

weather-data-analysis

November 11, 2024

```
[1]: import pandas as pd
```

```
[3]: data = pd.read_csv(r"D:\ANURAG KUMAR\Project\UDEMY\Data Analysis\Project_1\Weather Dataset.csv")
```

```
[5]: data
```

```
[5]:
```

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
0	1/1/2012 0:00	-1.8		-3.9	86		4
1	1/1/2012 1:00	-1.8		-3.7	87		4
2	1/1/2012 2:00	-1.8		-3.4	89		7
3	1/1/2012 3:00	-1.5		-3.2	88		6
4	1/1/2012 4:00	-1.5		-3.3	88		7
...
8779	12/31/2012 19:00	0.1		-2.7	81		30
8780	12/31/2012 20:00	0.2		-2.4	83		24
8781	12/31/2012 21:00	-0.5		-1.5	93		28
8782	12/31/2012 22:00	-0.2		-1.8	89		28
8783	12/31/2012 23:00	0.0		-2.1	86		30
	Visibility_km	Press_kPa					
0	8.0	101.24					Fog
1	8.0	101.24					Fog
2	4.0	101.26	Freezing Drizzle,Fog				
3	4.0	101.27	Freezing Drizzle,Fog				
4	4.8	101.23					Fog
...			
8779	9.7	100.13					Snow
8780	9.7	100.03					Snow
8781	4.8	99.95					Snow
8782	9.7	99.91					Snow
8783	11.3	99.89					Snow

```
[8784 rows x 8 columns]
```

```
[10]: data.head()
```

```
[10]:      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
0  1/1/2012 0:00    -1.8          -3.9         86           4
1  1/1/2012 1:00    -1.8          -3.7         87           4
2  1/1/2012 2:00    -1.8          -3.4         89           7
3  1/1/2012 3:00    -1.5          -3.2         88           6
4  1/1/2012 4:00    -1.5          -3.3         88           7
```

```
      Visibility_km  Press_kPa      Weather
0           8.0     101.24          Fog
1           8.0     101.24          Fog
2           4.0     101.26  Freezing Drizzle,Fog
3           4.0     101.27  Freezing Drizzle,Fog
4           4.8     101.23          Fog
```

```
[12]: data.shape
```

```
[12]: (8784, 8)
```

```
[14]: data.index
```

```
[14]: RangeIndex(start=0, stop=8784, step=1)
```

```
[16]: data.columns
```

```
[16]: Index(['Date/Time', 'Temp_C', 'Dew Point Temp_C', 'Rel Hum_%',
        'Wind Speed_km/h', 'Visibility_km', 'Press_kPa', 'Weather'],
        dtype='object')
```

```
[18]: data.dtypes
```

```
[18]: Date/Time      object
Temp_C           float64
Dew Point Temp_C  float64
Rel Hum_%         int64
Wind Speed_km/h   int64
Visibility_km      float64
Press_kPa          float64
Weather           object
dtype: object
```

```
[20]: data['Weather'].unique()
```

```
[20]: array(['Fog', 'Freezing Drizzle,Fog', 'Mostly Cloudy', 'Cloudy', 'Rain',
        'Rain Showers', 'Mainly Clear', 'Snow Showers', 'Snow', 'Clear',
        'Freezing Rain,Fog', 'Freezing Rain', 'Freezing Drizzle',
        'Rain,Snow', 'Moderate Snow', 'Freezing Drizzle,Snow',
        'Freezing Rain,Snow Grains', 'Snow,Blowing Snow', 'Freezing Fog',
```

```
'Haze', 'Rain,Fog', 'Drizzle,Fog', 'Drizzle',
'Freezing Drizzle,Haze', 'Freezing Rain,Haze', 'Snow,Haze',
'Snow,Fog', 'Snow,Ice Pellets', 'Rain,Haze', 'Thunderstorms,Rain',
'Thunderstorms,Rain Showers', 'Thunderstorms,Heavy Rain Showers',
'Thunderstorms,Rain Showers,Fog', 'Thunderstorms',
'Thunderstorms,Rain,Fog',
'Thunderstorms,Moderate Rain Showers,Fog', 'Rain Showers,Fog',
'Rain Showers,Snow Showers', 'Snow Pellets', 'Rain,Snow,Fog',
'Moderate Rain,Fog', 'Freezing Rain,Ice Pellets,Fog',
'Drizzle,Ice Pellets,Fog', 'Drizzle,Snow', 'Rain,Ice Pellets',
'Drizzle,Snow,Fog', 'Rain,Snow Grains', 'Rain,Snow,Ice Pellets',
'Snow Showers,Fog', 'Moderate Snow,Blowing Snow'], dtype=object)
```

```
[22]: data.nunique()
```

```
[22]: Date/Time      8784
      Temp_C        533
      Dew Point Temp_C  489
      Rel Hum_%      83
      Wind Speed_km/h  34
      Visibility_km   24
      Press_kPa       518
      Weather        50
      dtype: int64
```

```
[24]: data.count()
```

```
[24]: Date/Time      8784
      Temp_C        8784
      Dew Point Temp_C  8784
      Rel Hum_%      8784
      Wind Speed_km/h  8784
      Visibility_km   8784
      Press_kPa       8784
      Weather        8784
      dtype: int64
```

```
[26]: data['Weather'].value_counts()
```

```
[26]: Weather
      Mainly Clear      2106
      Mostly Cloudy    2069
      Cloudy           1728
      Clear            1326
      Snow              390
      Rain              306
      Rain Showers     188
```

Fog	150
Rain,Fog	116
Drizzle,Fog	80
Snow Showers	60
Drizzle	41
Snow,Fog	37
Snow,Blowing Snow	19
Rain,Snow	18
Thunderstorms,Rain Showers	16
Haze	16
Drizzle,Snow,Fog	15
Freezing Rain	14
Freezing Drizzle,Snow	11
Freezing Drizzle	7
Snow,Ice Pellets	6
Freezing Drizzle,Fog	6
Snow,Haze	5
Freezing Fog	4
Snow Showers,Fog	4
Moderate Snow	4
Rain,Snow,Ice Pellets	4
Freezing Rain,Fog	4
Freezing Drizzle,Haze	3
Rain,Haze	3
Thunderstorms,Rain	3
Thunderstorms,Rain Showers,Fog	3
Freezing Rain,Haze	2
Drizzle,Snow	2
Rain Showers,Snow Showers	2
Thunderstorms	2
Moderate Snow,Blowing Snow	2
Rain Showers,Fog	1
Thunderstorms,Moderate Rain Showers,Fog	1
Snow Pellets	1
Rain,Snow,Fog	1
Moderate Rain,Fog	1
Freezing Rain,Ice Pellets,Fog	1
Drizzle,Ice Pellets,Fog	1
Thunderstorms,Rain,Fog	1
Rain,Ice Pellets	1
Rain,Snow Grains	1
Thunderstorms,Heavy Rain Showers	1
Freezing Rain,Snow Grains	1

Name: count, dtype: int64

```
[28]: data.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8784 entries, 0 to 8783
Data columns (total 8 columns):
#   Column                Non-Null Count  Dtype
---  -
0   Date/Time              8784 non-null   object
1   Temp_C                 8784 non-null   float64
2   Dew Point Temp_C       8784 non-null   float64
3   Rel Hum_%              8784 non-null   int64
4   Wind Speed_km/h        8784 non-null   int64
5   Visibility_km           8784 non-null   float64
6   Press_kPa              8784 non-null   float64
7   Weather                8784 non-null   object
dtypes: float64(4), int64(2), object(2)
memory usage: 549.1+ KB

```

```
[46]: # Q1. Find all the unique "Wind Speed" values in the data.
```

```
[36]: data['Wind Speed_km/h'].nunique()
```

```
[36]: 34
```

```
[38]: data['Wind Speed_km/h'].unique()
```

```
[38]: array([ 4,  7,  6,  9, 15, 13, 20, 22, 19, 24, 30, 35, 39, 32, 33, 26, 44,
        43, 48, 37, 28, 17, 11,  0, 83, 70, 57, 46, 41, 52, 50, 63, 54,  2],
       dtype=int64)
```

```
[48]: # Q2. Find the number of times when the "Weather is exactly clear".
```

```
[52]: # Using value_counts()
data.Weather.value_counts()
```

```
[52]: Weather
Mainly Clear                2106
Mostly Cloudy              2069
Cloudy                     1728
Clear                      1326
Snow                       390
Rain                       306
Rain Showers               188
Fog                        150
Rain,Fog                   116
Drizzle,Fog                80
Snow Showers               60
Drizzle                    41
Snow,Fog                   37
```

Snow,Blowing Snow	19
Rain,Snow	18
Thunderstorms,Rain Showers	16
Haze	16
Drizzle,Snow,Fog	15
Freezing Rain	14
Freezing Drizzle,Snow	11
Freezing Drizzle	7
Snow,Ice Pellets	6
Freezing Drizzle,Fog	6
Snow,Haze	5
Freezing Fog	4
Snow Showers,Fog	4
Moderate Snow	4
Rain,Snow,Ice Pellets	4
Freezing Rain,Fog	4
Freezing Drizzle,Haze	3
Rain,Haze	3
Thunderstorms,Rain	3
Thunderstorms,Rain Showers,Fog	3
Freezing Rain,Haze	2
Drizzle,Snow	2
Rain Showers,Snow Showers	2
Thunderstorms	2
Moderate Snow,Blowing Snow	2
Rain Showers,Fog	1
Thunderstorms,Moderate Rain Showers,Fog	1
Snow Pellets	1
Rain,Snow,Fog	1
Moderate Rain,Fog	1
Freezing Rain,Ice Pellets,Fog	1
Drizzle,Ice Pellets,Fog	1
Thunderstorms,Rain,Fog	1
Rain,Ice Pellets	1
Rain,Snow Grains	1
Thunderstorms,Heavy Rain Showers	1
Freezing Rain,Snow Grains	1

Name: count, dtype: int64

```
[54]: # using Filtering
data[data.Weather == 'Clear']
```

```
[54]:
```

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
67	1/3/2012 19:00	-16.9		-24.8	50	24	
114	1/5/2012 18:00	-7.1		-14.4	56	11	
115	1/5/2012 19:00	-9.2		-15.4	61	7	
116	1/5/2012 20:00	-9.8		-15.7	62	9	

117	1/5/2012 21:00	-9.0	-14.8	63	13
...
8646	12/26/2012 6:00	-13.4	-14.8	89	4
8698	12/28/2012 10:00	-6.1	-8.6	82	19
8713	12/29/2012 1:00	-11.9	-13.6	87	11
8714	12/29/2012 2:00	-11.8	-13.1	90	13
8756	12/30/2012 20:00	-13.8	-16.5	80	24

	Visibility_km	Press_kPa	Weather
67	25.0	101.74	Clear
114	25.0	100.71	Clear
115	25.0	100.80	Clear
116	25.0	100.83	Clear
117	25.0	100.83	Clear
...
8646	25.0	102.47	Clear
8698	24.1	101.27	Clear
8713	25.0	101.31	Clear
8714	25.0	101.33	Clear
8756	25.0	101.52	Clear

[1326 rows x 8 columns]

```
[56]: # groupby()
data.groupby('Weather').get_group('Clear')
```

```
[56]:
```

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
67	1/3/2012 19:00	-16.9		-24.8	50		24
114	1/5/2012 18:00	-7.1		-14.4	56		11
115	1/5/2012 19:00	-9.2		-15.4	61		7
116	1/5/2012 20:00	-9.8		-15.7	62		9
117	1/5/2012 21:00	-9.0		-14.8	63		13
...
8646	12/26/2012 6:00	-13.4		-14.8	89		4
8698	12/28/2012 10:00	-6.1		-8.6	82		19
8713	12/29/2012 1:00	-11.9		-13.6	87		11
8714	12/29/2012 2:00	-11.8		-13.1	90		13
8756	12/30/2012 20:00	-13.8		-16.5	80		24

	Visibility_km	Press_kPa	Weather
67	25.0	101.74	Clear
114	25.0	100.71	Clear
115	25.0	100.80	Clear
116	25.0	100.83	Clear
117	25.0	100.83	Clear
...
8646	25.0	102.47	Clear

8698	24.1	101.27	Clear
8713	25.0	101.31	Clear
8714	25.0	101.33	Clear
8756	25.0	101.52	Clear

[1326 rows x 8 columns]

```
[60]: # Q3. Find the number of times when the 'Wind Speed was exactly 4 km/hr'.
```

```
[62]: data[data['Wind Speed_km/h'] == 4]
```

```
[62]:
```

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
0	1/1/2012 0:00	-1.8		-3.9	86	4	
1	1/1/2012 1:00	-1.8		-3.7	87	4	
96	1/5/2012 0:00	-8.8		-11.7	79	4	
101	1/5/2012 5:00	-7.0		-9.5	82	4	
146	1/7/2012 2:00	-8.1		-11.1	79	4	
...		
8768	12/31/2012 8:00	-8.6		-10.3	87	4	
8769	12/31/2012 9:00	-8.1		-9.6	89	4	
8770	12/31/2012 10:00	-7.4		-8.9	89	4	
8772	12/31/2012 12:00	-5.8		-7.5	88	4	
8773	12/31/2012 13:00	-4.6		-6.6	86	4	

	Visibility_km	Press_kPa	Weather
0	8.0	101.24	Fog
1	8.0	101.24	Fog
96	9.7	100.32	Snow
101	4.0	100.19	Snow
146	19.3	100.15	Cloudy
...
8768	3.2	101.14	Snow Showers
8769	2.4	101.09	Snow
8770	6.4	101.05	Snow,Fog
8772	12.9	100.78	Snow
8773	12.9	100.63	Snow

[474 rows x 8 columns]

```
[64]: # Q4. Find out all the Null Values in the data.
```

```
[66]: data.isnull().sum()
```

```
[66]: Date/Time      0
      Temp_C        0
      Dew Point Temp_C  0
      Rel Hum_%      0
```



```

Wind Speed_km/h      0
Visibility_km         0
Press_kPa             0
Weather              0
dtype: int64

```

```
[70]: data.notnull().sum()
```

```

[70]: Date/Time      8784
      Temp_C        8784
      Dew Point Temp_C 8784
      Rel Hum_%      8784
      Wind Speed_km/h 8784
      Visibility_km   8784
      Press_kPa       8784
      Weather        8784
      dtype: int64

```

```
[72]: # Q5. Rename the column name 'Weather' of the dataframe to 'Weather Condition'.
```

```
[74]: data.head(2)
```

```

[74]:      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
0  1/1/2012 0:00    -1.8          -3.9        86              4
1  1/1/2012 1:00    -1.8          -3.7        87              4

      Visibility_km  Press_kPa  Weather
0              8.0     101.24    Fog
1              8.0     101.24    Fog

```

```
[76]: data.rename(columns = {'Weather' : 'Weather Condition'}, inplace = True)
```

```
[78]: data.head(2)
```

```

[78]:      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
0  1/1/2012 0:00    -1.8          -3.9        86              4
1  1/1/2012 1:00    -1.8          -3.7        87              4

      Visibility_km  Press_kPa  Weather Condition
0              8.0     101.24              Fog
1              8.0     101.24              Fog

```

```
[80]: # Q6.What is the mean 'Visibility'?
```

```
[84]: data.Visibility_km.mean()
```

```
[84]: 27.6644446721311478
```

```
[86]: # Q7. What is the Standard Deviation of 'Pressure' in this data?
```

```
[88]: data.Press_kPa.std()
```

```
[88]: 0.8440047459486474
```

```
[90]: # Q8. What is the Variance of 'Relative Humidity' in this data?
```

```
[92]: data['Rel Hum_%'].var()
```

```
[92]: 286.2485501984998
```

```
[94]: # Q9. Find all instances when 'Snow' was recorded.
```

```
[96]: # value_counts()
data['Weather Condition'].value_counts()
```

```
[96]: Weather Condition
Mainly Clear                2106
Mostly Cloudy              2069
Cloudy                     1728
Clear                      1326
Snow                       390
Rain                      306
Rain Showers              188
Fog                       150
Rain,Fog                  116
Drizzle,Fog               80
Snow Showers              60
Drizzle                   41
Snow,Fog                  37
Snow,Blowing Snow         19
Rain,Snow                 18
Thunderstorms,Rain Showers 16
Haze                      16
Drizzle,Snow,Fog          15
Freezing Rain             14
Freezing Drizzle,Snow     11
Freezing Drizzle           7
Snow,Ice Pellets          6
Freezing Drizzle,Fog      6
Snow,Haze                 5
Freezing Fog              4
Snow Showers,Fog          4
Moderate Snow             4
Rain,Snow,Ice Pellets     4
Freezing Rain,Fog         4
```

Freezing Drizzle,Haze	3
Rain,Haze	3
Thunderstorms,Rain	3
Thunderstorms,Rain Showers,Fog	3
Freezing Rain,Haze	2
Drizzle,Snow	2
Rain Showers,Snow Showers	2
Thunderstorms	2
Moderate Snow,Blowing Snow	2
Rain Showers,Fog	1
Thunderstorms,Moderate Rain Showers,Fog	1
Snow Pellets	1
Rain,Snow,Fog	1
Moderate Rain,Fog	1
Freezing Rain,Ice Pellets,Fog	1
Drizzle,Ice Pellets,Fog	1
Thunderstorms,Rain,Fog	1
Rain,Ice Pellets	1
Rain,Snow Grains	1
Thunderstorms,Heavy Rain Showers	1
Freezing Rain,Snow Grains	1

Name: count, dtype: int64

```
[98]: # filtering
data[data['Weather Condition'] == 'Snow']
```

```
[98]:
```

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
55	1/3/2012 7:00	-14.0		-19.5	63		19
84	1/4/2012 12:00	-13.7		-21.7	51		11
86	1/4/2012 14:00	-11.3		-19.0	53		7
87	1/4/2012 15:00	-10.2		-16.3	61		11
88	1/4/2012 16:00	-9.4		-15.5	61		13
...			
8779	12/31/2012 19:00	0.1		-2.7	81		30
8780	12/31/2012 20:00	0.2		-2.4	83		24
8781	12/31/2012 21:00	-0.5		-1.5	93		28
8782	12/31/2012 22:00	-0.2		-1.8	89		28
8783	12/31/2012 23:00	0.0		-2.1	86		30

	Visibility_km	Press_kPa	Weather Condition
55	25.0	100.95	Snow
84	24.1	101.25	Snow
86	19.3	100.97	Snow
87	9.7	100.89	Snow
88	19.3	100.79	Snow
...	
8779	9.7	100.13	Snow

8780	9.7	100.03	Snow
8781	4.8	99.95	Snow
8782	9.7	99.91	Snow
8783	11.3	99.89	Snow

[390 rows x 8 columns]

```
[100]: # str.contains
```

```
[102]: data[data['Weather Condition'].str.contains('Snow')]
```

```
[102]:
```

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
41	1/2/2012 17:00	-2.1		-9.5	57	22	
44	1/2/2012 20:00	-5.6		-13.4	54	24	
45	1/2/2012 21:00	-5.8		-12.8	58	26	
47	1/2/2012 23:00	-7.4		-14.1	59	17	
48	1/3/2012 0:00	-9.0		-16.0	57	28	
...
8779	12/31/2012 19:00	0.1		-2.7	81	30	
8780	12/31/2012 20:00	0.2		-2.4	83	24	
8781	12/31/2012 21:00	-0.5		-1.5	93	28	
8782	12/31/2012 22:00	-0.2		-1.8	89	28	
8783	12/31/2012 23:00	0.0		-2.1	86	30	

	Visibility_km	Press_kPa	Weather Condition
41	25.0	99.66	Snow Showers
44	25.0	100.07	Snow Showers
45	25.0	100.15	Snow Showers
47	19.3	100.27	Snow Showers
48	25.0	100.35	Snow Showers
...
8779	9.7	100.13	Snow
8780	9.7	100.03	Snow
8781	4.8	99.95	Snow
8782	9.7	99.91	Snow
8783	11.3	99.89	Snow

[583 rows x 8 columns]

```
[106]: # Q10. Find all instances when 'Wind Speed is above 24' and 'Visibility is 25'.
```

```
[7]: data[(data['Wind Speed_km/h'] > 24) & (data['Visibility_km'] == 25)]
```

```
[7]:
```

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
23	1/1/2012 23:00	5.3		2.0	79	30	
24	1/2/2012 0:00	5.2		1.5	77	35	
25	1/2/2012 1:00	4.6		0.0	72	39	

26	1/2/2012 2:00	3.9	-0.9	71	32
27	1/2/2012 3:00	3.7	-1.5	69	33
...
8705	12/28/2012 17:00	-8.6	-12.0	76	26
8753	12/30/2012 17:00	-12.1	-15.8	74	28
8755	12/30/2012 19:00	-13.4	-16.5	77	26
8759	12/30/2012 23:00	-12.1	-15.1	78	28
8760	12/31/2012 0:00	-11.1	-14.4	77	26

	Visibility_km	Press_kPa	Weather
23	25.0	99.31	Cloudy
24	25.0	99.26	Rain Showers
25	25.0	99.26	Cloudy
26	25.0	99.26	Mostly Cloudy
27	25.0	99.30	Mostly Cloudy
...
8705	25.0	101.34	Mainly Clear
8753	25.0	101.26	Mainly Clear
8755	25.0	101.47	Mainly Clear
8759	25.0	101.52	Mostly Cloudy
8760	25.0	101.51	Cloudy

[308 rows x 8 columns]

```
[9]: # Q11. What is the Mean value of each column against each 'Weather Condition'?
```

```
[28]: data.head(2)
```

```
[28]:
```

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
0	1/1/2012 0:00	-1.8		-3.9	86		4
1	1/1/2012 1:00	-1.8		-3.7	87		4

	Visibility_km	Press_kPa	Weather
0	8.0	101.24	Fog
1	8.0	101.24	Fog

```
[42]: data.groupby('Weather').mean('Weather')
```

```
[42]:
```

	Temp_C	Dew Point	Temp_C	\
Weather				
Clear	6.825716		0.089367	
Cloudy	7.970544		2.375810	
Drizzle	7.353659		5.504878	
Drizzle,Fog	8.067500		7.033750	
Drizzle,Ice Pellets,Fog	0.400000		-0.700000	
Drizzle,Snow	1.050000		0.150000	
Drizzle,Snow,Fog	0.693333		0.120000	

Fog	4.303333	3.159333
Freezing Drizzle	-5.657143	-8.000000
Freezing Drizzle,Fog	-2.533333	-4.183333
Freezing Drizzle,Haze	-5.433333	-8.000000
Freezing Drizzle,Snow	-5.109091	-7.072727
Freezing Fog	-7.575000	-9.250000
Freezing Rain	-3.885714	-6.078571
Freezing Rain,Fog	-2.225000	-3.750000
Freezing Rain,Haze	-4.900000	-7.450000
Freezing Rain,Ice Pellets,Fog	-2.600000	-3.700000
Freezing Rain,Snow Grains	-5.000000	-7.300000
Haze	-0.200000	-2.975000
Mainly Clear	12.558927	4.581671
Moderate Rain,Fog	1.700000	0.800000
Moderate Snow	-5.525000	-7.250000
Moderate Snow,Blowing Snow	-5.450000	-6.500000
Mostly Cloudy	10.574287	3.131174
Rain	9.786275	7.042810
Rain Showers	13.722340	9.187766
Rain Showers,Fog	12.800000	12.100000
Rain Showers,Snow Showers	2.150000	-1.500000
Rain,Fog	8.273276	7.219828
Rain,Haze	4.633333	2.066667
Rain,Ice Pellets	0.600000	-0.600000
Rain,Snow	1.055556	-0.566667
Rain,Snow Grains	1.900000	-2.100000
Rain,Snow,Fog	0.800000	0.300000
Rain,Snow,Ice Pellets	1.100000	-0.175000
Snow	-4.524103	-7.623333
Snow Pellets	0.700000	-6.400000
Snow Showers	-3.506667	-7.866667
Snow Showers,Fog	-10.675000	-11.900000
Snow,Blowing Snow	-5.410526	-7.621053
Snow,Fog	-5.075676	-6.364865
Snow,Haze	-4.020000	-6.860000
Snow,Ice Pellets	-1.883333	-3.666667
Thunderstorms	24.150000	19.750000
Thunderstorms,Heavy Rain Showers	10.900000	9.000000
Thunderstorms,Moderate Rain Showers,Fog	19.600000	18.500000
Thunderstorms,Rain	20.433333	18.533333
Thunderstorms,Rain Showers	20.037500	17.618750
Thunderstorms,Rain Showers,Fog	21.600000	18.700000
Thunderstorms,Rain,Fog	20.600000	18.600000
Rel Hum_% Wind Speed_km/h \		
Weather		
Clear	64.497738	10.557315

Cloudy	69.592593	16.127315
Drizzle	88.243902	16.097561
Drizzle,Fog	93.275000	11.862500
Drizzle,Ice Pellets,Fog	92.000000	20.000000
Drizzle,Snow	93.500000	14.000000
Drizzle,Snow,Fog	95.866667	15.533333
Fog	92.286667	7.946667
Freezing Drizzle	83.571429	16.571429
Freezing Drizzle,Fog	88.500000	17.000000
Freezing Drizzle,Haze	82.000000	10.333333
Freezing Drizzle,Snow	86.090909	16.272727
Freezing Fog	87.750000	4.750000
Freezing Rain	84.642857	19.214286
Freezing Rain,Fog	89.500000	15.500000
Freezing Rain,Haze	82.500000	7.500000
Freezing Rain,Ice Pellets,Fog	92.000000	28.000000
Freezing Rain,Snow Grains	84.000000	32.000000
Haze	81.625000	10.437500
Mainly Clear	60.667142	14.144824
Moderate Rain,Fog	94.000000	17.000000
Moderate Snow	87.750000	33.750000
Moderate Snow,Blowing Snow	92.500000	40.000000
Mostly Cloudy	62.102465	15.813920
Rain	83.624183	19.254902
Rain Showers	75.159574	17.132979
Rain Showers,Fog	96.000000	13.000000
Rain Showers,Snow Showers	76.500000	22.500000
Rain,Fog	93.189655	14.793103
Rain,Haze	83.333333	11.666667
Rain,Ice Pellets	92.000000	24.000000
Rain,Snow	89.000000	28.388889
Rain,Snow Grains	75.000000	26.000000
Rain,Snow,Fog	96.000000	9.000000
Rain,Snow,Ice Pellets	91.500000	23.250000
Snow	79.307692	20.038462
Snow Pellets	59.000000	35.000000
Snow Showers	72.350000	19.233333
Snow Showers,Fog	90.750000	13.750000
Snow,Blowing Snow	84.473684	34.842105
Snow,Fog	90.675676	17.324324
Snow,Haze	80.600000	5.000000
Snow,Ice Pellets	87.666667	23.833333
Thunderstorms	77.000000	7.500000
Thunderstorms,Heavy Rain Showers	88.000000	9.000000
Thunderstorms,Moderate Rain Showers,Fog	93.000000	15.000000
Thunderstorms,Rain	89.000000	15.666667
Thunderstorms,Rain Showers	86.375000	18.312500

Thunderstorms,Rain Showers,Fog	84.000000	19.666667
Thunderstorms,Rain,Fog	88.000000	19.000000

	Visibility_km	Press_kPa
Weather		
Clear	30.153243	101.587443
Cloudy	26.625752	100.911441
Drizzle	17.931707	100.435366
Drizzle,Fog	5.257500	100.786625
Drizzle,Ice Pellets,Fog	4.000000	100.790000
Drizzle,Snow	10.500000	100.890000
Drizzle,Snow,Fog	5.513333	99.281333
Fog	6.248000	101.184067
Freezing Drizzle	9.200000	100.202857
Freezing Drizzle,Fog	5.266667	100.441667
Freezing Drizzle,Haze	2.666667	100.316667
Freezing Drizzle,Snow	5.872727	100.520909
Freezing Fog	0.650000	102.320000
Freezing Rain	8.242857	99.647143
Freezing Rain,Fog	7.550000	99.945000
Freezing Rain,Haze	2.400000	100.375000
Freezing Rain,Ice Pellets,Fog	8.000000	100.950000
Freezing Rain,Snow Grains	4.800000	98.560000
Haze	7.831250	101.482500
Mainly Clear	34.264862	101.248832
Moderate Rain,Fog	6.400000	99.980000
Moderate Snow	0.750000	100.275000
Moderate Snow,Blowing Snow	0.600000	100.570000
Mostly Cloudy	31.253842	101.025288
Rain	18.856536	100.233333
Rain Showers	22.816489	100.404043
Rain Showers,Fog	6.400000	99.830000
Rain Showers,Snow Showers	21.700000	101.100000
Rain,Fog	6.873276	100.500862
Rain,Haze	6.700000	100.540000
Rain,Ice Pellets	9.700000	100.120000
Rain,Snow	11.672222	99.951111
Rain,Snow Grains	25.000000	100.600000
Rain,Snow,Fog	6.400000	100.730000
Rain,Snow,Ice Pellets	6.000000	100.105000
Snow	11.171795	100.536103
Snow Pellets	2.400000	99.700000
Snow Showers	20.158333	100.963500
Snow Showers,Fog	7.025000	101.292500
Snow,Blowing Snow	4.105263	99.704737
Snow,Fog	4.537838	100.688649
Snow,Haze	4.640000	100.782000

Snow,Ice Pellets	7.416667	100.548333
Thunderstorms	24.550000	100.230000
Thunderstorms,Heavy Rain Showers	2.400000	100.260000
Thunderstorms,Moderate Rain Showers,Fog	3.200000	100.010000
Thunderstorms,Rain	19.833333	100.420000
Thunderstorms,Rain Showers	15.893750	100.233750
Thunderstorms,Rain Showers,Fog	9.700000	100.063333
Thunderstorms,Rain,Fog	4.800000	100.080000

```
[46]: # Q12. What is the Maximum & Minimum value of each column against each 'Weather_
      ↳Condition'?
```

```
[52]: data.groupby('Weather').min('Weather')
```

```
[52]:
```

	Temp_C	Dew Point	Temp_C	Rel Hum_%	\
Weather					
Clear	-23.3		-28.5	20	
Cloudy	-21.4		-26.8	18	
Drizzle	1.1		-0.2	74	
Drizzle,Fog	0.0		-1.6	85	
Drizzle,Ice Pellets,Fog	0.4		-0.7	92	
Drizzle,Snow	0.9		0.1	92	
Drizzle,Snow,Fog	0.3		-0.1	92	
Fog	-16.0		-17.2	80	
Freezing Drizzle	-9.0		-12.2	78	
Freezing Drizzle,Fog	-6.4		-9.0	82	
Freezing Drizzle,Haze	-5.8		-8.3	81	
Freezing Drizzle,Snow	-8.3		-10.4	79	
Freezing Fog	-19.0		-22.9	71	
Freezing Rain	-6.5		-9.0	81	
Freezing Rain,Fog	-6.1		-8.7	82	
Freezing Rain,Haze	-4.9		-7.5	82	
Freezing Rain,Ice Pellets,Fog	-2.6		-3.7	92	
Freezing Rain,Snow Grains	-5.0		-7.3	84	
Haze	-11.5		-16.0	68	
Mainly Clear	-22.8		-28.0	20	
Moderate Rain,Fog	1.7		0.8	94	
Moderate Snow	-6.3		-7.6	83	
Moderate Snow,Blowing Snow	-5.5		-6.6	92	
Mostly Cloudy	-23.2		-28.5	18	
Rain	0.3		-5.7	40	
Rain Showers	1.6		-7.2	37	
Rain Showers,Fog	12.8		12.1	96	
Rain Showers,Snow Showers	2.1		-1.8	75	
Rain,Fog	0.0		-1.2	83	
Rain,Haze	4.0		1.0	81	
Rain,Ice Pellets	0.6		-0.6	92	

Rain,Snow	0.6	-1.7	81
Rain,Snow Grains	1.9	-2.1	75
Rain,Snow,Fog	0.8	0.3	96
Rain,Snow,Ice Pellets	0.9	-0.7	88
Snow	-16.7	-24.6	41
Snow Pellets	0.7	-6.4	59
Snow Showers	-13.3	-19.3	52
Snow Showers,Fog	-11.3	-12.7	89
Snow,Blowing Snow	-12.0	-16.2	70
Snow,Fog	-10.1	-12.0	77
Snow,Haze	-4.3	-7.2	80
Snow,Ice Pellets	-4.3	-5.9	76
Thunderstorms	21.6	19.4	67
Thunderstorms,Heavy Rain Showers	10.9	9.0	88
Thunderstorms,Moderate Rain Showers,Fog	19.6	18.5	93
Thunderstorms,Rain	19.4	18.2	83
Thunderstorms,Rain Showers	11.0	7.0	68
Thunderstorms,Rain Showers,Fog	19.5	16.1	80
Thunderstorms,Rain,Fog	20.6	18.6	88

	Wind Speed_km/h	Visibility_km	\
Weather			
Clear	0	11.3	
Cloudy	0	11.3	
Drizzle	0	6.4	
Drizzle,Fog	0	1.0	
Drizzle,Ice Pellets,Fog	20	4.0	
Drizzle,Snow	9	9.7	
Drizzle,Snow,Fog	7	2.4	
Fog	0	0.2	
Freezing Drizzle	6	4.8	
Freezing Drizzle,Fog	6	3.6	
Freezing Drizzle,Haze	9	2.0	
Freezing Drizzle,Snow	6	2.4	
Freezing Fog	0	0.2	
Freezing Rain	7	2.8	
Freezing Rain,Fog	7	2.8	
Freezing Rain,Haze	6	2.0	
Freezing Rain,Ice Pellets,Fog	28	8.0	
Freezing Rain,Snow Grains	32	4.8	
Haze	0	4.8	
Mainly Clear	0	12.9	
Moderate Rain,Fog	17	6.4	
Moderate Snow	26	0.6	
Moderate Snow,Blowing Snow	39	0.6	
Mostly Cloudy	0	11.3	
Rain	0	4.0	

Rain Showers	0	6.4
Rain Showers,Fog	13	6.4
Rain Showers,Snow Showers	17	19.3
Rain,Fog	0	2.0
Rain,Haze	7	4.0
Rain,Ice Pellets	24	9.7
Rain,Snow	13	2.4
Rain,Snow Grains	26	25.0
Rain,Snow,Fog	9	6.4
Rain,Snow,Ice Pellets	17	4.8
Snow	0	1.0
Snow Pellets	35	2.4
Snow Showers	0	2.4
Snow Showers,Fog	7	4.0
Snow,Blowing Snow	24	0.6
Snow,Fog	4	1.2
Snow,Haze	0	4.0
Snow,Ice Pellets	19	2.8
Thunderstorms	0	24.1
Thunderstorms,Heavy Rain Showers	9	2.4
Thunderstorms,Moderate Rain Showers,Fog	15	3.2
Thunderstorms,Rain	4	16.1
Thunderstorms,Rain Showers	7	6.4
Thunderstorms,Rain Showers,Fog	7	9.7
Thunderstorms,Rain,Fog	19	4.8

Press_kPa

Weather	
Clear	99.52
Cloudy	98.39
Drizzle	97.84
Drizzle,Fog	98.65
Drizzle,Ice Pellets,Fog	100.79
Drizzle,Snow	100.63
Drizzle,Snow,Fog	97.79
Fog	98.31
Freezing Drizzle	98.44
Freezing Drizzle,Fog	98.74
Freezing Drizzle,Haze	100.28
Freezing Drizzle,Snow	99.19
Freezing Fog	101.97
Freezing Rain	98.22
Freezing Rain,Fog	98.32
Freezing Rain,Haze	100.34
Freezing Rain,Ice Pellets,Fog	100.95
Freezing Rain,Snow Grains	98.56
Haze	100.35

Mainly Clear	98.67
Moderate Rain,Fog	99.98
Moderate Snow	99.88
Moderate Snow,Blowing Snow	100.50
Mostly Cloudy	98.36
Rain	97.52
Rain Showers	98.51
Rain Showers,Fog	99.83
Rain Showers,Snow Showers	101.09
Rain,Fog	98.61
Rain,Haze	100.50
Rain,Ice Pellets	100.12
Rain,Snow	98.18
Rain,Snow Grains	100.60
Rain,Snow,Fog	100.73
Rain,Snow,Ice Pellets	99.85
Snow	97.75
Snow Pellets	99.70
Snow Showers	99.49
Snow Showers,Fog	100.63
Snow,Blowing Snow	98.11
Snow,Fog	99.38
Snow,Haze	100.61
Snow,Ice Pellets	99.40
Thunderstorms	99.84
Thunderstorms,Heavy Rain Showers	100.26
Thunderstorms,Moderate Rain Showers,Fog	100.01
Thunderstorms,Rain	100.19
Thunderstorms,Rain Showers	99.65
Thunderstorms,Rain Showers,Fog	99.71
Thunderstorms,Rain,Fog	100.08

```
[54]: data.groupby('Weather').max('Weather')
```

```
[54]:
```

	Temp_C	Dew Point	Temp_C	Rel Hum_%	\
Weather					
Clear	32.8		20.4	99	
Cloudy	30.5		22.6	99	
Drizzle	18.8		17.7	96	
Drizzle,Fog	19.9		19.1	100	
Drizzle,Ice Pellets,Fog	0.4		-0.7	92	
Drizzle,Snow	1.2		0.2	95	
Drizzle,Snow,Fog	1.1		0.6	98	
Fog	20.8		19.6	100	
Freezing Drizzle	-2.3		-3.3	93	
Freezing Drizzle,Fog	-0.3		-2.3	94	
Freezing Drizzle,Haze	-5.0		-7.7	83	

Freezing Drizzle,Snow	-3.3	-4.6	94
Freezing Fog	-0.1	-0.3	99
Freezing Rain	0.3	-1.7	92
Freezing Rain,Fog	0.1	-0.9	93
Freezing Rain,Haze	-4.9	-7.4	83
Freezing Rain,Ice Pellets,Fog	-2.6	-3.7	92
Freezing Rain,Snow Grains	-5.0	-7.3	84
Haze	14.1	11.1	86
Mainly Clear	33.0	21.2	99
Moderate Rain,Fog	1.7	0.8	94
Moderate Snow	-4.9	-6.7	93
Moderate Snow,Blowing Snow	-5.4	-6.4	93
Mostly Cloudy	32.4	24.4	100
Rain	22.8	20.4	99
Rain Showers	26.4	23.0	97
Rain Showers,Fog	12.8	12.1	96
Rain Showers,Snow Showers	2.2	-1.2	78
Rain,Fog	21.7	19.5	100
Rain,Haze	5.5	2.9	86
Rain,Ice Pellets	0.6	-0.6	92
Rain,Snow	1.7	0.5	94
Rain,Snow Grains	1.9	-2.1	75
Rain,Snow,Fog	0.8	0.3	96
Rain,Snow,Ice Pellets	1.3	0.1	94
Snow	3.7	0.3	96
Snow Pellets	0.7	-6.4	59
Snow Showers	2.9	-0.7	94
Snow Showers,Fog	-10.0	-11.1	92
Snow,Blowing Snow	-1.4	-2.9	91
Snow,Fog	1.1	0.8	99
Snow,Haze	-3.6	-6.4	81
Snow,Ice Pellets	0.8	-1.7	92
Thunderstorms	26.7	20.1	87
Thunderstorms,Heavy Rain Showers	10.9	9.0	88
Thunderstorms,Moderate Rain Showers,Fog	19.6	18.5	93
Thunderstorms,Rain	21.3	19.1	93
Thunderstorms,Rain Showers	25.5	23.1	98
Thunderstorms,Rain Showers,Fog	22.9	21.3	91
Thunderstorms,Rain,Fog	20.6	18.6	88

	Wind Speed_km/h	Visibility_km	\
Weather			
Clear	33	48.3	
Cloudy	54	48.3	
Drizzle	30	25.0	
Drizzle,Fog	28	9.7	
Drizzle,Ice Pellets,Fog	20	4.0	

Drizzle,Snow	19	11.3
Drizzle,Snow,Fog	32	9.7
Fog	22	9.7
Freezing Drizzle	26	12.9
Freezing Drizzle,Fog	33	8.0
Freezing Drizzle,Haze	11	4.0
Freezing Drizzle,Snow	24	12.9
Freezing Fog	9	0.8
Freezing Rain	28	16.1
Freezing Rain,Fog	26	9.7
Freezing Rain,Haze	9	2.8
Freezing Rain,Ice Pellets,Fog	28	8.0
Freezing Rain,Snow Grains	32	4.8
Haze	17	9.7
Mainly Clear	63	48.3
Moderate Rain,Fog	17	6.4
Moderate Snow	39	0.8
Moderate Snow,Blowing Snow	41	0.6
Mostly Cloudy	83	48.3
Rain	52	48.3
Rain Showers	41	48.3
Rain Showers,Fog	13	6.4
Rain Showers,Snow Showers	28	24.1
Rain,Fog	46	9.7
Rain,Haze	17	9.7
Rain,Ice Pellets	24	9.7
Rain,Snow	52	25.0
Rain,Snow Grains	26	25.0
Rain,Snow,Fog	9	6.4
Rain,Snow,Ice Pellets	28	6.4
Snow	57	25.0
Snow Pellets	35	2.4
Snow Showers	37	48.3
Snow Showers,Fog	22	9.7
Snow,Blowing Snow	48	9.7
Snow,Fog	35	9.7
Snow,Haze	15	6.4
Snow,Ice Pellets	33	11.3
Thunderstorms	15	25.0
Thunderstorms,Heavy Rain Showers	9	2.4
Thunderstorms,Moderate Rain Showers,Fog	15	3.2
Thunderstorms,Rain	30	24.1
Thunderstorms,Rain Showers	32	25.0
Thunderstorms,Rain Showers,Fog	35	9.7
Thunderstorms,Rain,Fog	19	4.8

Press_kPa

Weather	
Clear	103.63
Cloudy	103.65
Drizzle	101.56
Drizzle,Fog	102.07
Drizzle,Ice Pellets,Fog	100.79
Drizzle,Snow	101.15
Drizzle,Snow,Fog	100.15
Fog	103.04
Freezing Drizzle	101.02
Freezing Drizzle,Fog	101.27
Freezing Drizzle,Haze	100.36
Freezing Drizzle,Snow	101.18
Freezing Fog	102.85
Freezing Rain	101.00
Freezing Rain,Fog	101.01
Freezing Rain,Haze	100.41
Freezing Rain,Ice Pellets,Fog	100.95
Freezing Rain,Snow Grains	98.56
Haze	102.97
Mainly Clear	103.59
Moderate Rain,Fog	99.98
Moderate Snow	100.67
Moderate Snow,Blowing Snow	100.64
Mostly Cloudy	103.65
Rain	102.26
Rain Showers	102.31
Rain Showers,Fog	99.83
Rain Showers,Snow Showers	101.11
Rain,Fog	101.77
Rain,Haze	100.61
Rain,Ice Pellets	100.12
Rain,Snow	101.07
Rain,Snow Grains	100.60
Rain,Snow,Fog	100.73
Rain,Snow,Ice Pellets	100.47
Snow	102.73
Snow Pellets	99.70
Snow Showers	102.50
Snow Showers,Fog	102.52
Snow,Blowing Snow	100.62
Snow,Fog	102.07
Snow,Haze	100.99
Snow,Ice Pellets	100.96
Thunderstorms	100.62
Thunderstorms,Heavy Rain Showers	100.26
Thunderstorms,Moderate Rain Showers,Fog	100.01

Thunderstorms,Rain	100.83
Thunderstorms,Rain Showers	101.06
Thunderstorms,Rain Showers,Fog	100.64
Thunderstorms,Rain,Fog	100.08

[56]: # Q13. Show all the records where Weather Condition is Fog.

[64]: data[data['Weather'] == 'Fog']

[64]:

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
0	1/1/2012 0:00	-1.8		-3.9	86		4
1	1/1/2012 1:00	-1.8		-3.7	87		4
4	1/1/2012 4:00	-1.5		-3.3	88		7
5	1/1/2012 5:00	-1.4		-3.3	87		9
6	1/1/2012 6:00	-1.5		-3.1	89		7
...			
8716	12/29/2012 4:00	-16.0		-17.2	90		6
8717	12/29/2012 5:00	-14.8		-15.9	91		4
8718	12/29/2012 6:00	-13.8		-15.3	88		4
8719	12/29/2012 7:00	-14.8		-16.4	88		7
8722	12/29/2012 10:00	-12.0		-13.3	90		7

	Visibility_km	Press_kPa	Weather
0	8.0	101.24	Fog
1	8.0	101.24	Fog
4	4.8	101.23	Fog
5	6.4	101.27	Fog
6	6.4	101.29	Fog
...
8716	9.7	101.25	Fog
8717	6.4	101.25	Fog
8718	9.7	101.25	Fog
8719	8.0	101.22	Fog
8722	6.4	101.15	Fog

[150 rows x 8 columns]

[66]: # Q14. Find all instances when 'Weather is Clear' or 'Visibility is above 40'.

[70]: data[(data['Weather'] == 'Clear') | (data['Visibility_km'] > 40)]

[70]:

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
67	1/3/2012 19:00	-16.9		-24.8	50		24
106	1/5/2012 10:00	-6.0		-10.0	73		17
107	1/5/2012 11:00	-5.6		-10.2	70		22
108	1/5/2012 12:00	-4.7		-9.6	69		20
109	1/5/2012 13:00	-4.4		-9.7	66		26

...
8749	12/30/2012 13:00	-12.4		-16.2	73	37
8750	12/30/2012 14:00	-11.8		-16.1	70	37
8751	12/30/2012 15:00	-11.3		-15.6	70	32
8752	12/30/2012 16:00	-11.4		-15.5	72	26
8756	12/30/2012 20:00	-13.8		-16.5	80	24

	Visibility_km	Press_kPa	Weather
67	25.0	101.74	Clear
106	48.3	100.45	Mainly Clear
107	48.3	100.41	Mainly Clear
108	48.3	100.38	Mainly Clear
109	48.3	100.40	Mainly Clear
...
8749	48.3	100.92	Mostly Cloudy
8750	48.3	100.96	Mainly Clear
8751	48.3	101.05	Mainly Clear
8752	48.3	101.15	Mainly Clear
8756	25.0	101.52	Clear

[3027 rows x 8 columns]

```
[72]: # Q15. Find all instances when:
# A. 'Weather is Clear' and 'Relative Humidity is greater than 50'
# or
# B. 'Visibility is above 40'
```

```
[74]: data[(data['Weather'] == 'Clear') & (data['Rel Hum_%'] > 50) |
↳(data['Visibility_km'] > 40)]
```

```
[74]:
```

	Date/Time	Temp_C	Dew Point	Temp_C	Rel Hum_%	Wind Speed_km/h	\
106	1/5/2012 10:00	-6.0		-10.0	73	17	
107	1/5/2012 11:00	-5.6		-10.2	70	22	
108	1/5/2012 12:00	-4.7		-9.6	69	20	
109	1/5/2012 13:00	-4.4		-9.7	66	26	
110	1/5/2012 14:00	-5.1		-10.7	65	22	
...	
8749	12/30/2012 13:00	-12.4		-16.2	73	37	
8750	12/30/2012 14:00	-11.8		-16.1	70	37	
8751	12/30/2012 15:00	-11.3		-15.6	70	32	
8752	12/30/2012 16:00	-11.4		-15.5	72	26	
8756	12/30/2012 20:00	-13.8		-16.5	80	24	
	Visibility_km	Press_kPa		Weather			
106	48.3	100.45		Mainly Clear			
107	48.3	100.41		Mainly Clear			
108	48.3	100.38		Mainly Clear			

109	48.3	100.40	Mainly Clear
110	48.3	100.46	Mainly Clear
...
8749	48.3	100.92	Mostly Cloudy
8750	48.3	100.96	Mainly Clear
8751	48.3	101.05	Mainly Clear
8752	48.3	101.15	Mainly Clear
8756	25.0	101.52	Clear

[2921 rows x 8 columns]