```
In [1]: import pandas as pd
        import matplotlib.pyplot as plt
        import numpy as np
        import seaborn as sns
        from scipy.stats import chi2_contingency
        from scipy.stats import chi2
```

Data Cleaning

```
In [2]: df = pd.read_csv("survey.csv")
        df["Do you work on or off campus?"].fillna(0, inplace = True)
        df["How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs)."].fillna(
        df["How many hours in a typical week do you work?"].fillna(0, inplace = True)
        df.at[19, 'How many hours in a typical week do you work?'] = '60'
        df.at[30, 'How many hours in a typical week do you work?'] = '15'
        df.at[38, 'How many hours in a typical week do you work?'] = '0'
        df.at[82, 'How many hours in a typical week do you work?'] = '23'
        df.at[83, 'How many hours in a typical week do you work?'] = '12'
        df.at[64, 'How many hours in a typical week do you work?'] = '0'
        df.at[20, 'How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs).']
        df.at[31, 'How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs).']
        df.at[40, 'How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs).']
        df.at[42, 'How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs).']
        df.at[24, 'How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs).']
        df.at[34, 'How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs).']
        df.at[82, 'How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs).']
        df['How many hours in a typical week do you work?'] = df['How many hours in a typical week do you work?'].astyp
        df['How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs).'] = df['H
        df2 = df[['What is your age?', 'What gender do you identify as?', 'What year are you?', 'How often do you atten
        df2.head()
```

Out[2]:

	What is your age?	What gender do you identify as?	What year are you?	How often do you attend office hours?	How often do you attend lectures for your classes?	How often do you ask questions in your lectures?	Do you work on or off campus?	How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs).	How many hours in a typical week do you work?
0	21	Woman	Junior	2	5	2	On campus	1	20
1	20	Man	Sophomore	1	5	2	Off Campus	2	20
2	19	Man	Sophomore	2	5	4	0	2	0
3	20	Man	Junior	3	4	2	Off Campus	1	10
4	21	Man	Junior	1	5	1	0	0	0

What data do we have?
The data we have measures students' involvement within school. We gathered how often students attend office hours and lectures, how often they ask questions in class, the number of extra curricular activities they are involved in, if they work a non-academic vs academic job, and how many hours they work per week.

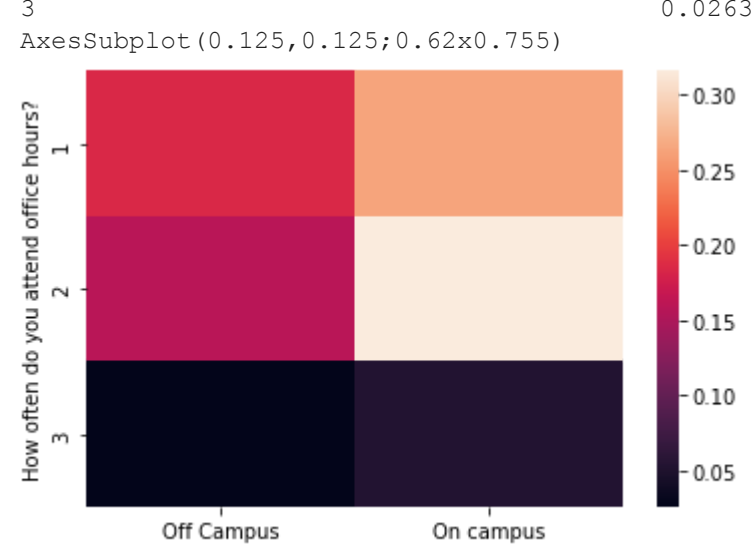
What would we like to know?
How does having an academic vs non-academic job affect involvement in school?

Visualizations and Statistics

Heatmap - Relationship of Office Hour Attendance between Off Campus and On Campus Jobs

```
In [3]: df3 = df2
        index_names = df3[ df3['Do you work on or off campus?'] == 0 ].index
        df3.drop(index_names, inplace = True)
        df3.head()
        officeh = pd.crosstab(df3['How often do you attend office hours?'], df3['Do you work on or off campus?'], norma
        print(officeh)
        print(sns.heatmap(officeh))
```

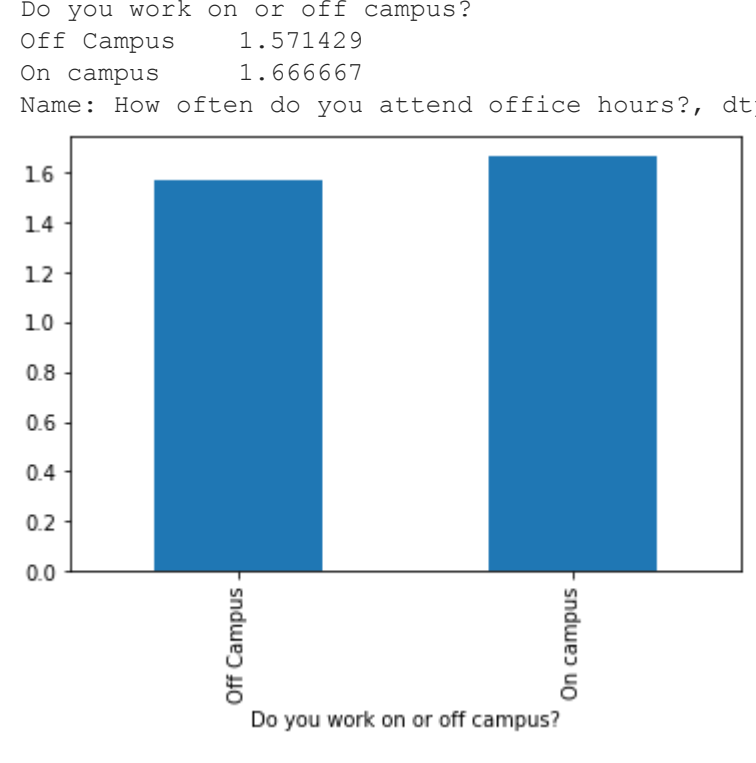
```
Do you work on or off campus?          Off Campus  On campus
How often do you attend office hours?
1                                        0.184211   0.263158
2                                        0.157895   0.315789
3                                        0.026316   0.052632
AxesSubplot(0.125,0.125;0.62x0.755)
```



Bar Graph - Average Office Hour Attendance (1 to 5) between Off Campus and On Campus Jobs

```
In [4]: df_group_OH = df2.groupby(['Do you work on or off campus?']).mean()['How often do you attend office hours?']
        print(df_group_OH)
        df_group_OH = df_group_OH.plot.bar()
```

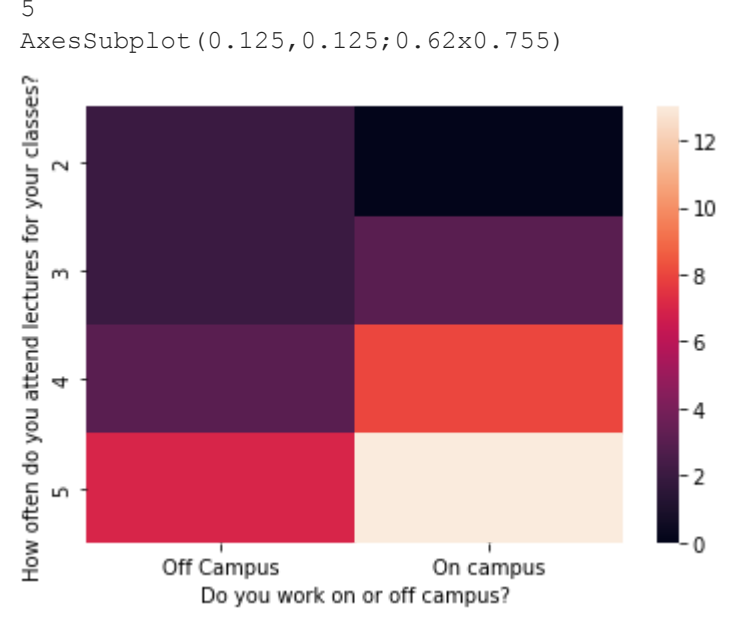
```
Do you work on or off campus?
Off Campus    1.571429
On campus     1.666667
Name: How often do you attend office hours?, dtype: float64
```



Heatmap - Relationship of Lecture Attendance between Off Campus and On Campus Jobs

```
In [5]: lectures = pd.crosstab(df3['How often do you attend lectures for your classes?'], df3['Do you work on or off ca
        print(lectures)
        print(sns.heatmap(lectures))
```

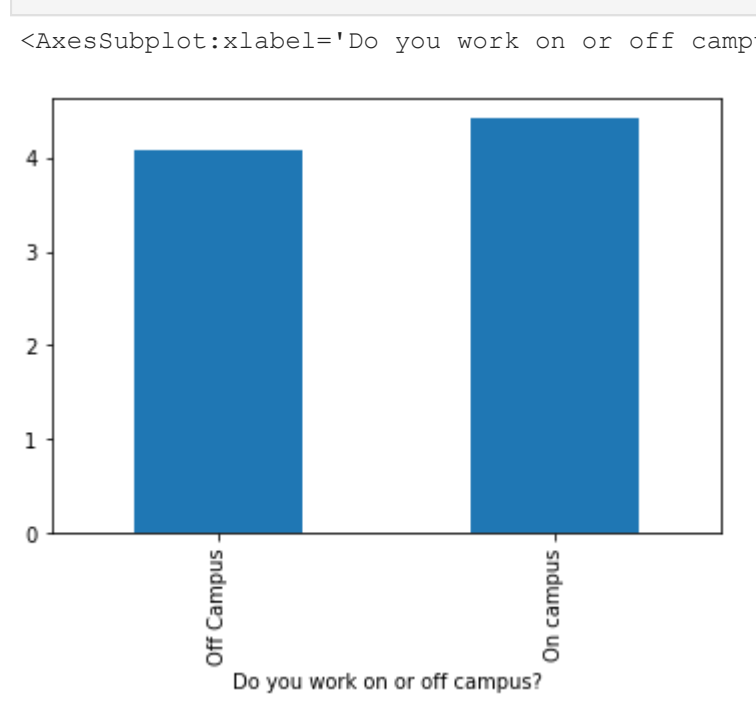
```
Do you work on or off campus?                        Off Campus  On campus
How often do you attend lectures for your classes?
2                                                             2          0
3                                                             2          3
4                                                             3          8
5                                                             7         13
AxesSubplot(0.125,0.125;0.62x0.755)
```



Bar Graph - Average Lecture Attendance (1 to 5) between Off Campus and On Campus Jobs

```
In [6]: X = df3.groupby("Do you work on or off campus?").mean()["How often do you attend lectures for your classes?"]
        X.plot.bar()
```

```
Out[6]: <AxesSubplot:xlabel='Do you work on or off campus?'>
```



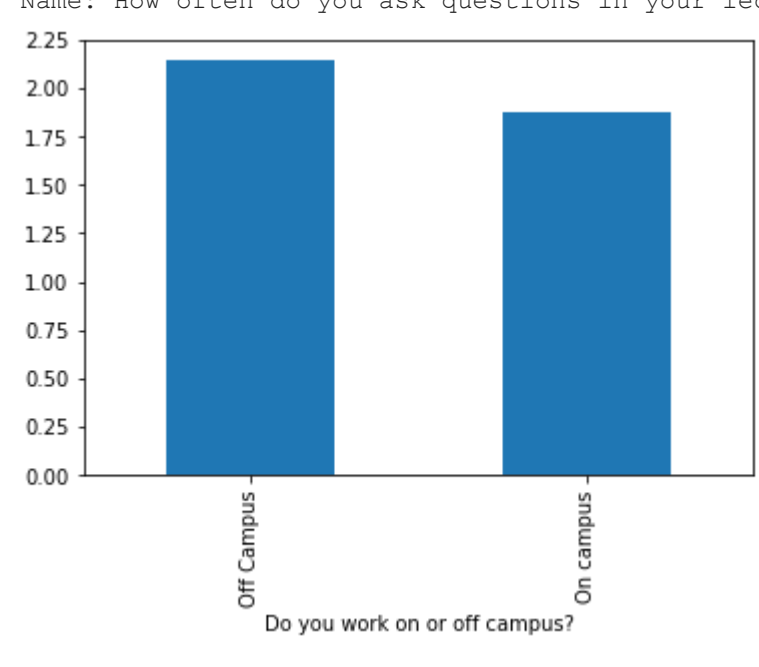
Bar Graph - Average Question Participation (1 to 5) between Off Campus and On Campus Jobs

```
In [7]: questions = pd.crosstab(df3['How often do you ask questions in your lectures?'], df3['Do you work on or off cam
        print(questions)
```

```
Do you work on or off campus?                       Off Campus  On campus
How often do you ask questions in your lectures?
1                                                     0.157895   0.236842
2                                                     0.105263   0.263158
3                                                     0.052632   0.105263
4                                                     0.000000   0.026316
5                                                     0.052632   0.000000
```

```
In [8]: df_group_questions = df2.groupby(['Do you work on or off campus?']).mean()['How often do you ask questions in yo
        print(df_group_questions)
        df_group_questions = df_group_questions.plot.bar()
```

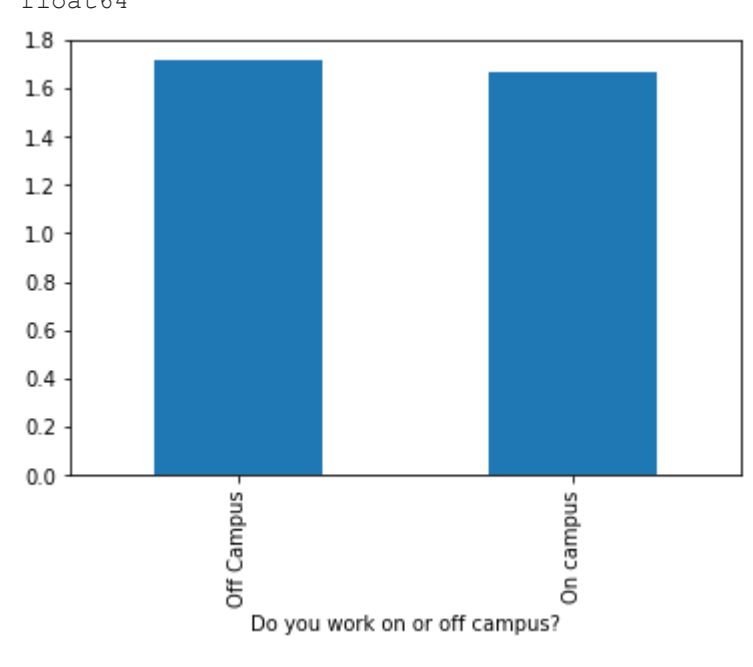
```
Do you work on or off campus?
Off Campus    2.142857
On campus     1.875000
Name: How often do you ask questions in your lectures?, dtype: float64
```



Bar Graph - Average Number of Extracurricular Activities between Off Campus and On Campus Jobs

```
In [9]: df_group_extra = df2.groupby(['Do you work on or off campus?']).mean()['How many extracurricular activities do
        print(df_group_extra)
        df_group_extra = df_group_extra.plot.bar()
```

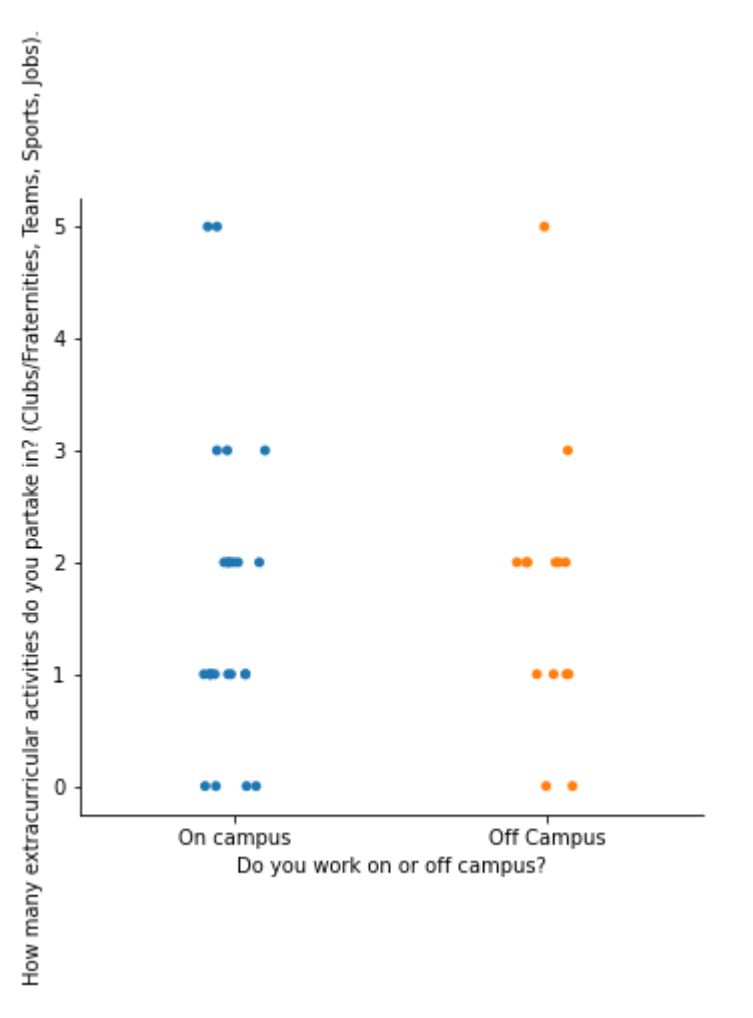
```
Do you work on or off campus?
Off Campus    1.714286
On campus     1.666667
Name: How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs)., dtype:
float64
```



Scatter Plot - Office Hour Attendance (1 to 5) between Off Campus and On Campus Jobs

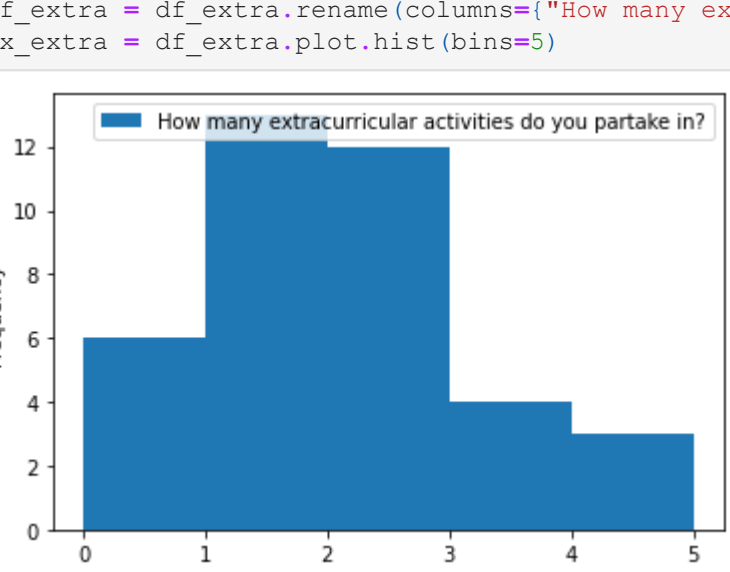
```
In [10]: sns.catplot(x='Do you work on or off campus?', y="How many extracurricular activities do you partake in? (Clubs
```

```
Out[10]: <seaborn.axisgrid.FacetGrid at 0x1c8cd964e20>
```



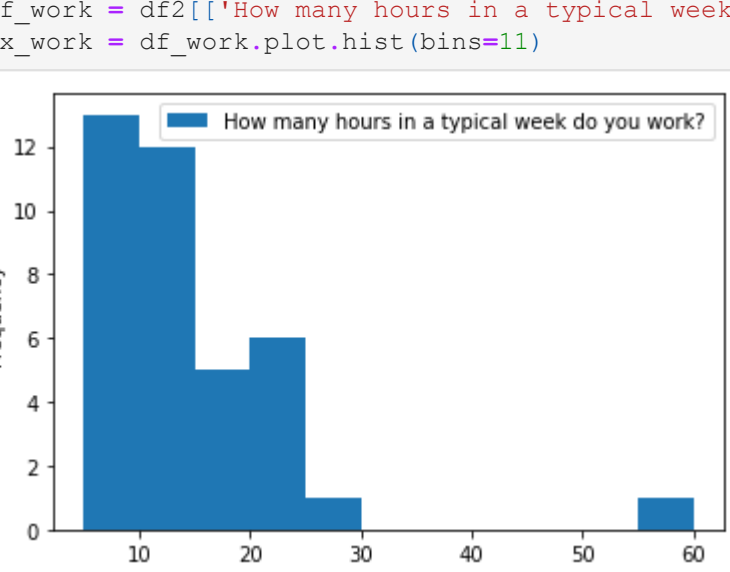
Histogram - Distribution of Students based on Number of Extracurricular Activities

```
In [11]: df_extra = df2[['How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Job
         df_extra = df_extra.rename(columns={"How many extracurricular activities do you partake in? (Clubs/Fraternities
         ax_extra = df_extra.plot.hist(bins=5)
```



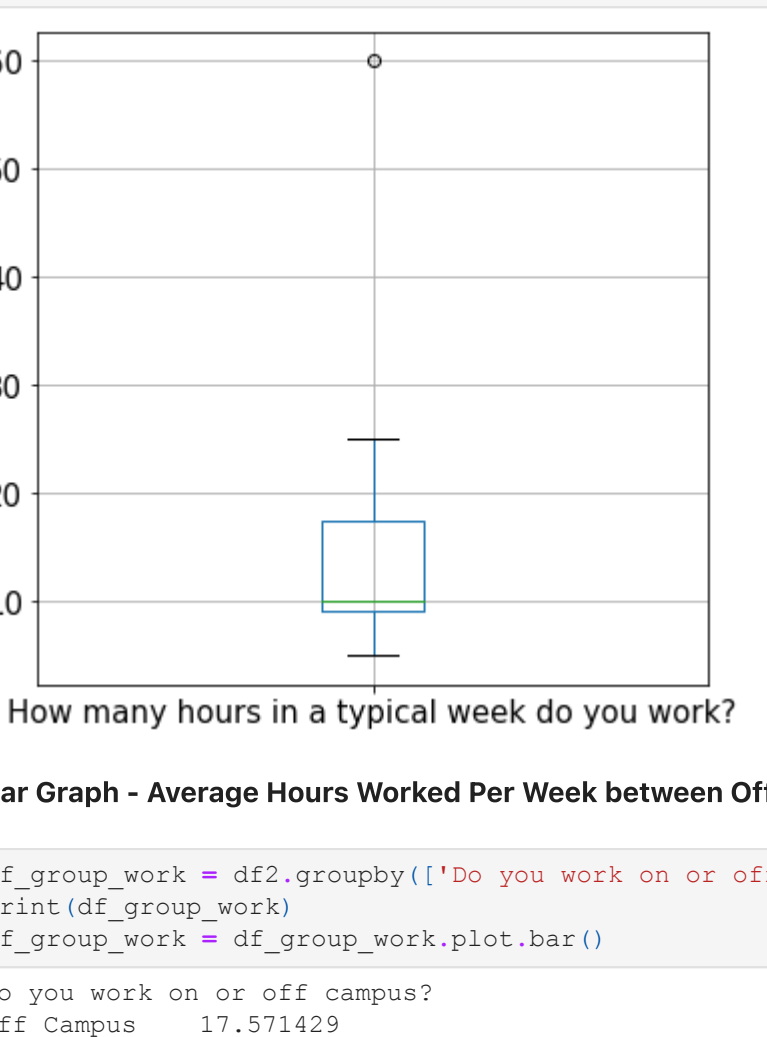
Histogram - Distribution of Students based on Hours Worked Per Week

```
In [12]: df_work = df2[['How many hours in a typical week do you work?']].copy()
         ax_work = df_work.plot.hist(bins=11)
```



Box Plot - Distribution of Students based on Hours Worked Per Week

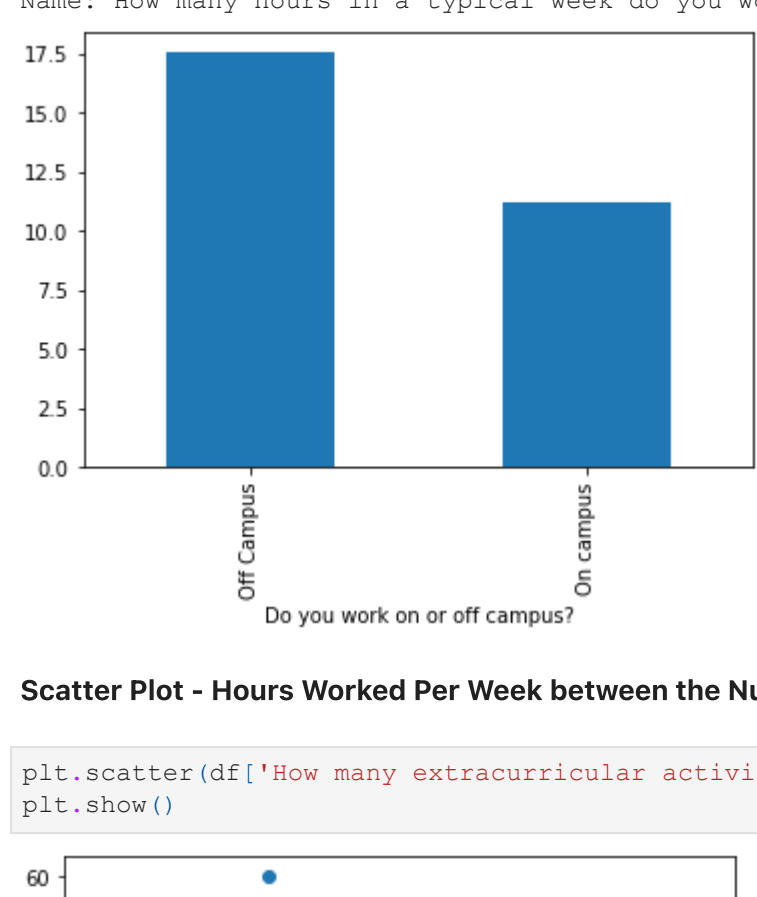
```
In [13]: df_work = df2[['How many hours in a typical week do you work?']].copy()
         boxplot = df_work.boxplot(column=['How many hours in a typical week do you work?'], fontsize = 15, figsize=(6,6
```



Bar Graph - Average Hours Worked Per Week between Off Campus and On Campus Jobs

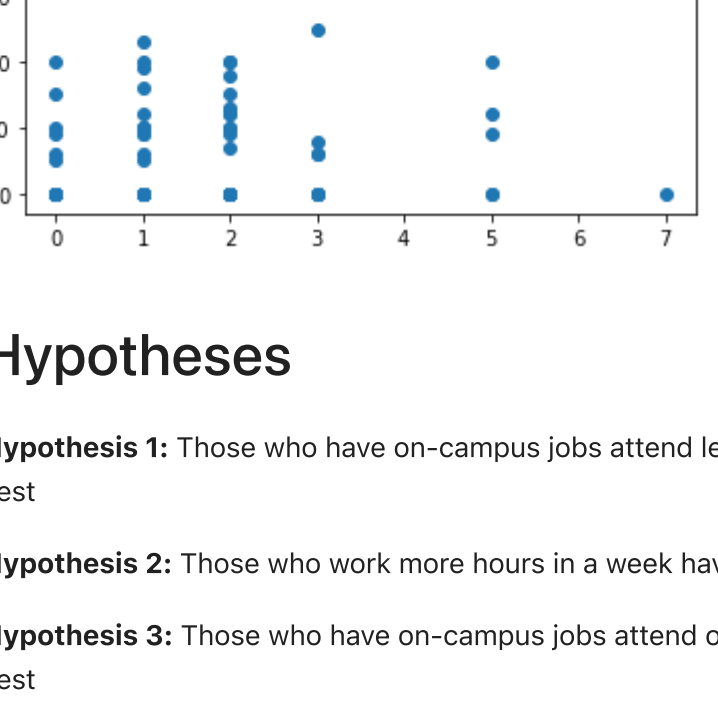
```
In [14]: df_group_work = df2.groupby(['Do you work on or off campus?']).mean()['How many hours in a typical week do you
         print(df_group_work)
         df_group_work = df_group_work.plot.bar()
```

```
Do you work on or off campus?
Off Campus    17.571429
On campus     11.250000
Name: How many hours in a typical week do you work?, dtype: float64
```



Scatter Plot - Hours Worked Per Week between the Number of Extracurricular Activities Students Partake In

```
In [15]: plt.scatter(df['How many extracurricular activities do you partake in? (Clubs/Fraternities, Teams, Sports, Jobs
         plt.show()
```



Hypotheses

Hypothesis 1: Those who have on-campus jobs attend lectures more often than those who have off-campus jobs. Chi Squared Test

Hypothesis 2: Those who work more hours in a week have more extracurricular activities that they partake in. Correlation Test

Hypothesis 3: Those who have on-campus jobs attend office hours more often than those who have off-campus jobs. Chi Squared Test

Tests

Hypothesis 1 Test:

```
In [16]: chi, p, dfree, expected = chi2_contingency(lectures)
         print("calculated chi square value: " ,chi)
```

```
calculated chi square value:  3.912067099567099
```

```
In [17]: print("for 3 degree of freedom, the chi-square value needed to reject the hypothesis at the 0.05 significance l
         chi2.ppf(1-0.05, 3)
```

```
for 3 degree of freedom, the chi-square value needed to reject the hypothesis at the 0.05 significance level:
Out[17]: 7.814727903251179
```

We see that we fail to reject the null hypothesis, which is that on-campus jobs and off-campus jobs attend lectures the same amount of time. Therefore, we do not have enough evidence to show that on-campus jobs attend lectures more often than those who have off-campus jobs.

Hypothesis 2 Test:

```
In [18]: df3['How many hours in a typical week do you work?'].corr(df3['How many extracurricular activities do you parta
```

```
Out[18]: 0.09119196084257807
```

There is a very small positive linear relationship between hours worked and number of extracurriculars taken. There is not enough of a correlation to prove that Those who work more hours in a week have more extracurricular activities that they partake in

Hypothesis 3 Test:

```
In [19]: chi, p, dfree, expected = chi2_contingency(officeh)
         print("calculated chi square value: " ,chi)
```

```
calculated chi square value:  0.006535947712418299
```

```
In [20]: print("for 2 degree of freedom, the chi-square value needed to reject the hypothesis at the 0.05 significance l
         chi2.ppf(1-0.05, 2)
```

```
for 2 degree of freedom, the chi-square value needed to reject the hypothesis at the 0.05 significance level:
Out[20]: 5.991464547107979
```

We see that we fail to reject the null hypothesis, which is that on-campus jobs and off-campus jobs attend office hours the same amount of time. Therefore, we do not have enough evidence to show that on-campus jobs attend office hours more often than those who have off-campus jobs.