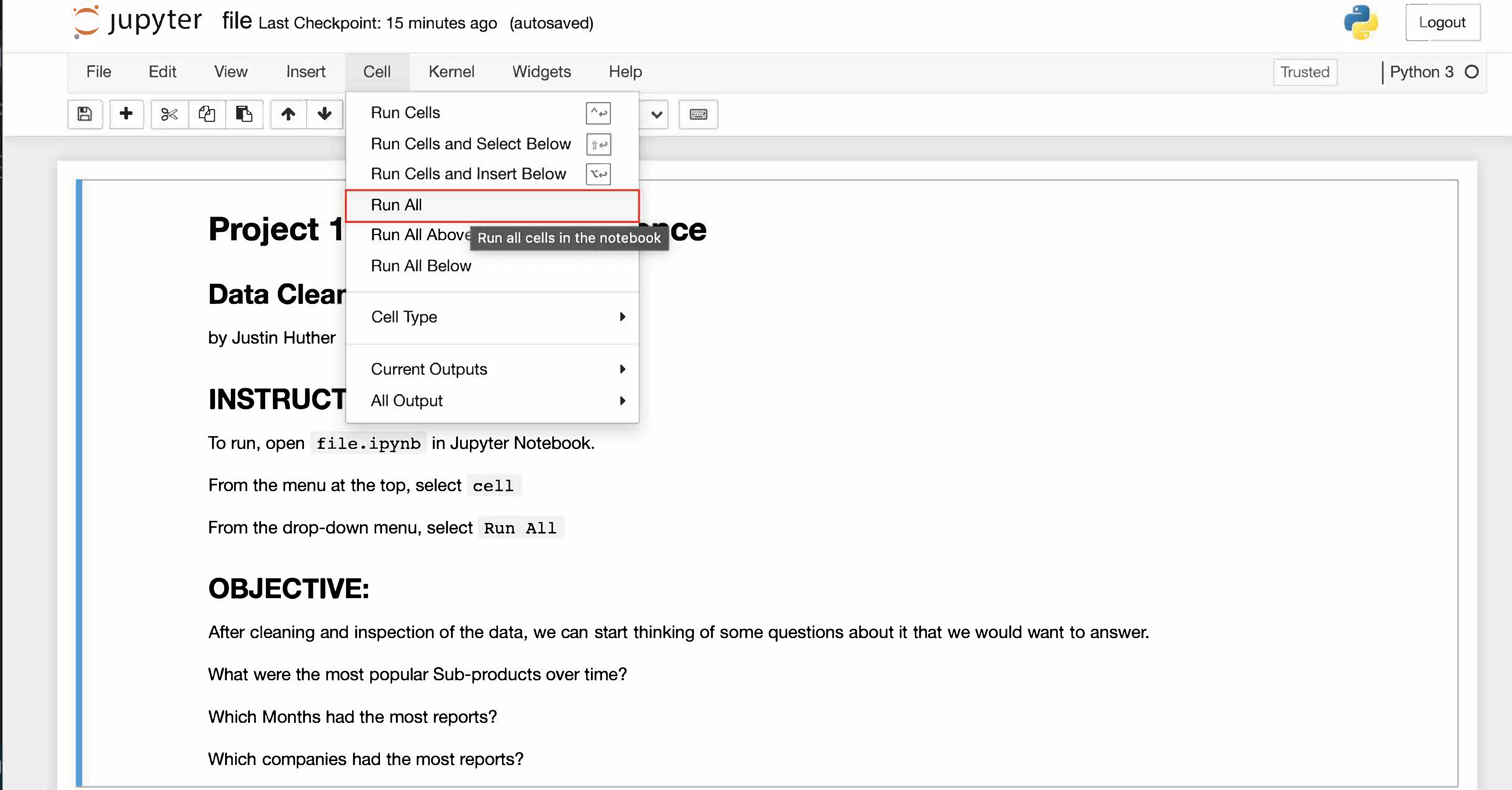

Project 1 ... ce

Data Clear

by Justin Huther

INSTRUCT

To run, open `file.ipynb` in Jupyter Notebook.

From the menu at the top, select `cell`

From the drop-down menu, select `Run All`

OBJECTIVE:

After cleaning and inspection of the data, we can start thinking of some questions about it that we would want to answer.

What were the most popular Sub-products over time?

Which Months had the most reports?

Which companies had the most reports?

Project 1 - Intro To Data Science

Data Cleaning

by Justin Huther

INSTRUCTIONS:

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What were the most popular Sub-products over time?

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Which companies had the most reports?

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

Read data from CSV into DataFrame

In [2]:
```
path = "complaints"
#path to the file
complaints_data = pd.DataFrame()
complaints_data = pd.read_csv(path + ".csv")
#read from csv into DataFrame
```

In [3]:
```
months = ["January","February","March","April","May","June","July",
            "August","September","October","November","December"]
```

In [4]:
```
complaints_data.head(3)
#print head
```

Out[4]:

	Date received	Product	Sub-product	Issue	Sub-issue	Consumer complaint narrative	Company public response	Company
0	6/13/19	Credit reporting, credit repair services, or o...	Credit reporting	Incorrect information on your report	Information belongs to someone else	NaN	NaN	CAPITAL ONE FINANCIAL CORPORATION
1	11/1/19	Vehicle loan or lease	Loan	Struggling to pay your loan	Denied request to lower payments	I contacted Ally on Friday XX/XX/XXXX after fa...	Company has responded to the consumer and the ...	ALLY FINANCIAL INC.
2	4/1/19	Credit reporting, credit repair services, or o...	Credit reporting	Incorrect information on your report	Account status incorrect	NaN	Company has responded to the consumer and the ...	TRANSUNION INTERMEDIATE HOLDINGS, INC.

What is the shape of our DataFrame?

In [5]:

```
print("The shape in (rows, cols) =", complaints_data.shape)
#print shape
```

```
The shape in (rows, cols) = (50001, 18)
```

Lets clean up the data!

Drop Tags Column

Drop rows of NAN

In [6]:

```
# drop 'Tags'
complaints_data = complaints_data.drop(columns=['Tags'])
nan_df = complaints_data[complaints_data.isna().any(axis=1)]
```

In [7]:

```
# drop NAN
all_data = complaints_data.dropna(how='all')
all_data.to_csv("all_data_noNan.csv", index=False)
```

Convert 'ZIP Code' column to correct type

In [8]:

```
all_data = all_data.dropna(subset=['ZIP code'])
#Drop NaN characters
all_data['ZIP code'] = all_data['ZIP code'].astype(int)
#Convert to int
```

Convert 'Timely response?' column to correct type

In [9]:
```
all_data = all_data.dropna(subset=['Timely response?'])
#Drop NaN characters
all_data['Timely response?'] = all_data['Timely response?'] == 'Yes'
#Convert to bool
all_data['Consumer disputed?'] = all_data['Consumer disputed?'] == 'Yes'
#Convert to bool
all_data['Date received'] = pd.to_datetime(all_data['Date received'])
#Convert to date time
```

Add 'month_year' and 'Month' column

In [10]:
```
all_data['month_year'] = pd.to_datetime(all_data['Date received']).dt.to_period(
#create month_year column and fill from datetime
all_data['Month'] = pd.to_datetime(all_data['Date received']).dt.month
#create Month column and fill from datetime
```

Output cleaned DataFrame to CSV

In [11]:
```
all_data.to_csv(path + "_cleaned.csv", index=False)
#output to csv
all_data.head(3)
#print head
```

Out[11]:

	Date received	Product	Sub-product	Issue	Sub-issue	Consumer complaint narrative	Company public response	Company
0	2019-06-13	Credit reporting, credit repair services, or o...	Credit reporting	Incorrect information on your report	Information belongs to someone else	NaN	NaN	CAPITAL ONE FINANCIAL CORPORATION
1	2019-11-01	Vehicle loan or lease	Loan	Struggling to pay your loan	Denied request to lower payments	I contacted Ally on Friday XX/XX/XXXX after fa...	Company has responded to the consumer and the ...	ALLY FINANCIAL INC.
2	2019-04-01	Credit reporting, credit repair services, or o...	Credit reporting	Incorrect information on your report	Account status incorrect	NaN	Company has responded to the consumer and the ...	TRANSUNION INTERMEDIATE HOLDINGS, INC.

Data Exploration!

Let us look at the number of complaints over time.

The graph below represents the amount of complaints.

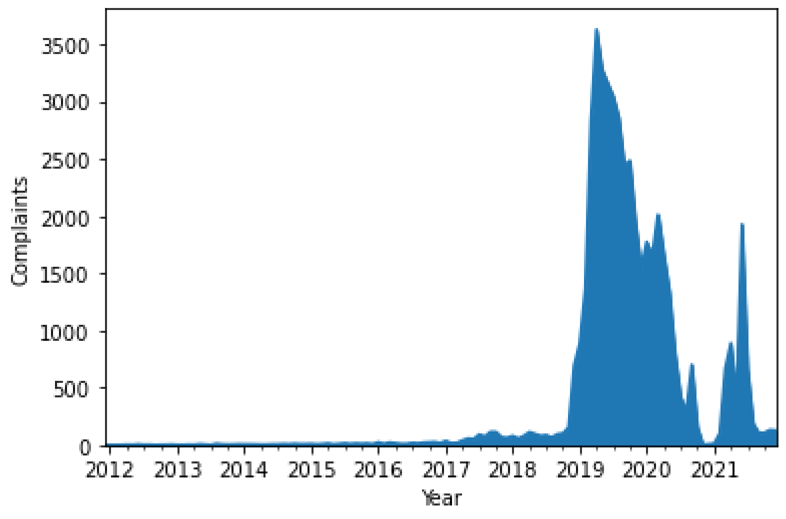
In [12]:

```
complaints_overTime = all_data.groupby('month_year').size().sort_values(ascendin
#create grouped Series to count complaints/time
print(complaints_overTime.sum(), "complaints total.")
#print total complaints
print(
    "The highest number of reports (",
    complaints_overTime.values[0],
    ") was during",
    complaints_overTime.index[0]
    )
#print top complaint
print(complaints_overTime.head())
#print head
complaints_overTime.sort_index(ascending=False).plot.area(xlabel="Year", ylabel=
#plot
```

```
48609 complaints total.
The highest number of reports ( 3629 ) was during 2019-04
month_year
2019-04    3629
2019-05    3281
2019-06    3161
2019-07    3045
2019-08    2860
Freq: M, dtype: int64
```

Out[12]:

```
<AxesSubplot:xlabel='Year', ylabel='Complaints'>
```



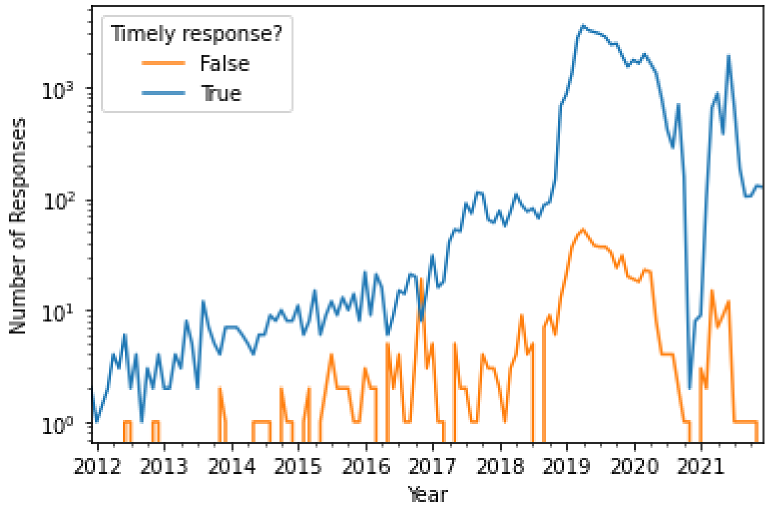
Next, let us look at the number of Timely Responses, and the response, over time.

The graph below represents the amount of responses, and the color represents the response given.

In [13]:
```python
timelyResponses_time = (
    all_data.sort_values(by='month_year')
    .groupby(pd.Grouper(key='month_year'))
    ['Timely response?'].value_counts()
    .unstack(fill_value=0)
)
#Group and sort
print(timelyResponses_time.sum(axis=0).head())
print(timelyResponses_time.sort_index(ascending=False).head())
#Print head
timelyResponses_time.plot.line(logy=True, color=['C1', 'C0'], xlabel="Year", yla
#plot
```

```
Timely response?
False      752
True     47857
dtype: int64
Timely response?  False  True
month_year
2021-12               0   128
2021-11               1   131
2021-10               1   106
2021-09               1   105
2021-08               1   187
```

Out[13]:
```
<AxesSubplot:xlabel='Year', ylabel='Number of Responses'>
```



Next, let us consider the problem ('Product') with the most complaints.

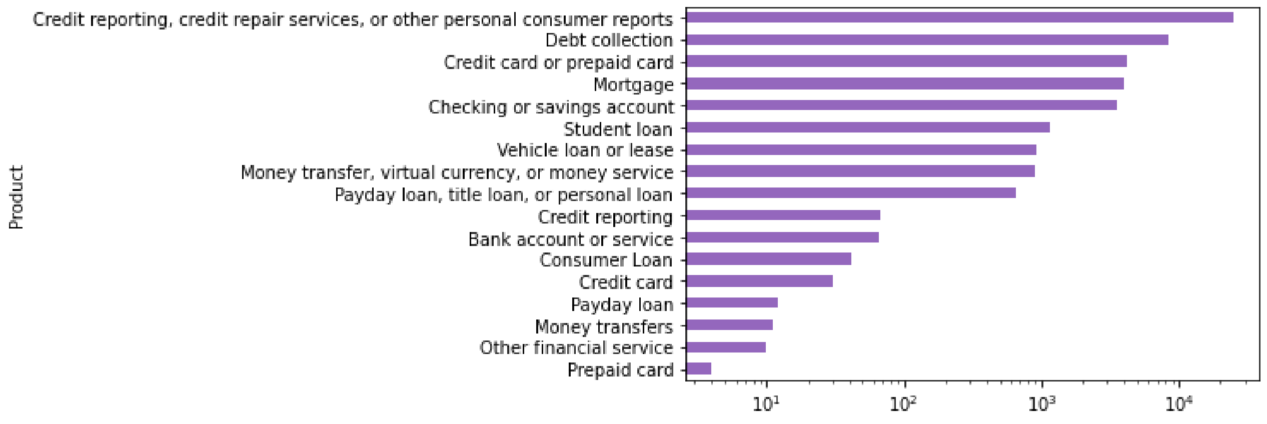
The graph below represents the number of complaints for each. It has a logarithm applied to the x-axis for better readability.

In [14]:
```python
productReports = all_data.groupby('Product').size().sort_values(ascending=False)
#Group and sort
print(
    "Product '",
    productReports.index[0],
    "' had the highest number of reports (",
    productReports.values[0],
    ")"
    )
```

```
#Print top result
print(productReports.head())
#Print head
productReports.sort_values(ascending=True).plot.barh(ylabel="Number of Reports",
#plot
```

```
Product ' Credit reporting, credit repair services, or other personal consumer r
eports ' had the highest number of reports ( 24733 )
Product
Credit reporting, credit repair services, or other personal consumer reports
24733
Debt collection
8260
Credit card or prepaid card
4217
Mortgage
3949
Checking or savings account
3581
dtype: int64
```

Out[14]:
```
<AxesSubplot:ylabel='Product'>
```



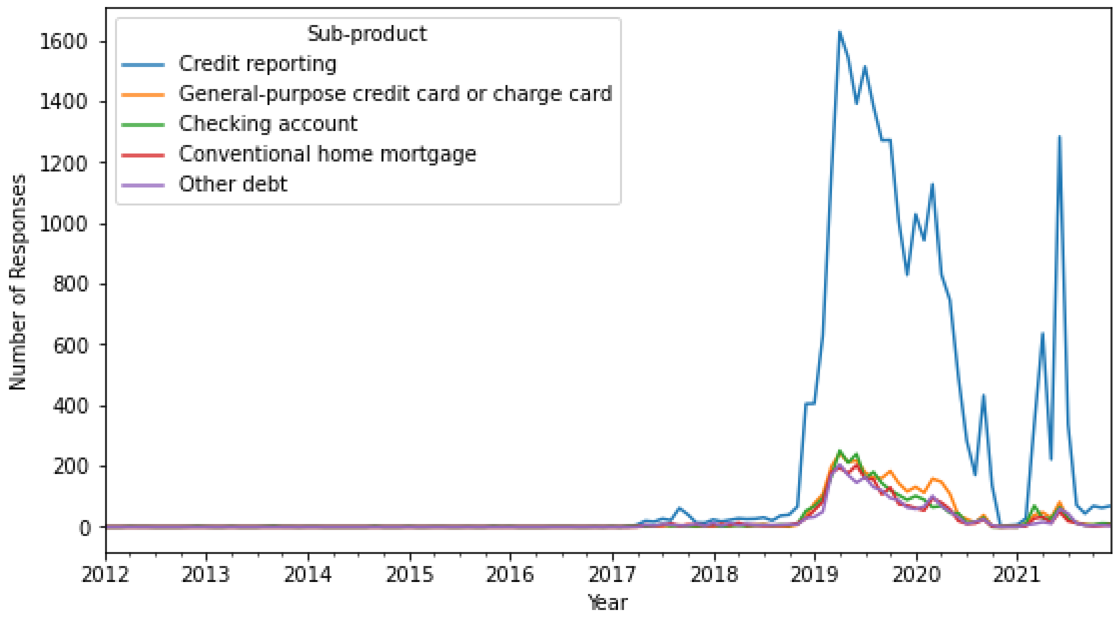
Question: What were the most popular Sub-products over time?

In [15]:
```
subProducts_time = (
    all_data.sort_values(by='month_year')
    .groupby(pd.Grouper(key='month_year'))
    ['Sub-product'].value_counts()
    .unstack(fill_value = 0)
    )
#Group and sort data for all sub products
subProducts_time = (
    subProducts_time[
        subProducts_time.sum(0)
        .sort_values(ascending=False)
        [:5].index]
    )
#Keep only the five most popular
print(
    subProducts_time.sum(axis=0).index[0],
    "is the most popular Sub-product, with",
    subProducts_time.sum(axis=0)[0],
    "complaints total."
    )
```

```
#print top result
print(subProducts_time.sum(axis=0).head())
#Print head
subProducts_time.plot.line(xlabel="Year", ylabel='Number of Responses', legend=T
#plot
```

```
Credit reporting is the most popular Sub-product, with 24359 complaints total.
Sub-product
Credit reporting                                24359
General-purpose credit card or charge card       3177
Checking account                                 2766
Conventional home mortgage                       2337
Other debt                                       2211
dtype: int64
```

Out[15]:
```
<AxesSubplot:xlabel='Year', ylabel='Number of Responses'>
```



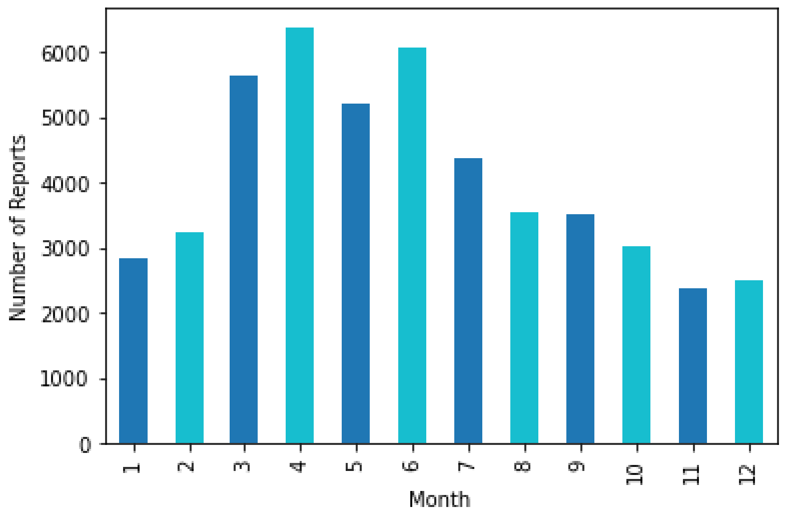
Question: Which Months had the most reports?

In [16]:
```
productReports = all_data.groupby('Month').size().sort_values(ascending=False)
#Group and sort
print(
    "Month",
    productReports.index[0],
    "(", months[productReports.index[0] - 1], ")",
    "had the highest number of reports (",
    productReports.values[0],
    ")"
    )
print(productReports.head())
#Print head
productReports.sort_index().plot.bar(ylabel="Number of Reports",color=['C0', 'C9
#plot
```

```
Month 4 ( April ) had the highest number of reports ( 6373 )
Month
4     6373
6     6057
3     5646
5     5201
```

```
7    4359
dtype: int64
```

Out[16]:
```
<AxesSubplot:xlabel='Month', ylabel='Number of Reports'>
```

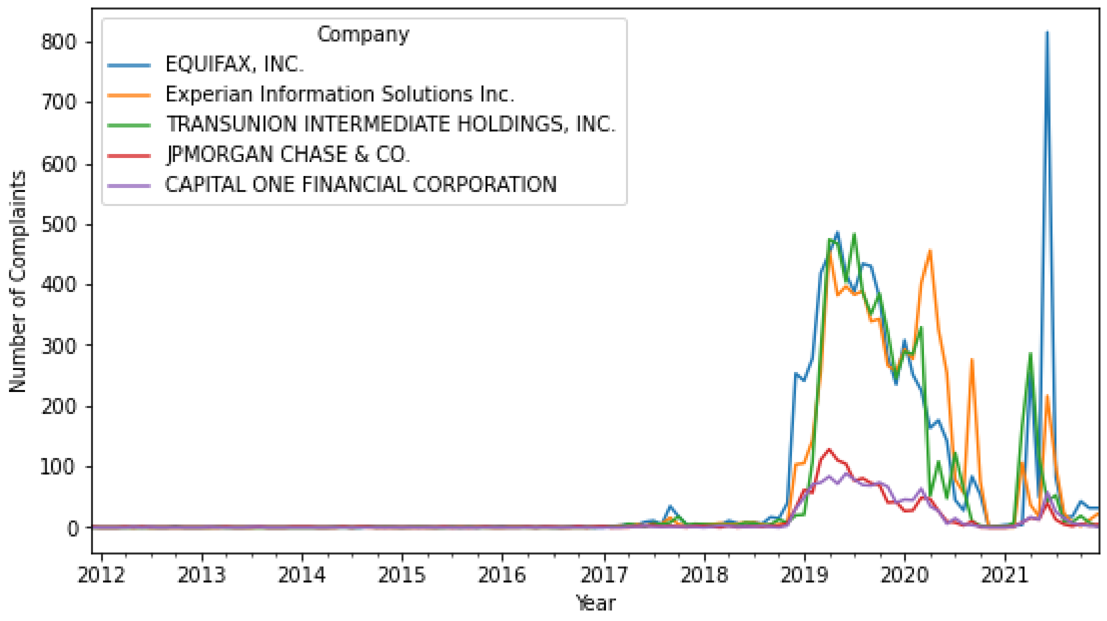


Question: Which companies had the most reports?

In [17]:
```
companyComplaints_time = (
    all_data.sort_values(by='month_year')
    .groupby(pd.Grouper(key='month_year'))
    ['Company'].value_counts()
    .unstack(fill_value = 0)
    )
#Group and sort data for all sub products
companyComplaints_time = (
    companyComplaints_time[
        companyComplaints_time.sum(0)
        .sort_values(ascending=False)
        [:5].index]
    )
#Keep only the five most popular
print(
    companyComplaints_time.sum(axis=0).index[0],
    "is the most popular Company, with",
    companyComplaints_time.sum(axis=0)[0],
    "complaints total."
    )
#print top result
print(companyComplaints_time.sum(axis=0).head())
#Print head
companyComplaints_time.plot.line(xlabel="Year", ylabel='Number of Complaints', l
#plot
```

```
EQUIFAX, INC. is the most popular Company, with 7766 complaints total.
Company
EQUIFAX, INC.                             7766
Experian Information Solutions Inc.       6982
TRANSUNION INTERMEDIATE HOLDINGS, INC.    6123
JPMORGAN CHASE & CO.                      1370
CAPITAL ONE FINANCIAL CORPORATION         1301
dtype: int64
```

Out[17]:
```
<AxesSubplot:xlabel='Year', ylabel='Number of Complaints'>
```



Company
EQUIFAX, INC.
Experian Information Solutions Inc.
TRANSUNION INTERMEDIATE HOLDINGS, INC.
JPMORGAN CHASE & CO.
CAPITAL ONE FINANCIAL CORPORATION
Number of Complaints
Year
0
100
200
300
400
500
600
700
800
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021