Appendix A

Jupyter Notebook part 1 (the page number is only for this Notebook)

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

```python
[2]: weather = pd.read_csv('data/2016_01_weather.CSV')
     weather
```

```
[2]:         time           12:51 AM             1:51 AM  \
     0    2016/1/1               Fair              Cloudy
     1    2016/1/2               Fair                Fair
     2    2016/1/3               Fair                Fair
     3    2016/1/4  Partly Cloudy / Windy             Fair
     4    2016/1/5               Fair        Fair / Windy
     5    2016/1/6               Fair                Fair
     6    2016/1/7               Fair                Fair
     7    2016/1/8             Cloudy                Fair
     8    2016/1/9             Cloudy              Cloudy
     9    2016/1/10     Mostly Cloudy          Light Rain
     10   2016/1/11              Fair       Mostly Cloudy
     11   2016/1/12  Partly Cloudy / Windy             Fair
     12   2016/1/13            Cloudy        Fair / Windy
     13   2016/1/14            Cloudy       Mostly Cloudy
     14   2016/1/15            Cloudy              Cloudy
     15   2016/1/16     Mostly Cloudy              Cloudy
     16   2016/1/17            Cloudy       Mostly Cloudy
     17   2016/1/18              Fair                Fair
     18   2016/1/19  Partly Cloudy / Windy             Fair
     19   2016/1/20            Cloudy        Fair / Windy
     20   2016/1/21       Fair / Windy                 NaN
     21   2016/1/22        Light Snow                Fair
     22   2016/1/23        Light Snow          Light Snow
     23   2016/1/24            Cloudy  Light Snow / Windy
     24   2016/1/25            Cloudy       Partly Cloudy
     25   2016/1/26            Cloudy              Cloudy
     26   2016/1/27            Cloudy              Cloudy
     27   2016/1/28            Cloudy                Fair
     28   2016/1/29              Fair              Cloudy
     29   2016/1/30     Partly Cloudy       Partly Cloudy
```

```
30  2016/1/31                  Cloudy              Cloudy

                      2:51 AM                 3:51 AM                 4:51 AM  \
0                      Cloudy                  Cloudy                  Cloudy
1                        Fair           Mostly Cloudy           Mostly Cloudy
2                        Fair                    Fair                    Fair
3               Mostly Cloudy   Mostly Cloudy / Windy           Mostly Cloudy
4                        Fair                    Fair                    Fair
5                        Fair                  Cloudy                    Fair
6                        Fair                    Fair                    Fair
7                        Fair           Partly Cloudy                    Fair
8               Mostly Cloudy           Mostly Cloudy                  Cloudy
9                      Cloudy                  Cloudy                    Rain
10      Mostly Cloudy / Windy   Partly Cloudy / Windy   Partly Cloudy / Windy
11              Partly Cloudy           Partly Cloudy           Mostly Cloudy
12      Partly Cloudy / Windy            Fair / Windy           Partly Cloudy
13                     Cloudy                  Cloudy                  Cloudy
14              Partly Cloudy           Partly Cloudy           Partly Cloudy
15                       Rain              Light Rain              Light Rain
16                     Cloudy                  Cloudy           Mostly Cloudy
17                       Fair                    Fair                    Fair
18               Fair / Windy                    Fair                    Fair
19                       Fair                    Fair                    Fair
20                     Cloudy                  Cloudy                  Cloudy
21                       Fair                    Fair                    Fair
22        Light Snow / Windy      Light Snow / Windy      Light Snow / Windy
23        Light Snow / Windy           Cloudy / Windy                  Cloudy
24              Partly Cloudy                    Fair                    Fair
25              Mostly Cloudy                  Cloudy                  Cloudy
26              Mostly Cloudy                  Cloudy                  Cloudy
27              Partly Cloudy           Partly Cloudy                    Fair
28                     Cloudy                  Cloudy                  Cloudy
29                       Fair           Partly Cloudy           Partly Cloudy
30              Partly Cloudy           Partly Cloudy                  Cloudy

                5:51 AM         6:51 AM         7:51 AM                 8:51 AM  …  \
0                Cloudy          Cloudy   Mostly Cloudy                  Cloudy  …
1         Partly Cloudy            Fair   Partly Cloudy           Mostly Cloudy  …
2                  Fair            Fair            Fair                    Fair  …
3         Mostly Cloudy   Partly Cloudy   Mostly Cloudy           Mostly Cloudy  …
4                  Fair            Fair            Fair                    Fair  …
5                Cloudy          Cloudy          Cloudy                  Cloudy  …
6                  Fair   Partly Cloudy   Partly Cloudy           Mostly Cloudy  …
7                  Fair            Fair            Fair           Partly Cloudy  …
8                Cloudy          Cloudy          Cloudy           Mostly Cloudy  …
9            Heavy Rain            Rain            Rain              Heavy Rain  …
10                 Fair            Fair            Fair                    Fair  …
```

11	Mostly Cloudy	Partly Cloudy	Mostly Cloudy	Mostly Cloudy	…
12	Fair / Windy	Fair / Windy	Fair / Windy	Fair	…
13	Cloudy	Light Snow	Cloudy	Cloudy	…
14	Partly Cloudy	Cloudy	Cloudy	Cloudy	…
15	Light Rain	Cloudy	Light Rain	Light Rain	…
16	Fair	Fair	Mostly Cloudy	Cloudy	…
17	Fair / Windy	Partly Cloudy	Light Snow	Mostly Cloudy / Windy	…
18	Fair	Fair / Windy	Fair	Fair / Windy	…
19	Fair	Partly Cloudy	Fair	Partly Cloudy	…
20	Cloudy	Partly Cloudy	Fair	Fair	…
21	Fair	Fair	Fair	Mostly Cloudy	…
22	Snow / Windy	Snow	Snow / Windy	Heavy Snow / Windy	…
23	Fair / Windy	Fair	Fair	Fair	…
24	Mostly Cloudy	Cloudy	Cloudy	Cloudy	…
25	Cloudy	Cloudy	Cloudy	Cloudy	…
26	Cloudy	Cloudy	Cloudy	Cloudy	…
27	Fair	Fair	Fair	Fair	…
28	Cloudy	Mostly Cloudy	Partly Cloudy	Partly Cloudy	…
29	Fair	Fair	Fair	Fair	…
30	Cloudy	Cloudy	Mostly Cloudy	Mostly Cloudy	…

	2:51 PM	3:51 PM	4:51 PM \
0	Cloudy	Mostly Cloudy	Mostly Cloudy
1	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
2	Partly Cloudy	Partly Cloudy	Partly Cloudy
3	Fair / Windy	Fair	Fair
4	Fair	Fair	Fair
5	Fair	Fair	Fair
6	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
7	Cloudy	Mostly Cloudy	Cloudy
8	Cloudy	Cloudy	Cloudy
9	Fog	Fog	Light Rain
10	Fair	Fair	Fair / Windy
11	Cloudy	Cloudy	Cloudy / Windy
12	Fair / Windy	Fair	Partly Cloudy
13	Mostly Cloudy	Mostly Cloudy	Cloudy
14	Cloudy	Cloudy	Cloudy
15	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
16	Cloudy	Light Snow	Light Snow
17	Fair / Windy	Partly Cloudy / Windy	Mostly Cloudy / Windy
18	Fair / Windy	Fair / Windy	Partly Cloudy / Windy
19	Mostly Cloudy	Cloudy	Cloudy
20	Partly Cloudy	Partly Cloudy	Partly Cloudy / Windy
21	Cloudy	Cloudy	Cloudy
22	Heavy Snow / Windy	Heavy Snow / Windy	Heavy Snow
23	Partly Cloudy	Partly Cloudy	Partly Cloudy
24	Mostly Cloudy	Cloudy	Cloudy

25	Cloudy	Cloudy	Fair
26	Cloudy	Cloudy	Fair
27	Fair	Mostly Cloudy	Cloudy
28	Cloudy	Cloudy	Cloudy
29	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
30	Mostly Cloudy	Cloudy	Mostly Cloudy

	5:51 PM	6:51 PM	7:51 PM \
0	Partly Cloudy	Partly Cloudy	Partly Cloudy
1	Mostly Cloudy	Partly Cloudy	Fair
2	Mostly Cloudy	Partly Cloudy	Partly Cloudy
3	Fair / Windy	Fair / Windy	Fair
4	Fair	Fair	Fair
5	Fair	Fair	Fair
6	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
7	Cloudy	Cloudy	Cloudy
8	Cloudy	Cloudy	Cloudy
9	Mostly Cloudy	Partly Cloudy	Fair
10	Fair	Fair	Fair
11	Light Rain	Cloudy	Mostly Cloudy
12	Partly Cloudy	Mostly Cloudy	Partly Cloudy
13	Cloudy	Cloudy	Cloudy
14	Cloudy	Cloudy	Cloudy
15	Cloudy	Cloudy	Mostly Cloudy
16	Light Snow	Light Snow	Light Snow
17	Partly Cloudy	Partly Cloudy / Windy	Partly Cloudy / Windy
18	Partly Cloudy / Windy	Fair	Fair / Windy
19	Cloudy	Mostly Cloudy	Mostly Cloudy
20	Partly Cloudy	Mostly Cloudy	Partly Cloudy
21	Cloudy	Cloudy	Cloudy
22	Heavy Snow / Windy	Heavy Snow / Windy	Heavy Snow
23	Mostly Cloudy	Mostly Cloudy	Partly Cloudy
24	Cloudy	Cloudy	Mostly Cloudy
25	Cloudy	Cloudy	Cloudy
26	Cloudy	Cloudy	Cloudy
27	Mostly Cloudy	Partly Cloudy	Cloudy
28	Mostly Cloudy / Windy	Mostly Cloudy / Windy	Mostly Cloudy / Windy
29	Mostly Cloudy	Partly Cloudy	Partly Cloudy
30	Cloudy	Mostly Cloudy	Cloudy

	8:51 PM	9:51 PM	10:51 PM \
0	Fair	Fair	Fair
1	Fair	Fair	Fair
2	Partly Cloudy	Fair	Fair
3	Partly Cloudy / Windy	Mostly Cloudy / Windy	Mostly Cloudy / Windy
4	Fair	Fair	Fair
5	Fair	Fair	Fair

6	Fair	Fair	Fair
7	Cloudy	Cloudy	Cloudy
8	Cloudy	Light Drizzle	Cloudy
9	Mostly Cloudy	Fair / Windy	Fair / Windy
10	Fair	Fair	Fair
11	Mostly Cloudy	Cloudy / Windy	Mostly Cloudy / Windy
12	Cloudy	Cloudy	Cloudy
13	Cloudy	Partly Cloudy	Mostly Cloudy
14	Cloudy	Cloudy	Cloudy
15	Cloudy	Cloudy	Cloudy
16	Light Snow	Mostly Cloudy	Partly Cloudy
17	Fair / Windy	Fair	Fair / Windy
18	Fair	Fair	Mostly Cloudy / Windy
19	Cloudy	Cloudy	Cloudy
20	Partly Cloudy	Fair	Fair
21	Cloudy	Cloudy	Cloudy
22	Heavy Snow / Windy	Snow / Windy	Light Snow
23	Partly Cloudy	Mostly Cloudy	Mostly Cloudy
24	Fair	Fair	Fair
25	Cloudy	Cloudy	Cloudy
26	Cloudy	Cloudy	Cloudy
27	Cloudy	Cloudy	Cloudy
28	Partly Cloudy / Windy	Fair	Fair
29	Partly Cloudy	Cloudy	Mostly Cloudy
30	Cloudy	Cloudy	Cloudy

	11:51 PM
0	Fair
1	Fair
2	Fair
3	Fair / Windy
4	Fair
5	Fair
6	Fair
7	Cloudy
8	Cloudy
9	Fair
10	Fair
11	Partly Cloudy
12	Cloudy
13	Cloudy
14	Cloudy
15	Mostly Cloudy
16	Partly Cloudy
17	Fair / Windy
18	Mostly Cloudy
19	Cloudy

```
20      Partly Cloudy
21         Light Snow
22  Light Snow / Windy
23             Cloudy
24      Mostly Cloudy
25             Cloudy
26             Cloudy
27             Cloudy
28               Fair
29      Mostly Cloudy
30             Cloudy

[31 rows x 25 columns]
```

```python
weather.columns = ['time'] + [i for i in range(24)]
weather_list = weather.iloc[:,1:].values.tolist()
weather
```

	time	0	1 \
0	2016/1/1	Fair	Cloudy
1	2016/1/2	Fair	Fair
2	2016/1/3	Fair	Fair
3	2016/1/4	Partly Cloudy / Windy	Fair
4	2016/1/5	Fair	Fair / Windy
5	2016/1/6	Fair	Fair
6	2016/1/7	Fair	Fair
7	2016/1/8	Cloudy	Fair
8	2016/1/9	Cloudy	Cloudy
9	2016/1/10	Mostly Cloudy	Light Rain
10	2016/1/11	Fair	Mostly Cloudy
11	2016/1/12	Partly Cloudy / Windy	Fair
12	2016/1/13	Cloudy	Fair / Windy
13	2016/1/14	Cloudy	Mostly Cloudy
14	2016/1/15	Cloudy	Cloudy
15	2016/1/16	Mostly Cloudy	Cloudy
16	2016/1/17	Cloudy	Mostly Cloudy
17	2016/1/18	Fair	Fair
18	2016/1/19	Partly Cloudy / Windy	Fair
19	2016/1/20	Cloudy	Fair / Windy
20	2016/1/21	Fair / Windy	NaN
21	2016/1/22	Light Snow	Fair
22	2016/1/23	Light Snow	Light Snow
23	2016/1/24	Cloudy	Light Snow / Windy
24	2016/1/25	Cloudy	Partly Cloudy
25	2016/1/26	Cloudy	Cloudy
26	2016/1/27	Cloudy	Cloudy
27	2016/1/28	Cloudy	Fair

```
28  2016/1/29                   Fair              Cloudy
29  2016/1/30           Partly Cloudy      Partly Cloudy
30  2016/1/31                 Cloudy              Cloudy

                             2                      3                      4  \
0                       Cloudy                 Cloudy                 Cloudy
1                         Fair         Mostly Cloudy          Mostly Cloudy
2                         Fair                   Fair                   Fair
3                Mostly Cloudy  Mostly Cloudy / Windy          Mostly Cloudy
4                         Fair                   Fair                   Fair
5                         Fair                 Cloudy                   Fair
6                         Fair                   Fair                   Fair
7                         Fair          Partly Cloudy                   Fair
8                Mostly Cloudy          Mostly Cloudy                 Cloudy
9                       Cloudy                 Cloudy                   Rain
10       Mostly Cloudy / Windy  Partly Cloudy / Windy  Partly Cloudy / Windy
11               Partly Cloudy          Partly Cloudy          Mostly Cloudy
12       Partly Cloudy / Windy           Fair / Windy          Partly Cloudy
13                      Cloudy                 Cloudy                 Cloudy
14               Partly Cloudy          Partly Cloudy          Partly Cloudy
15                        Rain             Light Rain             Light Rain
16                      Cloudy                 Cloudy          Mostly Cloudy
17                        Fair                   Fair                   Fair
18                Fair / Windy                   Fair                   Fair
19                        Fair                   Fair                   Fair
20                      Cloudy                 Cloudy                 Cloudy
21                        Fair                   Fair                   Fair
22          Light Snow / Windy     Light Snow / Windy     Light Snow / Windy
23          Light Snow / Windy         Cloudy / Windy                 Cloudy
24               Partly Cloudy                   Fair                   Fair
25               Mostly Cloudy                 Cloudy                 Cloudy
26               Mostly Cloudy                 Cloudy                 Cloudy
27               Partly Cloudy          Partly Cloudy                   Fair
28                      Cloudy                 Cloudy                 Cloudy
29                        Fair          Partly Cloudy          Partly Cloudy
30               Partly Cloudy          Partly Cloudy                 Cloudy

                     5              6              7                  8  … \
0               Cloudy         Cloudy  Mostly Cloudy             Cloudy  …
1        Partly Cloudy           Fair  Partly Cloudy      Mostly Cloudy  …
2                 Fair           Fair           Fair               Fair  …
3        Mostly Cloudy  Partly Cloudy  Mostly Cloudy      Mostly Cloudy  …
4                 Fair           Fair           Fair               Fair  …
5               Cloudy         Cloudy         Cloudy             Cloudy  …
6                 Fair  Partly Cloudy  Partly Cloudy      Mostly Cloudy  …
7                 Fair           Fair           Fair      Partly Cloudy  …
8               Cloudy         Cloudy         Cloudy      Mostly Cloudy  …
```

9	Heavy Rain	Rain	Rain	Heavy Rain	…
10	Fair	Fair	Fair	Fair	…
11	Mostly Cloudy	Partly Cloudy	Mostly Cloudy	Mostly Cloudy	…
12	Fair / Windy	Fair / Windy	Fair / Windy	Fair	…
13	Cloudy	Light Snow	Cloudy	Cloudy	…
14	Partly Cloudy	Cloudy	Cloudy	Cloudy	…
15	Light Rain	Cloudy	Light Rain	Light Rain	…
16	Fair	Fair	Mostly Cloudy	Cloudy	…
17	Fair / Windy	Partly Cloudy	Light Snow	Mostly Cloudy / Windy	…
18	Fair	Fair / Windy	Fair	Fair / Windy	…
19	Fair	Partly Cloudy	Fair	Partly Cloudy	…
20	Cloudy	Partly Cloudy	Fair	Fair	…
21	Fair	Fair	Fair	Mostly Cloudy	…
22	Snow / Windy	Snow	Snow / Windy	Heavy Snow / Windy	…
23	Fair / Windy	Fair	Fair	Fair	…
24	Mostly Cloudy	Cloudy	Cloudy	Cloudy	…
25	Cloudy	Cloudy	Cloudy	Cloudy	…
26	Cloudy	Cloudy	Cloudy	Cloudy	…
27	Fair	Fair	Fair	Fair	…
28	Cloudy	Mostly Cloudy	Partly Cloudy	Partly Cloudy	…
29	Fair	Fair	Fair	Fair	…
30	Cloudy	Cloudy	Mostly Cloudy	Mostly Cloudy	…

	14	15	16 \
0	Cloudy	Mostly Cloudy	Mostly Cloudy
1	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
2	Partly Cloudy	Partly Cloudy	Partly Cloudy
3	Fair / Windy	Fair	Fair
4	Fair	Fair	Fair
5	Fair	Fair	Fair
6	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
7	Cloudy	Mostly Cloudy	Cloudy
8	Cloudy	Cloudy	Cloudy
9	Fog	Fog	Light Rain
10	Fair	Fair	Fair / Windy
11	Cloudy	Cloudy	Cloudy / Windy
12	Fair / Windy	Fair	Partly Cloudy
13	Mostly Cloudy	Mostly Cloudy	Cloudy
14	Cloudy	Cloudy	Cloudy
15	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
16	Cloudy	Light Snow	Light Snow
17	Fair / Windy	Partly Cloudy / Windy	Mostly Cloudy / Windy
18	Fair / Windy	Fair / Windy	Partly Cloudy / Windy
19	Mostly Cloudy	Cloudy	Cloudy
20	Partly Cloudy	Partly Cloudy	Partly Cloudy / Windy
21	Cloudy	Cloudy	Cloudy
22	Heavy Snow / Windy	Heavy Snow / Windy	Heavy Snow

23	Partly Cloudy	Partly Cloudy	Partly Cloudy
24	Mostly Cloudy	Cloudy	Cloudy
25	Cloudy	Cloudy	Fair
26	Cloudy	Cloudy	Fair
27	Fair	Mostly Cloudy	Cloudy
28	Cloudy	Cloudy	Cloudy
29	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
30	Mostly Cloudy	Cloudy	Mostly Cloudy

	17	18	19 \
0	Partly Cloudy	Partly Cloudy	Partly Cloudy
1	Mostly Cloudy	Partly Cloudy	Fair
2	Mostly Cloudy	Partly Cloudy	Partly Cloudy
3	Fair / Windy	Fair / Windy	Fair
4	Fair	Fair	Fair
5	Fair	Fair	Fair
6	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
7	Cloudy	Cloudy	Cloudy
8	Cloudy	Cloudy	Cloudy
9	Mostly Cloudy	Partly Cloudy	Fair
10	Fair	Fair	Fair
11	Light Rain	Cloudy	Mostly Cloudy
12	Partly Cloudy	Mostly Cloudy	Partly Cloudy
13	Cloudy	Cloudy	Cloudy
14	Cloudy	Cloudy	Cloudy
15	Cloudy	Cloudy	Mostly Cloudy
16	Light Snow	Light Snow	Light Snow
17	Partly Cloudy	Partly Cloudy / Windy	Partly Cloudy / Windy
18	Partly Cloudy / Windy	Fair	Fair / Windy
19	Cloudy	Mostly Cloudy	Mostly Cloudy
20	Partly Cloudy	Mostly Cloudy	Partly Cloudy
21	Cloudy	Cloudy	Cloudy
22	Heavy Snow / Windy	Heavy Snow / Windy	Heavy Snow
23	Mostly Cloudy	Mostly Cloudy	Partly Cloudy
24	Cloudy	Cloudy	Mostly Cloudy
25	Cloudy	Cloudy	Cloudy
26	Cloudy	Cloudy	Cloudy
27	Mostly Cloudy	Partly Cloudy	Cloudy
28	Mostly Cloudy / Windy	Mostly Cloudy / Windy	Mostly Cloudy / Windy
29	Mostly Cloudy	Partly Cloudy	Partly Cloudy
30	Cloudy	Mostly Cloudy	Cloudy

	20	21	22 \
0	Fair	Fair	Fair
1	Fair	Fair	Fair
2	Partly Cloudy	Fair	Fair
3	Partly Cloudy / Windy	Mostly Cloudy / Windy	Mostly Cloudy / Windy

4	Fair	Fair	Fair
5	Fair	Fair	Fair
6	Fair	Fair	Fair
7	Cloudy	Cloudy	Cloudy
8	Cloudy	Light Drizzle	Cloudy
9	Mostly Cloudy	Fair / Windy	Fair / Windy
10	Fair	Fair	Fair
11	Mostly Cloudy	Cloudy / Windy	Mostly Cloudy / Windy
12	Cloudy	Cloudy	Cloudy
13	Cloudy	Partly Cloudy	Mostly Cloudy
14	Cloudy	Cloudy	Cloudy
15	Cloudy	Cloudy	Cloudy
16	Light Snow	Mostly Cloudy	Partly Cloudy
17	Fair / Windy	Fair	Fair / Windy
18	Fair	Fair	Mostly Cloudy / Windy
19	Cloudy	Cloudy	Cloudy
20	Partly Cloudy	Fair	Fair
21	Cloudy	Cloudy	Cloudy
22	Heavy Snow / Windy	Snow / Windy	Light Snow
23	Partly Cloudy	Mostly Cloudy	Mostly Cloudy
24	Fair	Fair	Fair
25	Cloudy	Cloudy	Cloudy
26	Cloudy	Cloudy	Cloudy
27	Cloudy	Cloudy	Cloudy
28	Partly Cloudy / Windy	Fair	Fair
29	Partly Cloudy	Cloudy	Mostly Cloudy
30	Cloudy	Cloudy	Cloudy

	23
0	Fair
1	Fair
2	Fair
3	Fair / Windy
4	Fair
5	Fair
6	Fair
7	Cloudy
8	Cloudy
9	Fair
10	Fair
11	Partly Cloudy
12	Cloudy
13	Cloudy
14	Cloudy
15	Mostly Cloudy
16	Partly Cloudy
17	Fair / Windy

```
18        Mostly Cloudy
19               Cloudy
20        Partly Cloudy
21          Light Snow
22  Light Snow / Windy
23               Cloudy
24        Mostly Cloudy
25               Cloudy
26               Cloudy
27               Cloudy
28                 Fair
29        Mostly Cloudy
30               Cloudy

[31 rows x 25 columns]
```

[4]:
```python
possible = []
for i in weather_list:
    possible = possible + i

possible = list(set(possible))
possible
len(possible)
```

[4]: 21

[5]:
```python
preci = ['Heavy Rain','Light Drizzle', 'Light Snow', 'Rain',
         'Light Rain / Windy', 'Heavy Snow', 'Snow', 'Light Snow / Windy',
         'Snow / Windy', 'Light Rain', 'Heavy Snow / Windy']

remain = ['Partly Cloudy', 'Cloudy / Windy', 'Partly Cloudy / Windy',
          'Fair / Windy', 'Fair', 'Mostly Cloudy',
          'Mostly Cloudy / Windy', 'Fog', 'Cloudy']
```

[ ]:

[6]:
```python
def precipitation_or_not(condition):
    if condition in preci:
        return 'preci'
    elif condition in remain:
        return 'remain'
    else:
        return 'unknown'
```

[7]:
```python
for i in range(24):
    weather.loc[:,i] = weather.loc[:,i].apply(precipitation_or_not)
```

```
[8]: weather.iloc[20,2] = 'remain'
```

```
[ ]:
```

```
[9]: weather['time'] = pd.to_datetime(weather['time'], format='%Y/%m/%d')
     weather
```

```
[9]:          time       0       1       2       3       4       5       6       7  \
     0   2016-01-01  remain  remain  remain  remain  remain  remain  remain  remain
     1   2016-01-02  remain  remain  remain  remain  remain  remain  remain  remain
     2   2016-01-03  remain  remain  remain  remain  remain  remain  remain  remain
     3   2016-01-04  remain  remain  remain  remain  remain  remain  remain  remain
     4   2016-01-05  remain  remain  remain  remain  remain  remain  remain  remain
     5   2016-01-06  remain  remain  remain  remain  remain  remain  remain  remain
     6   2016-01-07  remain  remain  remain  remain  remain  remain  remain  remain
     7   2016-01-08  remain  remain  remain  remain  remain  remain  remain  remain
     8   2016-01-09  remain  remain  remain  remain  remain  remain  remain  remain
     9   2016-01-10  remain   preci  remain  remain   preci   preci   preci   preci
     10  2016-01-11  remain  remain  remain  remain  remain  remain  remain  remain
     11  2016-01-12  remain  remain  remain  remain  remain  remain  remain  remain
     12  2016-01-13  remain  remain  remain  remain  remain  remain  remain  remain
     13  2016-01-14  remain  remain  remain  remain  remain  remain   preci  remain
     14  2016-01-15  remain  remain  remain  remain  remain  remain  remain  remain
     15  2016-01-16  remain  remain   preci   preci   preci   preci  remain   preci
     16  2016-01-17  remain  remain  remain  remain  remain  remain  remain  remain
     17  2016-01-18  remain  remain  remain  remain  remain  remain  remain   preci
     18  2016-01-19  remain  remain  remain  remain  remain  remain  remain  remain
     19  2016-01-20  remain  remain  remain  remain  remain  remain  remain  remain
     20  2016-01-21  remain  remain  remain  remain  remain  remain  remain  remain
     21  2016-01-22   preci  remain  remain  remain  remain  remain  remain  remain
     22  2016-01-23   preci   preci   preci   preci   preci   preci   preci   preci
     23  2016-01-24  remain   preci   preci  remain  remain  remain  remain  remain
     24  2016-01-25  remain  remain  remain  remain  remain  remain  remain  remain
     25  2016-01-26  remain  remain  remain  remain  remain  remain  remain  remain
     26  2016-01-27  remain  remain  remain  remain  remain  remain  remain  remain
     27  2016-01-28  remain  remain  remain  remain  remain  remain  remain  remain
     28  2016-01-29  remain  remain  remain  remain  remain  remain  remain  remain
     29  2016-01-30  remain  remain  remain  remain  remain  remain  remain  remain
     30  2016-01-31  remain  remain  remain  remain  remain  remain  remain  remain

             8  …      14      15      16      17      18      19      20  \
     0   remain  …  remain  remain  remain  remain  remain  remain  remain
     1   remain  …  remain  remain  remain  remain  remain  remain  remain
     2   remain  …  remain  remain  remain  remain  remain  remain  remain
     3   remain  …  remain  remain  remain  remain  remain  remain  remain
     4   remain  …  remain  remain  remain  remain  remain  remain  remain
     5   remain  …  remain  remain  remain  remain  remain  remain  remain
```

```
6    remain  …  remain  remain  remain  remain  remain  remain  remain
7    remain  …  remain  remain  remain  remain  remain  remain  remain
8    remain  …  remain  remain  remain  remain  remain  remain  remain
9     preci  …  remain  remain   preci  remain  remain  remain  remain
10   remain  …  remain  remain  remain  remain  remain  remain  remain
11   remain  …  remain  remain  remain   preci  remain  remain  remain
12   remain  …  remain  remain  remain  remain  remain  remain  remain
13   remain  …  remain  remain  remain  remain  remain  remain  remain
14   remain  …  remain  remain  remain  remain  remain  remain  remain
15    preci  …  remain  remain  remain  remain  remain  remain  remain
16   remain  …  remain   preci   preci   preci   preci   preci   preci
17   remain  …  remain  remain  remain  remain  remain  remain  remain
18   remain  …  remain  remain  remain  remain  remain  remain  remain
19   remain  …  remain  remain  remain  remain  remain  remain  remain
20   remain  …  remain  remain  remain  remain  remain  remain  remain
21   remain  …  remain  remain  remain  remain  remain  remain  remain
22    preci  …   preci   preci   preci   preci   preci   preci   preci
23   remain  …  remain  remain  remain  remain  remain  remain  remain
24   remain  …  remain  remain  remain  remain  remain  remain  remain
25   remain  …  remain  remain  remain  remain  remain  remain  remain
26   remain  …  remain  remain  remain  remain  remain  remain  remain
27   remain  …  remain  remain  remain  remain  remain  remain  remain
28   remain  …  remain  remain  remain  remain  remain  remain  remain
29   remain  …  remain  remain  remain  remain  remain  remain  remain
30   remain  …  remain  remain  remain  remain  remain  remain  remain

        21      22      23
0    remain  remain  remain
1    remain  remain  remain
2    remain  remain  remain
3    remain  remain  remain
4    remain  remain  remain
5    remain  remain  remain
6    remain  remain  remain
7    remain  remain  remain
8     preci  remain  remain
9    remain  remain  remain
10   remain  remain  remain
11   remain  remain  remain
12   remain  remain  remain
13   remain  remain  remain
14   remain  remain  remain
15   remain  remain  remain
16   remain  remain  remain
17   remain  remain  remain
18   remain  remain  remain
19   remain  remain  remain
```

```
20  remain  remain  remain
21  remain  remain   preci
22   preci   preci   preci
23  remain  remain  remain
24  remain  remain  remain
25  remain  remain  remain
26  remain  remain  remain
27  remain  remain  remain
28  remain  remain  remain
29  remain  remain  remain
30  remain  remain  remain

[31 rows x 25 columns]
```

[10]: `weather.to_csv('data/weather_preprocessed.csv', index=False)`

[ ]: