         2        11
         3        11
         4        15
                  ..
         1150      7
         1151     16
         1152     16
         1153      7
         1154      9
         Name: STOP, Length: 1155, dtype: int64
```

```
In [ ]:
```

```
In [89]: data.head()
```

Out[89]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE
0	1/1/2016 21:11	1/1/2016 21:17	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain
1	1/2/2016 1:25	1/2/2016 1:37	Business	Fort Pierce	Fort Pierce	5.0	NaN
2	1/2/2016 20:25	1/2/2016 20:38	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies
3	1/5/2016 17:31	1/5/2016 17:45	Business	Fort Pierce	Fort Pierce	4.7	Meeting
4	1/6/2016 14:42	1/6/2016 15:49	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit

In [90]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1155 entries, 0 to 1154
Data columns (total 7 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   START_DATE  1155 non-null   object 
 1   END_DATE    1155 non-null   object 
 2   CATEGORY    1155 non-null   object 
 3   START       1155 non-null   object 
 4   STOP        1155 non-null   object 
 5   MILES       1155 non-null   float64
 6   PURPOSE     653 non-null    object 
dtypes: float64(1), object(6)
memory usage: 72.2+ KB
```

In [92]:

```
data['START_DATE'][0]
```

Out[92]:

```
'1/1/2016 21:11'
```

In [94]:

```
data['START_DATE'] = pd.to_datetime(data['START_DATE'])
data['END_DATE'] = pd.to_datetime(data['END_DATE'])
```

In [95]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1155 entries, 0 to 1154
Data columns (total 7 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   START_DATE  1155 non-null   datetime64[ns]
 1   END_DATE    1155 non-null   datetime64[ns]
 2   CATEGORY    1155 non-null   object
 3   START       1155 non-null   object
 4   STOP        1155 non-null   object
 5   MILES       1155 non-null   float64
 6   PURPOSE     653 non-null    object
dtypes: datetime64[ns](2), float64(1), object(4)
memory usage: 104.5+ KB
```

In [96]:
```
# datetime.strptime(date_of_execution,"%Y-%m-%d")
```

In [97]:
```
data.head()
```

Out[97]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	NaN
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	Meeting
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit

In [100]:
```
ts = data['START_DATE'][1]
ts
```

Out[100]:
```
Timestamp('2016-01-01 21:11:00')
```

```
In [101]: ts.year

Out[101]: 2016

In [102]: ts.month

Out[102]: 1

In [104]: ts.day

Out[104]: 1

In [105]: ts.month_name()

Out[105]: 'January'

In [107]: ts.day_name()

Out[107]: 'Friday'

In [110]: ts.weekday()

Out[110]: 4

In [111]: ts.hour

Out[111]: 21

In [112]: ts.minute

Out[112]: 11
```

In [119]:

```
data['START_DATE'].apply(lambda x : x.year)
```

Out[119]:

```
0       2016
1       2016
2       2016
3       2016
4       2016
        ...
1150    2016
1151    2016
1152    2016
1153    2016
1154    2016
Name: START_DATE, Length: 1155, dtype: int64
```

In [123]:

```
data['year'] = data['START_DATE'].dt.year
```

In [ ]:

```
```

In [124]:

```
data.head()
```

Out[124]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain	2016
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	NaN	2016
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies	2016
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	Meeting	2016
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit	2016

In [125]:
```
data.describe()
```

Out[125]:

	MILES	year
count	1155.000000	1155.0
mean	10.566840	2016.0
std	21.579106	0.0
min	0.500000	2016.0
25%	2.900000	2016.0
50%	6.000000	2016.0
75%	10.400000	2016.0
max	310.300000	2016.0

In [126]:
```
data.head()
```

Out[126]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain	2016
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	NaN	2016
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies	2016
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	Meeting	2016
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit	2016

In [127]:
```
data['MILES'].mean()
```

Out[127]:
```
10.566839826839812
```

In [128]:
```
data['MONTH'] = data['START_DATE'].dt.month_name()
```

In [129]:

```
data.head()
```

Out[129]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year	MONTH
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain	2016	January
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	NaN	2016	January
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies	2016	January
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	Meeting	2016	January
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit	2016	January

In [130]:

```
data['MONTH'].value_counts()
```

Out[130]:

```
December     146
August       133
November     122
February     115
March        113
July         112
June         108
October      106
January       61
April         54
May           49
September     36
Name: MONTH, dtype: int64
```

In [141]:

```
gb = data.groupby(by='MONTH')
gb.sum().sort_values('MILES', ascending=False)['MILES']
```

Out[141]:

```
MONTH
October      1810.0
March        1693.9
August       1335.5
July         1224.6
April        1113.0
December      981.3
February      908.2
June          842.8
November      816.9
September     601.8
January       512.9
May           363.8
Name: MILES, dtype: float64
```

In [135]:

```
# gb.get_group('January')
```

In [ ]:

```
```

In [145]:

```
data[data['MILES']>200]
```

Out[145]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year	MONTH
269	2016-03-25 16:52:00	2016-03-25 22:22:00	Business	Latta	Jacksonville	310.3	Customer Visit	2016	March
270	2016-03-25 22:54:00	2016-03-26 01:39:00	Business	Jacksonville	Kissimmee	201.0	Meeting	2016	March

In [149]:

```
data[data['MILES']< 1].head()
```

Out[149]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year	MONTH
7	2016-01-07 13:27:00	2016-01-07 13:33:00	Business	Cary	Cary	0.8	Meeting	2016	January
44	2016-01-26 17:27:00	2016-01-26 17:29:00	Business	Cary	Cary	0.5	Errand/Supplies	2016	January
120	2016-02-17 16:38:00	2016-02-17 16:43:00	Business	Katunayaka	Katunayaka	0.5	Errand/Supplies	2016	February
189	2016-03-04 16:16:00	2016-03-04 16:22:00	Business	Fayetteville Street	Depot Historic District	0.8	Errand/Supplies	2016	March
212	2016-03-11 10:29:00	2016-03-11 10:36:00	Business	Congress Ave District	Downtown	0.8	NaN	2016	March

In [150]:

```
data['KMs']= data['MILES']*1.609
```

In [151]:

```
data.head()
```

Out[151]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year	MONTH	KMs
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain	2016	January	8.2059
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	NaN	2016	January	8.0450
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies	2016	January	7.7232
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	Meeting	2016	January	7.5623
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit	2016	January	102.4933

In [152]:

```
data['HOUR'] = data['START_DATE'].dt.hour
```

In [154]:

```
data.head()
```

Out[154]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year	MONTH	KMs	HOUR
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain	2016	January	8.2059	21
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	NaN	2016	January	8.0450	1
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies	2016	January	7.7232	20
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	Meeting	2016	January	7.5623	17
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit	2016	January	102.4933	14

In [155]:

```
data['HOUR'].value_counts()
```

Out[155]:

```
15    98
17    95
18    94
13    94
14    89
16    88
12    77
11    72
20    71
19    68
10    65
21    51
9     51
8     35
22    31
23    26
0     19
7     13
1      5
6      4
5      4
3      3
2      2
Name: HOUR, dtype: int64
```

In [156]:
```
data.head()
```

Out[156]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year	MONTH	KMs	HOUR
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain	2016	January	8.2059	21
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	NaN	2016	January	8.0450	1
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies	2016	January	7.7232	20
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	Meeting	2016	January	7.5623	17
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit	2016	January	102.4933	14

In [173]:
```
def convertToMinutes(time):
    return time.seconds/60
```

In [175]:
```
data['DURATION_MINS'] = (data['END_DATE'] - data['START_DATE']).apply(convertToMinutes)
```

In [176]:
```
data.head()
```

Out[176]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year	MONTH	KMs	HOUR	DURATION_MINS
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain	2016	January	8.2059	21	6.0
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	NaN	2016	January	8.0450	1	12.0
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies	2016	January	7.7232	20	13.0
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	Meeting	2016	January	7.5623	17	14.0
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit	2016	January	102.4933	14	67.0

```
In [ ]:
```

```
In [181]: data['SPEED_KMPH']= (data['KMs']/(data['DURATION_MINS']/60)).round(1)
```

```
In [182]: data.head()
```

Out[182]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year	MONTH	KMs	HOUR	DURATION_MINS	SPEED_KMPH
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain	2016	January	8.2059	21	6.0	82.1
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	NaN	2016	January	8.0450	1	12.0	40.2
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies	2016	January	7.7232	20	13.0	35.6
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	Meeting	2016	January	7.5623	17	14.0	32.4
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit	2016	January	102.4933	14	67.0	91.8

```
In [ ]:
```

```
In [183]: data['SPEED_KMPH'].mean()

Out[183]: inf
```

In [184]:

```
data[data['SPEED_KMPH'] > 10000]
```

Out[184]:

	START_DATE	END_DATE	CATEGORY	START	STOP	MILES	PURPOSE	year	MONTH	KMs	HOUR	DURATION_MINS	SPEED_KI
751	2016-09-06 17:49:00	2016-09-06 17:49:00	Business	Unknown Location	Unknown Location	69.1	NaN	2016	September	111.1819	17	0.0	
761	2016-09-16 07:08:00	2016-09-16 07:08:00	Business	Unknown Location	Unknown Location	1.6	NaN	2016	September	2.5744	7	0.0	
798	2016-10-08 15:03:00	2016-10-08 15:03:00	Business	Karachi	Karachi	3.6	NaN	2016	October	5.7924	15	0.0	
807	2016-10-13 13:02:00	2016-10-13 13:02:00	Business	Islamabad	Islamabad	0.7	NaN	2016	October	1.1263	13	0.0	

In [ ]:

In [ ]:

In [188]:

```
data['PURPOSE'].value_counts(dropna=False)
```

Out[188]:

```
NaN                   502
Meeting               187
Meal/Entertain        160
Errand/Supplies       128
Customer Visit        101
Temporary Site         50
Between Offices        18
Moving                  4
Airport/Travel          3
Commute                 1
Charity ($)             1
Name: PURPOSE, dtype: int64
```

In [189]:

```
data['PURPOSE'].fillna('OTHER', inplace=True)
```

In [190]:

```
data.isna().sum()
```

Out[190]:

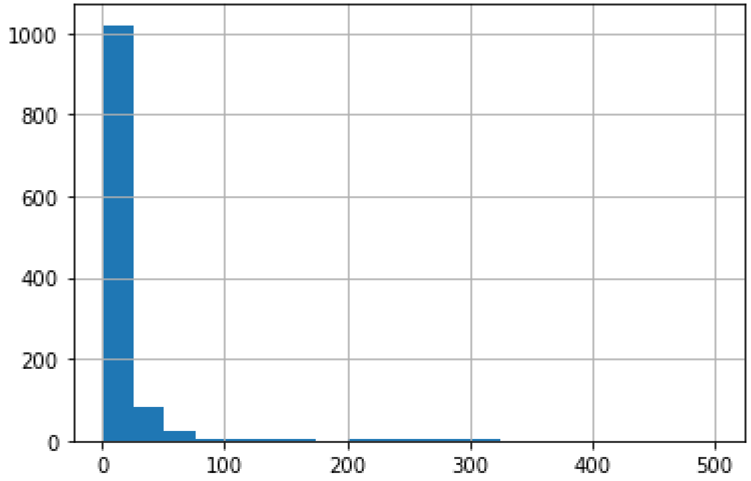
```
START_DATE       0
END_DATE         0
CATEGORY         0
START            0
STOP             0
MILES            0
PURPOSE          0
year             0
MONTH            0
KMs              0
HOUR             0
DURATION_MINS    0
SPEED_KMPH       0
dtype: int64
```

In [196]:

```
data['KMs'].hist(bins=20)
```

Out[196]:

```
<AxesSubplot:>
```



In [ ]: