Cermati Business Analyst Application

Preliminary Guideline

The file above contains data for a info commercial (late night commercial) app (-- Imagine those iklan for panci presto or ultra red heater that you see on tv but being streamed on mobile app all day long). Where a user can open the app and look for products demonstration online (just like the late night info commercial on TV). If the user needs help to complete transaction they can see if there is agent available to help. If this is an agent available, they can request the agent to call them to complete transaction.
So, for example, from this data look at row 11, or the hour beginning 4pm (hour 16), September 10th, 2012:
During this hour: 11 people opened the call center app (Eyeballs). 2 of them did not see any agents (Zeroes), and 4 of them requested a call (Requests). Of the 4 Requests, only 3 complete calls actually resulted (Completed). During this time, there were a total of 6 call center agents who

Import Necessary Libraries

In [239]:
```
import pandas as pd
import matplotlib
import matplotlib.pyplot as plt
```

Question 1: Load Dataset

In [240]:
```
df=pd.read_excel('D:/Data D/Data E/My Data/Modern/My Folder/Kurikulum Pr
ibadi/Resume/CV Application/Cermati/Caller and Agent Data Test.xlsx')
```

In [241]:
```
df.head()
```

Out[241]:

	Date	Time (Local)	Eyeballs	Zeroes	Completed Calls	Requests	Unique Agents
0	2012-09-10	7	5	0	2	2	9
1	2012-09-10	8	6	0	2	2	14
2	2012-09-10	9	8	3	0	0	14
3	2012-09-10	10	9	2	0	1	14
4	2012-09-10	11	11	1	4	4	11

In [242]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 336 entries, 0 to 335
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   Date             336 non-null    datetime64[ns]
 1   Time (Local)     336 non-null    int64
 2   Eyeballs         336 non-null    int64
 3   Zeroes           336 non-null    int64
 4   Completed Calls  336 non-null    int64
 5   Requests         336 non-null    int64
 6   Unique Agents    336 non-null    int64
dtypes: datetime64[ns](1), int64(6)
memory usage: 18.5 KB
```

In [243]:
```
df.describe()
```

Out[243]:

	Time (Local)	Eyeballs	Zeroes	Completed Calls	Requests	Unique Agents
count	336.00000	336.000000	336.000000	336.000000	336.000000	336.000000
mean	11.50000	19.901786	4.252976	4.062500	5.529762	7.895833
std	6.93251	16.902862	5.795391	5.672581	7.339416	5.884296
min	0.00000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	5.75000	9.000000	1.000000	0.000000	1.000000	3.000000
50%	11.50000	17.000000	3.000000	2.000000	3.000000	8.000000
75%	17.25000	25.000000	5.000000	5.000000	6.250000	11.000000
max	23.00000	99.000000	59.000000	36.000000	46.000000	30.000000

Answer: ***A.*** *I was able to download the data, open the file, and view Row 11!*

Question 2: Which date had the most completed call during the two week period?

In [244]:
```
df_2=df.loc[:,['Date','Completed Calls']]
df_2_group = df_2.groupby('Date').sum()
df_2_group.sort_values(by='Completed Calls', ascending=False)
```

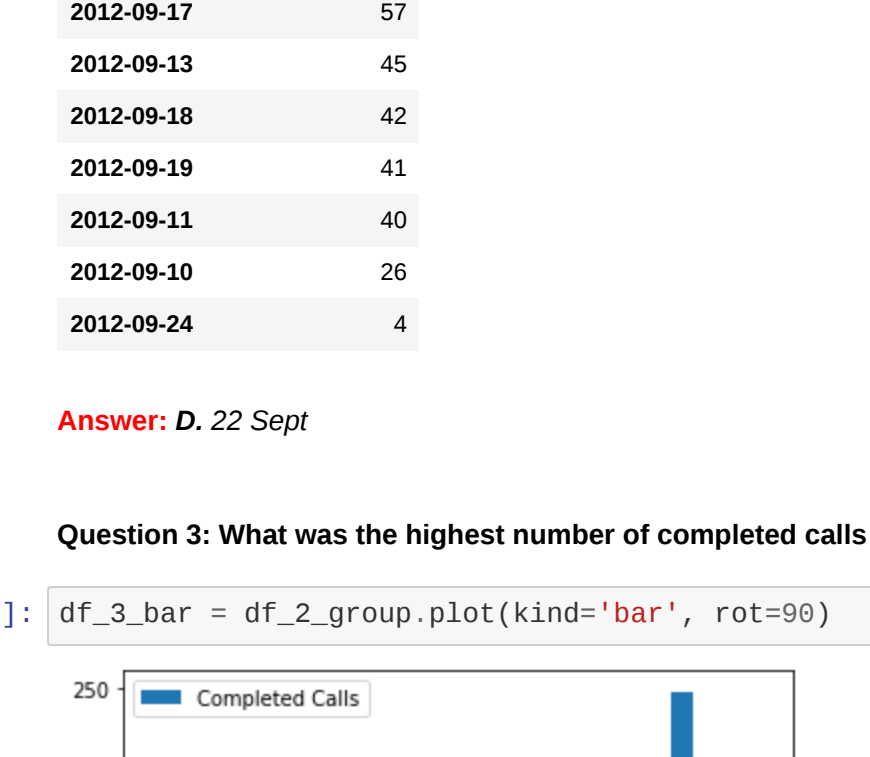
Out[244]:

Date	Completed Calls
2012-09-22	248
2012-09-15	199
2012-09-21	190
2012-09-23	111
2012-09-14	108
2012-09-16	93
2012-09-12	91
2012-09-20	70
2012-09-17	57
2012-09-13	45
2012-09-18	42
2012-09-19	41
2012-09-11	40
2012-09-10	26
2012-09-24	4

Answer: ***D.*** *22 Sept*

Question 3: What was the highest number of completed calls within a 24 hour period?

In [245]:
```
df_3_bar = df_2_group.plot(kind='bar', rot=90)
```



Answer: ***N/A.*** *(248)*

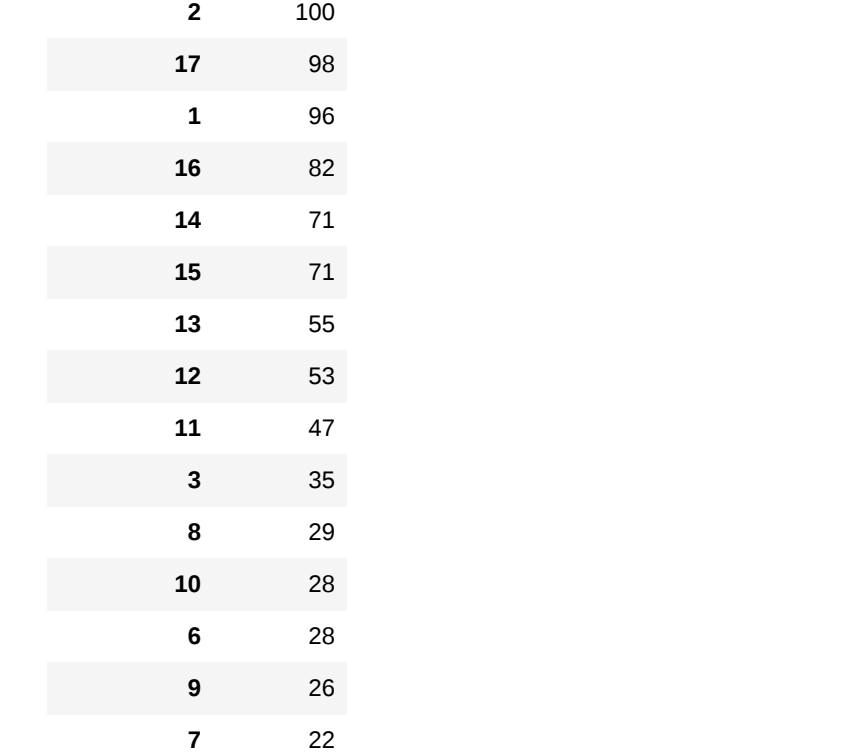
Question 4: Which hour of the day had the most call requests during the two week period?

In [246]:
```
df_4=df.loc[:,['Time (Local)','Requests ']]
df_4_group = df_4.groupby('Time (Local)').sum()
df_4_group.sort_values(by='Requests ', ascending=False)
```

Out[246]:

Time (Local)	Requests
23	184
22	174
19	156
0	142
18	119
21	112
20	107
2	100
17	98
1	96
16	82
14	71
15	71
13	55
12	53
11	47
3	35
8	29
10	28
6	28
9	26
7	22
5	14
4	9

In [247]:
```
df_4_bar = df_4_group.plot(kind='bar', rot=0)
```



Answer: ***D.*** *11pm-12am*

Question 5: What percentage of all zeroes during the two week period occurred on weekends (Friday at 5pm to Sunday at 3am)?

In [248]:
```
df_5 = df.copy()
df_5['Day']=df_5['Date'].dt.day_name()
df_5.head()
```

Out[248]:

	Date	Time (Local)	Eyeballs	Zeroes	Completed Calls	Requests	Unique Agents	Day
0	2012-09-10	7	5	0	2	2	9	Monday
1	2012-09-10	8	6	0	2	2	14	Monday
2	2012-09-10	9	8	3	0	0	14	Monday

In [249]:
```
friday = (df_5['Day']=='Friday') & (df_5['Time (Local)'].isin(['17','18'
,'19','20','21','22','23']))
saturday = df_5['Day']=='Saturday'
sunday = (df_5['Day']=='Sunday') & (df_5['Time (Local)'].isin(['0','1',
'2']))
df_5_wn_hr = df_5[friday | saturday | sunday]
```

Out[249]:

	Date	Time (Local)	Eyeballs	Zeroes	Completed Calls	Requests	Unique Agents	Day
106	2012-09-14	17	34	4	3	5	13	Friday
107	2012-09-14	18	40	2	8	9	14	Friday
108	2012-09-14	19	46	6	9	10	15	Friday

In [250]:
```
a = (df_5_wn_hr['Zeroes '].sum())
b = (df['Zeroes '].sum())
persentase = a*100/b
print(str(persentase) + '%')
```

```
44.856543037088876%
```

Answer: ***C.*** *44.9%*

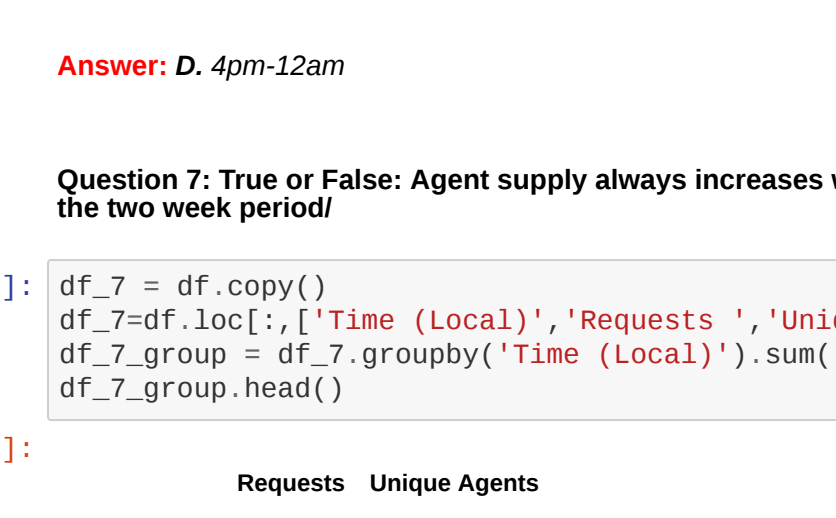
Question 6: In drafting an agent schedule in terms of 8 hour shifts, when are the busiest 8 consecutive hours over the two week period in terms of unique requests?Assume that an agent will work the same shift each day.

In [251]:
```
df_6 = df.copy()
df_6=df.loc[:,['Time (Local)','Requests ']]
df_6_group = df_6.groupby('Time (Local)').sum()
df_6_group
```

Out[251]:

Time (Local)	Requests
0	142
1	96
2	100
3	35
4	9
5	14
6	28
7	22
8	29
9	26
10	28
11	47
12	53
13	55
14	71
15	71
16	82
17	98
18	119
19	156
20	107
21	112
22	174
23	184

In [252]:
```
df_6_bar = df_6_group.plot(kind='bar', rot=0)
```



Answer: ***D.*** *4pm-12am*

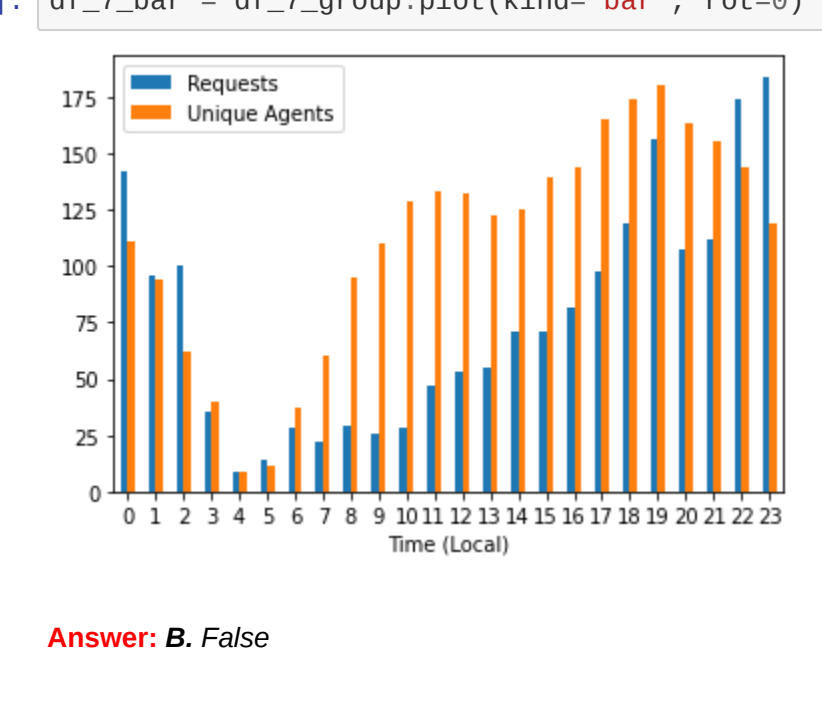
Question 7: True or False: Agent supply always increases when demand increases during the two week period

In [253]:
```
df_7 = df.copy()
df_7=df.loc[:,['Time (Local)','Requests ','Unique Agents']]
df_7_group = df_7.groupby('Time (Local)').sum()
df_7_group.head()
```

Out[253]:

Time (Local)	Requests	Unique Agents
0	142	111
1	96	94
2	100	62
3	35	40
4	9	9

In [254]:
```
df_7_bar = df_7_group.plot(kind='bar', rot=0)
```



Answer: ***B.*** *False*

Question 8: In which 72 hour period is the ratio of Zeroes to Eyeballs the highest?

In [255]:
```
#Jawaban A
df_8_a = df.copy()
df_8_a['Date'] = pd.to_datetime(df_8_a['Date'])

start_date1 = '19-09-2012'
start_time1 = 4
end_time1 = 23
a_date1 = df_8_a['Date'] == start_date1
a_time1 = (df_8_a['Time (Local)'] >= start_time1) & (df_8_a['Time (Loca
l)'] <= end_time1)

start_date2 = '20-09-2012'
start_time2 = 0
end_time2 = 23
a_date2 = df_8_a['Date'] == start_date2
a_time2 = (df_8_a['Time (Local)'] >= start_time2) & (df_8['Time (Local)'
] <= end_time2)

start_date3 = '21-09-2012'
start_time3 = 0
end_time3 = 23
a_date3 = df_8_a['Date'] == start_date3
a_time3 = (df_8_a['Time (Local)'] >= start_time3) & (df_8_a['Time (Loca
l)'] <= end_time3)

start_date4 = '22-09-2012'
end_date4 = '22-09-2012'
start_time4 = 0
end_time4 = 4
a_date4 = df_8_a['Date'] == start_date4
a_time4 = (df_8_a['Time (Local)'] >= start_time4) & (df_8_a['Time (Loca
l)'] <= end_time4)

df_8_a1 = df_8_a.loc[a_date1 & a_time1]
df_8_a2 = df_8_a.loc[a_date2 & a_time2]
df_8_a3 = df_8_a.loc[a_date3 & a_time3]
```

Out[255]:

	Date	Time (Local)	Eyeballs	Zeroes	Completed Calls	Requests	Unique Agents
213	2012-09-19	4	1	1	0	0	0
214	2012-09-19	5	2	0	0	0	1
215	2012-09-19	6	7	1	2	3	5
216	2012-09-19	7	8	0	2	2	7
217	2012-09-19	8	11	1	2	2	6
...	...	...	...	...	...	...	...
281	2012-09-22	0	62	4	19	27	27
282	2012-09-22	1	39	5	17	24	24
283	2012-09-22	2	30	0	9	18	12
284	2012-09-22	3	11	3	3	3	8
285	2012-09-22	4	6	4	2	3	1

73 rows × 7 columns

In [256]:
```
#Hasil Ratio Jawaban A
a_z= df_8_a_r['Zeroes '].sum()
a_e= df_8_a_r['Eyeballs '].sum()
print('Ratio Zeroes to Eyeballs pada 4am 9/19-4am 9/22:' + ' ' +str(a_z/
```

```
Ratio Zeroes to Eyeballs pada 4am 9/19-4am 9/22: 0.16091954022988506
```

In [257]:
```
#Jawaban B
df_8_b = df.copy()
df_8_b['Date'] = pd.to_datetime(df_8_b['Date'])

start_date5 = '20-09-2012'
start_time5 = 11
end_time5 = 23
a_date5 = df_8_b['Date'] == start_date5
a_time5 = (df_8_b['Time (Local)'] >= start_time5) & (df_8_b['Time (Loca
l)'] <= end_time5)

start_date6 = '21-09-2012'
start_time6 = 0
end_time6 = 23
a_date6 = df_8_b['Date'] == start_date6
a_time6 = (df_8_b['Time (Local)'] >= start_time6) & (df_8_b['Time (Loca
l)'] <= end_time6)

start_date7 = '22-09-2012'
start_time7 = 0
end_time7 = 23
a_date7 = df_8_b['Date'] == start_date7
a_time7 = (df_8_b['Time (Local)'] >= start_time7) & (df_8_b['Time (Loca
l)'] <= end_time7)

start_date8 = '23-09-2012'
end_date8 = '23-09-2012'
start_time8 = 0
end_time8 = 11
a_date4 = df_8_b['Date'] == start_date8
a_time4 = (df_8_b['Time (Local)'] >= start_time8) & (df_8_b['Time (Loca
l)'] <= end_time8)

df_8_b1 = df_8_b.loc[a_date4 & a_time4]
df_8_b2 = df_8_b.loc[a_date5 & a_time5]
df_8_b3 = df_8_b.loc[a_date6 & a_time6]
```

Out[257]:

	Date	Time (Local)	Eyeballs	Zeroes	Completed Calls	Requests	Unique Agents
305	2012-09-23	0	62	25	23	32	18
306	2012-09-23	1	38	1	15	23	18
307	2012-09-23	2	34	4	13	18	18
308	2012-09-23	3	19	1	9	9	16
309	2012-09-23	4	1	0	0	1	4
...	...	...	...	...	...	...	...
300	2012-09-22	19	43	10	21	24	15
301	2012-09-22	20	49	4	7	14	18
302	2012-09-22	21	53	3	15	19	21
303	2012-09-22	22	77	11	25	33	19
304	2012-09-22	23	99	59	25	44	17

73 rows × 7 columns

In [258]:
```
#Hasil Ratio Jawaban B
b_z= df_8_b_r['Zeroes '].sum()
b_e= df_8_b_r['Eyeballs '].sum()
print('Ratio Zeroes to Eyeballs pada 11am 9/20-11am 9/23:' + ' ' +str(b_
```

```
Ratio Zeroes to Eyeballs pada 11am 9/20-11am 9/23: 0.2014165559982293
```

In [259]:
```
#Jawaban C
df_8_c = df.copy()
df_8_c['Date'] = pd.to_datetime(df_8_c['Date'])

start_date8 = '14-09-2012'
start_time8 = 17
end_time8 = 23
a_date8 = df_8_c['Date'] == start_date8
a_time8 = (df_8_c['Time (Local)'] >= start_time8) & (df_8_c['Time (Loca
l)'] <= end_time8)

start_date9 = '15-09-2012'
start_time9 = 0
end_time9 = 23
a_date9 = df_8_c['Date'] == start_date9
a_time9 = (df_8_c['Time (Local)'] >= start_time9) & (df_8_c['Time (Loca
l)'] <= end_time9)

start_date10 = '16-09-2012'
start_time10= 0
end_time10 = 23
a_date10 = df_8_c['Date'] == start_date10
a_time10 = (df_8_c['Time (Local)'] >= start_time10) & (df_8_c['Time (Loc
al)'] <= end_time10)

start_date11 = '17-09-2012'
end_date11 = '17-09-2012'
start_time11 = 0
end_time11 = 17
a_date11 = df_8_c['Date'] == start_date11
a_time11 = (df_8_c['Time (Local)'] >= start_time11) & (df_8_c['Time (Loc
al)'] <= end_time11)

df_8_c1 = df_8_c.loc[a_date8 & a_time8]
df_8_c2 = df_8_c.loc[a_date9 & a_time9]
df_8_c3 = df_8_c.loc[a_date10 & a_time10]
```

Out[259]:

	Date	Time (Local)	Eyeballs	Zeroes	Completed Calls	Requests	Unique Agents
106	2012-09-14	17	34	4	3	5	13
107	2012-09-14	18	40	2	8	9	14
108	2012-09-14	19	46	6	9	10	15
109	2012-09-14	20	38	4	8	9	14
110	2012-09-14	21	49	6	8	9	17
...	...	...	...	...	...	...	...
174	2012-09-17	13	19	3	1	2	8
175	2012-09-17	14	19	3	0	1	8
176	2012-09-17	15	20	3	1	1	8
177	2012-09-17	16	23	7	3	5	7
178	2012-09-17	17	23	3	8	10	9

73 rows × 7 columns

In [260]:
```
#Hasil Ratio Jawaban C
c_z= df_8_c_r['Zeroes '].sum()
c_e= df_8_c_r['Eyeballs '].sum()
print('Ratio Zeroes to Eyeballs pada 5pm 9/14-5pm 9/17:' + ' ' +str(c_z/
```

```
Ratio Zeroes to Eyeballs pada 5pm 9/14-5pm 9/17: 0.2515580736543909
```

In [261]:
```
#Jawaban D
df_8_d = df.copy()
df_8_d['Date'] = pd.to_datetime(df_8_d['Date'])

start_date12 = '16-09-2012'
start_time12 = 4
end_time12 = 23
a_date12 = df_8_d['Date'] == start_date12
a_time12 = (df_8_d['Time (Local)'] >= start_time12) & (df_8_d['Time (Loc
al)'] <= end_time12)

start_date13 = '17-09-2012'
start_time13 = 0
end_time13 = 23
a_date13 = df_8_d['Date'] == start_date13
a_time13 = (df_8_d['Time (Local)'] >= start_time13) & (df_8_d['Time (Loc
al)'] <= end_time13)

start_date14 = '18-09-2012'
start_time14= 0
end_time14 = 23
a_date14 = df_8_d['Date'] == start_date14
a_time14 = (df_8_d['Time (Local)'] >= start_time14) & (df_8_d['Time (Loc
al)'] <= end_time14)

start_date15 = '19-09-2012'
end_date15 = '19-09-2012'
start_time15 = 0
end_time15 = 4
a_date15 = df_8_d['Date'] == start_date15
a_time15 = (df_8_d['Time (Local)'] >= start_time15) & (df_8_d['Time (Loc
al)'] <= end_time15)

df_8_d1 = df_8_d.loc[a_date12 & a_time12]
df_8_d2 = df_8_d.loc[a_date13 & a_time13]
df_8_d3 = df_8_d.loc[a_date14 & a_time14]
```

Out[261]:

	Date	Time (Local)	Eyeballs	Zeroes	Completed Calls	Requests	Unique Agents
141	2012-09-16	4	6	6	0	3	2
142	2012-09-16	5	5	5	0	1	1
143	2012-09-16	6	3	3	0	2	0
144	2012-09-16	7	3	0	0	0	1
145	2012-09-16	8	8	2	1	2	3
...	...	...	...	...	...	...	...
209	2012-09-19	0	9	1	0	0	3
210	2012-09-19	1	3	0	0	0	3
211	2012-09-19	2	3	0	2	2	1
212	2012-09-19	3	1	1	0	1	0
213	2012-09-19	4	1	1	0	0	0

73 rows × 7 columns

In [262]:
```
#Hasil Ratio Jawaban D
d_z= df_8_d_r['Zeroes '].sum()
d_e= df_8_d_r['Eyeballs '].sum()
print('Ratio Zeroes to Eyeballs pada 4am 9/16-4am 9/19:' + ' ' +str(d_z/
```

```
Ratio Zeroes to Eyeballs pada 4am 9/16-4am 9/19: 0.24783027965284474
```

In [263]:
```
#Rekap Hasil Jawaban
result = {'Option':['A','B','C','D'],
          'Ratio':['0.161','0.201','0.251','0.247']
         }
df_result = pd.DataFrame(result, columns=['Option','Ratio'])
df_result
```

Out[263]:

	Option	Ratio
0	A	0.161
1	B	0.201
2	C	0.251
3	D	0.247

Answer: ***C.*** *5pm 9/14-5pm 9/17*

Question 9: If you could add 5 agents to any single hour every day during the two week period, which hour should you add them to?

In [264]:
```
df_9=df.copy()
df_9=df.loc[:,['Time (Local)','Eyeballs ','Requests ','Unique Agents']]
df_9_group = df_9.groupby('Time (Local)').sum()
df_9_group['Gap']=df_9_group['Unique Agents'] - df_9_group['Requests ']
df_9_group.sort_values(by='Gap', ascending=True)
```

Out[264]:

Time (Local)	Eyeballs	Requests	Unique Agents	Gap
23	488	184	119	-65
2	170	100	62	-38
0	339	142	111	-31
22	492	174	144	-30
5	42	14	11	-3
1	207	96	94	-2
4	29	9	9	0
3	83	35	40	5
6	78	28	37	9
19	448	156	180	24
7	111	22	60	38
21	459	112	155	43
14	332	71	125	54
18	447	119	174	55
20	410	107	163	56
16	358	82	144	62
8	151	29	95	66
13	311	55	122	67
17	408	98	165	67
15	337	71	139	68
12	278	53	132	79
9	202	26	110	84
11	264	47	133	86
10	243	28	129	101

Answer: ***D.*** *11pm-12am*

Question 10: Looking at the data from all two weeks, which time might make the most sense to consider a true "end of day" instead of midnight? (i.e., when are supply and demand both at natural minimums)

In [265]:
```
df_10 = df.copy()
df_10=df.loc[:,['Time (Local)','Requests ','Unique Agents']]
df_10_group = df_10.groupby('Time (Local)').sum()
df_10_group.sort_values(by='Requests ', ascending=True)
```

Out[265]:

Time (Local)	Requests	Unique Agents
4	9	9
5	14	11
7	22	60
9	26	110
10	28	129
6	28	37
8	29	95
3	35	40
11	47	133
12	53	132
13	55	122
14	71	125
15	71	139
16	82	144
1	96	94
17	98	165
2	100	62
20	107	163
21	112	155
18	119	174
0	142	111
19	156	180
22	174	144
23	184	119

Answer: ***C.*** *4 am*

In [ ]: