EDA

In [1]:
```
#import packages
import pandas as pd
import numpy as np
import seaborn as sns
import scipy.stats
import matplotlib.pyplot as plt
%matplotlib inline
```

In [2]:
```
#define filename
filename='NYC Charter Schools 3-8 Test Scores 2017/Data-Table 1.csv'
#import csv
data=pd.read_csv(filename,skiprows=3)
#I had to skip the first 3 rows of the file due to some fancy formatting that messed up which data got gr
#which column
```

In [3]:
```
data.shape
```

Out[3]:
```
(885, 25)
```

In [4]:
```
data.head()
```

Out[4]:

	Unnamed: 0	Borough	CSD	BedsCode	DBN	School Name	Grade	Charter	District	Diff	...	Diff.2	Charter.3	District.3	Diff.3	Char
0	NaN	Bronx	7	320700860957	84X491	Academic Leadership Charter School	3	85.7%	27.5%	58.2	...	52	85.7%	28.4%	57.3	64
1	NaN	Bronx	7	320700860957	84X491	Academic Leadership Charter School	4	72.6%	25.5%	47.1	...	37	68.6%	22.3%	46.3	47
2	NaN	Bronx	7	320700860957	84X491	Academic Leadership Charter School	5	50.9%	19.4%	31.5	...	46	60.8%	21.1%	39.7	31
3	NaN	Bronx	7	320700860957	84X491	Academic Leadership Charter School	6	25.0%	12.6%	12.4	...	22	35.3%	12.6%	22.7	15
4	NaN	Bronx	7	320700860957	84X491	Academic Leadership Charter School	7	48.4%	20.0%	28.4	...	24	44.6%	11.4%	33.2	13

5 rows × 25 columns

In [5]:
```
#let's find out exactly what that first column is called so we can drop it like a hot potato
data.columns[0]
```

Out[5]:
```
'Unnamed: 0'
```

In [6]:
```
#now let's drop it like the aforementioned hot potato
data.drop('Unnamed: 0',axis=1,inplace=True)
```

In [7]:

```
#Fixing the column names, which yes, I typed in manually
fixednames=['Borough','CSD','BedsCode','DBN','School Name','Grade','ELA Proficient (L3+L4) Charter',
            'ELA Proficient (L3+L4) District','ELA Proficient (L3+L4) Diff','ELA Advanced (L4) Charter',
            'ELA Advanced (L4) District','ELA Advanced (L4) Diff','ELA Mean Scale Score Charter',
            'ELA Mean Scale Score District','ELA Mean Scale Score Diff','Math Proficient (L3+L4) Charter'
            'Math Proficient (L3+L4) District','Math Proficient (L3+L4) Diff','Math Advanced (L4) Charter
            'Math Advanced (L4) District','Math Advanced (L4) Diff','Math Mean Scale Score Charter',
            'Math Mean Scale Score District','Math Mean Scale Score Diff']
data.columns=fixednames
#Seeing if it took
data.head()
```

Out[7]:

	Borough	CSD	BedsCode	DBN	School Name	Grade	ELA Proficient (L3+L4) Charter	ELA Proficient (L3+L4) District	ELA Proficient (L3+L4) Diff	ELA Advanced (L4) Charter	...	ELA Mean Scale Score Diff	Math Proficient (L3+L4) Charter	Math Proficient (L3+L4) District	I
0	Bronx	7	320700860957	84X491	Academic Leadership Charter School	3	85.7%	27.5%	58.2	40.5%	...	52	85.7%	28.4%	
1	Bronx	7	320700860957	84X491	Academic Leadership Charter School	4	72.6%	25.5%	47.1	43.1%	...	37	68.6%	22.3%	
2	Bronx	7	320700860957	84X491	Academic Leadership Charter School	5	50.9%	19.4%	31.5	34.0%	...	46	60.8%	21.1%	
3	Bronx	7	320700860957	84X491	Academic Leadership Charter School	6	25.0%	12.6%	12.4	17.3%	...	22	35.3%	12.6%	
4	Bronx	7	320700860957	84X491	Academic Leadership Charter School	7	48.4%	20.0%	28.4	8.4%	...	24	44.6%	11.4%	

5 rows × 24 columns

In [8]:

```
#those percent signs make me nervous, let's check out the data types
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 885 entries, 0 to 884
Data columns (total 24 columns):
Borough                             885 non-null object
CSD                                 885 non-null int64
BedsCode                            885 non-null int64
DBN                                 885 non-null object
School Name                         885 non-null object
Grade                               885 non-null object
ELA Proficient (L3+L4) Charter      885 non-null object
ELA Proficient (L3+L4) District     885 non-null object
ELA Proficient (L3+L4) Diff         885 non-null object
ELA Advanced (L4) Charter           885 non-null object
ELA Advanced (L4) District          885 non-null object
ELA Advanced (L4) Diff              885 non-null object
ELA Mean Scale Score Charter        885 non-null int64
ELA Mean Scale Score District       885 non-null int64
ELA Mean Scale Score Diff           885 non-null object
Math Proficient (L3+L4) Charter     872 non-null object
Math Proficient (L3+L4) District    872 non-null object
Math Proficient (L3+L4) Diff        871 non-null object
Math Advanced (L4) Charter          872 non-null object
Math Advanced (L4) District         872 non-null object
Math Advanced (L4) Diff             871 non-null object
Math Mean Scale Score Charter       872 non-null object
Math Mean Scale Score District      872 non-null float64
Math Mean Scale Score Diff          872 non-null object
dtypes: float64(1), int64(4), object(19)
memory usage: 166.0+ KB
```

```
In [9]: #Crap, I was right. And it even looks like there's some data missing in the math columns. Let's find out
        #before we carry on.
        data.isnull().sum()
```

```
Out[9]: Borough                           0
        CSD                               0
        BedsCode                          0
        DBN                               0
        School Name                       0
        Grade                             0
        ELA Proficient (L3+L4) Charter    0
        ELA Proficient (L3+L4) District   0
        ELA Proficient (L3+L4) Diff       0
        ELA Advanced (L4) Charter         0
        ELA Advanced (L4) District        0
        ELA Advanced (L4) Diff            0
        ELA Mean Scale Score Charter      0
        ELA Mean Scale Score District     0
        ELA Mean Scale Score Diff         0
        Math Proficient (L3+L4) Charter  13
        Math Proficient (L3+L4) District 13
        Math Proficient (L3+L4) Diff     14
        Math Advanced (L4) Charter       13
        Math Advanced (L4) District      13
        Math Advanced (L4) Diff          14
        Math Mean Scale Score Charter    13
        Math Mean Scale Score District   13
        Math Mean Scale Score Diff       13
        dtype: int64
```

```
In [10]: #Let's try and figure out which schools are missing the math data
         print(data['School Name'][data['Math Proficient (L3+L4) Charter'].isnull()])
```

```
94                       Hyde Leadership Charter School
271    Leadership Preparatory Bedford Stuyvesant Char...
306                Williamsburg Collegiate Charter School
342          Bedford Stuyvesant Collegiate Charter School
368    Excellence Boys Charter School of Bedford Stuy...
375                     Excellence Girls Charter School
453                     Kings Collegiate Charter School
459        Leadership Preparatory Canarsie Charter School
548               Brownsville Collegiate Charter School
557    Leadership Preparatory Brownsville Charter School
564     Leadership Preparatory Ocean Hill Charter School
569                Ocean Hill Collegiate Charter School
811             Middle Village Preparatory Charter School
Name: School Name, dtype: object
```

Looking at the Notes tab of the source spreadsheet, we find that "8th grades in the Uncommon Schools network, Middle Village Preparatory Charter School, and Hyde Leadership Charter School - Brooklyn were tested in the Common Core Algebra Regents Examination in lieu of the 8th Grade Common Core Math Assessment." Which explains why, in the spreadsheet, the rows named above have "N/A" in the math assessment cells. (I cheated and manually looked at the spreadsheet, so sue me.)

```
In [11]: #Are there enough schools missing math data to get away with throwing them all out entirely?
         data['School Name'].nunique()
```

```
Out[11]: 178
```

```
In [12]: #Okay, and what percentage of the school names belong to our miscreants?
         print(100*data['School Name'][data['Math Proficient (L3+L4) Charter'].isnull()].nunique()/178,'%')
```

```
7.303370786516854 %
```

```
In [13]: at's hardly a flyspeck. Let's get rid of them. (also I checked with Carleton and he said it was OK)
          index of what we now know to be the 8th grade math assessment for each school was given above, and no sc
         ist goes higher than 8th grade, all we need to know is how many rows belong to each school (n), then drop
         ding row, the row below it (the row for the total of the school), and n-2 rows above it.
          I will make the school names into a list, which I should really have done straight off.
         _drop=[data['School Name'][94],data['School Name'][271],data['School Name'][306],data['School Name'][342],
          pulled the names into the list came about because a) I could just put data['School Name'] on the clipboa
          to less typing than the entire name, and b) the second and fifth names were too long to print all of, so
          to go into the spreadsheet to see what they were, and who wants to do that? Oh and c) I was too lazy to n
         ving to type some element of it directly.
         _drop #making sure it worked
```

```
Out[13]: ['Hyde Leadership Charter School',
          'Leadership Preparatory Bedford Stuyvesant Charter School',
          'Williamsburg Collegiate Charter School',
          'Bedford Stuyvesant Collegiate Charter School',
          'Excellence Boys Charter School of Bedford Stuyvesant',
          'Excellence Girls Charter School',
          'Kings Collegiate Charter School',
          'Leadership Preparatory Canarsie Charter School',
          'Brownsville Collegiate Charter School',
          'Leadership Preparatory Brownsville Charter School',
          'Leadership Preparatory Ocean Hill Charter School',
          'Ocean Hill Collegiate Charter School',
          'Middle Village Preparatory Charter School']
```

```
In [14]: #Now I'm going to make another dataframe. This will eventually store the number of rows each of the mathl
         #has in the main dataframe, so I can know which rows to drop (as per the rationale I laid out above).
         num_rows_to_drop=list(range(len(schools_to_drop))) #once again I'm too lazy to even figure out how long t
         num_rows_to_drop=[0 for i in num_rows_to_drop] #zeroing the odometer
         #Now I'm going to create another list, this one of the indices of the 8th grade row for each school. This
         #me to automatically populate two more empty lists I'm going to make with the start and finish indices wh
         #to be dropped.
         eighth_grade_indices=[94,271,306,342,368,375,453,459,548,557,564,569,811]
         starting_drop_indices=list(range(len(schools_to_drop))) #rationalizing my laziness by calling it flexibil
         starting_drop_indices=[0 for i in starting_drop_indices] #zeroing it out
         ending_drop_indices=list(range(len(schools_to_drop)))
         ending_drop_indices=[eighth_grade_indices[i]+2 for i in ending_drop_indices] #no point in waiting til the
         #to calculate these, we already know what they'll need to be; it's +2 instead of +1 since Python does the
         #but not including" thing at the end of index ranges when list slicing
         rowstoredf=pd.DataFrame() #putting the lists we just made into their own dataframe
         rowstoredf['School Name']=schools_to_drop
         rowstoredf['Number of rows']=num_rows_to_drop
         rowstoredf['Eighth grade indices']=eighth_grade_indices
         rowstoredf['Starting drop indices']=starting_drop_indices
         rowstoredf['Ending drop indices']=ending_drop_indices
         rowstoredf #let's see how it looks
```

Out[14]:

	School Name	Number of rows	Eighth grade indices	Starting drop indices	Ending drop indices
0	Hyde Leadership Charter School	0	94	0	96
1	Leadership Preparatory Bedford Stuyvesant Char...	0	271	0	273
2	Williamsburg Collegiate Charter School	0	306	0	308
3	Bedford Stuyvesant Collegiate Charter School	0	342	0	344
4	Excellence Boys Charter School of Bedford Stuy...	0	368	0	370
5	Excellence Girls Charter School	0	375	0	377
6	Kings Collegiate Charter School	0	453	0	455
7	Leadership Preparatory Canarsie Charter School	0	459	0	461
8	Brownsville Collegiate Charter School	0	548	0	550
9	Leadership Preparatory Brownsville Charter School	0	557	0	559
10	Leadership Preparatory Ocean Hill Charter School	0	564	0	566
11	Ocean Hill Collegiate Charter School	0	569	0	571
12	Middle Village Preparatory Charter School	0	811	0	813

In [15]:

```
#That looks perfect. Now let's put it to work.
#This will iterate over the entire list of school names in the main dataframe, and for each entry in that
#list it will check to see if the school name matches any in the list. If it does, it will increment the
#value in the number of rows column. There's almost certainly a more efficient way to do this, but by the
#figured out what that was the course would probably be over.
for i in range(len(data['School Name'])):
    for j in range(len(rowstoredf['School Name'])):
        if (rowstoredf['School Name'][j]==data['School Name'][i]):
            rowstoredf['Number of rows'][j]+=1
#Now we will go through and auto generate the starting index which needs to be dropped.
for k in range(len(rowstoredf['School Name'])):
    rowstoredf['Starting drop indices'][k]=rowstoredf['Eighth grade indices'][k]-(rowstoredf['Number of r
#Let's see how that all worked.
rowstoredf
```

```
/Users/bentweed/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:9: SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexi
ng-view-versus-copy (http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexing-view-versus-co
py)
  if __name__ == '__main__':
/Users/bentweed/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:12: SettingWithCopyWarnin
g:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexi
ng-view-versus-copy (http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexing-view-versus-co
py)
  if sys.path[0] == '':
```

Out[15]:

	School Name	Number of rows	Eighth grade indices	Starting drop indices	Ending drop indices
0	Hyde Leadership Charter School	7	94	89	96
1	Leadership Preparatory Bedford Stuyvesant Char...	7	271	266	273
2	Williamsburg Collegiate Charter School	5	306	303	308
3	Bedford Stuyvesant Collegiate Charter School	5	342	339	344
4	Excellence Boys Charter School of Bedford Stuy...	7	368	363	370
5	Excellence Girls Charter School	7	375	370	377
6	Kings Collegiate Charter School	5	453	450	455
7	Leadership Preparatory Canarsie Charter School	6	459	455	461
8	Brownsville Collegiate Charter School	5	548	545	550
9	Leadership Preparatory Brownsville Charter School	7	557	552	559
10	Leadership Preparatory Ocean Hill Charter School	7	564	559	566
11	Ocean Hill Collegiate Charter School	5	569	566	571
12	Middle Village Preparatory Charter School	4	811	809	813

In [16]:

```
#In case I can't figure out how to do this in a non-brute-force way, this cell will generate the text I'll
#copy to slice the main dataframe into sub-frames (which don't include the bad schools) to then be re-conc
ranges_to_copy=list(range(14)); ranges_to_copy[0]='[0:89]'; ranges_to_copy[13]='[813:]'
for i in range(1,13):
    ranges_to_copy[i]='['+str(rowstoredf['Ending drop indices'][i-1])+':'+str(rowstoredf['Starting drop in
#Jesus that was a mess. Let's see if it worked out okay.
ranges_to_copy
```

Out[16]:

```
['[0:89]',
 '[96:266]',
 '[273:303]',
 '[308:339]',
 '[344:363]',
 '[370:370]',
 '[377:450]',
 '[455:455]',
 '[461:545]',
 '[550:552]',
 '[559:559]',
 '[566:566]',
 '[571:809]',
 '[813:]']
```

In [17]:

```
#I forgot to account for some of the schools coming immediately after one another in the main dataframe (
#several ranges where the start and end index are the same). I'm gonna be even lazier and make another li
#those "ranges", on the off chance I can somehow automatically pass the strings as arguments to slicing f
#rather than typing/copy-pasting them myself. Remember that the ranges stored in these strings are the ra
#to KEEP (i.e. if I slice the main dataframe to include only these ranges, it gets rid of the schools wit
#math scores and keeps everything else).
ranges_to_copy_final=[]
for zed in range(0,5):
    ranges_to_copy_final.append(ranges_to_copy[zed])
ranges_to_copy_final.append(ranges_to_copy[6])
ranges_to_copy_final.append(ranges_to_copy[8])
ranges_to_copy_final.append(ranges_to_copy[9])
ranges_to_copy_final.append(ranges_to_copy[12])
ranges_to_copy_final.append(ranges_to_copy[13])
ranges_to_copy_final
```

Out[17]:

```
['[0:89]',
 '[96:266]',
 '[273:303]',
 '[308:339]',
 '[344:363]',
 '[377:450]',
 '[461:545]',
 '[550:552]',
 '[571:809]',
 '[813:]']
```

In [18]:
```
#Or, in case I can only pass numbers, I'll make another dataframe with two columns of ints, one for the s
#slice and one for the end of the same slice.
slice_start_inds=[0,96,273,308,344,377,461,550,571,813]
slice_end_inds=[89,266,303,339,363,470,545,552,809,12345] #since I'm not actually ever gonna use that las
slice_inds_df=pd.DataFrame()
slice_inds_df['Starting index']=slice_start_inds
slice_inds_df['Ending index']=slice_end_inds
slice_inds_df
```

Out[18]:

	Starting index	Ending index
0	0	89
1	96	266
2	273	303
3	308	339
4	344	363
5	377	470
6	461	545
7	550	552
8	571	809
9	813	12345

Path forward from here is to figure out how lazy I can be in terms of slicing (i.e. if I can actually feed those strings or ints into something as arguments or if I have to copy-paste), then go ahead and be the appropriate level of lazy. Once I have my new, more svelte main data frame, then I want to go back and look at my Project 2 code because if I remember correctly I had to deal with trimming percent signs and converting to float there as well. I briefly considered also altering the Project 2 code and applying it to the issue of negative values in the difference columns being denoted by parentheses, but it's probably just more efficient to get the difference myself and overwrite the values with that.

Okay, it's a few days later and I am still really lazy. So I'm just going to manually slice the lot. Hopefully this works. (I'm actually so lazy that I'm going to reprint ranges_to_copy_final so I don't have to scroll up.)

In [19]:
```
print(ranges_to_copy_final)
```

```
['[0:89]', '[96:266]', '[273:303]', '[308:339]', '[344:363]', '[377:450]', '[461:545]', '[550:552]',
'[571:809]', '[813:]']
```

In [20]:
```
data_slice_0=data[:][0:89]
```

In [21]:
```
#Let's see if that worked before I expend a bunch of energy doing it for all the rest
data_slice_0.head()
```

Out[21]:

	Borough	CSD	BedsCode	DBN	School Name	Grade	ELA Proficient (L3+L4) Charter	ELA Proficient (L3+L4) District	ELA Proficient (L3+L4) Diff	ELA Advanced (L4) Charter	...	ELA Mean Scale Score Diff	Math Proficient (L3+L4) Charter	Math Proficient (L3+L4) District	I
0	Bronx	7	320700860957	84X491	Academic Leadership Charter School	3	85.7%	27.5%	58.2	40.5%	...	52	85.7%	28.4%	
1	Bronx	7	320700860957	84X491	Academic Leadership Charter School	4	72.6%	25.5%	47.1	43.1%	...	37	68.6%	22.3%	
2	Bronx	7	320700860957	84X491	Academic Leadership Charter School	5	50.9%	19.4%	31.5	34.0%	...	46	60.8%	21.1%	
3	Bronx	7	320700860957	84X491	Academic Leadership Charter School	6	25.0%	12.6%	12.4	17.3%	...	22	35.3%	12.6%	
4	Bronx	7	320700860957	84X491	Academic Leadership Charter School	7	48.4%	20.0%	28.4	8.4%	...	24	44.6%	11.4%	

5 rows × 24 columns

In [22]:
```
#Hell yeah! Unfortunately I have to re-reprint the ranges. Lazy.
print(ranges_to_copy_final)
```

```
['[0:89]', '[96:266]', '[273:303]', '[308:339]', '[344:363]', '[377:450]', '[461:545]', '[550:552]',
'[571:809]', '[813:]']
```

In [23]:
```
#Let's make the other slices.
data_slice_1=data[:][96:266]; data_slice_2=data[:][273:303]; data_slice_3=data[:][308:339]
data_slice_4=data[:][344:363]; data_slice_5=data[:][377:450]; data_slice_6=data[:][461:545]
data_slice_7=data[:][550:552]; data_slice_8=data[:][571:809]; data_slice_9=data[:][813:]
```

In [24]:
```
#Before I go to all the effort of putting them together, let's double check that my index generation from
#worked.
data_slice_1.isnull().sum()
```

Out[24]:
```
Borough                            0
CSD                                0
BedsCode                           0
DBN                                0
School Name                        0
Grade                              0
ELA Proficient (L3+L4) Charter     0
ELA Proficient (L3+L4) District    0
ELA Proficient (L3+L4) Diff        0
ELA Advanced (L4) Charter          0
ELA Advanced (L4) District         0
ELA Advanced (L4) Diff             0
ELA Mean Scale Score Charter       0
ELA Mean Scale Score District      0
ELA Mean Scale Score Diff          0
Math Proficient (L3+L4) Charter    0
Math Proficient (L3+L4) District   0
Math Proficient (L3+L4) Diff       1
Math Advanced (L4) Charter         0
Math Advanced (L4) District        0
Math Advanced (L4) Diff            1
Math Mean Scale Score Charter      0
Math Mean Scale Score District     0
Math Mean Scale Score Diff         0
dtype: int64
```

In [25]:
```
#You have got to be kidding me. Let's pull out the row number to see what this is about now.
print(data_slice_1['School Name'][data_slice_1['Math Proficient (L3+L4) Diff'].isnull()])
```

```
242    Brooklyn East Collegiate Charter School
Name: School Name, dtype: object
```

I looked at the spreadsheet and quite simply there is just no eighth grade math anything, and no explanation in the Notes tab. I'm angry now. So goodbye Brooklyn East Collegiate Charter School, and no bloody thank you.

In [26]:
```
#Manual-visual inspection reveals that it has 5 rows, so we need to slice around it.
data_slice_1a=data[:][96:239]; data_slice_1b=data[:][244:266]
```

In [27]:
```
#Gentlemen, we can rebuild him.
data_svelte=pd.concat([data_slice_0,data_slice_1a,data_slice_1b,data_slice_2,data_slice_3,data_slice_4,
                       data_slice_5,data_slice_6,data_slice_7,data_slice_8,data_slice_9],ignore_index=Tru
data_svelte.head()
```

Out[27]:

	Borough	CSD	BedsCode	DBN	School Name	Grade	ELA Proficient (L3+L4) Charter	ELA Proficient (L3+L4) District	ELA Proficient (L3+L4) Diff	ELA Advanced (L4) Charter	...	ELA Mean Scale Score Diff	Math Proficient (L3+L4) Charter	Math Proficient (L3+L4) District
0	Bronx	7	320700860957	84X491	Academic Leadership Charter School	3	85.7%	27.5%	58.2	40.5%	...	52	85.7%	28.4%
1	Bronx	7	320700860957	84X491	Academic Leadership Charter School	4	72.6%	25.5%	47.1	43.1%	...	37	68.6%	22.3%
2	Bronx	7	320700860957	84X491	Academic Leadership Charter School	5	50.9%	19.4%	31.5	34.0%	...	46	60.8%	21.1%
3	Bronx	7	320700860957	84X491	Academic Leadership Charter School	6	25.0%	12.6%	12.4	17.3%	...	22	35.3%	12.6%
4	Bronx	7	320700860957	84X491	Academic Leadership Charter School	7	48.4%	20.0%	28.4	8.4%	...	24	44.6%	11.4%

5 rows × 24 columns

In [28]:
```
#Cross your fingers.
data_svelte.isnull().sum()
```

Out[28]:
```
Borough                          0
CSD                              0
BedsCode                         0
DBN                              0
School Name                      0
Grade                            0
ELA Proficient (L3+L4) Charter   0
ELA Proficient (L3+L4) District  0
ELA Proficient (L3+L4) Diff      0
ELA Advanced (L4) Charter        0
ELA Advanced (L4) District       0
ELA Advanced (L4) Diff           0
ELA Mean Scale Score Charter     0
ELA Mean Scale Score District    0
ELA Mean Scale Score Diff        0
Math Proficient (L3+L4) Charter  0
Math Proficient (L3+L4) District 0
Math Proficient (L3+L4) Diff     0
Math Advanced (L4) Charter       0
Math Advanced (L4) District      0
Math Advanced (L4) Diff          0
Math Mean Scale Score Charter    0
Math Mean Scale Score District   0
Math Mean Scale Score Diff       0
dtype: int64
```

Holy crap, that took a minute, didn't it? Now we can get on with converting the data types as necessary. Let's refresh ourselves as to which columns need fixing.

```
In [29]: data_svelte.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 803 entries, 0 to 802
Data columns (total 24 columns):
Borough                            803 non-null object
CSD                                803 non-null int64
BedsCode                           803 non-null int64
DBN                                803 non-null object
School Name                        803 non-null object
Grade                              803 non-null object
ELA Proficient (L3+L4) Charter     803 non-null object
ELA Proficient (L3+L4) District    803 non-null object
ELA Proficient (L3+L4) Diff        803 non-null object
ELA Advanced (L4) Charter          803 non-null object
ELA Advanced (L4) District         803 non-null object
ELA Advanced (L4) Diff             803 non-null object
ELA Mean Scale Score Charter       803 non-null int64
ELA Mean Scale Score District      803 non-null int64
ELA Mean Scale Score Diff          803 non-null object
Math Proficient (L3+L4) Charter    803 non-null object
Math Proficient (L3+L4) District   803 non-null object
Math Proficient (L3+L4) Diff       803 non-null object
Math Advanced (L4) Charter         803 non-null object
Math Advanced (L4) District        803 non-null object
Math Advanced (L4) Diff            803 non-null object
Math Mean Scale Score Charter      803 non-null object
Math Mean Scale Score District     803 non-null float64
Math Mean Scale Score Diff         803 non-null object
dtypes: float64(1), int64(4), object(19)
memory usage: 150.6+ KB
```

```
In [30]: #Since the English Mean Scale Score columns are already ints, we can just go ahead and overwrite the diff
         #columns rather than having to bother with "if there are parens, strip, cast as int and make negative"
         #or some such silly thing.
         data_svelte['ELA Mean Scale Score Diff']=data_svelte['ELA Mean Scale Score Charter']-data_svelte['ELA Mea
```

```
In [31]: #And let's see if that worked
         data_svelte.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 803 entries, 0 to 802
Data columns (total 24 columns):
Borough                            803 non-null object
CSD                                803 non-null int64
BedsCode                           803 non-null int64
DBN                                803 non-null object
School Name                        803 non-null object
Grade                              803 non-null object
ELA Proficient (L3+L4) Charter     803 non-null object
ELA Proficient (L3+L4) District    803 non-null object
ELA Proficient (L3+L4) Diff        803 non-null object
ELA Advanced (L4) Charter          803 non-null object
ELA Advanced (L4) District         803 non-null object
ELA Advanced (L4) Diff             803 non-null object
ELA Mean Scale Score Charter       803 non-null int64
ELA Mean Scale Score District      803 non-null int64
ELA Mean Scale Score Diff          803 non-null int64
Math Proficient (L3+L4) Charter    803 non-null object
Math Proficient (L3+L4) District   803 non-null object
Math Proficient (L3+L4) Diff       803 non-null object
Math Advanced (L4) Charter         803 non-null object
Math Advanced (L4) District        803 non-null object
Math Advanced (L4) Diff            803 non-null object
Math Mean Scale Score Charter      803 non-null object
Math Mean Scale Score District     803 non-null float64
Math Mean Scale Score Diff         803 non-null object
dtypes: float64(1), int64(5), object(18)
memory usage: 150.6+ KB
```

In [32]:
```
#The only reason the Math Mean Scale Score columns were ever anything but ints was because of the mean ol
#that we removed in previous steps, so we should be able to make them ints without much trouble.
for col in ['Math Mean Scale Score Charter','Math Mean Scale Score District']:
    data_svelte[col] = data_svelte[col].astype(int)
```

In [33]:
```
data_svelte['Math Mean Scale Score Diff']=data_svelte['Math Mean Scale Score Charter']-data_svelte['Math
```

In [34]:
```
data_svelte.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 803 entries, 0 to 802
Data columns (total 24 columns):
Borough                            803 non-null object
CSD                                803 non-null int64
BedsCode                           803 non-null int64
DBN                                803 non-null object
School Name                        803 non-null object
Grade                              803 non-null object
ELA Proficient (L3+L4) Charter     803 non-null object
ELA Proficient (L3+L4) District    803 non-null object
ELA Proficient (L3+L4) Diff        803 non-null object
ELA Advanced (L4) Charter          803 non-null object
ELA Advanced (L4) District         803 non-null object
ELA Advanced (L4) Diff             803 non-null object
ELA Mean Scale Score Charter       803 non-null int64
ELA Mean Scale Score District      803 non-null int64
ELA Mean Scale Score Diff          803 non-null int64
Math Proficient (L3+L4) Charter    803 non-null object
Math Proficient (L3+L4) District   803 non-null object
Math Proficient (L3+L4) Diff       803 non-null object
Math Advanced (L4) Charter         803 non-null object
Math Advanced (L4) District        803 non-null object
Math Advanced (L4) Diff            803 non-null object
Math Mean Scale Score Charter      803 non-null int64
Math Mean Scale Score District     803 non-null int64
Math Mean Scale Score Diff         803 non-null int64
dtypes: int64(8), object(16)
memory usage: 150.6+ KB
```

I was about to pull in my Project 2 code for stripping percent signs, but guess what, I seem to have made that up. Project 2 did not involve that at all. Carleton was nice enough to whip something up for me though. Let's use that.

In [35]:
```
import re
cols_to_convert = ['ELA Proficient (L3+L4) Charter', 'ELA Proficient (L3+L4) District',
                   'ELA Advanced (L4) Charter', 'ELA Advanced (L4) District',
                   'Math Proficient (L3+L4) Charter', 'Math Proficient (L3+L4) District',
                   'Math Advanced (L4) Charter', 'Math Advanced (L4) District']
for col in cols_to_convert:
    data_svelte[col].replace(re.compile(r'%'),'',inplace=True,regex=True)
    #print(type(data_svelte[col][0]))
    #print(col+' trimmed')
    data_svelte[col] = data_svelte[col].astype(np.float)
    #print(type(data_svelte[col][0]))
    #print(col+' converted')
```

In [36]:
```
data_svelte.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 803 entries, 0 to 802
Data columns (total 24 columns):
Borough                            803 non-null object
CSD                                803 non-null int64
BedsCode                           803 non-null int64
DBN                                803 non-null object
School Name                        803 non-null object
Grade                              803 non-null object
ELA Proficient (L3+L4) Charter     803 non-null float64
ELA Proficient (L3+L4) District    803 non-null float64
ELA Proficient (L3+L4) Diff        803 non-null object
ELA Advanced (L4) Charter          803 non-null float64
ELA Advanced (L4) District         803 non-null float64
ELA Advanced (L4) Diff             803 non-null object
ELA Mean Scale Score Charter       803 non-null int64
ELA Mean Scale Score District      803 non-null int64
ELA Mean Scale Score Diff          803 non-null int64
Math Proficient (L3+L4) Charter    803 non-null float64
Math Proficient (L3+L4) District   803 non-null float64
Math Proficient (L3+L4) Diff       803 non-null object
Math Advanced (L4) Charter         803 non-null float64
Math Advanced (L4) District        803 non-null float64
Math Advanced (L4) Diff            803 non-null object
Math Mean Scale Score Charter      803 non-null int64
Math Mean Scale Score District     803 non-null int64
Math Mean Scale Score Diff         803 non-null int64
dtypes: float64(8), int64(8), object(8)
memory usage: 150.6+ KB
```

In [37]:
```
#Jesus that was rough. Let's do the difference columns now.
data_svelte['ELA Proficient (L3+L4) Diff']=data_svelte['ELA Proficient (L3+L4) Charter']-data_svelte['ELA
data_svelte['ELA Advanced (L4) Diff']=data_svelte['ELA Advanced (L4) Charter']-data_svelte['ELA Advanced
data_svelte['Math Proficient (L3+L4) Diff']=data_svelte['Math Proficient (L3+L4) Charter']-data_svelte['M
data_svelte['Math Advanced (L4) Diff']=data_svelte['Math Advanced (L4) Charter']-data_svelte['Math Advanc
```

In [38]:
```
data_svelte.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 803 entries, 0 to 802
Data columns (total 24 columns):
Borough                            803 non-null object
CSD                                803 non-null int64
BedsCode                           803 non-null int64
DBN                                803 non-null object
School Name                        803 non-null object
Grade                              803 non-null object
ELA Proficient (L3+L4) Charter     803 non-null float64
ELA Proficient (L3+L4) District    803 non-null float64
ELA Proficient (L3+L4) Diff        803 non-null float64
ELA Advanced (L4) Charter          803 non-null float64
ELA Advanced (L4) District         803 non-null float64
ELA Advanced (L4) Diff             803 non-null float64
ELA Mean Scale Score Charter       803 non-null int64
ELA Mean Scale Score District      803 non-null int64
ELA Mean Scale Score Diff          803 non-null int64
Math Proficient (L3+L4) Charter    803 non-null float64
Math Proficient (L3+L4) District   803 non-null float64
Math Proficient (L3+L4) Diff       803 non-null float64
Math Advanced (L4) Charter         803 non-null float64
Math Advanced (L4) District        803 non-null float64
Math Advanced (L4) Diff            803 non-null float64
Math Mean Scale Score Charter      803 non-null int64
Math Mean Scale Score District     803 non-null int64
Math Mean Scale Score Diff         803 non-null int64
dtypes: float64(12), int64(8), object(4)
memory usage: 150.6+ KB
```

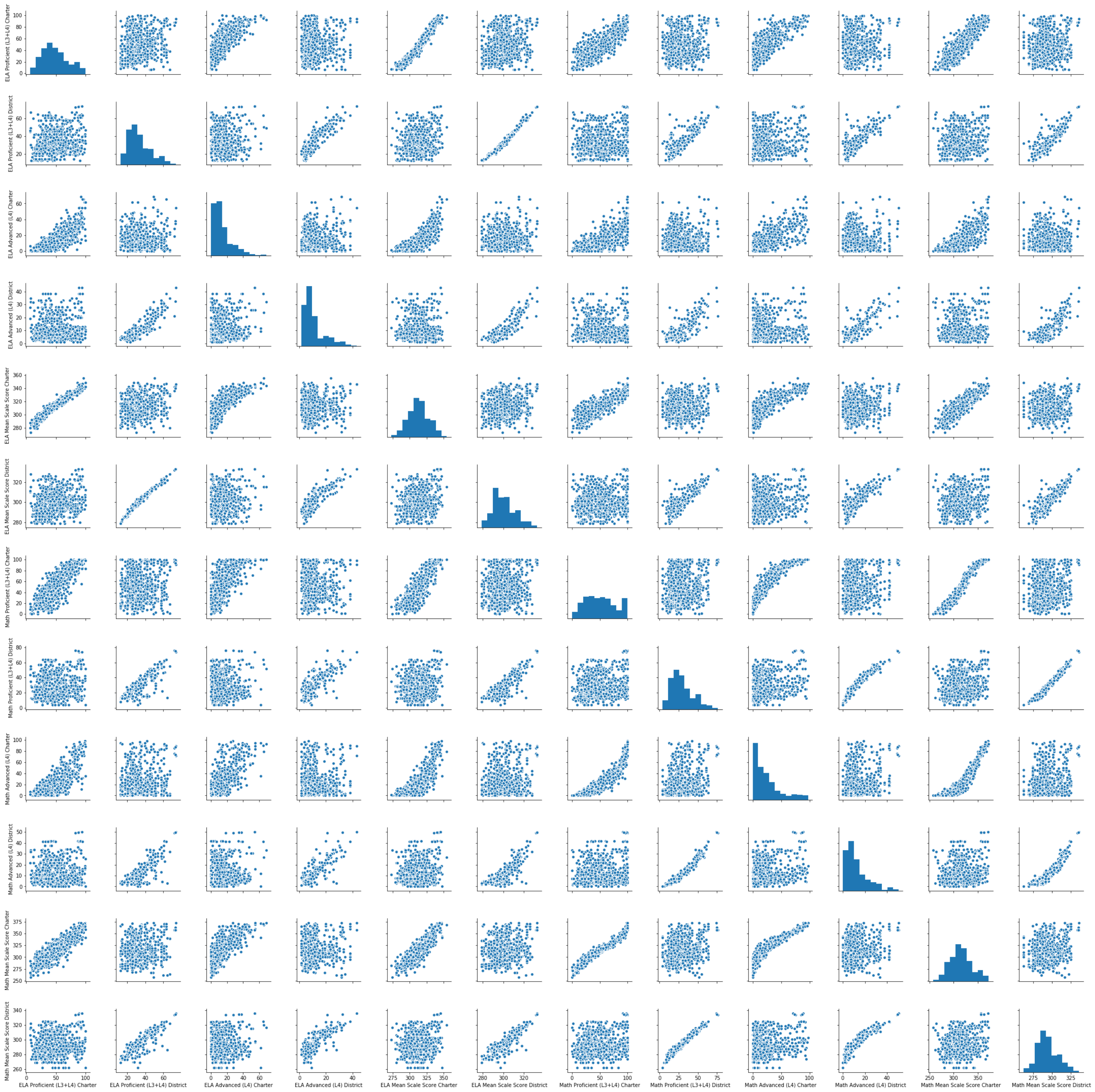
In [39]:
```
#FINALLY WE CAN DO THIS:
data_svelte.describe()
```

Out[39]:

	CSD	BedsCode	ELA Proficient (L3+L4) Charter	ELA Proficient (L3+L4) District	ELA Proficient (L3+L4) Diff	ELA Advanced (L4) Charter	ELA Advanced (L4) District	ELA Advanced (L4) Diff	ELA Mean Scale Score Charter	ELA Mean Scale Score District	ELA Mea Sca Score D
count	803.00000	8.030000e+02	803.000000	803.000000	803.000000	803.000000	803.000000	803.000000	803.000000	803.000000	803.00000
mean	12.65878	3.241337e+11	48.334496	33.464882	14.869614	13.796264	10.927895	2.868369	313.028643	300.491905	12.5367
std	8.23808	1.073899e+10	21.566607	12.616343	22.575186	11.683698	7.971193	12.733923	14.705689	10.891593	16.5541
min	1.00000	3.101009e+11	6.500000	12.600000	-60.100000	0.000000	1.300000	-36.100000	273.000000	279.000000	-48.00000
25%	6.00000	3.106009e+11	32.150000	24.300000	-1.100000	5.700000	5.800000	-4.150000	303.000000	293.000000	1.00000
50%	11.00000	3.211009e+11	45.400000	30.100000	13.300000	10.400000	8.500000	1.400000	313.000000	298.000000	12.00000
75%	17.00000	3.317009e+11	62.350000	41.500000	28.600000	17.700000	12.800000	8.200000	323.000000	307.000000	24.00000
max	32.00000	3.531009e+11	100.000000	73.900000	78.100000	68.600000	43.100000	52.600000	355.000000	333.000000	53.00000

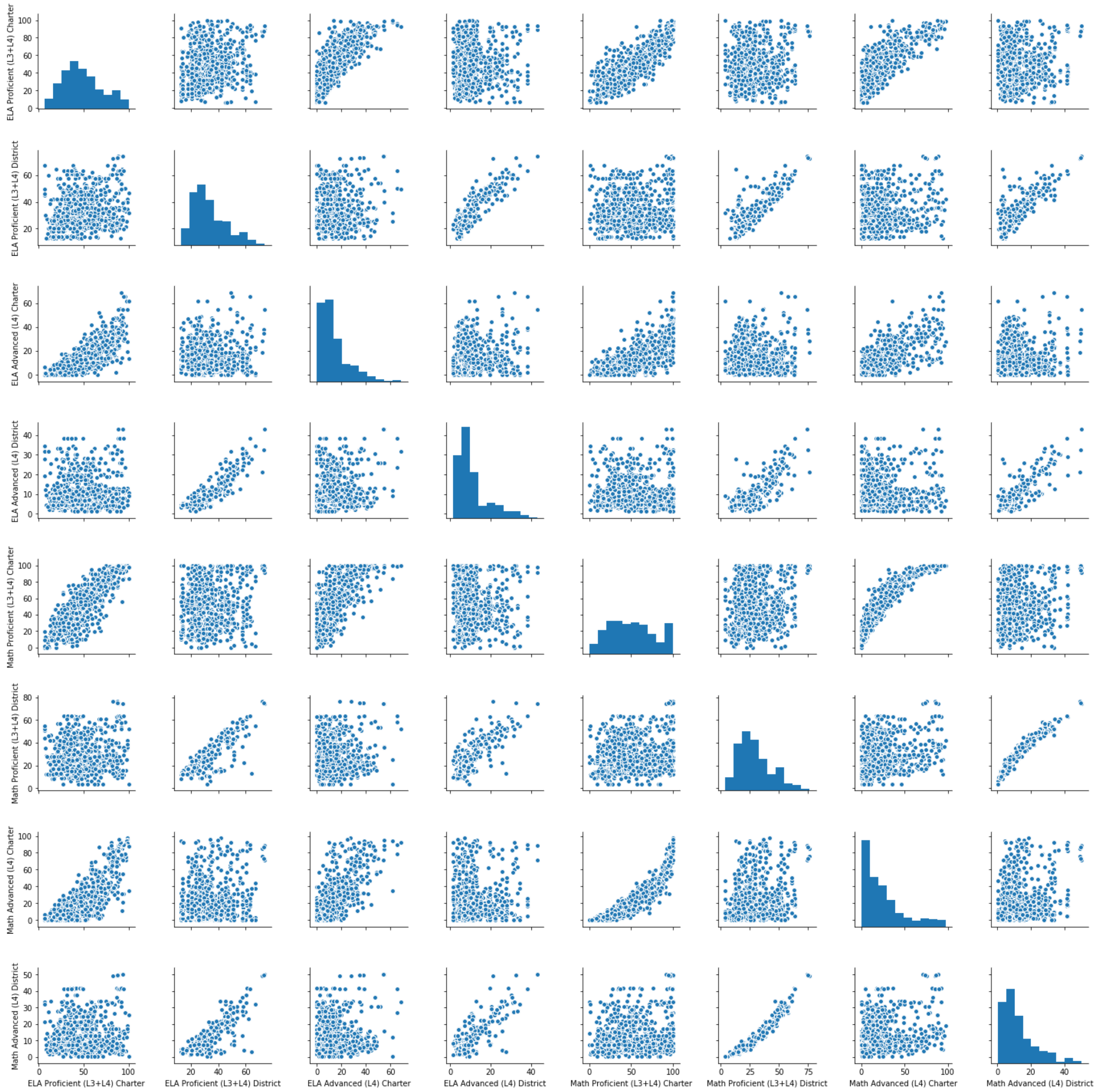
```
In [40]: #For whatever reason, sending everything to pairplot seems to overload it. So I'm going to pass only the
         #represent rates and scores, not differences (because that doesn't seem worth plotting and also because I
         #Additionally, I'm going to split off the Mean Scale Scores into a different list, as "Proficient" and "A
         #just mean rates of attainment of certain scores (I think). But first I'm going to plot both lists at onc
         #to see what it looks like.
         cols_to_first_plot=['ELA Proficient (L3+L4) Charter','ELA Proficient (L3+L4) District','ELA Advanced (L4)
                             'ELA Advanced (L4) District','Math Proficient (L3+L4) Charter',
                             'Math Proficient (L3+L4) District','Math Advanced (L4) Charter','Math Advanced (L4) D
         cols_to_second_plot=['ELA Mean Scale Score Charter','ELA Mean Scale Score District',
                              'Math Mean Scale Score Charter','Math Mean Scale Score District']
         cols_to_combo_plot=['ELA Proficient (L3+L4) Charter','ELA Proficient (L3+L4) District','ELA Advanced (L4)
                             'ELA Advanced (L4) District','ELA Mean Scale Score Charter','ELA Mean Scale Score Dis
                             'Math Proficient (L3+L4) Charter','Math Proficient (L3+L4) District','Math Advanced (
                             'Math Advanced (L4) District','Math Mean Scale Score Charter','Math Mean Scale Score
         sns.pairplot(data_svelte[cols_to_combo_plot])
```

```
Out[40]: <seaborn.axisgrid.PairGrid at 0x108fab518>
```



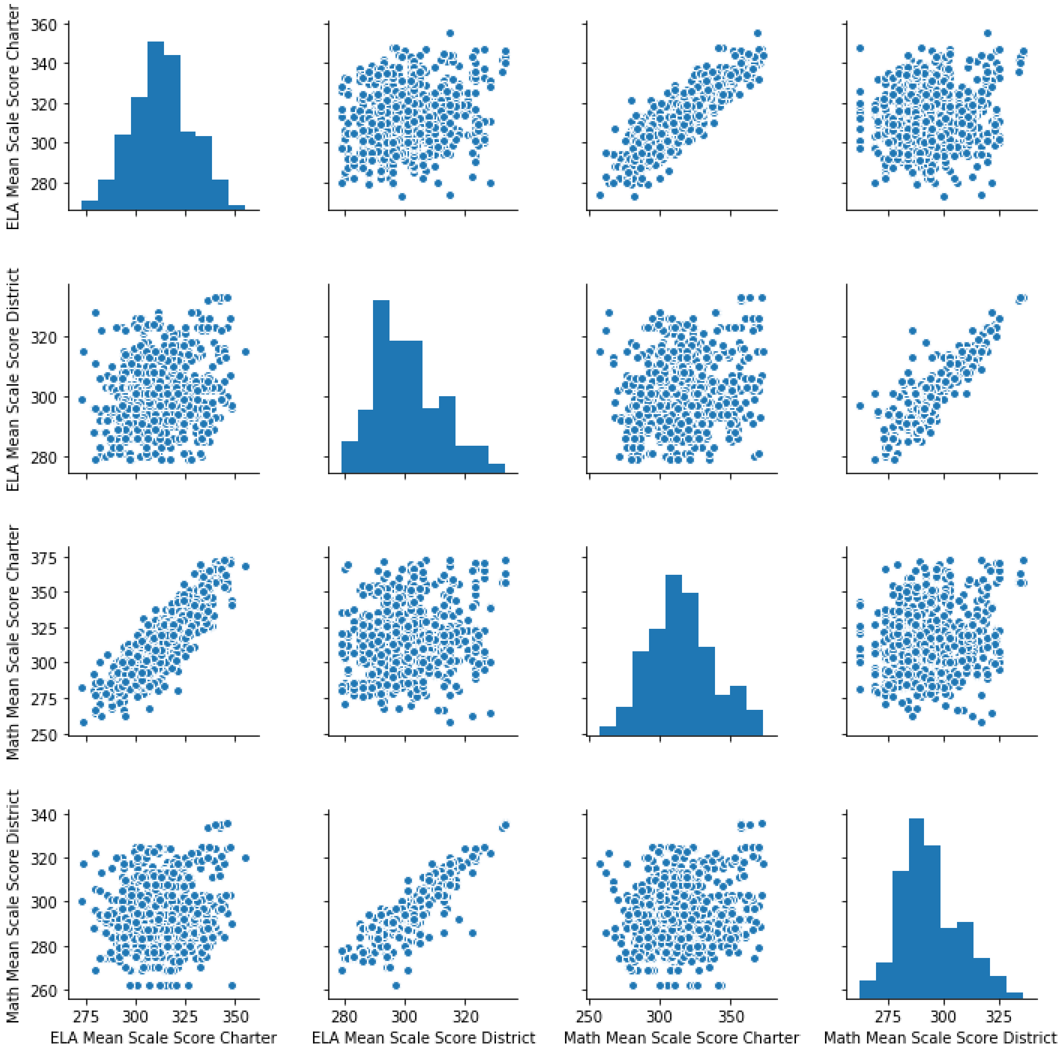
```
In [42]: sns.pairplot(data_svelte[cols_to_first_plot])
```

```
Out[42]: <seaborn.axisgrid.PairGrid at 0x1a1e9dc198>
```



```
In [43]: sns.pairplot(data_svelte[cols_to_second_plot])

Out[43]: <seaborn.axisgrid.PairGrid at 0x1a22f147b8>
```



Okay, so admittedly anything I say here is not really supported by anything other than Mk1Mod0 Eyeball. BUT. The apparent lack of any significant correlation between Charter and District on the same column, especially relative to the strong correlations between different columns for the same populations, is pretty striking and does definitely suggest significant differences between the two environments (obvious, I know, but still). The question now becomes what those differences are, and what other inferences I can draw from them.