

Task A

A1

1. Code: `df.shape[0]`
There are 5792 instances
2. Code: `df.columns`
By counting how many elements in the list. There are 5 columns

A2

Code: `df.isnull().sum()`

```
Month                0
Transaction          0
Smartcard.Type       0
Action.Reason        0
Number.of.transactions 0
dtype: int64
```

There are no null values

A3

```
Month                object
Transaction          object
Smartcard.Type       object
Action.Reason        object
Number.of.transactions int64
dtype: object
```

Code:

```
data_types = df.dtypes
print(data_types)
```

A4

```
Month Transaction Smartcard.Type \
0 2019-03-01 Replace Smartcard Photo Identification Card
1 2019-03-01 Replace Smartcard Driver Licence Card
2 2019-03-01 Replace Smartcard Industry Authority Card
3 2019-03-01 Replace Smartcard Marine Licence Ind Card
4 2019-03-01 Replace Smartcard Marine Licence Ind Card
... ..
5787 2020-11-01 Replace Smartcard Photo Identification Card
5788 2020-12-01 Replace Smartcard Marine Licence Ind Card
5789 2021-07-01 Replace Smartcard Marine Licence Ind Card
5790 2021-07-01 Replace Smartcard Photo Identification Card
5791 2021-12-01 Replace Smartcard Driver Licence Card

Action.Reason Number.of.transactions
0 Change Customer Details 156
1 Destroyed 110
2 Lost In Mail - Imu 48
3 Managers Approval 8
4 Lost In Mail - Imu 7
... ..
5787 Remove Gender From Smartcard 1
5788 Stolen 1
5789 Stolen 1
5790 Merged 1
5791 Transition Laminate To Smartcard 2
```

[5792 rows x 5 columns]

Code:

```
df["Month"]=pd.to_datetime(df["Month"])
print(df)
```

A5

Number.of.transactions	
count	5792.000000
mean	303.241540
std	845.056684
min	1.000000
25%	5.000000
50%	18.000000
75%	84.000000
max	9097.000000

Code: `df[['Number.of.transactions']].describe()`

Discuss:

The average number of transactions until card replacement is 303.242.

There is a large variation on the number of transactions.

A7

1. Code:

```
types_amount= len(pd.unique(df['Smartcard.Type']))  
print('There are',types_amount,'types of smartcard')
```

There are 4 types of smartcards

2. Code:

```
df['Smartcard.Type'].value_counts()  
DLC_percent=(1896/5792)*100  
print('drivel licenser percent is',DLC_percent,'%')
```

Driver license percent if 32.735%

A7

1a. Code:

```
reason_types= pd.unique(df['Action.Reason'])  
print(reason_types)
```

```
['Change Customer Details' 'Destroyed' 'Lost In Mail - Imu'  
'Managers Approval' 'Disaster Relief' 'Lost' 'Merged' 'Stolen' 'Damaged'  
'Facial Image Is Not A True Likeness' 'Transition Laminate To Smartcard'  
'Condition Change' 'Expired' 'Product Exists Othr Surrend Void Cancel'  
'Da/dgd Smartcard Replacement Fee Exempt' 'Faulty'  
'Court Order Issued X3 Or X4 Condition' 'Marine Licence Transition'  
'Defective' 'Remove Gender From Smartcard']
```

1b. Code: `df['Action.Reason'].value_counts()`

Lost	539
Managers Approval	532
Change Customer Details	521
Lost In Mail - Imu	519
Stolen	471
Destroyed	379
Condition Change	364
Faulty	344
Damaged	342
Product Exists Othr Surrend Void Cancel	321
Facial Image Is Not A True Likeness	304
Transition Laminate To Smartcard	256
Merged	200
Court Order Issued X3 Or X4 Condition	137
Da/dgd Smartcard Replacement Fee Exempt	134
Expired	133
Marine Licence Transition	132
Defective	88
Disaster Relief	48
Remove Gender From Smartcard	28

Name: Action.Reason, dtype: int64

2.Code:

```
action_reason_lost=df.loc[(df['Action.Reason']=='Lost')]
```

```
action_reason_lost
```

	Month	Transaction	Smartcard.Type	Action.Reason	Number.of.transactions
6	2019-03-01	Replace Smartcard	Industry Authority Card	Lost	22
11	2019-04-01	Replace Smartcard	Industry Authority Card	Lost	30
12	2019-05-01	Replace Smartcard	Driver Licence Card	Lost	4907
22	2019-07-01	Replace Smartcard	Driver Licence Card	Lost	5369
23	2019-07-01	Replace Smartcard	Photo Identification Card	Lost	681
...
5735	2018-07-01	Replace Smartcard	Photo Identification Card	Lost	596
5748	2018-10-01	Replace Smartcard	Industry Authority Card	Lost	32
5749	2018-10-01	Replace Smartcard	Marine Licence Ind Card	Lost	7
5759	2018-12-01	Replace Smartcard	Photo Identification Card	Lost	445
5761	2018-12-01	Replace Smartcard	Industry Authority Card	Lost	31

539 rows × 5 columns

Code:

```
action_reason_lost['month new collumn'] =
pd.DatetimeIndex(action_reason_lost['Month']).month
```

```
action_reason_lost.head(20)
```

	Month	Transaction	Smartcard.Type	Action.Reason	Number.of.transactions	month new collumn
6	2019-03-01	Replace Smartcard	Industry Authority Card	Lost	22	3
11	2019-04-01	Replace Smartcard	Industry Authority Card	Lost	30	4
12	2019-05-01	Replace Smartcard	Driver Licence Card	Lost	4907	5
22	2019-07-01	Replace Smartcard	Driver Licence Card	Lost	5369	7
23	2019-07-01	Replace Smartcard	Photo Identification Card	Lost	681	7
30	2019-09-01	Replace Smartcard	Marine Licence Ind Card	Lost	15	9
32	2019-08-01	Replace Smartcard	Photo Identification Card	Lost	641	8
34	2019-09-01	Replace Smartcard	Industry Authority Card	Lost	23	9
46	2019-10-01	Replace Smartcard	Driver Licence Card	Lost	5261	10
52	2019-11-01	Replace Smartcard	Industry Authority Card	Lost	34	11
64	2020-02-01	Replace Smartcard	Industry Authority Card	Lost	29	2
75	2020-03-01	Replace Smartcard	Industry Authority Card	Lost	29	3
81	2020-06-01	Replace Smartcard	Driver Licence Card	Lost	4427	6
90	2020-08-01	Replace Smartcard	Photo Identification Card	Lost	625	8
102	2020-09-01	Replace Smartcard	Marine Licence Ind Card	Lost	9	9
111	2020-11-01	Replace Smartcard	Driver Licence Card	Lost	5748	11
117	2020-12-01	Replace Smartcard	Industry Authority Card	Lost	35	12
148	2011-08-01	Replace Smartcard	Driver Licence Card	Lost	2907	8
150	2011-08-01	Replace Smartcard	Industry Authority Card	Lost	36	8
151	2011-08-01	Replace Smartcard	Marine Licence Ind Card	Lost	5	8

Code:

```
action_reason_lost['month new collumn'].value_counts()
```

```
3      47
11     47
2      47
12     46
1      46
5      44
7      44
9      44
8      44
10     44
4      43
6      43
```

```
Name: month new collumn, dtype: int64
```

There is no month in which 100 or more smartcard replacements are reported due to being "Lost"

B1

1.Code:

```
df['Year']=df['Month'].dt.year
```

```
df
```

	Month	Transaction	Smartcard.Type	Action.Reason	Number.of.transactions	Year
0	2019-03-01	Replace Smartcard	Photo Identification Card	Change Customer Details	156	2019
1	2019-03-01	Replace Smartcard	Driver Licence Card	Destroyed	110	2019
2	2019-03-01	Replace Smartcard	Industry Authority Card	Lost In Mail - Imu	48	2019
3	2019-03-01	Replace Smartcard	Marine Licence Ind Card	Managers Approval	8	2019
4	2019-03-01	Replace Smartcard	Marine Licence Ind Card	Lost In Mail - Imu	7	2019
...
5787	2020-11-01	Replace Smartcard	Photo Identification Card	Remove Gender From Smartcard	1	2020
5788	2020-12-01	Replace Smartcard	Marine Licence Ind Card	Stolen	1	2020
5789	2021-07-01	Replace Smartcard	Marine Licence Ind Card	Stolen	1	2021
5790	2021-07-01	Replace Smartcard	Photo Identification Card	Merged	1	2021
5791	2021-12-01	Replace Smartcard	Driver Licence Card	Transition Laminate To Smartcard	2	2021

5792 rows × 6 columns

2 code:

```
df['Year'].value_counts()
```

```
year_frequency=[[2010,39],[2011,426],[2012,534],[2013,530],[2014,526],[2015,504],[2016,508],[2017,510],[2018,509],[2019,527],
[2020,519],[2021,522],[2022,138]]
```

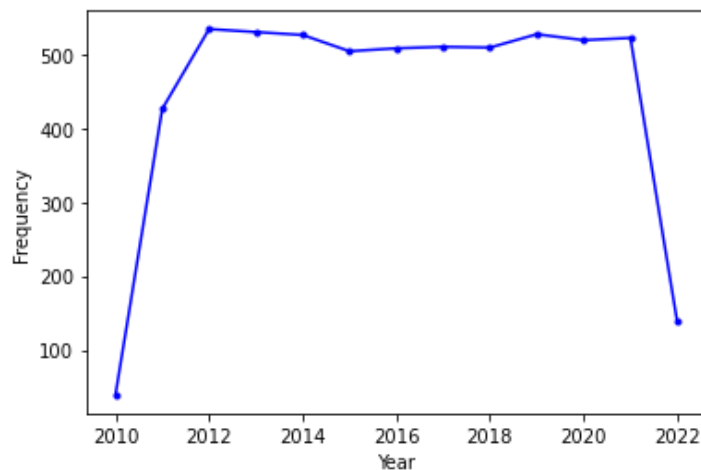
```
year_line = pd.DataFrame(year_frequency, columns=['Year', 'Frequency'])
```

year_line

	Year	Frequency
0	2010	39
1	2011	426
2	2012	534
3	2013	530
4	2014	526
5	2015	504
6	2016	508
7	2017	510
8	2018	509
9	2019	527
10	2020	519
11	2021	522
12	2022	138

Code:

```
plt.plot(year_line.Year, year_line.Frequency, 'b.-')  
plt.xlabel('Year')  
plt.ylabel('Frequency')  
plt.show()
```



3. 2010 is an odd year, after doing B3 I believe there is an increase in credit card replacement because people are using smartcard more often.

B2

1.how many Number.of.transactions for each Action.Reason

Code:

```
df_reason_bar=df.drop(['Month','Transaction','Smartcard.Type','Year'], axis=1)
```

df_reason_bar

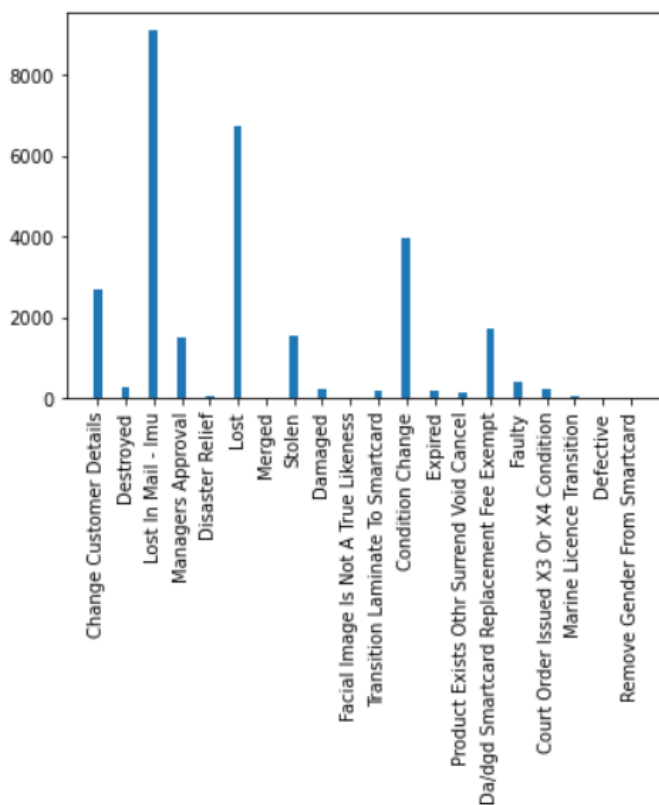
	Action.Reason	Number.of.transactions
0	Change Customer Details	156
1	Destroyed	110
2	Lost In Mail - Imu	48
3	Managers Approval	8
4	Lost In Mail - Imu	7
...
5787	Remove Gender From Smartcard	1
5788	Stolen	1
5789	Stolen	1
5790	Merged	1
5791	Transition Laminate To Smartcard	2

Code: df_reason_bar.groupby('Action.Reason').sum()

Action.Reason	Number.of.transactions
Change Customer Details	294435
Condition Change	344905
Court Order Issued X3 Or X4 Condition	17295
Da/dgd Smartcard Replacement Fee Exempt	8012
Damaged	13027
Defective	673
Destroyed	14393
Disaster Relief	313
Expired	2028
Facial Image Is Not A True Likeness	4272
Faulty	14876
Lost	642749
Lost In Mail - Imu	172552
Managers Approval	52555
Marine Licence Transition	1822
Merged	507
Product Exists Othr Surrend Void Cancel	5628
Remove Gender From Smartcard	47
Stolen	158356
Transition Laminate To Smartcard	7930

Code:

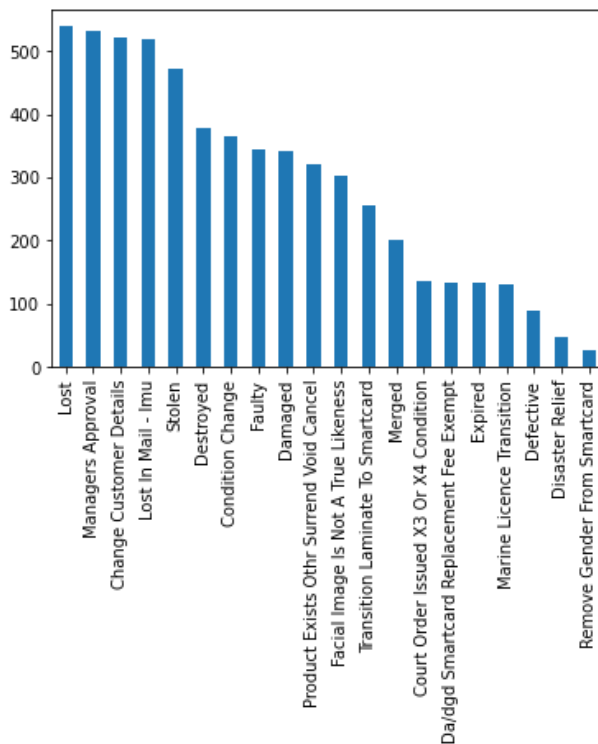
```
plt.bar(df_reason_bar['Action.Reason'],df_reason_bar['Number.of.transactions'], 0.3)
plt.xticks(rotation=90)
```



2.Code:

```
Action_Reason_count=df['Action.Reason'].value_counts()
```

Action_Reason_count.plot(kind='bar')



By seeing the bar chart of how often an 'Action.Reason' appears. The top 3 reasons are lost, manager approval, and change customer details.

3.

Action.Reason	Number.of.transactions
Change Customer Details	294435
Condition Change	344905
Court Order Issued X3 Or X4 Condition	17295
Da/dgd Smartcard Replacement Fee Exempt	8012
Damaged	13027
Defective	673
Destroyed	14393
Disaster Relief	313
Expired	2028
Facial Image Is Not A True Likeness	4272
Faulty	14876
Lost	642749
Lost In Mail - Imu	172552
Managers Approval	52555
Marine Licence Transition	1822
Merged	507
Product Exists Othr Surrend Void Cancel	5628
Remove Gender From Smartcard	47
Stolen	158356
Transition Laminate To Smartcard	7930

Code:

```
df_reason_bar.groupby('Action.Reason').sum()
```

By reading the table, we can see that the only 'Action.Reason' with number of transactions between 1000 and 2000 is 'Marine License Transisition'.

B3

Q1

To find the number of transactions annually starting from 2013 I used this function.

```
def find_NOT_of_each_AR_anually(year):
```

```
    df_year=df.loc[(df['Year']==year)]
```

```
    df_year=df_year.drop(['Month','Transaction','Smartcard.Type','Year'], axis=1)
```

```
    df_year=df_year.groupby('Action.Reason').sum()
```

```
    return df_year
```

1. Data for 2010

```
df_2010=df.loc[(df['Year']==2010)]
```

```
df_2010=df_2010.drop(['Month','Transaction','Smartcard.Type','Year'], axis=1)
```

```
df_2010=df_2010.groupby('Action.Reason').sum()
```

Action.Reason	Number.of.transactions
Change Customer Details	84
Condition Change	39
Court Order Issued X3 Or X4 Condition	7
Da/dgd Smartcard Replacement Fee Exempt	3
Damaged	9
Defective	1
Faulty	265
Lost	124
Lost In Mail - Imu	14
Managers Approval	13
Stolen	48
Transition Laminate To Smartcard	64

2. Data for 2011

```
df_2011=df.loc[(df['Year']==2011)]
```

```
df_2011=df_2011.drop(['Month','Transaction','Smartcard.Type','Year'], axis=1)
```

```
df_2011=df_2011.groupby('Action.Reason').sum()
```

```
df_2011
```

Action.Reason	Number.of.transactions
Change Customer Details	12265
Condition Change	7408
Court Order Issued X3 Or X4 Condition	1014
Da/dgd Smartcard Replacement Fee Exempt	3212
Damaged	1660
Defective	120
Destroyed	320
Disaster Relief	18
Expired	3
Facial Image Is Not A True Likeness	174
Faulty	1596
Lost	26325
Lost In Mail - Imu	1986
Managers Approval	2551
Marine Licence Transition	55
Merged	9
Product Exists Othr Surrend Void Cancel	260
Stolen	7929
Transition Laminate To Smartcard	1513

3. Data for 2012

```
df_2012=df.loc[(df['Year']==2012)]
```

```
df_2012=df_2012.drop(['Month','Transaction','Smartcard.Type','Year'], axis=1)
```

```
df_2012=df_2012.groupby('Action.Reason').sum()
```

Action.Reason	Number.of.transactions
Change Customer Details	28446
Condition Change	18136
Court Order Issued X3 Or X4 Condition	2085
Da/dgd Smartcard Replacement Fee Exempt	1118
Damaged	2709
Defective	243
Destroyed	750
Disaster Relief	4
Expired	7
Facial Image Is Not A True Likeness	381
Faulty	4199
Lost	57727
Lost In Mail - Imu	6002
Managers Approval	8803
Marine Licence Transition	94
Merged	23
Product Exists Othr Surrend Void Cancel	1489
Stolen	17132
Transition Laminate To Smartcard	1538

4. Data for 2013

```
df_2013=find_NOT_of_each_AR_anually(2013)
```

```
df_2013
```

Action.Reason	Number.of.transactions
Change Customer Details	28603
Condition Change	21262
Court Order Issued X3 Or X4 Condition	2219
Da/dgd Smartcard Replacement Fee Exempt	215
Damaged	1685
Defective	156
Destroyed	645
Disaster Relief	123
Expired	16
Facial Image Is Not A True Likeness	339
Faulty	2519
Lost	52220
Lost In Mail - Imu	8333
Managers Approval	9311
Marine Licence Transition	99
Merged	28
Product Exists Othr Surrend Void Cancel	1178
Stolen	15384
Transition Laminate To Smartcard	857

5. Data for 2014

```
df_2014=find_NOT_of_each_AR_anually(2014)
```

```
df_2014
```

Action.Reason	Number.of.transactions
Change Customer Details	28188
Condition Change	23426
Court Order Issued X3 Or X4 Condition	2244
Da/dgd Smartcard Replacement Fee Exempt	224
Damaged	1281
Defective	123
Destroyed	699
Disaster Relief	2
Expired	13
Facial Image Is Not A True Likeness	311
Faulty	2003
Lost	49599
Lost In Mail - Imu	14173
Managers Approval	6576
Marine Licence Transition	86
Merged	27
Product Exists Othr Surrend Void Cancel	1033
Stolen	13966
Transition Laminate To Smartcard	575

6. Data for 2015

Action.Reason	Number.of.transactions
Change Customer Details	28267
Condition Change	27316
Court Order Issued X3 Or X4 Condition	1928
Da/dgd Smartcard Replacement Fee Exempt	262
Damaged	1096
Defective	30
Destroyed	1025
Disaster Relief	7
Expired	36
Facial Image Is Not A True Likeness	334
Faulty	1472
Lost	52237
Lost In Mail - Imu	16777
Managers Approval	5738
Marine Licence Transition	120
Merged	25
Product Exists Othr Surrend Void Cancel	543
Stolen	13561
Transition Laminate To Smartcard	335

Code:

```
df_2015=find_NOT_of_each_AR_anually(2015)
df_2015
```

7. Data for 2016

```
df_2016=find_NOT_of_each_AR_anually(2016)
df_2016
```

Action.Reason	Number.of.transactions
Change Customer Details	27730
Condition Change	33056
Court Order Issued X3 Or X4 Condition	1634
Da/dgd Smartcard Replacement Fee Exempt	299
Damaged	1046
Destroyed	1278
Expired	45
Facial Image Is Not A True Likeness	376
Faulty	1100
Lost	55953
Lost In Mail - Imu	17784
Managers Approval	4071
Marine Licence Transition	165
Merged	29
Product Exists Othr Surrend Void Cancel	341
Stolen	14218
Transition Laminate To Smartcard	302

8. Data for 2017

df_2017=find_NOT_of_each_AR_anually(2017)

df_2017

Action.Reason	Number.of.transactions
Change Customer Details	26837
Condition Change	40274
Court Order Issued X3 Or X4 Condition	1450
Da/dgd Smartcard Replacement Fee Exempt	385
Damaged	747
Destroyed	1402
Disaster Relief	27
Expired	78
Facial Image Is Not A True Likeness	371
Faulty	549
Lost	56800
Lost In Mail - Imu	18667
Managers Approval	3128
Marine Licence Transition	190
Merged	19
Product Exists Othr Surrend Void Cancel	181
Remove Gender From Smartcard	8
Stolen	14200
Transition Laminate To Smartcard	413

9. Data for 2018

df_2018=find_NOT_of_each_AR_anually(2018)

df_2018

	Number.of.transactions
Action.Reason	
Change Customer Details	27083
Condition Change	41440
Court Order Issued X3 Or X4 Condition	1145
Da/dgd Smartcard Replacement Fee Exempt	438
Damaged	670
Destroyed	1394
Disaster Relief	8
Expired	92
Facial Image Is Not A True Likeness	395
Faulty	347
Lost	60463
Lost In Mail - Imu	18317
Managers Approval	2800
Marine Licence Transition	208
Merged	26
Product Exists Othr Surrend Void Cancel	154
Remove Gender From Smartcard	8
Stolen	14079
Transition Laminate To Smartcard	410

10. Data for 2019

```
df_2019=find_NOT_of_each_AR_anually(2019)
df_2019
```

	Number.of.transactions
Action.Reason	
Change Customer Details	26856
Condition Change	42143
Court Order Issued X3 Or X4 Condition	1148
Da/dgd Smartcard Replacement Fee Exempt	527
Damaged	674
Destroyed	1612
Disaster Relief	80
Expired	154
Facial Image Is Not A True Likeness	389
Faulty	293
Lost	65467
Lost In Mail - Imu	19784
Managers Approval	3231
Marine Licence Transition	243
Merged	53
Product Exists Othr Surrend Void Cancel	135
Remove Gender From Smartcard	3
Stolen	15150
Transition Laminate To Smartcard	453

11. Data for 2020

```
df_2020=find_NOT_of_each_AR_anually(2020)
df_2020
```

Action.Reason	Number.of.transactions
Change Customer Details	24934
Condition Change	38585
Court Order Issued X3 Or X4 Condition	1085
Da/dgd Smartcard Replacement Fee Exempt	554
Damaged	689
Destroyed	1961
Expired	227
Facial Image Is Not A True Likeness	463
Faulty	209
Lost	66765
Lost In Mail - Imu	18639
Managers Approval	2814
Marine Licence Transition	235
Merged	94
Product Exists Othr Surrend Void Cancel	129
Remove Gender From Smartcard	4
Stolen	13243
Transition Laminate To Smartcard	576

12. Data for 2021

```
df_2021=find_NOT_of_each_AR_anually(2021)
df_2021
```

Action.Reason	Number.of.transactions
Change Customer Details	28593
Condition Change	41637
Court Order Issued X3 Or X4 Condition	1082
Da/dgd Smartcard Replacement Fee Exempt	651
Damaged	627
Destroyed	2563
Expired	902
Facial Image Is Not A True Likeness	590
Faulty	253
Lost	79211
Lost In Mail - Imu	27262
Managers Approval	2848
Marine Licence Transition	264
Merged	142
Product Exists Othr Surrend Void Cancel	144
Remove Gender From Smartcard	20
Stolen	15144
Transition Laminate To Smartcard	738

13. Data for 2022

```
df_2022=find_NOT_of_each_AR_anually(2022)
df_2022
```

	Number.of.transactions
Action.Reason	
Change Customer Details	6549
Condition Change	10183
Court Order Issued X3 Or X4 Condition	254
Da/dgd Smartcard Replacement Fee Exempt	124
Damaged	134
Destroyed	744
Disaster Relief	44
Expired	455
Facial Image Is Not A True Likeness	149
Faulty	71
Lost	19858
Lost In Mail - Imu	4814
Managers Approval	671
Marine Licence Transition	63
Merged	32
Product Exists Othr Surrent Void Cancel	41
Remove Gender From Smartcard	4
Stolen	4302
Transition Laminate To Smartcard	156

Q2

Code: df_2010[df_2010['Number.of.transactions']> 10000]

	Number.of.transactions
Action.Reason	

Code: df_2011[df_2011['Number.of.transactions']> 10000]

	Number.of.transactions
Action.Reason	
Change Customer Details	12265
Lost	26325

Code: df_2012[df_2012['Number.of.transactions']> 10000]

	Number.of.transactions
Action.Reason	
Change Customer Details	28446
Condition Change	18136
Lost	57727
Stolen	17132

Code: df_2013[df_2013['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Change Customer Details	28603
Condition Change	21262
Lost	52220
Stolen	15384

Code: df_2014[df_2014['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Change Customer Details	28188
Condition Change	23426
Lost	49599
Lost In Mail - Imu	14173
Stolen	13966

Code: df_2015[df_2015['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Change Customer Details	28267
Condition Change	27316
Lost	52237
Lost In Mail - Imu	16777
Stolen	13561

Code: df_2016[df_2016['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Change Customer Details	27730
Condition Change	33056
Lost	55953
Lost In Mail - Imu	17784
Stolen	14218

Code: df_2017[df_2017['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Change Customer Details	26837
Condition Change	40274
Lost	56800
Lost In Mail - Imu	18667
Stolen	14200

Code: df_2018[df_2018['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Change Customer Details	27083
Condition Change	41440
Lost	60463
Lost In Mail - Imu	18317
Stolen	14079

Code: df_2019[df_2019['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Change Customer Details	26856
Condition Change	42143
Lost	65467
Lost In Mail - Imu	19784
Stolen	15150

Code: df_2020[df_2020['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Change Customer Details	24934
Condition Change	38585
Lost	66765
Lost In Mail - Imu	18639
Stolen	13243

Code: df_2021[df_2021['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Change Customer Details	28593
Condition Change	41637
Lost	79211
Lost In Mail - Imu	27262
Stolen	15144

Code: df_2022[df_2022['Number.of.transactions']> 10000]

Action.Reason	Number.of.transactions
Condition Change	10183
Lost	19858

I counted how much each 'Action.Reason' appears

1.change customer details= 11 years

2.condition change= 11 years

- 3 court order issued X3 or X4 condition = 0
4. Da/dgd smartcard replacement fee exempt = 0
5. damaged = 0
6. destroyed = 0
7. disaster relief = 0
- 8.expired = 0
- 9.facial image is not a true likeness = 0
- 10.faulty = 0
11. lost = 12 years
12. lost in mail-lmu= 8 years
13. manager approval = 0
14. marine license transistion = 0
15. merged = 0
16. Product Exists Othr Surrend Void Cancel = 0
17. Remove Gender From Smartcard = 0
18. Stolen = 10 years
19. Transition Laminate To Smartcard = 0

Q3: change customer details, condition change, lost, lost in mail-lmu, Stolen

Q4 Code:

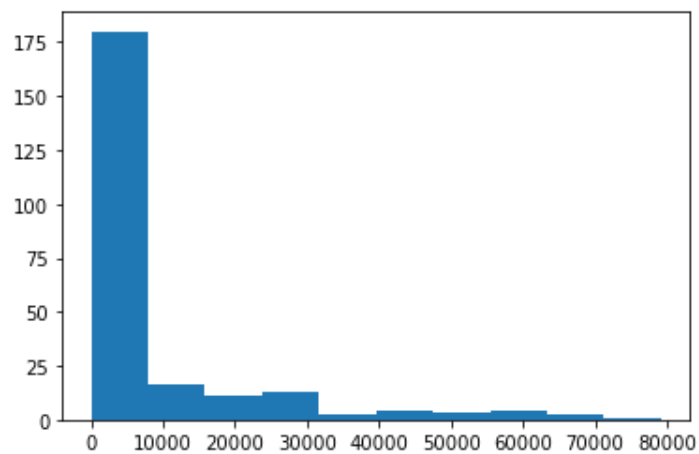
```
df_histogram=df.groupby(['Action.Reason','Year']).sum()
```

df_histogram

Number.of.transactions		
Action.Reason	Year	
Change Customer Details	2010	84
	2011	12265
	2012	28446
	2013	28603
	2014	28188
...
Transition Laminate To Smartcard	2018	410
	2019	453
	2020	576
	2021	738
	2022	156

236 rows × 1 columns

Code: plt.hist(df_histogram)



Q5

The less the number of transactions, the more often problems appear.