Connection with Google Sheet

In [162]:

```
import pandas as pd
import gspread
from oauth2client.service_account import ServiceAccountCredentials
scope = ['https://spreadsheets.google.com/feeds']
credentials = ServiceAccountCredentials.from_json_keyfile_name('DL Workshop-52707c954725.json', scope)
gc = gspread.authorize(credentials)
spreadsheet_key = '1qMBlsO134705quy7EtzPyimSBIUjk9cCi9TjFUMQKJQ'
book = gc.open_by_key(spreadsheet_key)
worksheet = book.worksheet("result2")
table = worksheet.get_all_values()
df = pd.DataFrame(table[1:], columns=table[0])
##Only keep columns we need
df = df[['Rk', 'Pk', 'Tm', 'Player', 'College', 'Yrs', 'G', 'MP']]
df = df.apply(pd.to_numeric, errors='ignore')
df.head()
```

Out[162]:

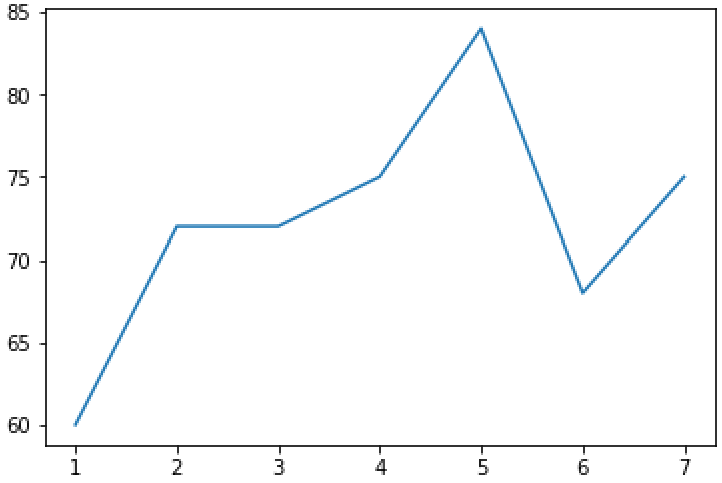
	Rk	Pk	Tm	Player	College	Yrs	G	MP	MP
0	1	1	CLE	Andrew Wiggins	University of Kansas	4	327	11841	36.2
1	2	2	MIL	Jabari Parker	Duke University	4	183	5617	30.7
2	3	3	PHI	Joel Embiid	University of Kansas	2	94	2698	28.7
3	4	4	ORL	Aaron Gordon	University of Arizona	4	263	6867	26.1
4	5	5	UTA	Dante Exum		3	162	3280	20.2

Introduction to Matpotlib

from matplotlib import pyplot as plt x = [100, 150, 300, 400] y = [1, 2, 9, 16] plt.plot(x, y) plt.show()

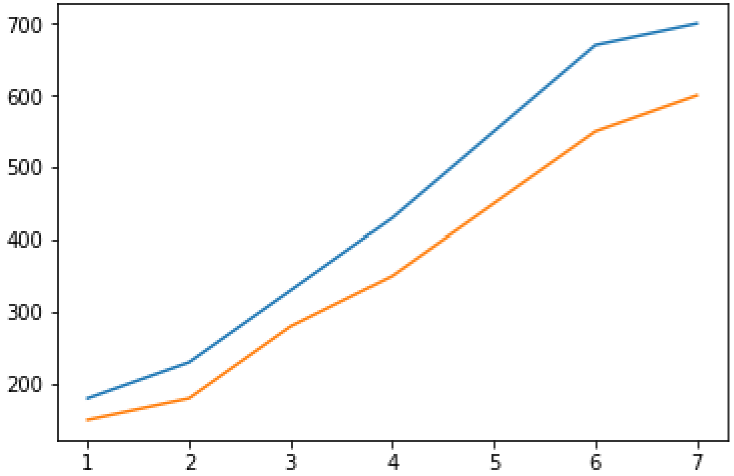
In [160]:

```
from matplotlib import pyplot as plt
days = [1,2,3,4,5,6,7]
daily_assignments = [60,72,72,75,84,68,75]
plt.plot(days,daily_assignments)
plt.show()
```



In [161]:

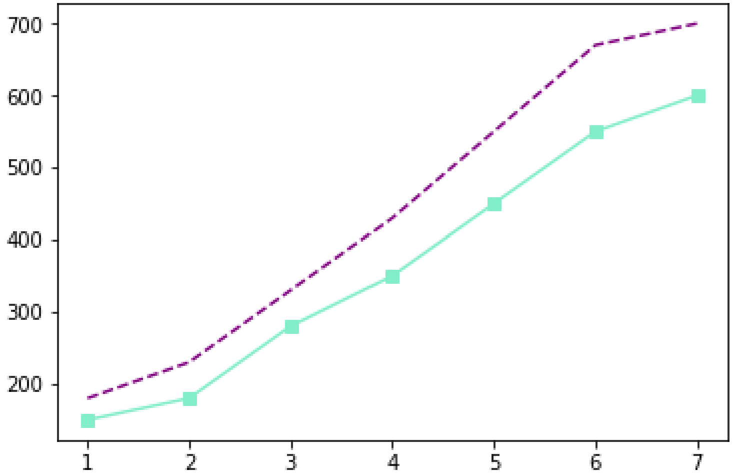
```
from matplotlib import pyplot as plt
day_of_week = [1, 2, 3, 4, 5,6,7]
# work_days.set_xticklabels(tick_labels.astype(int))
income = [180, 230, 330, 430, 550, 670, 700]
expense = [150, 180, 280, 350, 450, 550, 600]
plt.plot(day_of_week, income)
plt.plot(day_of_week, expense)
plt.show()
```



```
<h1><center>Linestyles/Marker: Provide a different color for a line by using the keyword color with either an HTML color name or a HEX code</center></h1>
```

In [42]:

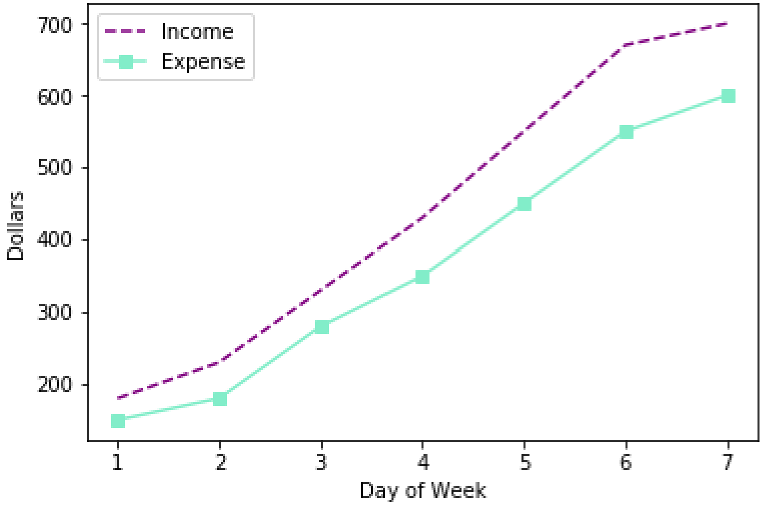
```
from matplotlib import pyplot as plt
day_of_week = [1, 2, 3, 4,5,6,7]
income = [180, 230, 330, 430, 550, 670, 700]
expense = [150, 180, 280, 350, 450, 550, 600]
plt.plot(day_of_week, income, color='purple',linestyle='--')
plt.plot(day_of_week, expense, color='#82edc9',marker='s')
plt.show()
```



```
<h1><center>Add Legends and Labels</center></h1>
```

In [46]:

```
from matplotlib import pyplot as plt
day_of_week = [1, 2, 3, 4,5,6,7]
income = [180, 230, 330, 430, 550, 670, 700]
expense = [150, 180, 280, 350, 450, 550, 600]
plt.plot(day_of_week, income, color='purple',linestyle='--')
plt.plot(day_of_week, expense, color='#82edc9',marker='s')
plt.xlabel('Day of Week')
plt.ylabel('Dollars')
plt.legend(['Income', 'Expense'])
plt.show()
```

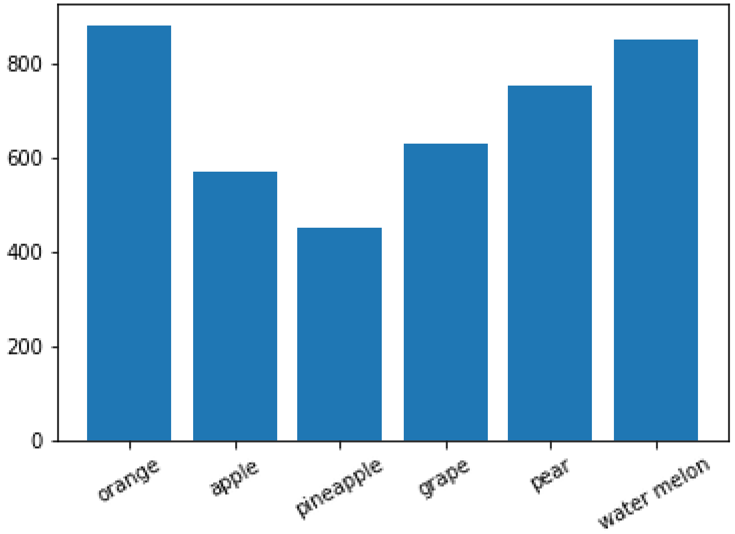


Bar Chart

In [133]:

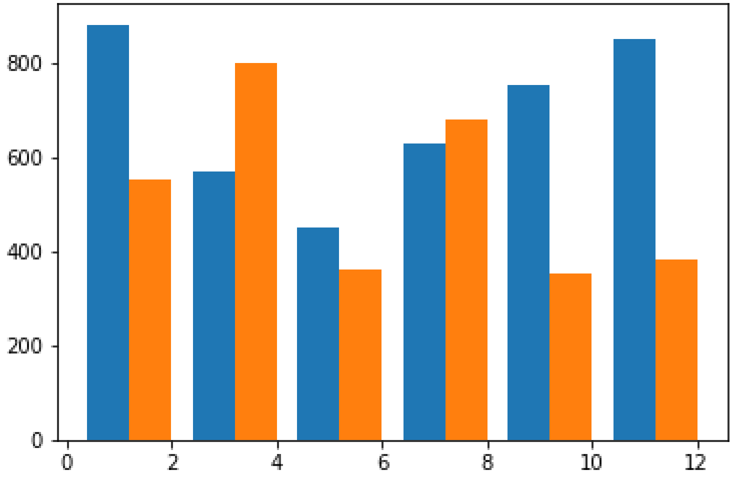
```python
from matplotlib import pyplot as plt
def warn(*args, **kwargs):
    pass
import warnings
warnings.warn = warn

fruits = ["orange", "apple", "pineapple", "grape", "pear", "water melon"]
production = [880, 570, 450, 630, 750, 850]
plt.bar(range(len(fruits)),production)
# Create your ax object here
ax = plt.subplot()
ax.set_xticks([0,1,2,3,4,5])
ax.set_xticklabels(["orange", "apple", "pineapple", "grape", "pear", "water melon"], rotation=30)
plt.show()
```



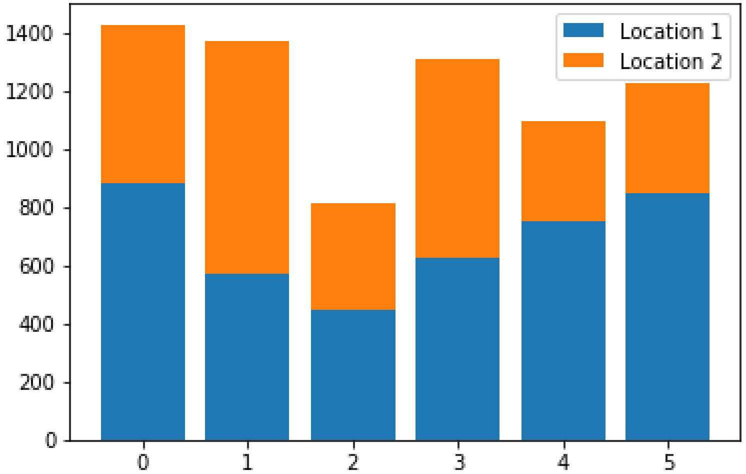
In [132]:

```
from matplotlib import pyplot as plt
fruits = ["orange", "apple", "pineapple", "grape", "pear", "water melon"]
production1 = [880, 570, 450, 630, 750, 850]
production2 = [550, 800, 360, 680, 350, 380]
#Paste the x_values code here
n = 1 # This is our first dataset (n = no. of entry - out of the total)
t = 2 # Total number of dataset (t = total)
d = 6 # Number of sets of bars (d = dataset of bars)
w = 0.8 # Width of each bar (w = width)
location1_x = [t*element + w*n for element in range(d)]
plt.bar(location1_x, production1)
#Paste the x_values code here
n = 2 # This is our second dataset (out of 2)
t = 2 # Number of dataset
d = 6 # Number of sets of bars
w = 0.8 # Width of each bar
location2_x = [t*element + w*n for element in range(d)]
plt.bar(location2_x, production2)
plt.show()
```



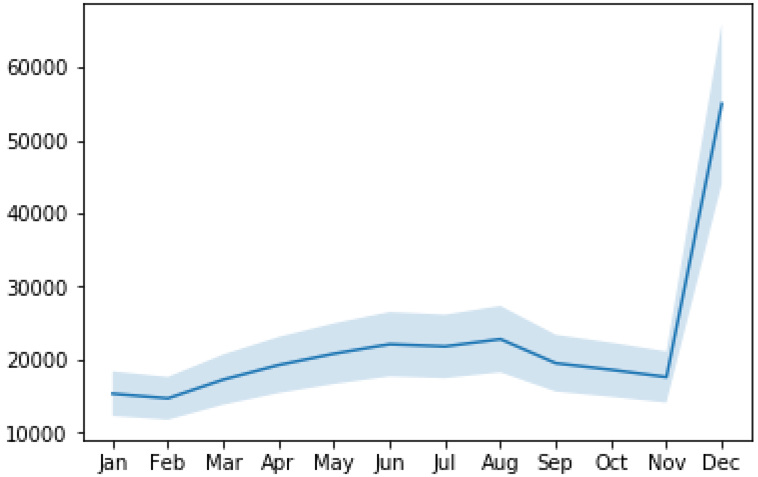
In [134]:

```
from matplotlib import pyplot as plt
fruits = ["orange", "apple", "pineapple", "grape", "pear", "water melon"]
production1 = [880, 570, 450, 630, 750, 850]
production2 = [550, 800, 360, 680, 350, 380]
plt.bar(range(len(production1)),production1)
plt.bar(range(len(production2)),production2,bottom=production1)
plt.legend(['Location 1', 'Location 2'])
plt.show()
```



In [143]:

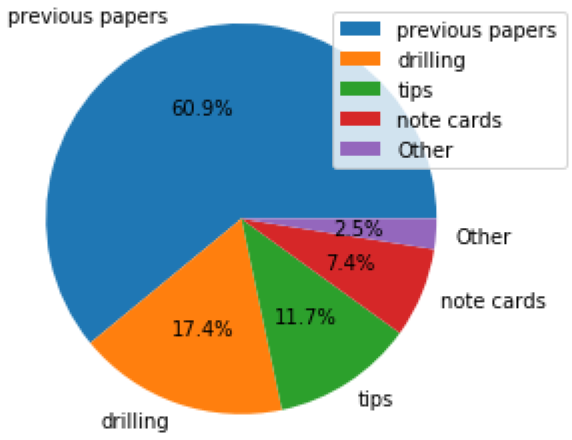
```
from matplotlib import pyplot as plt
months = range(12)
month_names = ["Jan", "Feb", "Mar", "Apr", "May", "Jun", "Jul", "Aug", "Sep", "Oct", "Nov", "Dec"]
sales = [15320, 14680, 17250, 19250, 20800, 22100, 21800, 22800, 19500, 18600,17600, 55000]
plt.plot(months, sales)
ax = plt.subplot()
ax.set_xticks(months)
ax.set_xticklabels(month_names)
y_upper = [i + (i*0.20) for i in sales]
y_lower = [i - (i*0.20) for i in sales]
plt.fill_between(months, y_lower, y_upper, alpha=0.2)
plt.show()
```



Pie Chart

In [149]:

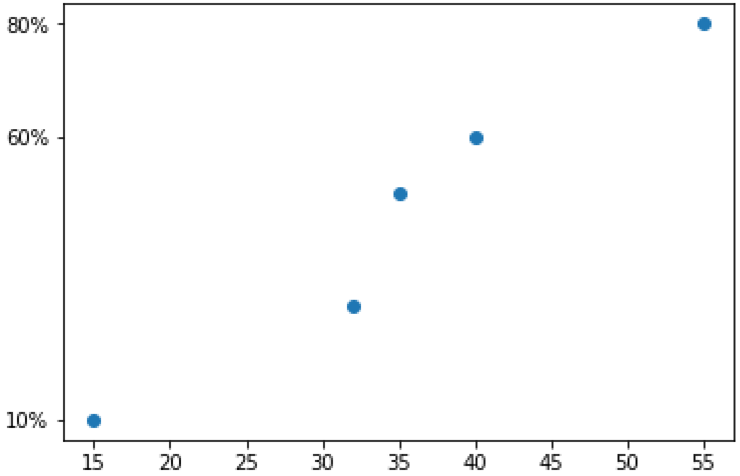
```
from matplotlib import pyplot as plt
study_methods = ["previous papers", "drilling", "tips", "note cards" , "Other"]
method_usages = [270, 77, 52, 33, 11]
plt.pie(method_usages,labels=study_methods,autopct='%0.1f%%')
plt.axis('equal')
plt.legend(study_methods)
plt.show()
```



Scatter Plot

In [155]:

```
from matplotlib import pyplot as plt
ax = plt.subplot()
plt.plot([15, 32, 35, 40, 55], [0.1, 0.3, 0.5, 0.6, 0.8], 'o')
ax.set_yticks([0.1, 0.6, 0.8])
ax.set_yticklabels(['10%','60%', '80%'])
# ax.set_yticks([0.1, 0.3, 0.6, 0.8])
# ax.set_yticklabels(['10%','30%','60%', '80%'])
plt.show()
```



Use plt.axis to zoom in to important information

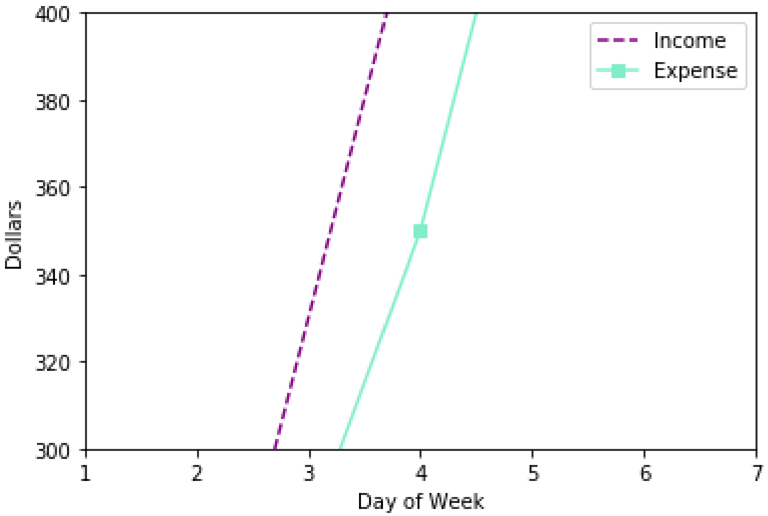
This list should contain:

- The minimum x-value displayed
- The maximum x-value displayed
- The minimum y-value displayed
- The maximum y-value displayed

plt.axis([1, 7, 300, 400])

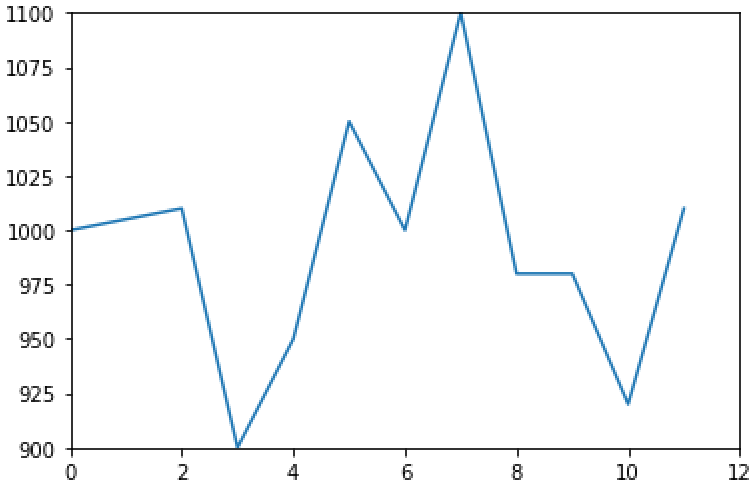
In [54]:

```
from matplotlib import pyplot as plt
day_of_week = [1, 2, 3, 4,5,6,7]
income = [180, 230, 330, 430, 550, 670, 700]
expense = [150, 180, 280, 350, 450, 550, 600]
plt.plot(day_of_week, income, color='purple',linestyle='--')
plt.plot(day_of_week, expense, color='#82edc9',marker='s')
plt.xlabel('Day of Week')
plt.ylabel('Dollars')
plt.legend(['Income', 'Expense'])
plt.axis([1, 7, 300, 400])
plt.show()
```



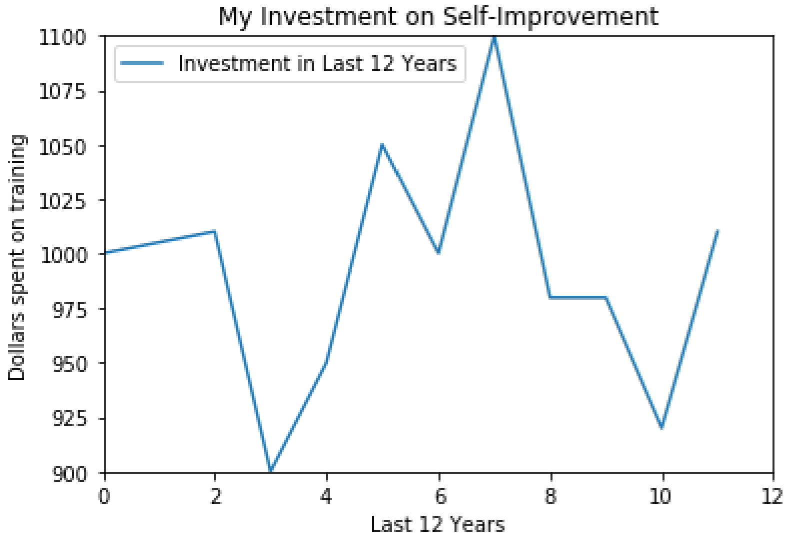
In [65]:

```
from matplotlib import pyplot as plt
x = range(12)
y = [1000, 1005, 1010, 900, 950, 1050, 1000, 1100, 980, 980, 920, 1010]
plt.plot(x, y)
plt.axis([0, 12, 900, 1100])
plt.show()
```



In [71]:

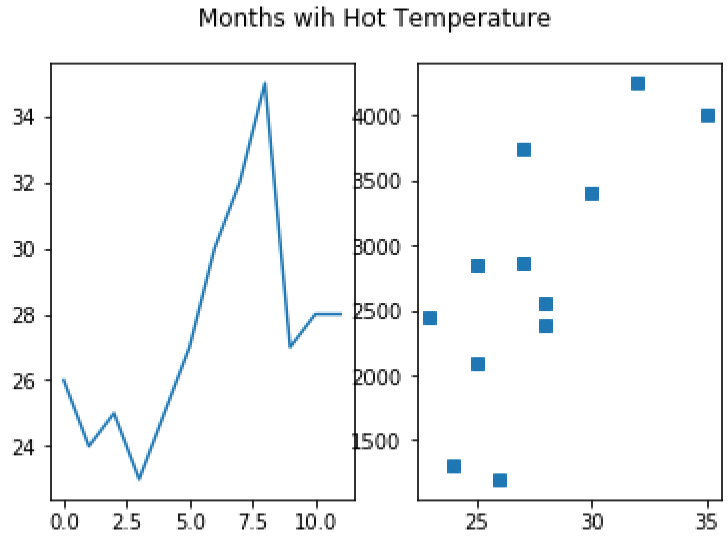
```
from matplotlib import pyplot as plt
x = range(12)
y = [1000, 1005, 1010, 900, 950, 1050, 1000, 1100, 980, 980, 920, 1010]
plt.plot(x, y)
plt.axis([0, 12, 900, 1100])
plt.legend(['Investment in Last 12 Years']) # add legends
plt.xlabel('Last 12 Years')
plt.ylabel('Dollars spent on training')
plt.title('My Investment on Self-Improvement') # add title
plt.show()
```



Creating subplots and axes

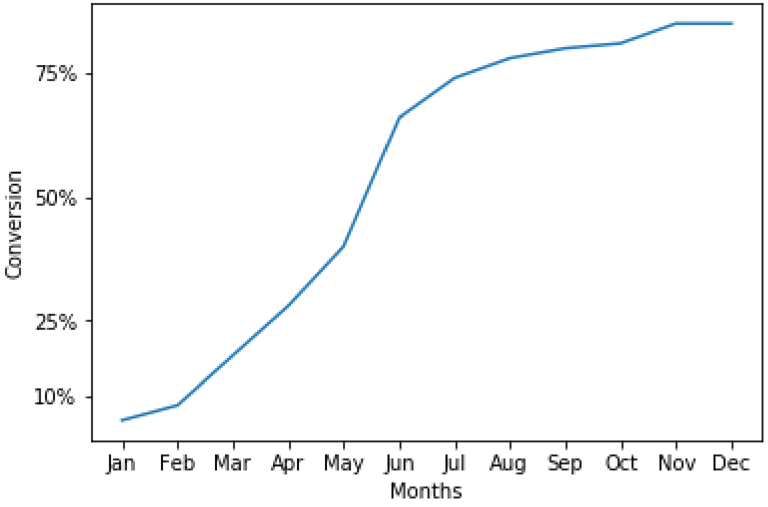
In [96]:

```
from matplotlib import pyplot as plt
months = range(12)
temperature = [26, 24, 25, 23, 25, 27, 30, 32, 35, 27, 28, 28]
visit_to_beach = [1200, 1300, 2100, 2450, 2850, 3750, 3400, 4250, 4000, 2860, 2390, 2560]
ax, (ax1, ax2) = plt.subplots(1, 2, sharey=True)
ax.suptitle('Months wih Hot Temperature')
plt.subplot(1, 2, 1)# 1 row 2 columns: 1 column
plt.plot(months, temperature)
plt.subplot(1, 2, 2) # 1 row 2 columns: 2 columns
plt.plot(temperature, visit_to_beach, "s")
plt.show()
```



In [126]:

```
from matplotlib import pyplot as plt
def warn(*args, **kwargs):
    pass
import warnings
warnings.warn = warn
month_names = ["Jan", "Feb", "Mar", "Apr", "May", "Jun", "Jul", "Aug", "Sep","Oct", "Nov", "Dec"]
months = range(12)
conversion = [0.05, 0.08, 0.18, 0.28, 0.4, 0.66, 0.74, 0.78, 0.8, 0.81, 0.85, 0.85]
plt.xlabel("Months")
plt.ylabel("Conversion")
plt.plot(months, conversion)
# Your work here
ax = plt.subplot()
# measuring units and lables
ax.set_xticks(range(12))
ax.set_xticklabels(month_names[0:12])
ax.set_yticks([0.10, 0.25, 0.5, 0.75])
ax.set_yticklabels(['10%', '25%', '50%','75%'])
plt.show()
```



In [163]:

```
from bs4 import BeautifulSoup
import requests
import csv
import pandas as pd
import matplotlib.pyplot as plt

# Fetch URL
html_page = requests.get('https://www.travelchinaguide.com/climate/air-pollution.htm')
# Obtain the entire HTML page
soup = BeautifulSoup(html_page.content,'html.parser')
# Find all the HTML tables
tables = soup.find_all(class_="c_tableX")
# Access the first HTML table that contains Air Quality information (header + data)
table = tables[1]
# Obtaih air quality column header descriptions from the first HTML table
table_header = table.find(class_="c_tableX_th")
# Extract the header names from the 'td' elements of the header table and store in the variable 'tds'
tds = table_header.find_all('td')
# Create two empty lists for holding the air quality header names and air quality data
header = []
data = []
# Loop through the table cells (i.e. 'tds') to extract header names and append to the list
for i in tds:
    # print(i.text)
    header.append(i.text)
# print header
all_rows = table.find_all("tr")
# print data_rows.text
for i, row in enumerate(all_rows,1):
        # print row.text
        if (i < len(all_rows)):
            tds = all_rows[i].find_all("td")
            for j, td in enumerate(tds,1):
                # print j,td.text
                if j==1:
                    rank = td.text
                if j==2:
                    city = td.text
                if j==3:
                    province = td.text
                if j==4:
                    aqi = td.text
                if j==5:
                    air_quality = td.text
                if j==6:
                    pm2_5 = td.text
                if j==7:
                    pm10 = td.text
            data.append([rank,city,province,aqi,air_quality,pm2_5,pm10])
# Assign row data and column headers to dataframe
df = pd.DataFrame(data,
  columns = header
)
# Save dataframe to external csv file
df.to_csv('china_air_quality.csv', sep='\t', encoding='utf-8')
# open csv file and read csv data into Pandas dataframe
df = pd.read_csv("china_air_quality.csv",sep='\t', encoding='utf-8')
# Set column headings for entire air quality table and print out the entire table
air_quality_ranking = df[['Rank','City','AQI','Air Quality Level','PM2.5','PM10']]
# //////////////////////////////////////////////////////////////////
# Display City Ranking by Pollution Level
# //////////////////////////////////////////////////////////////////
print("Air Quality Ranking\n")
print(air_quality_ranking)
# Extract cities that are polluted
lightly_polluted = df[df['Air Quality Level'] == 'Lightly Polluted']
heavily_polluted = df[df['Air Quality Level'] == 'Heavily Polluted']
# Combine the cities of different pollution level into one table
selected = lightly_polluted.append(heavily_polluted)
pc = selected[['Rank','City','AQI','Air Quality Level','PM2.5','PM10']]
# //////////////////////////////////////////////////////////////////
# Display Cities with Pollution
# //////////////////////////////////////////////////////////////////
print("\nCities with Pollution\n")
print(pc)
cities = pc['City'].tolist()
aqi_lvl = pc['AQI'].tolist()
ax = plt.subplot()
plt.bar(range(len(cities)),aqi_lvl)
# Create ax object here
j = 0
ax_list = []
while j<len(cities):
    ax_list.append(j)
    j += 1
ax.set_xticks(ax_list)
plt.xlabel('Cities')
plt.ylabel('AQI Levels')
plt.title('Cities with High AQI Levels')
ax.set_xticklabels(cities, rotation=70)
plt.show()
```

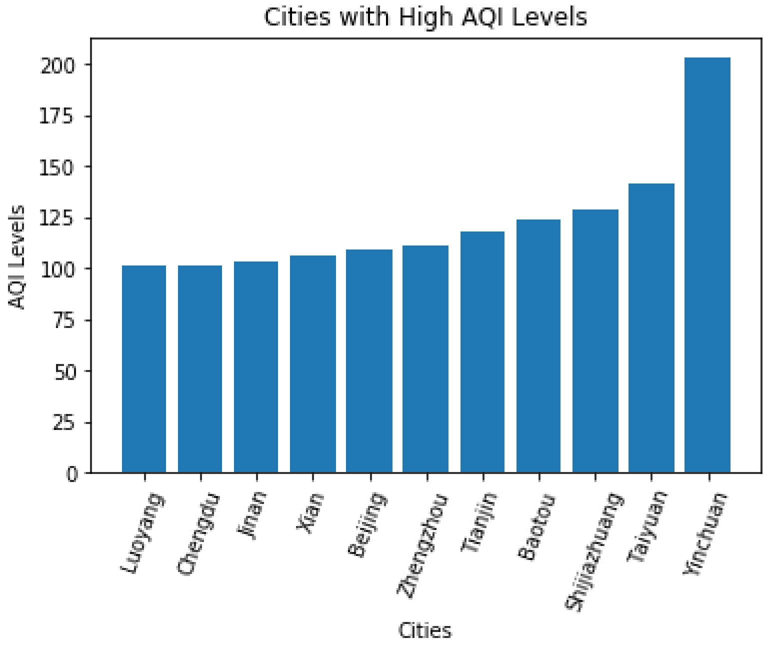
```
Air Quality Ranking

    Rank          City  AQI Air Quality Level  PM2.5  PM10
0      1        Urumqi   30         Excellent     11    21
1      2     Changchun   50         Excellent     29    51
2      3        Dalian   53              Good     26    56
3      4         Lhasa   52              Good     20    58
4      5         Sanya   55              Good     20    60
5      6      Shenyang   56              Good     33    63
6      7       Kunming   57              Good     36    59
7      8      Hangzhou   59              Good     27    65
8      9        Haikou   59              Good     30    68
9     10       Qingdao   68              Good     28    85
10    11     Changsha    69              Good     33    88
11    12     Chongqing   69              Good     26    87
12    13      Shenzhen   70              Good     37    91
13    14        Suzhou   72              Good     33   102
14    15        Fuzhou   72              Good     31    94
15    16         Wuhan   74              Good     32   104
16    17       Nanjing   77              Good     23   104
17    18      Shanghai   77              Good     40   103
18    19        Xiamen   77              Good     30    90
19    20       Nanning   79              Good     46   108
20    21         Hefei   84              Good     36   118
21    22        Datong   87              Good     51   124
22    23        Guilin   87              Good     56   122
23    24       Guiyang   91              Good     48   132
24    25        Harbin   94              Good     63   103
25    26        Xining   95              Good     55   118
26    27      Yangzhou   96              Good     36   142
27    28     Guangzhou   99              Good     71   131
28    29        Hohhot  100              Good     53   150
```

```
29    30       Lanzhou  100                Good     43   135
30    31       Luoyang  101  Lightly Polluted     67   144
31    32       Chengdu  101  Lightly Polluted     62   143
32    33         Jinan  103  Lightly Polluted     43   151
33    34          Xian  106  Lightly Polluted     75   137
34    35       Beijing  109  Lightly Polluted     82   103
35    36     Zhengzhou  111  Lightly Polluted     63   172
36    37       Tianjin  118  Lightly Polluted     83   179
37    38        Baotou  124  Lightly Polluted     59   198
38    39  Shijiazhuang  129  Lightly Polluted     87   200
39    40       Taiyuan  141  Lightly Polluted     88   214
40    41      Yinchuan  203  Heavily Polluted     77   340

Cities with Pollution

    Rank          City  AQI Air Quality Level  PM2.5  PM10
30    31       Luoyang  101  Lightly Polluted     67   144
31    32       Chengdu  101  Lightly Polluted     62   143
32    33         Jinan  103  Lightly Polluted     43   151
33    34          Xian  106  Lightly Polluted     75   137
34    35       Beijing  109  Lightly Polluted     82   103
35    36     Zhengzhou  111  Lightly Polluted     63   172
36    37       Tianjin  118  Lightly Polluted     83   179
37    38        Baotou  124  Lightly Polluted     59   198
38    39  Shijiazhuang  129  Lightly Polluted     87   200
39    40       Taiyuan  141  Lightly Polluted     88   214
40    41      Yinchuan  203  Heavily Polluted     77   340
```


Cities with High AQI Levels
AQI Levels
200
175
150
125
100
75
50
25
0
Luoyang
Chengdu
Jinan
Xian
Beijing
Zhengzhou
Tianjin
Baotou
Shijiazhuang
Taiyuan
Yinchuan
Cities

In [165]:

```
from bs4 import BeautifulSoup
import requests
import csv
import pandas as pd
import matplotlib.pyplot as plt

# Fetch URL
html_page = requests.get('https://www.travelchinaguide.com/climate/air-pollution.htm')
# Obtain the entire HTML page
soup = BeautifulSoup(html_page.content,'html.parser')
# Find all the HTML tables
tables = soup.find_all(class_="c_tableX")
# Access the first HTML table that contains Air Quality information (header + data)
table = tables[1]
# Obtaih air quality column header descriptions from the first HTML table
table_header = table.find(class_="c_tableX_th")
# Extract the header names from the 'td' elements of the header table and store in the variable 'tds'
tds = table_header.find_all('td')
# Create two empty lists for holding the air quality header names and air quality data
header = []
data = []
# Loop through the table cells (i.e. 'tds') to extract header names and append to the list
for i in tds:
    # print(i.text)
    header.append(i.text)
# print header
all_rows = table.find_all("tr")
# print data_rows.text
for i, row in enumerate(all_rows,1):
        # print row.text
        if (i < len(all_rows)):
            tds = all_rows[i].find_all("td")
            for j, td in enumerate(tds,1):
                # print j,td.text
                if j==1:
                    rank = td.text
                if j==2:
                    city = td.text
                if j==3:
                    province = td.text
                if j==4:
                    aqi = td.text
                if j==5:
                    air_quality = td.text
                if j==6:
                    pm2_5 = td.text
                if j==7:
                    pm10 = td.text
            data.append([rank,city,province,aqi,air_quality,pm2_5,pm10])
# Assign row data and column headers to dataframe
df = pd.DataFrame(data,
  columns = header
)
# Save dataframe to external csv file
df.to_csv('china_air_quality.csv', sep='\t', encoding='utf-8')
# open csv file and read csv data into Pandas dataframe


```

In [166]:

```
import gspread
import pandas as pd
from oauth2client.service_account import ServiceAccountCredentials
import requests
import csv
import matplotlib.pyplot as plt

scope = ['https://spreadsheets.google.com/feeds']
credentials = ServiceAccountCredentials.from_json_keyfile_name('DL Workshop-52707c954725.json', scope)
gc = gspread.authorize(credentials)
spreadsheet_key = '1qMBlsO134705quy7EtzPyimSBIUjk9cCi9TjFUMQKJQ'
book = gc.open_by_key(spreadsheet_key)
worksheet = book.worksheet("air_quality")
table = worksheet.get_all_values()
df = pd.DataFrame(table[1:], columns=table[0])
##Only keep columns we need
df = df[['Rank', 'City', 'AQI', 'Air Quality Level', 'PM2.5', 'PM10']]
df = df.apply(pd.to_numeric, errors='ignore')
df.head()

# df = pd.read_csv("china_air_quality.csv",sep='\t', encoding='utf-8')
# Set column headings for entire air quality table and print out the entire table
air_quality_ranking = df[['Rank','City','AQI','Air Quality Level','PM2.5','PM10']]
# //////////////////////////////////////////////////////////////////////
# Display City Ranking by Pollution Level
# //////////////////////////////////////////////////////////////////////
print("Air Quality Ranking\n")
print(air_quality_ranking)
# Extract cities that are polluted
lightly_polluted = df[df['Air Quality Level'] == 'Lightly Polluted']
heavily_polluted = df[df['Air Quality Level'] == 'Heavily Polluted']
# Combine the cities of different pollution level into one table
selected = lightly_polluted.append(heavily_polluted)
pc = selected[['Rank','City','AQI','Air Quality Level','PM2.5','PM10']]
# //////////////////////////////////////////////////////////////////////
# Display Cities with Pollution
# //////////////////////////////////////////////////////////////////////
print("\nCities with Pollution\n")
print(pc)
cities = pc['City'].tolist()
aqi_lvl = pc['AQI'].tolist()
```

```
ax = plt.subplot()
plt.bar(range(len(cities)),aqi_lvl)
# Create ax object here
j = 0
ax_list = []
while j<len(cities):
    ax_list.append(j)
    j += 1
ax.set_xticks(ax_list)
plt.xlabel('Cities')
plt.ylabel('AQI Levels')
plt.title('Cities with High AQI Levels')
ax.set_xticklabels(cities, rotation=70)
plt.show()
```

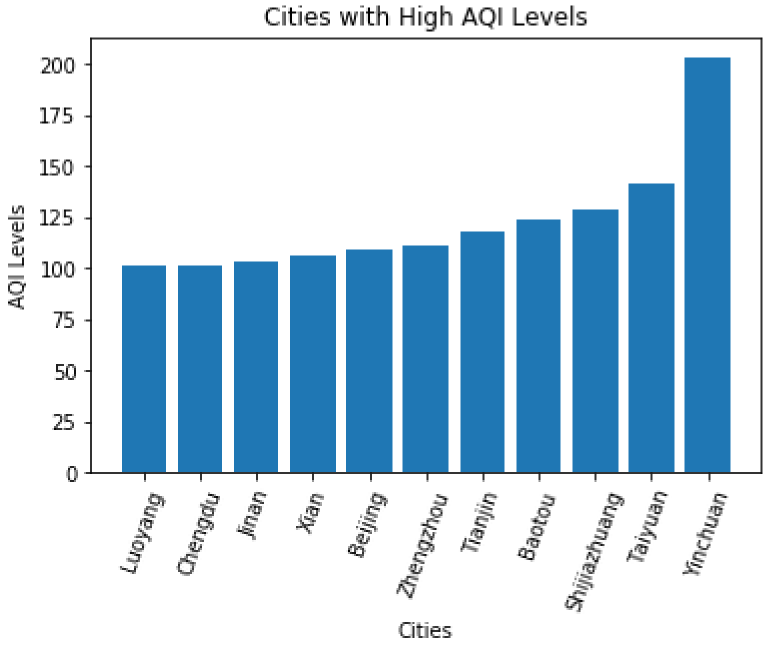
```
Air Quality Ranking

    Rank          City  AQI Air Quality Level  PM2.5  PM10
0      1        Urumqi   30         Excellent     11    21
1      2     Changchun   50         Excellent     29    51
2      3        Dalian   53              Good     26    56
3      4         Lhasa   52              Good     20    58
4      5         Sanya   55              Good     20    60
5      6      Shenyang   56              Good     33    63
6      7       Kunming   57              Good     36    59
7      8      Hangzhou   59              Good     27    65
8      9        Haikou   59              Good     30    68
9     10       Qingdao   68              Good     28    85
10    11      Changsha   69              Good     33    88
11    12     Chongqing   69              Good     26    87
12    13      Shenzhen   70              Good     37    91
13    14        Suzhou   72              Good     33   102
14    15        Fuzhou   72              Good     31    94
15    16         Wuhan   74              Good     32   104
16    17       Nanjing   77              Good     23   104
17    18      Shanghai   77              Good     40   103
18    19        Xiamen   77              Good     30    90
19    20       Nanning   79              Good     46   108
20    21         Hefei   84              Good     36   118
21    22        Datong   87              Good     51   124
22    23        Guilin   87              Good     56   122
```

```
23    24        Guiyang   91                Good     48   132
24    25         Harbin   94                Good     63   103
25    26         Xining   95                Good     55   118
26    27       Yangzhou   96                Good     36   142
27    28      Guangzhou   99                Good     71   131
28    29         Hohhot  100                Good     53   150
29    30        Lanzhou  100                Good     43   135
30    31        Luoyang  101  Lightly Polluted     67   144
31    32        Chengdu  101  Lightly Polluted     62   143
32    33          Jinan  103  Lightly Polluted     43   151
33    34           Xian  106  Lightly Polluted     75   137
34    35        Beijing  109  Lightly Polluted     82   103
35    36      Zhengzhou  111  Lightly Polluted     63   172
36    37        Tianjin  118  Lightly Polluted     83   179
37    38         Baotou  124  Lightly Polluted     59   198
38    39   Shijiazhuang  129  Lightly Polluted     87   200
39    40        Taiyuan  141  Lightly Polluted     88   214
40    41       Yinchuan  203  Heavily Polluted     77   340

Cities with Pollution

    Rank           City  AQI Air Quality Level  PM2.5  PM10
30    31        Luoyang  101  Lightly Polluted     67   144
31    32        Chengdu  101  Lightly Polluted     62   143
32    33          Jinan  103  Lightly Polluted     43   151
33    34           Xian  106  Lightly Polluted     75   137
34    35        Beijing  109  Lightly Polluted     82   103
35    36      Zhengzhou  111  Lightly Polluted     63   172
36    37        Tianjin  118  Lightly Polluted     83   179
37    38         Baotou  124  Lightly Polluted     59   198
38    39   Shijiazhuang  129  Lightly Polluted     87   200
39    40        Taiyuan  141  Lightly Polluted     88   214
40    41       Yinchuan  203  Heavily Polluted     77   340
```


Cities with High AQI Levels
AQI Levels
0
25
50
75
100
125
150
175
200
Luoyang
Chengdu
Jinan
Xian
Beijing
Zhengzhou
Tianjin
Baotou
Shijiazhuang
Taiyuan
Yinchuan
Cities

In [ ]: