

# HappyMoney

May 11, 2020

```
[1]: import pandas as pd
      from pandas import read_csv
      import numpy as np
      import seaborn as sns
      import matplotlib.pyplot as plt
      import math
```

```
[2]: path = r'Application_Status_History.csv'
      app_status_history = pd.read_csv(path)
      app_status_history.head(5)
```

```
[2]:      HK_H_APPL_STATUS_HISTORY      OWNERID \
0  91292937bb2d3d223cc71d3422a4e656  2f8973e24a146b94f4749746432088e1
1  9349d4f8e26866b05629261317b3a4a5  2f8973e24a146b94f4749746432088e1
2  a772d9c3ec2137ff58784cdba0959d38  2f8973e24a146b94f4749746432088e1
3  ae2b11897373e880ab5ad245b59e0cec  2f8973e24a146b94f4749746432088e1
4  705463b9d36bff5cb934ee01aee958a1  2f8973e24a146b94f4749746432088e1

      CREATEDDATE      CREATEDBYID \
0  2015-01-02T08:01:10Z  2f8973e24a146b94f4749746432088e1
1  2015-01-02T08:01:25Z  2f8973e24a146b94f4749746432088e1
2  2015-01-02T08:01:48Z  2f8973e24a146b94f4749746432088e1
3  2015-01-02T08:02:44Z  2f8973e24a146b94f4749746432088e1
4  2015-01-02T08:02:46Z  2f8973e24a146b94f4749746432088e1

      LASTMODIFIEDDATE      LASTMODIFIEDBYID \
0  2015-01-02T14:14:01Z  558766830a2f5b01ca1126a925b6393b
1  2015-01-02T14:14:01Z  558766830a2f5b01ca1126a925b6393b
2  2015-01-02T14:14:01Z  558766830a2f5b01ca1126a925b6393b
3  2015-01-02T14:14:01Z  558766830a2f5b01ca1126a925b6393b
4  2015-01-02T14:14:01Z  558766830a2f5b01ca1126a925b6393b

      APPLICATION_ID  APPLICATION_CREATED  NEWHAPPYPATH \
0  a1bc447174b656fb6694e2a10bfe6c2d  2015-01-02T08:01:10Z  1
1  f5d5f5f0e69ace0a65f652cf708b463b  2015-01-02T08:01:09Z  1
2  5e14fff02fc09df0c0ccaa4ad187b8de  2015-01-02T08:01:48Z  1
3  e08bc4b76287981d8b37cccee0794e36  2015-01-02T08:02:44Z  1
```

4 99f254fd9b1e5897fb63ee8f54b5e1ca 2015-01-02T08:02:31Z

1

OLDHAPPYPATH

0	0
1	0
2	0
3	0
4	0

```
[3]: path = r'SocialChannelAdSpend.csv'
ad_spend = pd.read_csv(path)
ad_spend.head(20)
```

```
[3]:
```

	ad_id	adset_id	campaign_name \
0	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3a
1	NaN	NaN	NaN
2	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3a
3	NaN	NaN	NaN
4	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3a
5	NaN	NaN	NaN
6	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3a
7	NaN	NaN	NaN
8	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3b
9	NaN	NaN	NaN
10	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3b
11	NaN	NaN	NaN
12	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3b
13	NaN	NaN	NaN
14	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3b
15	NaN	NaN	NaN
16	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3c
17	NaN	NaN	NaN
18	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3c
19	6.110000e+12	6.110000e+12	1808 Social Channel - Group 3c

	date_start	date_stop	Unnamed: 5	spend
0	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z	NaN	11.783722
1	NaN	NaN	11.78372188 Total	11.783722
2	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z	NaN	9.204166
3	NaN	NaN	9.20416613 Total	9.204166
4	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z	NaN	2.426740
5	NaN	NaN	2.426740168 Total	2.426740
6	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z	NaN	43.818204
7	NaN	NaN	43.81820357 Total	43.818204
8	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z	NaN	6.200913
9	NaN	NaN	6.200913472 Total	6.200913
10	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z	NaN	7.369723

11		NaN	NaN	7.369722738	Total	7.369723
12	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z			NaN	212.105002
13			NaN	212.105002	Total	212.105002
14	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z			NaN	3.321044
15			NaN	3.321044228	Total	3.321044
16	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z			NaN	129.924890
17			NaN	129.9248901	Total	129.924890
18	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z			NaN	NaN
19	2018-09-30T07:00:00Z	2018-09-30T07:00:00Z			NaN	41.349464

```
[4]: path = r'SocialChannelConversions.csv'
      conversions = pd.read_csv(path)
      conversions.head(10)
```

```
[4]:   lead_id  lead_created  applied  offered  offer_accepted  funded  \
0         1  9/15/18 0:02         0         0                0         0
1         2  9/15/18 0:20         1         1                0         0
2         3  9/15/18 0:28         1         0                0         0
3         4  9/15/18 1:13         0         0                0         0
4         5  9/15/18 2:02         0         0                0         0
5         6  9/15/18 2:03         1         1                0         0
6         7  9/15/18 2:22         0         0                0         0
7         8  9/15/18 2:24         0         0                0         0
8         9  9/15/18 2:58         0         0                0         0
9        10  9/15/18 3:05         0         0                0         0
```

	campaign_month	campaign_group
0	201808	group_3a
1	201808	group_3b
2	201808	group_3b
3	201808	group_2
4	201808	group_3b
5	201808	group_3a
6	201808	group_3a
7	201808	group_3b
8	201808	group_3c
9	201808	group_3c

```
[5]: ad_spend = ad_spend.drop(columns=['ad_id', 'adset_id', 'date_start',
    ↪ 'date_stop'])
```

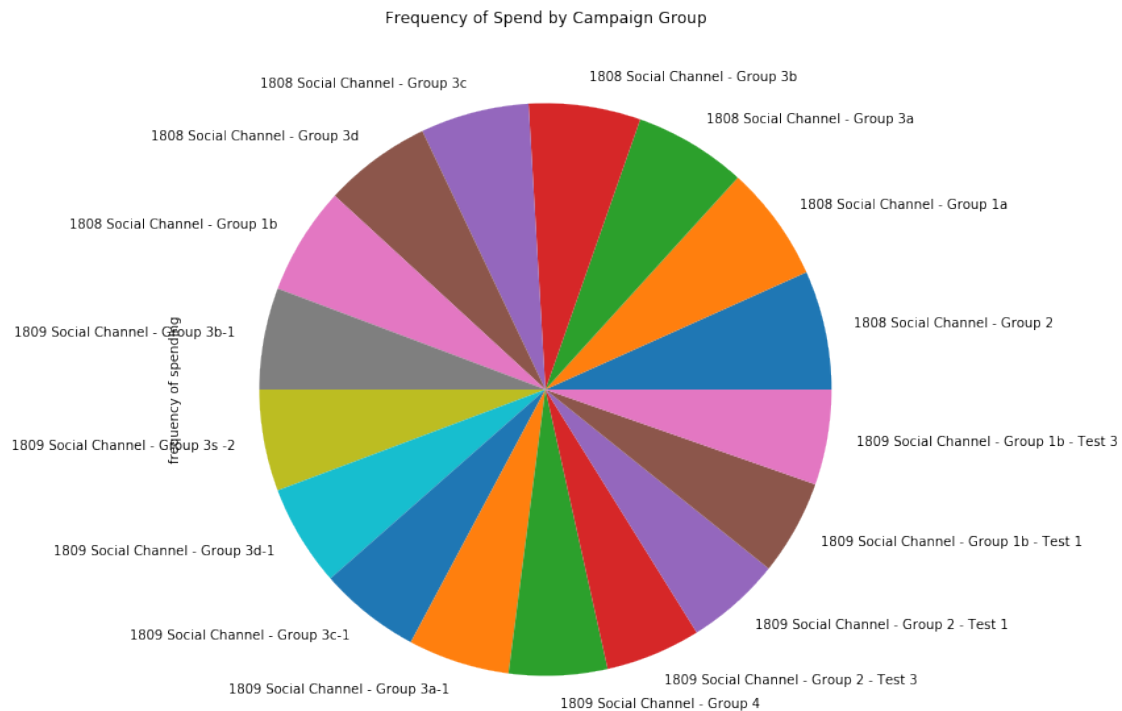
```
[6]: freq_of_spend = ad_spend.groupby('campaign_name').count()
      freq_of_spend = freq_of_spend.rename(columns={'spend' : 'frequency of_
    ↪ spending'})
      freq_of_spend = freq_of_spend.sort_values('frequency of spending',
    ↪ ascending=False)
      freq_of_spend
```

[6]: Unnamed: 5 frequency of spending

campaign_name		
1808 Social Channel - Group 2	0	150
1808 Social Channel - Group 1a	0	146
1808 Social Channel - Group 3a	0	142
1808 Social Channel - Group 3b	0	141
1808 Social Channel - Group 3c	0	137
1808 Social Channel - Group 3d	0	136
1808 Social Channel - Group 1b	0	136
1809 Social Channel - Group 3b-1	0	128
1809 Social Channel - Group 3s -2	0	128
1809 Social Channel - Group 3d-1	0	128
1809 Social Channel - Group 3c-1	0	128
1809 Social Channel - Group 3a-1	0	128
1809 Social Channel - Group 4	0	124
1809 Social Channel - Group 2 - Test 3	0	120
1809 Social Channel - Group 2 - Test 1	0	120
1809 Social Channel - Group 1b - Test 1	0	120
1809 Social Channel - Group 1b - Test 3	0	120

```
[7]: freq_of_spend.plot.pie(y='frequency of spending', figsize=(10, 10),
    ↪ legend=False)
plt.title('Frequency of Spend by Campaign Group')
```

[7]: Text(0.5, 1.0, 'Frequency of Spend by Campaign Group')



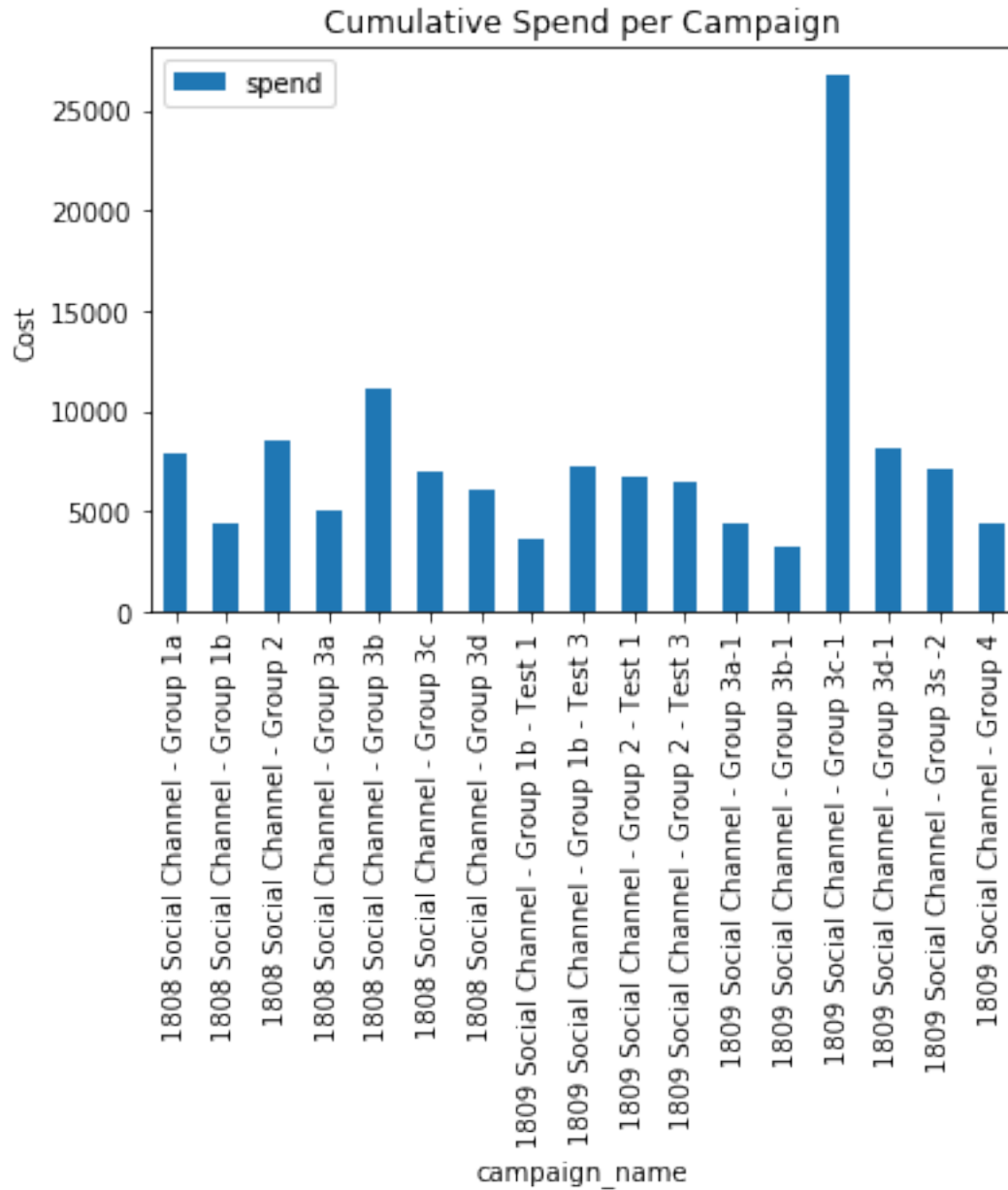
```
[8]: spend_sum_per_campaign = ad_spend.groupby('campaign_name').sum()
      spend_sum_per_campaign
```

```
[8]:
```

	campaign_name	spend
1808	Social Channel - Group 1a	7816.445696
1808	Social Channel - Group 1b	4366.921587
1808	Social Channel - Group 2	8512.420122
1808	Social Channel - Group 3a	5060.728660
1808	Social Channel - Group 3b	11063.233520
1808	Social Channel - Group 3c	6941.512786
1808	Social Channel - Group 3d	6004.859604
1809	Social Channel - Group 1b - Test 1	3560.584075
1809	Social Channel - Group 1b - Test 3	7283.850019
1809	Social Channel - Group 2 - Test 1	6761.492483
1809	Social Channel - Group 2 - Test 3	6404.473076
1809	Social Channel - Group 3a-1	4341.425951
1809	Social Channel - Group 3b-1	3221.911662
1809	Social Channel - Group 3c-1	26777.477958
1809	Social Channel - Group 3d-1	8188.815042
1809	Social Channel - Group 3s -2	7114.681892
1809	Social Channel - Group 4	4429.024078

```
[9]: spend_sum_per_campaign.plot.bar()
      plt.title('Cumulative Spend per Campaign')
      plt.ylabel('Cost')
```

```
[9]: Text(0, 0.5, 'Cost')
```



```
[10]: len(conversions)
```

```
[10]: 10025
```

```
[11]: conversions = conversions.drop(conversions[conversions['campaign_group'] == 'group_1b_2'].index)
      conversions = conversions.drop(conversions[conversions['campaign_group'] == 'group_2_2'].index)
      conversions
```

```
[11]:
```

	lead_id	lead_created	applied	offered	offer_accepted	funded	\
0	1	9/15/18 0:02	0	0	0	0	
1	2	9/15/18 0:20	1	1	0	0	
2	3	9/15/18 0:28	1	0	0	0	
3	4	9/15/18 1:13	0	0	0	0	
4	5	9/15/18 2:02	0	0	0	0	
...	...	...	...	...	...	...	
10020	10021	11/14/18 22:12	0	0	0	0	
10021	10022	11/14/18 23:12	1	1	1	0	
10022	10023	11/14/18 23:13	1	1	0	0	
10023	10024	11/14/18 23:14	0	0	0	0	
10024	10025	11/14/18 23:19	1	1	1	0	

	campaign_month	campaign_group
0	201808	group_3a
1	201808	group_3b
2	201808	group_3b
3	201808	group_2
4	201808	group_3b
...	...	...
10020	201809	group_3c_1
10021	201809	group_3a_1
10022	201809	group_4
10023	201809	group_1b_3
10024	201809	group_3c_1

[9744 rows x 8 columns]

```
[12]: len(conversions)
```

```
[12]: 9744
```

```
[ ]:
```

```
[13]: # Part 1 Q4
```

```
[14]: conversions = conversions.drop(columns=['lead_id', 'lead_created'])
conversions = conversions.groupby(['campaign_month', 'campaign_group']).sum()
conversions
```

```
[14]:
```

		applied	offered	offer_accepted	funded
campaign_month	campaign_group				
201808	group_1a	203	132	56	30
	group_1b	112	75	23	5
	group_2	138	83	35	17
	group_3a	1637	889	356	178
	group_3b	417	283	89	43

	group_3c	155	103	34	17
	group_3d	42	31	13	8
201809	group_1b_1	95	68	31	10
	group_1b_3	112	58	22	10
	group_2_1	109	67	16	8
	group_2_3	135	89	24	9
	group_3a_1	422	291	101	52
	group_3b_1	102	67	21	8
	group_3c_1	68	47	25	10
	group_3d_1	19	13	5	2
	group_3s_2	601	398	132	57
	group_4	500	240	98	38

```
[15]: ad_spend = ad_spend.groupby('campaign_name').sum()
ad_spend['campaign_group'] = ['group_1a', 'group_1b', 'group_2', 'group_3a',
    ↳ 'group_3b', 'group_3c',
    ↳ 'group_3d', 'group_1b_1', 'group_1b_3',
    ↳ 'group_2_1', 'group_2_3', 'group_3a_1',
    ↳ 'group_3b_1', 'group_3c_1', 'group_3d_1',
    ↳ 'group_3s_2', 'group_4']
ad_spend
```

```
[15]:                                spend campaign_group
campaign_name
1808 Social Channel - Group 1a          7816.445696      group_1a
1808 Social Channel - Group 1b          4366.921587      group_1b
1808 Social Channel - Group 2           8512.420122      group_2
1808 Social Channel - Group 3a          5060.728660      group_3a
1808 Social Channel - Group 3b        11063.233520      group_3b
1808 Social Channel - Group 3c          6941.512786      group_3c
1808 Social Channel - Group 3d          6004.859604      group_3d
1809 Social Channel - Group 1b - Test 1  3560.584075      group_1b_1
1809 Social Channel - Group 1b - Test 3  7283.850019      group_1b_3
1809 Social Channel - Group 2 - Test 1   6761.492483      group_2_1
1809 Social Channel - Group 2 - Test 3   6404.473076      group_2_3
1809 Social Channel - Group 3a-1         4341.425951      group_3a_1
1809 Social Channel - Group 3b-1         3221.911662      group_3b_1
1809 Social Channel - Group 3c-1        26777.477958      group_3c_1
1809 Social Channel - Group 3d-1         8188.815042      group_3d_1
1809 Social Channel - Group 3s -2        7114.681892      group_3s_2
1809 Social Channel - Group 4          4429.024078      group_4
```

```
[16]: len(ad_spend) == len(conversions)
```

```
[16]: True
```

```
[ ]:
```



```
[17]: merged = ad_spend.merge(conversions, how='inner', on = 'campaign_group')
merged
```

```
[17]:
```

	spend	campaign_group	applied	offered	offer_accepted	funded
0	7816.445696	group_1a	203	132	56	30
1	4366.921587	group_1b	112	75	23	5
2	8512.420122	group_2	138	83	35	17
3	5060.728660	group_3a	1637	889	356	178
4	11063.233520	group_3b	417	283	89	43
5	6941.512786	group_3c	155	103	34	17
6	6004.859604	group_3d	42	31	13	8
7	3560.584075	group_1b_1	95	68	31	10
8	7283.850019	group_1b_3	112	58	22	10
9	6761.492483	group_2_1	109	67	16	8
10	6404.473076	group_2_3	135	89	24	9
11	4341.425951	group_3a_1	422	291	101	52
12	3221.911662	group_3b_1	102	67	21	8
13	26777.477958	group_3c_1	68	47	25	10
14	8188.815042	group_3d_1	19	13	5	2
15	7114.681892	group_3s_2	601	398	132	57
16	4429.024078	group_4	500	240	98	38

```
[18]: merged['cpa'] = merged['spend']/merged['applied']
merged['cpo'] = merged['spend']/merged['offered']
merged['cpoa'] = merged['spend']/merged['offer_accepted']
merged['cpfl'] = merged['spend']/merged['funded']
merged = merged.sort_values('campaign_group')
merged = merged.drop(columns=['applied', 'offered', 'offer_accepted', 'funded'],
→ 'spend'])
merged
```

```
[18]:
```

	campaign_group	cpa	cpo	cpoa	cpfl
0	group_1a	38.504659	59.215498	139.579387	260.548190
1	group_1b	38.990371	58.225621	189.866156	873.384317
7	group_1b_1	37.479832	52.361531	114.857551	356.058407
8	group_1b_3	65.034375	125.583621	331.084092	728.385002
2	group_2	61.684204	102.559279	243.212003	500.730595
9	group_2_1	62.032041	100.917798	422.593280	845.186560
10	group_2_3	47.440541	71.960372	266.853045	711.608120
3	group_3a	3.091465	5.692608	14.215530	28.431060
11	group_3a_1	10.287739	14.918990	42.984415	83.488961
4	group_3b	26.530536	39.092698	124.305995	257.284500
12	group_3b_1	31.587369	48.088234	153.424365	402.738958
5	group_3c	44.783953	67.393328	204.162141	408.324282
13	group_3c_1	393.786441	569.733574	1071.099118	2677.747796
6	group_3d	142.972848	193.705149	461.912277	750.607451
14	group_3d_1	430.990265	629.908849	1637.763008	4094.407521

15	group_3s_2	11.838073	17.876085	53.899105	124.818981
16	group_4	8.858048	18.454267	45.194123	116.553265

```
[19]: # Round to hundredths place
```

```
merged = merged.round(2)
merged
```

```
[19]:
```

	campaign_group	cpa	cpo	cpoa	cpfl
0	group_1a	38.50	59.22	139.58	260.55
1	group_1b	38.99	58.23	189.87	873.38
7	group_1b_1	37.48	52.36	114.86	356.06
8	group_1b_3	65.03	125.58	331.08	728.39
2	group_2	61.68	102.56	243.21	500.73
9	group_2_1	62.03	100.92	422.59	845.19
10	group_2_3	47.44	71.96	266.85	711.61
3	group_3a	3.09	5.69	14.22	28.43
11	group_3a_1	10.29	14.92	42.98	83.49
4	group_3b	26.53	39.09	124.31	257.28
12	group_3b_1	31.59	48.09	153.42	402.74
5	group_3c	44.78	67.39	204.16	408.32
13	group_3c_1	393.79	569.73	1071.10	2677.75
6	group_3d	142.97	193.71	461.91	750.61
14	group_3d_1	430.99	629.91	1637.76	4094.41
15	group_3s_2	11.84	17.88	53.90	124.82
16	group_4	8.86	18.45	45.19	116.55

```
[20]: group1 = merged[:4]
group1
```

```
[20]:
```

	campaign_group	cpa	cpo	cpoa	cpfl
0	group_1a	38.50	59.22	139.58	260.55
1	group_1b	38.99	58.23	189.87	873.38
7	group_1b_1	37.48	52.36	114.86	356.06
8	group_1b_3	65.03	125.58	331.08	728.39

```
[21]: group2 = merged[4:7]
group2
```

```
[21]:
```

	campaign_group	cpa	cpo	cpoa	cpfl
2	group_2	61.68	102.56	243.21	500.73
9	group_2_1	62.03	100.92	422.59	845.19
10	group_2_3	47.44	71.96	266.85	711.61

```
[22]: group3 = merged[7:16]
group3
```

```
[22]:
```

	campaign_group	cpa	cpo	cpoa	cpfl
3	group_3a	3.09	5.69	14.22	28.43
11	group_3a_1	10.29	14.92	42.98	83.49
4	group_3b	26.53	39.09	124.31	257.28
12	group_3b_1	31.59	48.09	153.42	402.74
5	group_3c	44.78	67.39	204.16	408.32
13	group_3c_1	393.79	569.73	1071.10	2677.75
6	group_3d	142.97	193.71	461.91	750.61
14	group_3d_1	430.99	629.91	1637.76	4094.41
15	group_3s_2	11.84	17.88	53.90	124.82

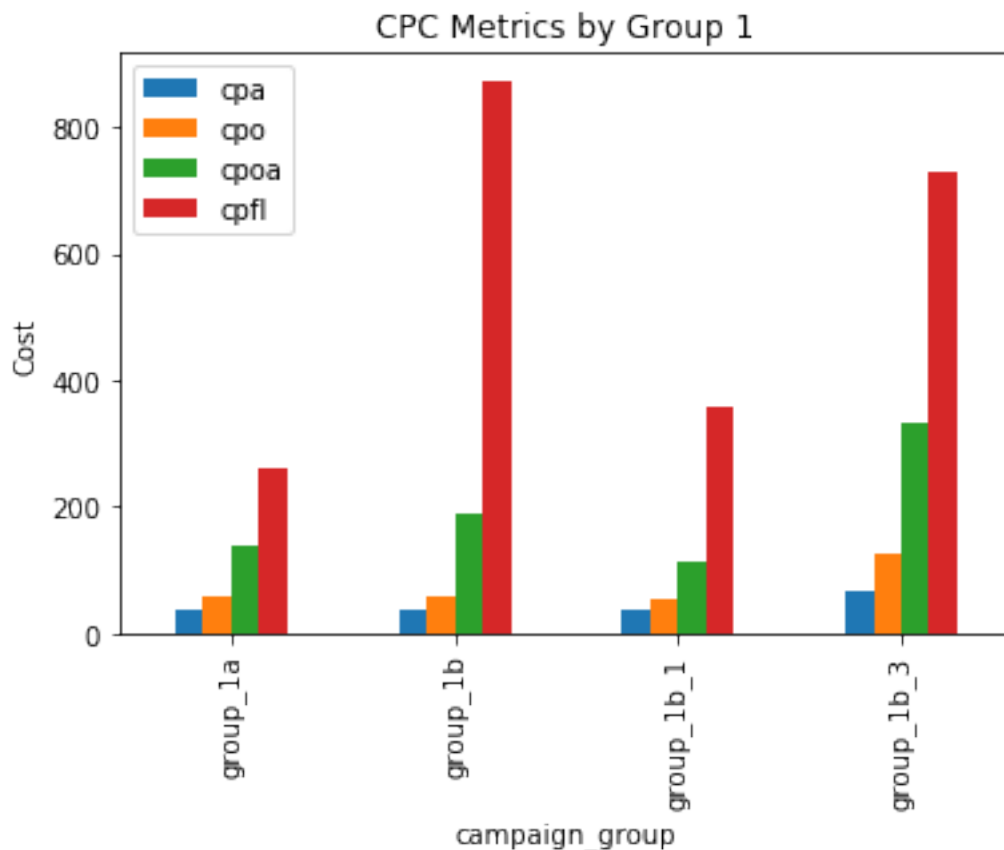
```
[23]: group4 = merged[16:]
      group4
```

```
[23]:
```

	campaign_group	cpa	cpo	cpoa	cpfl
16	group_4	8.86	18.45	45.19	116.55

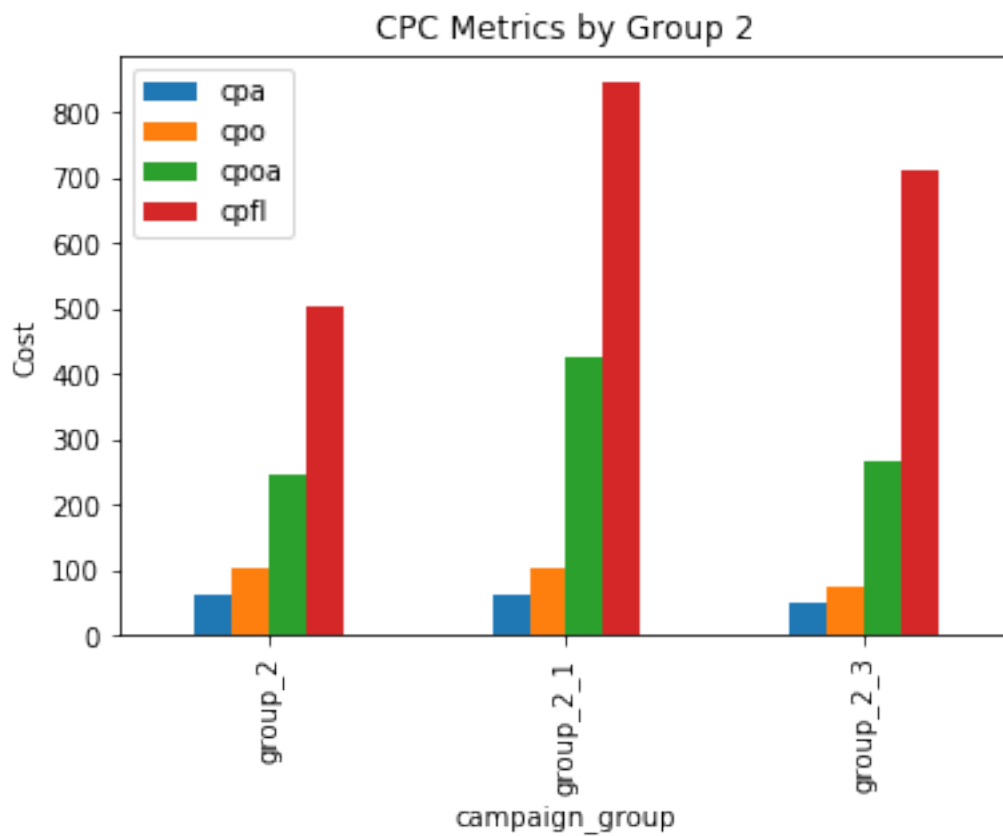
```
[24]: group1.plot(x="campaign_group", y=["cpa", "cpo", "cpoa", "cpfl"], kind="bar")
      plt.title('CPC Metrics by Group 1')
      plt.ylabel('Cost')
```

```
[24]: Text(0, 0.5, 'Cost')
```



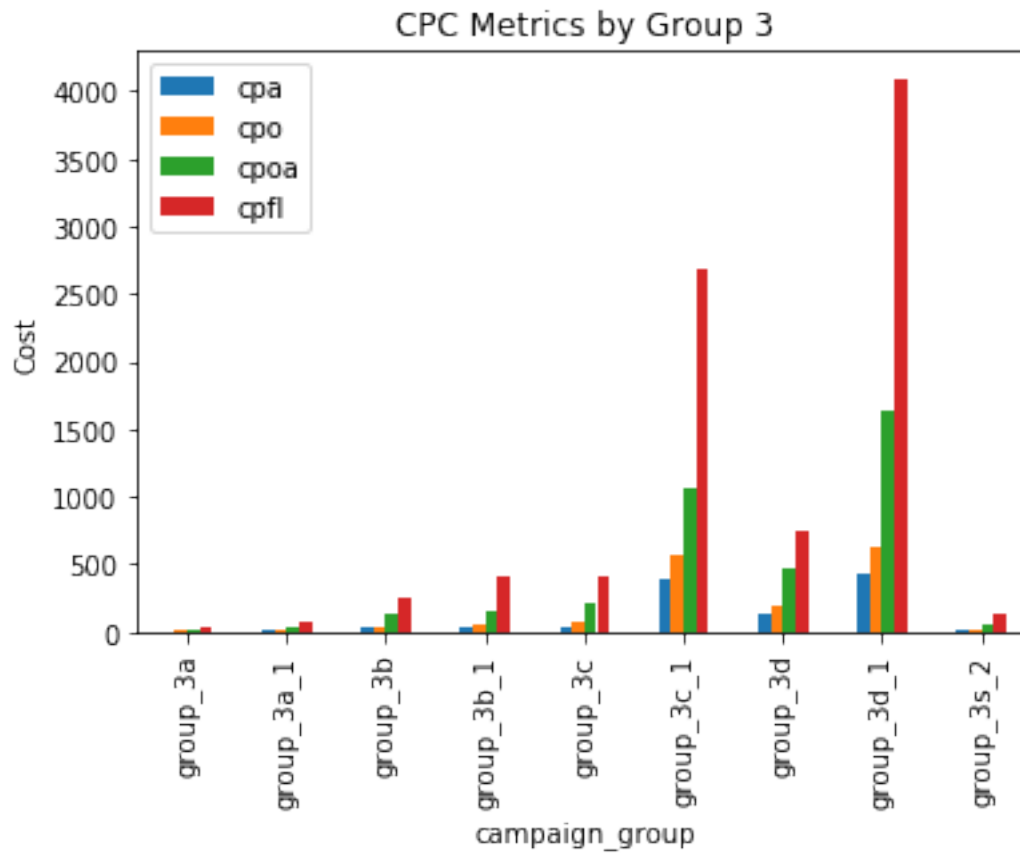
```
[25]: group2.plot(x="campaign_group", y=["cpa", "cpo", "cpoa", "cpfl"], kind="bar")
plt.title('CPC Metrics by Group 2')
plt.ylabel('Cost')
```

```
[25]: Text(0, 0.5, 'Cost')
```



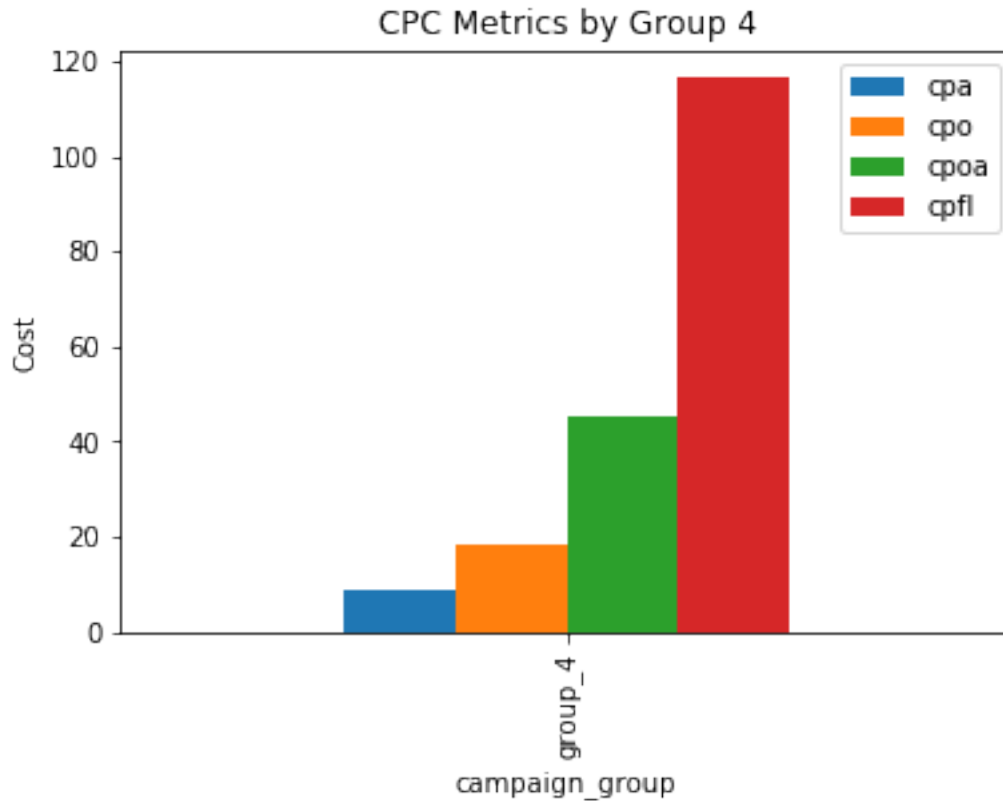
```
[26]: group3.plot(x="campaign_group", y=["cpa", "cpo", "cpoa", "cpfl"], kind="bar")
plt.title('CPC Metrics by Group 3')
plt.ylabel('Cost')
```

```
[26]: Text(0, 0.5, 'Cost')
```



```
[27]: group4.plot(x="campaign_group", y=["cpa", "cpo", "cpoa", "cpfl"], kind="bar")
plt.title('CPC Metrics by Group 4')
plt.ylabel('Cost')
```

```
[27]: Text(0, 0.5, 'Cost')
```



[ ]:

[28]: # Part 2 Q3

```
[29]: app_status_history = app_status_history.sort_values(by=['NEWHAPPYPATH'],
    ↪ascending=False)
app_status_history['CREATEDDATE'] = pd.
    ↪to_datetime(app_status_history['CREATEDDATE'])
app_status_history['LASTMODIFIEDDATE'] = pd.
    ↪to_datetime(app_status_history['LASTMODIFIEDDATE'])
app_status_history
```

```
[29]:
```

	HK_H_APPL_STATUS_HISTORY	OWNERID \
8715	2bd51baa9ab8748594c89fa8400e63d9	6379016b6e948b37620044e73fd3f801
8644	6e3cbf26b39e68939651ade10ef5d75f	2f8973e24a146b94f4749746432088e1
8688	2a2d3f4de7c6eb5ed37e108e3c11e47b	2f8973e24a146b94f4749746432088e1
8481	7e9353d3641b31ccd35dc27f9970d48c	2f8973e24a146b94f4749746432088e1
7603	70d2cdf52b1432db56d962502dc9ffbba	2f8973e24a146b94f4749746432088e1
...	...	...
5334	24755b6675e6fd6784c36648dab0be70	2f8973e24a146b94f4749746432088e1
5333	e360e90df5e3d8d5c834312244106936	2f8973e24a146b94f4749746432088e1

5332	6077e0ab9e7afe754dda6fa15dcaeb0c	2f8973e24a146b94f4749746432088e1
5331	6ef9c243154e2bb7f7bd40f941773286	2f8973e24a146b94f4749746432088e1
0	91292937bb2d3d223cc71d3422a4e656	2f8973e24a146b94f4749746432088e1

	CREATEDDATE	CREATEDBYID	\
8715	2015-01-17 07:42:03+00:00	6379016b6e948b37620044e73fd3f801	
8644	2015-01-15 09:03:07+00:00	2f8973e24a146b94f4749746432088e1	
8688	2015-01-16 04:53:23+00:00	2f8973e24a146b94f4749746432088e1	
8481	2015-01-11 07:07:40+00:00	2f8973e24a146b94f4749746432088e1	
7603	2015-01-04 08:58:23+00:00	2f8973e24a146b94f4749746432088e1	
...	...	...	
5334	2015-01-04 01:11:04+00:00	2f8973e24a146b94f4749746432088e1	
5333	2015-01-04 01:09:28+00:00	2f8973e24a146b94f4749746432088e1	
5332	2015-01-04 01:09:19+00:00	2f8973e24a146b94f4749746432088e1	
5331	2015-01-04 01:09:17+00:00	2f8973e24a146b94f4749746432088e1	
0	2015-01-02 08:01:10+00:00	2f8973e24a146b94f4749746432088e1	

	LASTMODIFIEDDATE	LASTMODIFIEDBYID	\
8715	2015-01-17 07:42:08+00:00	6379016b6e948b37620044e73fd3f801	
8644	2015-01-16 02:47:34+00:00	2d5547fbd61a4082a786f69e5bf721e4	
8688	2015-01-17 02:40:13+00:00	2d5547fbd61a4082a786f69e5bf721e4	
8481	2015-01-12 02:26:14+00:00	2d5547fbd61a4082a786f69e5bf721e4	
7603	2015-01-05 02:25:03+00:00	2d5547fbd61a4082a786f69e5bf721e4	
...	...	...	
5334	2015-01-04 14:12:16+00:00	558766830a2f5b01ca1126a925b6393b	
5333	2015-01-04 14:12:16+00:00	558766830a2f5b01ca1126a925b6393b	
5332	2015-01-04 14:12:16+00:00	558766830a2f5b01ca1126a925b6393b	
5331	2015-01-04 14:12:16+00:00	558766830a2f5b01ca1126a925b6393b	
0	2015-01-02 14:14:01+00:00	558766830a2f5b01ca1126a925b6393b	

	APPLICATION_ID	APPLICATION_CREATED	NEWHAPPYPATH	\
8715	2a6c416c0434e783f62383faa60228d1	2015-01-03T06:44:36Z	10	
8644	64068c036d6cfb33f2c3b29c1c05ab47	2015-01-03T14:35:11Z	10	
8688	7d5c2a0b0f8e4ac62ad32272cc80ddc9	2015-01-02T11:00:59Z	10	
8481	ce9bdf8ec40740b285bb39bfa8b53d15	2015-01-04T02:05:50Z	10	
7603	7d1f97009d8ff6a2eec1e1794cbe29d5	2015-01-03T03:19:42Z	10	
...	...	...	...	
5334	452d21c3b91522751320ccf0cb292fc1	2015-01-04T01:11:04Z	1	
5333	8b061b02175d4b29e5c6c3d2470465e0	2015-01-04T01:09:12Z	1	
5332	76b58c0693985b007dc06339362237a5	2015-01-04T01:09:19Z	1	
5331	6b172ed1d8f9ac73eb7bda0a5ee098c5	2015-01-04T01:09:02Z	1	
0	a1bc447174b656fb6694e2a10bfe6c2d	2015-01-02T08:01:10Z	1	

	OLDHAPPYPATH
8715	9
8644	9
8688	9

8481	9
7603	9
...	...
5334	0
5333	0
5332	0
5331	0
0	0

[8927 rows x 10 columns]

```
[30]: ten = app_status_history[app_status_history['NEWHAPPYPATH'] == 10]
ten
```

```
[30]:
```

	HK_H_APPL_STATUS_HISTORY	OWNERID \
8715	2bd51baa9ab8748594c89fa8400e63d9	6379016b6e948b37620044e73fd3f801
8644	6e3cbf26b39e68939651ade10ef5d75f	2f8973e24a146b94f4749746432088e1
8688	2a2d3f4de7c6eb5ed37e108e3c11e47b	2f8973e24a146b94f4749746432088e1
8481	7e9353d3641b31ccd35dc27f9970d48c	2f8973e24a146b94f4749746432088e1
7603	70d2cdf52b1432db56d962502dc9ffbba	2f8973e24a146b94f4749746432088e1
...	...	...
5275	455e4ee6dc8a0739dc12aa816f2e9572	2f8973e24a146b94f4749746432088e1
7743	eb57d42820d028bcfdb3fdc60d5b9842	2f8973e24a146b94f4749746432088e1
8803	6abb50a66bd491a8160e793be64daa96	2f8973e24a146b94f4749746432088e1
7729	a3bb9992f8a9f496fa35dd7311797ce0	2f8973e24a146b94f4749746432088e1
7879	7e66e8b508ebe7df27457130d9c349cb	2f8973e24a146b94f4749746432088e1

	CREATEDDATE	CREATEDBYID \
8715	2015-01-17 07:42:03+00:00	6379016b6e948b37620044e73fd3f801
8644	2015-01-15 09:03:07+00:00	2f8973e24a146b94f4749746432088e1
8688	2015-01-16 04:53:23+00:00	2f8973e24a146b94f4749746432088e1
8481	2015-01-11 07:07:40+00:00	2f8973e24a146b94f4749746432088e1
7603	2015-01-04 08:58:23+00:00	2f8973e24a146b94f4749746432088e1
...	...	...
5275	2015-01-04 00:58:35+00:00	2f8973e24a146b94f4749746432088e1
7743	2015-01-05 01:33:58+00:00	2f8973e24a146b94f4749746432088e1
8803	2015-01-23 05:57:34+00:00	2f8973e24a146b94f4749746432088e1
7729	2015-01-05 00:59:09+00:00	2f8973e24a146b94f4749746432088e1
7879	2015-01-05 06:58:19+00:00	2f8973e24a146b94f4749746432088e1

	LASTMODIFIEDDATE	LASTMODIFIEDBYID \
8715	2015-01-17 07:42:08+00:00	6379016b6e948b37620044e73fd3f801
8644	2015-01-16 02:47:34+00:00	2d5547fbd61a4082a786f69e5bf721e4
8688	2015-01-17 02:40:13+00:00	2d5547fbd61a4082a786f69e5bf721e4
8481	2015-01-12 02:26:14+00:00	2d5547fbd61a4082a786f69e5bf721e4
7603	2015-01-05 02:25:03+00:00	2d5547fbd61a4082a786f69e5bf721e4
...	...	...



```

5275 2015-01-04 00:59:43+00:00 2f8973e24a146b94f4749746432088e1
7743 2015-01-08 01:39:43+00:00 2d5547fbd61a4082a786f69e5bf721e4
8803 2015-01-24 02:32:34+00:00 2d5547fbd61a4082a786f69e5bf721e4
7729 2015-01-08 01:40:12+00:00 2d5547fbd61a4082a786f69e5bf721e4
7879 2015-01-08 01:39:43+00:00 2d5547fbd61a4082a786f69e5bf721e4

```

	APPLICATION_ID	APPLICATION_CREATED	NEWHAPPYPATH \
8715	2a6c416c0434e783f62383faa60228d1	2015-01-03T06:44:36Z	10
8644	64068c036d6c6b33f2c3b29c1c05ab47	2015-01-03T14:35:11Z	10
8688	7d5c2a0b0f8e4ac62ad32272cc80ddc9	2015-01-02T11:00:59Z	10
8481	ce9bdf8ec40740b285bb39bfa8b53d15	2015-01-04T02:05:50Z	10
7603	7d1f97009d8ff6a2eec1e1794cbe29d5	2015-01-03T03:19:42Z	10
...	...	...	...
5275	a2e371bfa2ff98946489b4d6465344d0	2015-01-04T00:56:18Z	10
7743	bd1a634bdf3937bc96d808075087bc81	2015-01-03T04:25:38Z	10
8803	319018f6e05ee273749863770c4fc9a4	2015-01-04T02:50:22Z	10
7729	f0b211b31b9b3447a3de94ef5269d108	2015-01-03T08:06:55Z	10
7879	b24e62925d3a9932e7e2f803b92ef7b1	2015-01-03T02:36:04Z	10

	OLDHAPPYPATH
8715	9
8644	9
8688	9
8481	9
7603	9
...	...
5275	9
7743	9
8803	9
7729	9
7879	9

[213 rows x 10 columns]

```
[31]: len(ten)
```

```
[31]: 213
```

```
[32]: len(app_status_history)
```

```
[32]: 8927
```

```
[33]: ten = ten.loc[:, ['CREATEDDATE', 'APPLICATION_ID']]
ten
```

```
[33]:
```

	CREATEDDATE	APPLICATION_ID
8715	2015-01-17 07:42:03+00:00	2a6c416c0434e783f62383faa60228d1

```

8644 2015-01-15 09:03:07+00:00 64068c036d6cfb33f2c3b29c1c05ab47
8688 2015-01-16 04:53:23+00:00 7d5c2a0b0f8e4ac62ad32272cc80ddc9
8481 2015-01-11 07:07:40+00:00 ce9bdf8ec40740b285bb39bfa8b53d15
7603 2015-01-04 08:58:23+00:00 7d1f97009d8ff6a2eec1e1794cbe29d5
...
5275 2015-01-04 00:58:35+00:00 a2e371bfa2ff98946489b4d6465344d0
7743 2015-01-05 01:33:58+00:00 bd1a634bdf3937bc96d808075087bc81
8803 2015-01-23 05:57:34+00:00 319018f6e05ee273749863770c4fc9a4
7729 2015-01-05 00:59:09+00:00 f0b211b31b9b3447a3de94ef5269d108
7879 2015-01-05 06:58:19+00:00 b24e62925d3a9932e7e2f803b92ef7b1

```

[213 rows x 2 columns]

```

[34]: ten['CREATEDDATE'] = pd.to_datetime(ten['CREATEDDATE']).apply(lambda x: x.
    ↳ date())
ten

```

```

[34]:      CREATEDDATE      APPLICATION_ID
8715  2015-01-17  2a6c416c0434e783f62383faa60228d1
8644  2015-01-15  64068c036d6cfb33f2c3b29c1c05ab47
8688  2015-01-16  7d5c2a0b0f8e4ac62ad32272cc80ddc9
8481  2015-01-11  ce9bdf8ec40740b285bb39bfa8b53d15
7603  2015-01-04  7d1f97009d8ff6a2eec1e1794cbe29d5
...
5275  2015-01-04  a2e371bfa2ff98946489b4d6465344d0
7743  2015-01-05  bd1a634bdf3937bc96d808075087bc81
8803  2015-01-23  319018f6e05ee273749863770c4fc9a4
7729  2015-01-05  f0b211b31b9b3447a3de94ef5269d108
7879  2015-01-05  b24e62925d3a9932e7e2f803b92ef7b1

```

[213 rows x 2 columns]

```

[35]: count_tens = ten.groupby('CREATEDDATE').count()
count_tens

```

```

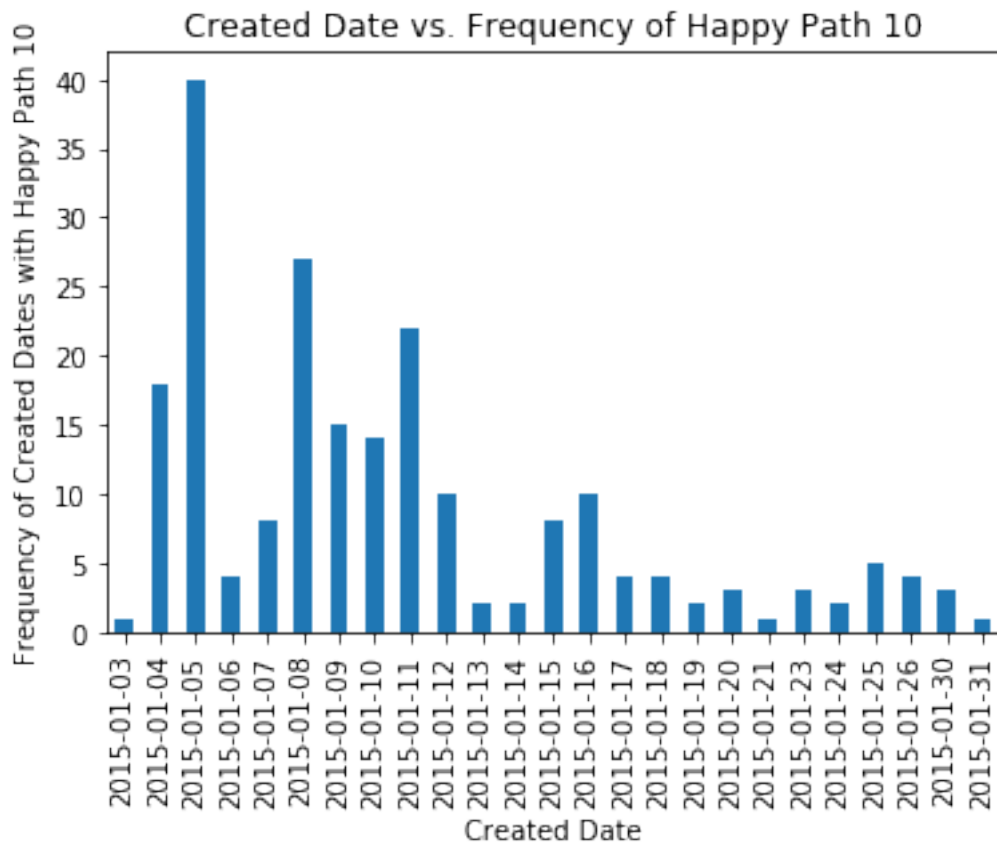
[35]:      APPLICATION_ID
CREATEDDATE
2015-01-03          1
2015-01-04         18
2015-01-05         40
2015-01-06          4
2015-01-07          8
2015-01-08         27
2015-01-09         15
2015-01-10         14
2015-01-11         22
2015-01-12         10

```

2015-01-13	2
2015-01-14	2
2015-01-15	8
2015-01-16	10
2015-01-17	4
2015-01-18	4
2015-01-19	2
2015-01-20	3
2015-01-21	1
2015-01-23	3
2015-01-24	2
2015-01-25	5
2015-01-26	4
2015-01-30	3
2015-01-31	1

```
[36]: count_tens.plot.bar(y='APPLICATION_ID', legend=False)
plt.title('Created Date vs. Frequency of Happy Path 10')
plt.xlabel('Created Date')
plt.ylabel('Frequency of Created Dates with Happy Path 10')
```

```
[36]: Text(0, 0.5, 'Frequency of Created Dates with Happy Path 10')
```



```
[37]: app_status_history['CONVERSION_DAYS'] = app_status_history['LASTMODIFIEDDATE']_
      ↪- app_status_history['CREATEDDATE']
      app_status_history
```

```
[37]:
```

	HK_H_APPL_STATUS_HISTORY	OWNERID \
8715	2bd51baa9ab8748594c89fa8400e63d9	6379016b6e948b37620044e73fd3f801
8644	6e3cbf26b39e68939651ade10ef5d75f	2f8973e24a146b94f4749746432088e1
8688	2a2d3f4de7c6eb5ed37e108e3c11e47b	2f8973e24a146b94f4749746432088e1
8481	7e9353d3641b31ccd35dc27f9970d48c	2f8973e24a146b94f4749746432088e1
7603	70d2cdf52b1432db56d962502dc9ffba	2f8973e24a146b94f4749746432088e1
...	...	...
5334	24755b6675e6fd6784c36648dab0be70	2f8973e24a146b94f4749746432088e1
5333	e360e90df3d8d5c834312244106936	2f8973e24a146b94f4749746432088e1
5332	6077e0ab9e7afe754dda6fa15dcaeb0c	2f8973e24a146b94f4749746432088e1
5331	6ef9c243154e2bb7f7bd40f941773286	2f8973e24a146b94f4749746432088e1
0	91292937bb2d3d223cc71d3422a4e656	2f8973e24a146b94f4749746432088e1

	CREATEDDATE	CREATEDBYID \
8715	2015-01-17 07:42:03+00:00	6379016b6e948b37620044e73fd3f801
8644	2015-01-15 09:03:07+00:00	2f8973e24a146b94f4749746432088e1
8688	2015-01-16 04:53:23+00:00	2f8973e24a146b94f4749746432088e1
8481	2015-01-11 07:07:40+00:00	2f8973e24a146b94f4749746432088e1
7603	2015-01-04 08:58:23+00:00	2f8973e24a146b94f4749746432088e1
...	...	...
5334	2015-01-04 01:11:04+00:00	2f8973e24a146b94f4749746432088e1
5333	2015-01-04 01:09:28+00:00	2f8973e24a146b94f4749746432088e1
5332	2015-01-04 01:09:19+00:00	2f8973e24a146b94f4749746432088e1
5331	2015-01-04 01:09:17+00:00	2f8973e24a146b94f4749746432088e1
0	2015-01-02 08:01:10+00:00	2f8973e24a146b94f4749746432088e1

	LASTMODIFIEDDATE	LASTMODIFIEDBYID \
8715	2015-01-17 07:42:08+00:00	6379016b6e948b37620044e73fd3f801
8644	2015-01-16 02:47:34+00:00	2d5547fbd61a4082a786f69e5bf721e4
8688	2015-01-17 02:40:13+00:00	2d5547fbd61a4082a786f69e5bf721e4
8481	2015-01-12 02:26:14+00:00	2d5547fbd61a4082a786f69e5bf721e4
7603	2015-01-05 02:25:03+00:00	2d5547fbd61a4082a786f69e5bf721e4
...	...	...
5334	2015-01-04 14:12:16+00:00	558766830a2f5b01ca1126a925b6393b
5333	2015-01-04 14:12:16+00:00	558766830a2f5b01ca1126a925b6393b
5332	2015-01-04 14:12:16+00:00	558766830a2f5b01ca1126a925b6393b
5331	2015-01-04 14:12:16+00:00	558766830a2f5b01ca1126a925b6393b
0	2015-01-02 14:14:01+00:00	558766830a2f5b01ca1126a925b6393b

	APPLICATION_ID	APPLICATION_CREATED	NEWHAPPYPATH \
8715	2a6c416c0434e783f62383faa60228d1	2015-01-03T06:44:36Z	10

8644	64068c036d6cfb33f2c3b29c1c05ab47	2015-01-03T14:35:11Z	10
8688	7d5c2a0b0f8e4ac62ad32272cc80ddc9	2015-01-02T11:00:59Z	10
8481	ce9bdf8ec40740b285bb39bfa8b53d15	2015-01-04T02:05:50Z	10
7603	7d1f97009d8ff6a2eec1e1794cbe29d5	2015-01-03T03:19:42Z	10
...	...	...	...
5334	452d21c3b91522751320ccf0cb292fc1	2015-01-04T01:11:04Z	1
5333	8b061b02175d4b29e5c6c3d2470465e0	2015-01-04T01:09:12Z	1
5332	76b58c0693985b007dc06339362237a5	2015-01-04T01:09:19Z	1
5331	6b172ed1d8f9ac73eb7bda0a5ee098c5	2015-01-04T01:09:02Z	1
0	a1bc447174b656fb6694e2a10bfe6c2d	2015-01-02T08:01:10Z	1

#### OLDHAPPYPATH CONVERSION\_DAYS

8715	9	00:00:05
8644	9	17:44:27
8688	9	21:46:50
8481	9	19:18:34
7603	9	17:26:40
...	...	...
5334	0	13:01:12
5333	0	13:02:48
5332	0	13:02:57
5331	0	13:02:59
0	0	06:12:51

[8927 rows x 11 columns]

```
[38]: app_status_history = app_status_history.
      ↪drop(columns=['HK_H_APPL_STATUS_HISTORY', 'CREATEDBYID', 'LASTMODIFIEDBYID',
      ↪'APPLICATION_ID', 'APPLICATION_CREATED', 'CREATEDDATE', 'LASTMODIFIEDDATE'])
      app_status_history
```

[38]:	OWNERID	NEWHAPPYPATH	OLDHAPPYPATH	\
8715	6379016b6e948b37620044e73fd3f801	10	9	
8644	2f8973e24a146b94f4749746432088e1	10	9	
8688	2f8973e24a146b94f4749746432088e1	10	9	
8481	2f8973e24a146b94f4749746432088e1	10	9	
7603	2f8973e24a146b94f4749746432088e1	10	9	
...	...	...	...	
5334	2f8973e24a146b94f4749746432088e1	1	0	
5333	2f8973e24a146b94f4749746432088e1	1	0	
5332	2f8973e24a146b94f4749746432088e1	1	0	
5331	2f8973e24a146b94f4749746432088e1	1	0	
0	2f8973e24a146b94f4749746432088e1	1	0	

#### CONVERSION\_DAYS

8715	00:00:05
8644	17:44:27

8688	21:46:50
8481	19:18:34
7603	17:26:40
...	...
5334	13:01:12
5333	13:02:48
5332	13:02:57
5331	13:02:59
0	06:12:51

[8927 rows x 4 columns]

```
[39]: app_status_history = app_status_history.sort_values(by=['OWNERID'])
      app_status_history.head(15)
```

```
[39]:
```

	OWNERID	NEWHAPPYPATH	OLDHAPPYPATH	\
8909	00436679265122c3ad5758400d89b17c	6	5	
8884	00436679265122c3ad5758400d89b17c	6	5	
8682	02f4958358e3c82915f1cc76d198188f	5	4	
6100	0dcac0d9fc03d1c2861df868e0a8df4c	2	1	
7858	1278a00ab3c7b9e7eb2d8c13fb8755e4	6	5	
6592	1278a00ab3c7b9e7eb2d8c13fb8755e4	5	4	
3191	1278a00ab3c7b9e7eb2d8c13fb8755e4	5	4	
8197	1278a00ab3c7b9e7eb2d8c13fb8755e4	6	5	
7314	1278a00ab3c7b9e7eb2d8c13fb8755e4	7	6	
7817	1278a00ab3c7b9e7eb2d8c13fb8755e4	6	5	
8836	140d49c315e9f37a89aa777421b83134	3	2	
5810	140d49c315e9f37a89aa777421b83134	9	8	
1677	1b0b08997e79285d229bbf1cc740d615	6	5	
6948	1b0b08997e79285d229bbf1cc740d615	5	4	
7736	1b0b08997e79285d229bbf1cc740d615	6	5	

	CONVERSION_DAYS
8909	0 days 00:00:21
8884	0 days 00:00:11
8682	16 days 13:49:59
6100	16 days 04:09:21
7858	0 days 00:00:11
6592	4 days 22:02:44
3191	11 days 18:08:11
8197	0 days 00:00:08
7314	14 days 02:52:21
7817	0 days 00:00:12
8836	0 days 00:54:54
5810	0 days 03:07:34
1677	1 days 04:46:34
6948	0 days 23:09:40

7736 0 days 00:00:16

```
[40]: app_status_history['CONVERSION_DAYS'] = pd.  
      ↪to_timedelta(app_status_history['CONVERSION_DAYS'], errors='coerce').dt.days  
      app_status_history
```

```
[40]:
```

	OWNERID	NEWHAPPYPATH	OLDHAPPYPATH	\
8909	00436679265122c3ad5758400d89b17c	6	5	
8884	00436679265122c3ad5758400d89b17c	6	5	
8682	02f4958358e3c82915f1cc76d198188f	5	4	
6100	0dcac0d9fc03d1c2861df868e0a8df4c	2	1	
7858	1278a00ab3c7b9e7eb2d8c13fb8755e4	6	5	
...	...	...	...	
8349	e0c4d6e93c1faf39c0d709b1b0a4fb4f	6	5	
7867	e0c4d6e93c1faf39c0d709b1b0a4fb4f	6	5	
7937	e0c4d6e93c1faf39c0d709b1b0a4fb4f	5	4	
7303	fae6a47d9adbdbb5c8cdc091fd9807ad	8	7	
8444	fae6a47d9adbdbb5c8cdc091fd9807ad	9	8	

	CONVERSION_DAYS
8909	0
8884	0
8682	16
6100	16
7858	0
...	...
8349	0
7867	0
7937	0
7303	5
8444	0

[8927 rows x 4 columns]

```
[41]: # This is each user's current path and how long it took for their latest status_  
      ↪change  
      app_status_history = app_status_history.groupby('OWNERID').first().reset_index()  
      app_status_history
```

```
[41]:
```

	OWNERID	NEWHAPPYPATH	OLDHAPPYPATH	\
0	00436679265122c3ad5758400d89b17c	6	5	
1	02f4958358e3c82915f1cc76d198188f	5	4	
2	0dcac0d9fc03d1c2861df868e0a8df4c	2	1	
3	1278a00ab3c7b9e7eb2d8c13fb8755e4	6	5	
4	140d49c315e9f37a89aa777421b83134	3	2	
5	1b0b08997e79285d229bbf1cc740d615	6	5	
6	1ddd34d0c758c5290674a24f1e283da4	5	4	

7	21ff78e4490a1198c59f473c01cf0079	8	7
8	251a6e0bd8ece5b563fa31ccff691915	5	4
9	25d48a48c440f62e1439bf8bccf0310c	6	5
10	2d5547fbd61a4082a786f69e5bf721e4	10	9
11	2f8973e24a146b94f4749746432088e1	1	0
12	340ca166c7d3975136db95be072d7f50	5	4
13	3e46791f5d6f86d9ca8c971e0ad64edb	3	2
14	3e9b463c5c817ac5e823f5d85fcd84d3	10	9
15	432e2da02f1b7437a62ac7a333b7a2d2	5	4
16	44952b2d60daf32057c5e54d94cb6a49	5	4
17	47da8e735bceafe93a1337351db319e7	9	8
18	49700a7cae152bd442e8cbcc1faa756e	6	5
19	525edb311a420ff4db9d49762f5132b4	10	9
20	56d6f992ea66bf53e1955ff8490de3be	5	4
21	6379016b6e948b37620044e73fd3f801	8	7
22	64de525096f7e8bf60c0a6e845674eb8	5	4
23	67443e639bb9ac6558a27be3debf4091	3	2
24	70ba2d4650f2b0b9116f1eb99eb16a32	2	1
25	76f6c5f46a77b5a17f107438da7e6360	5	4
26	775be71713895ced8b2ed40e1fca5106	6	5
27	7fb25287e2afc20b42a86bde4f26840d	6	5
28	88ec9b4ad401977a7c942e10abdbff88	5	4
29	8a97832896ec7aa442f07929fca9fdf4	7	6
30	95ec434d3f4030bcfcfc3b064fb640b2	7	6
31	9bf551c7dc19d212b29bddce70f8f7d8	8	7
32	9c33da9ec13136ac6d57d944c53b3af5	10	9
33	a852dbbdfd2e757c349e502596a0fb60	7	6
34	a8bd923ec8bcb2990b4a11b606f7cc3c	7	6
35	a943aaf3f772875d4184d45c6cd040df	10	9
36	ac4132126a3905e05f216610309290c8	2	1
37	bedad6258fd40f1ad13cef1db640d8fc	3	2
38	c7fce1331932b2de29fc6d80c62af3b0	6	5
39	c829c9b67088023a5ff6c37ab7bf4e50	8	7
40	cb6476f5cae92939e517e67972516718	8	7
41	ceb47f43154b3afdb0dc32f9897ac82e	5	4
42	cf818ba4de1b6d10ae9b36d03e1e0bdc	6	5
43	d54ee72b9a9809c8486511358f28c13c	8	7
44	dbc5a139d62c03f312f72cc343a97b92	5	4
45	de24599d794a23e960a1d2ff17cbb324	6	5
46	deca10ff558e099e2d2f718d653776e6	2	1
47	e0c4d6e93c1faf39c0d709b1b0a4fb4f	5	4
48	fae6a47d9adbdbb5c8cdc091fd9807ad	8	7

#### CONVERSION\_DAYS

0	0
1	16
2	16



3	0
4	0
5	1
6	0
7	0
8	1
9	6
10	0
11	0
12	0
13	1
14	0
15	0
16	6
17	1
18	7
19	0
20	28
21	1
22	0
23	0
24	29
25	20
26	0
27	0
28	0
29	0
30	0
31	0
32	0
33	0
34	0
35	0
36	1
37	0
38	0
39	2
40	28
41	0
42	1
43	0
44	13
45	0
46	1
47	1
48	5

```
[42]: app_status_history = app_status_history.drop(columns=['OLDHAPPYPATH',
↳ 'OWNERID'])
app_status_history
```

```
[42]:
```

	NEWHAPPYPATH	CONVERSION_DAYS
0	6	0
1	5	16
2	2	16
3	6	0
4	3	0
5	6	1
6	5	0
7	8	0
8	5	1
9	6	6
10	10	0
11	1	0
12	5	0
13	3	1
14	10	0
15	5	0
16	5	6
17	9	1
18	6	7
19	10	0
20	5	28
21	8	1
22	5	0
23	3	0
24	2	29
25	5	20
26	6	0
27	6	0
28	5	0
29	7	0
30	7	0
31	8	0
32	10	0
33	7	0
34	7	0
35	10	0
36	2	1
37	3	0
38	6	0
39	8	2
40	8	28
41	5	0

42	6	1
43	8	0
44	5	13
45	6	0
46	2	1
47	5	1
48	8	5

```
[43]: app_status_history = app_status_history.sort_values('NEWHAPPYPATH',
↪ascending=False)
app_status_history
```

```
[43]:
```

	NEWHAPPYPATH	CONVERSION_DAYS
35	10	0
19	10	0
14	10	0
32	10	0
10	10	0
17	9	1
48	8	5
31	8	0
21	8	1
7	8	0
39	8	2
40	8	28
43	8	0
33	7	0
30	7	0
29	7	0
34	7	0
38	6	0
26	6	0
42	6	1
45	6	0
27	6	0
0	6	0
3	6	0
5	6	1
18	6	7
9	6	6
47	5	1
12	5	0
41	5	0
6	5	0
8	5	1
1	5	16
44	5	13

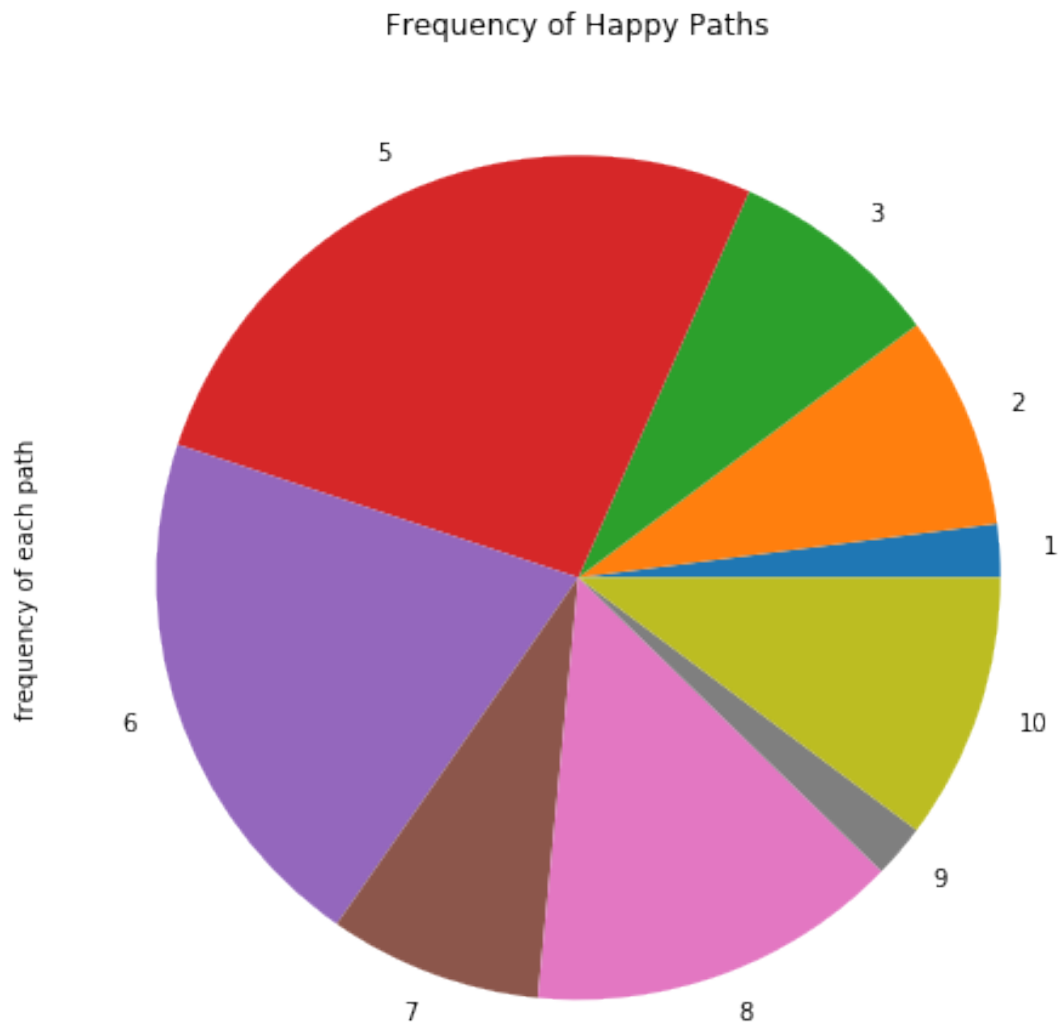
15	5	0
16	5	6
28	5	0
20	5	28
22	5	0
25	5	20
13	3	1
37	3	0
4	3	0
23	3	0
46	2	1
36	2	1
2	2	16
24	2	29
11	1	0

```
[44]: freq_path = app_status_history.groupby('NEWHAPPYPATH').count()
freq_path = freq_path.rename(columns={'CONVERSION_DAYS' : 'frequency of each_
↳path'})
freq_path
```

```
[44]: frequency of each path
NEWHAPPYPATH
1                1
2                4
3                4
5               13
6               10
7                4
8                7
9                1
10               5
```

```
[45]: freq_path.plot.pie(y='frequency of each path', figsize=(8, 8), legend=False)
plt.title('Frequency of Happy Paths')
```

```
[45]: Text(0.5, 1.0, 'Frequency of Happy Paths')
```



```
[46]: longest_status_path = app_status_history.groupby('NEWHAPPYPATH').sum()
      longest_status_path
```

```
[46]:
```

NEWHAPPYPATH	CONVERSION_DAYS
1	0
2	47
3	1
5	85
6	15
7	0
8	36
9	1

```
[47]: longest_status_path = longest_status_path.rename(columns={'CONVERSION_DAYS' :
↳ 'path with longest status change'})
longest_status_path['path with longest status change'] =
↳ longest_status_path['path with longest status change']/freq_path['frequency_
↳ of each path']
longest_status_path
```

```
[47]: path with longest status change
NEWHAPPYPATH
1          0.000000
2         11.750000
3          0.250000
5          6.538462
6          1.500000
7          0.000000
8          5.142857
9          1.000000
10         0.000000
```

```
[48]: longest_status_path.plot.line(legend=False)
plt.title('Happy Path vs. Days of Conversion')
plt.xlabel('Happy Path')
plt.ylabel('Days')
plt.xticks(np.arange(11), np.arange(11))
```

```
[48]: ([<matplotlib.axis.XTick at 0x1296cb0d0>,
<matplotlib.axis.XTick at 0x129640d50>,
<matplotlib.axis.XTick at 0x1288c5090>,
<matplotlib.axis.XTick at 0x129cf5b50>,
<matplotlib.axis.XTick at 0x129cfe290>,
<matplotlib.axis.XTick at 0x129cfe890>,
<matplotlib.axis.XTick at 0x129cfef10>,
<matplotlib.axis.XTick at 0x129676d50>,
<matplotlib.axis.XTick at 0x129d04d90>,
<matplotlib.axis.XTick at 0x129d04e50>,
<matplotlib.axis.XTick at 0x129d0a650>],
<a list of 11 Text xticklabel objects>)
```

