| Module | Description | Example | Script |
|--------|---|--|---------------------|
| core | dictionary, adding a new entry | co['po'] = 'CO' | g05/demo.py |
| core | dictionary, creating | co = {'name':'Colorado', 'capital':'Denver'} | g05/demo.py |
| core | dictionary, creating via comprehension | fips_cols = {col:str for col in fips_vars} | g13/demo.py |
| core | dictionary, looking up a value | name = ny['name'] | g05/demo.py |
| core | dictionary, making a list of | list1 = [co, ny] | g05/demo.py |
| core | dictionary, obtaining a list of keys | $names = super_dict.keys()$ | g05/demo.py |
| core | f-string, using a formatting string | print(f"PV of {payment} with T={year} and r={r} is p | g07/demo.py |
| core | file, closing | fh.close() | g02/demo.py |
| core | file, opening for reading | fh = open('states.csv') | ${\sf g05/demo.py}$ |
| core | file, opening for writing | fh = open(filename, "w") | g02/demo.py |
| core | file, output using print | <pre>print("It was written during",year,file=fh)</pre> | g02/demo.py |
| core | file, output using write | fh.write("Where was this file was written?\n") | g02/demo.py |
| core | file, print without adding spaces | <pre>print('\nOuter:\n', join_o['_merge'].value_counts(), s</pre> | g14/demo.py |
| core | file, reading one line at a time | for line in fh: | g05/demo.py |
| core | for, looping through a list | for n in a_list: | g04/demo.py |
| core | for, looping through a list of tuples | for number,name in div_info: | g13/demo.py |
| core | function, calling | $d1_ssq = sumsq(d1)$ | g06/demo.py |
| core | function, calling with an optional argument | sample_function(100, 10, r=0.07) | g07/demo.py |
| core | function, defining | def sumsq(values): | g06/demo.py |
| core | function, defining with optional argument | <pre>def sample_function(payment,year,r=0.05):</pre> | g07/demo.py |
| core | function, returning a result | return values | g06/demo.py |
| core | list, appending an element | a_list.append("four") | g03/demo.py |
| core | list, create via comprehension | cubes = $[n**3 for n in a_list]$ | g04/demo.py |
| core | list, creating | $a_{list} = ["zero", "one", "two", "three"]$ | g03/demo.py |
| core | list, determining length | $n = len(b_list)$ | g03/demo.py |
| core | list, extending with another list | a_list.extend(a_more) | g03/demo.py |
| core | list, generating a sequence | $b_list = range(1,6)$ | g04/demo.py |
| core | list, joining with spaces | a_string = " ".join(a_list) | g03/demo.py |
| core | list, selecting an element | print(a_list[0]) | g03/demo.py |
| core | list, selecting elements 0 to 3 | print(a_list[:4]) | g03/demo.py |
| core | list, selecting elements 1 to 2 | print(a_list[1:3]) | g03/demo.py |
| core | list, selecting elements 1 to the end | print(a_list[1:]) | g03/demo.py |

| Module | Description | Example | Script |
|-----------|---|---|-------------|
| core | list, selecting last 3 elements | print(a_list[-3:]) | g03/demo.py |
| core | list, selecting the last element | print(a_list[-1]) | g03/demo.py |
| core | list, sorting | c_sort = sorted(b_list) | g03/demo.py |
| core | list, summing | tot_inc = sum(incomes) | g08/demo.py |
| core | math, raising a number to a power | a_cubes.append(n**3) | g04/demo.py |
| core | math, rounding a number | rounded = round(ratio,2) | g05/demo.py |
| core | sets, computing difference | <pre>print(name_states - pop_states)</pre> | g13/demo.py |
| core | sets, creating | name_states = set(name_data['State']) | g13/demo.py |
| core | sets, of tuples | tset1 = set([(1,2), (2,3), (1,3), (2,3)]) | g13/demo.py |
| core | string, concatenating | name = $s1+""+s2+""+s3$ | g02/demo.py |
| core | string, converting to an int | values.append(int(line)) | g06/demo.py |
| core | string, creating | filename = "demo.txt" | g02/demo.py |
| core | string, including a newline character | $fh.write(name+"!\n")$ | g02/demo.py |
| core | string, splitting on a comma | parts = line.split(',') | g05/demo.py |
| core | string, splitting on whitespace | $b_list = b_string.split()$ | g03/demo.py |
| core | string, stripping blank space | $clean = [item.strip() \; for \; item \; in \; parts]$ | g05/demo.py |
| core | type, obtaining for a variable | <pre>print('\nraw_states is a DataFrame object:', type(raw</pre> | g09/demo.py |
| CSV | setting up a DictReader object | ${\sf reader} = {\sf csv.DictReader(fh)}$ | g08/demo.py |
| fiona | importing the module | import fiona | g24/demo.py |
| fiona | list layers in a geopackage | layers = fiona.listlayers(demo_file) | g24/demo.py |
| geopandas | adding a heatmap legend | slices.plot('s_pop',edgecolor='yellow',linewidth=0.2,le | g26/demo.py |
| geopandas | clip a layer | $zips_clip = zips.clip(county,keep_geom_type=True)$ | g24/demo.py |
| geopandas | combine all geographies in a layer | water_dis = water_by_name.dissolve() | g24/demo.py |
| geopandas | combine geographies by attribute | $water_by_name = water.dissolve('FULLNAME')$ | g24/demo.py |
| geopandas | computing areas | zips['z_area'] = zips.area | g26/demo.py |
| geopandas | construct a buffer | $near_water = water_dis.buffer(1600)$ | g24/demo.py |
| geopandas | extracting geometry from a geodataframe | $wv_geo = wv['geometry']$ | g22/demo.py |
| geopandas | importing the module | import geopandas as gpd | g21/demo.py |
| geopandas | merging data onto a geodataframe | $conus = conus.merge(trim, on = `STATEFP', how = `left', valida. \ . \ .$ | g22/demo.py |
| geopandas | obtaining coordinates | <pre>print('Number of points:', len(wv_geo.exterior.coords)</pre> | g22/demo.py |

| geopandas overlaying a layer using union slices = zips overlay(county,how='union',keep_geom_type | Module | Description | Example | Script |
|--|------------|-------------------------------------|--|-------------|
| geopandas plot with categorical coloring sel.plott("NAME".cmap="Dark2".ax=ax1) g22/demo.py geopandas project a layer county = county.to_crs(epsg=utm16n) g24/demo.py geopandas project a layer county = county.to_crs(epsg=utm16n) g24/demo.py geopandas reading a file syr = gpd.read_file("tl_2016_36_place-syracuse.zip") g22/demo.py geopandas reading a shapefile states = gpd.read_file("tl_2016_36_place-syracuse.zip") g22/demo.py geopandas setting the color of a plot county.plot(color="tan".ax=ax1) g24/demo.py geopandas setting transparency via alpha near_clip.plot(alpha=0.25,ax=ax1) g24/demo.py geopandas spatial join, contains c_contains_z = county.sjoin(zips.how="right".predicate= g25/demo.py geopandas spatial join, crosses i_crosses_z = inter.sjoin(zips.how="right".predicate= g25/demo.py geopandas spatial join, overlaps z_overlaps_c = zips.sjoin(county.how="left".predicate= g25/demo.py geopandas spatial join, overlaps z_overlaps_c = zips.sjoin(county.how="left".predicate= g25/demo.py geopandas spatial join, votelaps z_overlaps_c = zips.sjoin(county.how="left".predicate=-!cu g25/demo.py geopandas spatial join, votelaps_c = zips.sjoin(county.how="left".predicate=-!cu g25/demo.py geopandas spatial join, votelaps_c = zips.sjoin(county.how="left".predicate=-!cu g25 | geopandas | overlaying a layer using union | slices = zips.overlay(county,how='union',keep_geom_type | g26/demo.py |
| geopandas plotting a boundary syr.boundary.plot(color='gray.' linewidth=1,ax=ax1) g21/demo.py geopandas reading a file syr = god.read_file("tl_2016_36_place-syracuse.zip") g21/demo.py geopandas reading a shapefile states = gpd.read_file("tl_2016_36_place-syracuse.zip") g21/demo.py geopandas setting the color of a plot county.plot(color='drain', ax=ax1) g24/demo.py geopandas setting transparency via alpha near_clip.plot(alpha=0.25,ax=ax1) g24/demo.py geopandas spatial join, crosses countains_z = county.sjoin(zips.how='right',predicate=-c g25/demo.py geopandas spatial join, crosses i_crosses_z = inters_sjoin(zips.how='right',predicate=-c g25/demo.py geopandas spatial join, crosses i_crosses_z = inters_sjoin(zips.how='right',predicate=-c g25/demo.py geopandas spatial join, coroses z_crosse_z = inters_sjoin(zounty.how='left',predicate=-c g25/demo.py geopandas spatial join, coroses z_crosse_z = inters_sjoin(county.how='left',predicate=-c g25/demo.py geopandas spatial join, coroses z_cross_z_cross_join(county.how='left',predicate=-c g25/demo.py geopandas spatial join, touches z_touch_c = zips.sjoin(county.how='left',predicate=-c g25/demo.py geopandas spatial join, touches z_touch_c = zips.sjoin(county.how='left',predicate=-c g25/demo.py geopandas spatial join, touches z_touch_c = zips.sjoin(county.how='left',predicate=-c g25/demo.py geopandas writing a layer to a geodatabase cons.touches(wp.acu | geopandas | | sel.plot('NAME',cmap='Dark2',ax=ax1) | g22/demo.py |
| geopandas reading a file syr = gpd.read_file("tL_2016_36_place-syracuse.zip") g21/demo.py geopandas reading a shapefile states = gpd.read_file("tc_2019_us_state_500k.zip") g22/demo.py geopandas setting the color of a plot county.plot(color="tan",ax=ax1) g24/demo.py geopandas setting transparency via alpha near_clip.plot(alpha=0.25,ax=ax1) g24/demo.py geopandas spatial join, contains c_contains_z = county,sjoin(zips,how='right'.predicate= g25/demo.py geopandas spatial join, cortains c_contains_z = county,sjoin(zips,how='right'.predicate= g25/demo.py geopandas spatial join, overlaps z_overlaps_c = zips.sjoin(county,how=left',predicate= g25/demo.py geopandas spatial join, overlaps z_overlaps_c = zips.sjoin(county,how=left',predicate= g25/demo.py geopandas spatial join, within z_cultinic_c = zips.sjoin(county,how=left',predicate= g25/demo.py geopandas spatial join, within z_vithin_c = zips.sjoin(county,how=left',predicate=-\text{viol} g25/demo.py geopandas utesting if rows touch a geometry touches_wv = conus.touches(wv_geo) g22/demo.py geopandas writing a layer to a geodatabase conus.to_file("conus.gpkg",layer="states") g22/demo.py g | geopandas | plotting a boundary | | |
| geopandas reading a file syr = gpd.read_file("tL_2016_36_place-syracuse.zip") g21/demo.py geopandas reading a shapefile states = gpd.read_file("tc_2019_us_state_500k.zip") g22/demo.py geopandas setting the color of a plot county.plot(color="tan",ax=ax1) g24/demo.py geopandas setting transparency via alpha near_clip.plot(alpha=0.25,ax=ax1) g24/demo.py geopandas spatial join, contains c_contains_z = county,sjoin(zips,how='right'.predicate= g25/demo.py geopandas spatial join, cortains c_contains_z = county,sjoin(zips,how='right'.predicate= g25/demo.py geopandas spatial join, overlaps z_overlaps_c = zips.sjoin(county,how=left',predicate= g25/demo.py geopandas spatial join, overlaps z_overlaps_c = zips.sjoin(county,how=left',predicate= g25/demo.py geopandas spatial join, within z_cultinic_c = zips.sjoin(county,how=left',predicate= g25/demo.py geopandas spatial join, within z_vithin_c = zips.sjoin(county,how=left',predicate=-\text{viol} g25/demo.py geopandas utesting if rows touch a geometry touches_wv = conus.touches(wv_geo) g22/demo.py geopandas writing a layer to a geodatabase conus.to_file("conus.gpkg",layer="states") g22/demo.py g | geopandas | project a layer | county = county.to_crs(epsg=utm18n) | g24/demo.py |
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| geopandas spatial join, contains c_contains_z = county.sjoin(zips,how='right'.predicate= | geopandas | setting the color of a plot | county.plot(color='tan',ax=ax1) | g24/demo.py |
| geopandas spatial join, contains c_contains_z = county.sjoin(zips,how='right'.predicate= | geopandas | setting transparency via alpha | near_clip.plot(alpha=0.25,ax=ax1) | g24/demo.py |
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| geopandas spatial join, overlaps z_overlaps_c = zips.sjoin(county,how='left',predicate=' | geopandas | spatial join, intersects | <pre>z_intersect_c = zips.sjoin(county,how='left',predicate=</pre> | g25/demo.py |
| geopandas spatial join, within z_within_c = zips.sjoin(county,how='left',predicate='wi | geopandas | spatial join, overlaps | <pre>z_overlaps_c = zips.sjoin(county,how='left',predicate='</pre> | g25/demo.py |
| geopandas writing a layer to a geometry geopandas writing a layer to a geodatabase conus.to_file("conus.gpkg",layer="states") json importing the module import json g05/demo.py json using to print an object nicely print(json.dumps(list1,indent=4)) matplotlib axes, adding a horizontal line ax21.axhline(medians['etr'], c='r', ls='-', lw=1) g12/demo.py matplotlib axes, adding a vertical line ax21.axvline(medians['inc'], c='r', ls='-', lw=1) g12/demo.py matplotlib axes, labeling the X axis ax1.set_xlabel('Millions') g11/demo.py matplotlib axes, labeling the Y axis ax1.set_ylabel("Population, Millions") g11/demo.py matplotlib axes, setting a title ax1.set_ylabel(None) axis, turning off ax1.axis('off') g26/demo.py matplotlib axis, turning off ax1.axis('off') g26/demo.py matplotlib colors, xkcd palette syr.plot(color='xkcd:lightblue',ax=ax1) g21/demo.py matplotlib figure, adding a title fig2.qux1itle('Pooled Data') g12/demo.py matplotlib figure, four panel grid fig3, axs = plt.subplots(2,2,sharex=True,sharey=True) g12/demo.py matplotlib figure, saving fig1.savefig('figure.png') g11/demo.py matplotlib figure, setting the size fig, axs = plt.subplots(1,2,figsize=(12,6)) g20/demo.py matplotlib figure, working with a list of axes for ax in axs: g20/demo.py matplotlib figure, working with a list of axes for ax in axs: g20/demo.py matplotlib importing pyplot import matplotlib.pyplot as plt | geopandas | spatial join, touches | <pre>z_touch_c = zips.sjoin(county,how='left',predicate='tou</pre> | g25/demo.py |
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| matplotlibaxes, adding a vertical lineax21.axvline(medians['inc'], c='r', ls='-', lw=1)g12/demo.pymatplotlibaxes, labeling the X axisax1.set_xlabel('Millions')g11/demo.pymatplotlibaxes, labeling the Y axisax1.set_ylabel("Population, Millions")g11/demo.pymatplotlibaxes, setting a titleax1.set_title('Population')g13/demo.pymatplotlibaxes, turning off the labelax.set_ylabel(None)g13/demo.pymatplotlibaxis, turning offax1.axis('off')g26/demo.pymatplotlibcolors, xkcd palettesyr.plot(color='xkcd:lightblue',ax=ax1)g21/demo.pymatplotlibfigure, adding a titlefig2.suptile('Pooled Data')g12/demo.pymatplotlibfigure, four panel gridfig3, axs = plt.subplots(2,2,sharex=True,sharey=True)g12/demo.pymatplotlibfigure, left and right panelsfig2, (ax21,ax22) = plt.subplots(1,2)g12/demo.pymatplotlibfigure, setting the sizefig, axs = plt.subplots(1,2,figsize=(12,6))g20/demo.pymatplotlibfigure, tuning the layoutfig1.tight_layout()g20/demo.pymatplotlibfigure, working with a list of axesfor ax in axs:g20/demo.pymatplotlibimporting pyplotimport matplotlib.pyplot as plt | json | using to print an object nicely | <pre>print(json.dumps(list1,indent=4))</pre> | g05/demo.py |
| matplotlibaxes, labeling the X axisax1.set_xlabel('Millions')g11/demo.pymatplotlibaxes, labeling the Y axisax1.set_ylabel("Population, Millions")g11/demo.pymatplotlibaxes, setting a titleax1.set_title('Population')g11/demo.pymatplotlibaxes, turning off the labelax.set_ylabel(None)g13/demo.pymatplotlibaxis, turning offax1.axis('off')g26/demo.pymatplotlibcolors, xkcd palettesyr.plot(color='xkcd:lightblue',ax=ax1)g21/demo.pymatplotlibfigure, adding a titlefig2.suptitle('Pooled Data')g12/demo.pymatplotlibfigure, four panel gridfig3, axs = plt.subplots(2,2,sharex=True,sharey=True)g12/demo.pymatplotlibfigure, left and right panelsfig2, (ax21,ax22) = plt.subplots(1,2)g12/demo.pymatplotlibfigure, savingfig1.savefig('figure.png')g11/demo.pymatplotlibfigure, setting the sizefig, axs = plt.subplots(1,2,figsize=(12,6))g20/demo.pymatplotlibfigure, tuning the layoutfig1.tight_layout()g11/demo.pymatplotlibfigure, working with a list of axesfor ax in axs:g20/demo.pymatplotlibimporting pyplotimport matplotlib.pyplot as pltg11/demo.py | matplotlib | axes, adding a horizontal line | ax21.axhline(medians['etr'], c='r', ls='-', lw=1) | g12/demo.py |
| matplotlibaxes, labeling the Y axisax1.set_ylabel("Population, Millions")g11/demo.pymatplotlibaxes, setting a titleax1.set_title('Population')g11/demo.pymatplotlibaxes, turning off the labelax.set_ylabel(None)g13/demo.pymatplotlibaxis, turning offax1.axis('off')g26/demo.pymatplotlibcolors, xkcd palettesyr.plot(color='xkcd:lightblue',ax=ax1)g21/demo.pymatplotlibfigure, adding a titlefig2.suptitle('Pooled Data')g12/demo.pymatplotlibfigure, four panel gridfig3, axs = plt.subplots(2,2,sharex=True,sharey=True)g12/demo.pymatplotlibfigure, left and right panelsfig2, (ax21,ax22) = plt.subplots(1,2)g12/demo.pymatplotlibfigure, savingfig1.savefig('figure.png')g11/demo.pymatplotlibfigure, setting the sizefig, axs = plt.subplots(1,2,figsize=(12,6))g20/demo.pymatplotlibfigure, tuning the layoutfig1.tight_layout()g11/demo.pymatplotlibfigure, working with a list of axesfor ax in axs:g20/demo.pymatplotlibimporting pyplotimport matplotlib.pyplot as pltg11/demo.py | matplotlib | axes, adding a vertical line | ax21.axvline(medians['inc'], c='r', ls='-', lw=1) | g12/demo.py |
| matplotlibaxes, setting a titleax1.set_title('Population')g11/demo.pymatplotlibaxes, turning off the labelax.set_ylabel(None)g13/demo.pymatplotlibaxis, turning offax1.axis('off')g26/demo.pymatplotlibcolors, xkcd palettesyr.plot(color='xkcd:lightblue',ax=ax1)g21/demo.pymatplotlibfigure, adding a titlefig2.suptitle('Pooled Data')g12/demo.pymatplotlibfigure, four panel gridfig3, axs = plt.subplots(2,2,sharex=True,sharey=True)g12/demo.pymatplotlibfigure, left and right panelsfig2, (ax21,ax22) = plt.subplots(1,2)g12/demo.pymatplotlibfigure, savingfig1.savefig('figure.png')g11/demo.pymatplotlibfigure, setting the sizefig, axs = plt.subplots(1,2,figsize=(12,6))g20/demo.pymatplotlibfigure, tuning the layoutfig1.tight_layout()g11/demo.pymatplotlibfigure, working with a list of axesfor ax in axs:g20/demo.pymatplotlibimporting pyplotimport matplotlib.pyplot as pltg11/demo.py | matplotlib | axes, labeling the X axis | ax1.set_xlabel('Millions') | g11/demo.py |
| matplotlib axes, turning off the label ax.set_ylabel(None) ax.set_ylabel(None) ax1.axis('off') g26/demo.py matplotlib colors, xkcd palette syr.plot(color='xkcd:lightblue',ax=ax1) g21/demo.py matplotlib figure, adding a title figure, four panel grid fig3, axs = plt.subplots(2,2,sharex=True,sharey=True) g12/demo.py matplotlib figure, left and right panels fig2.suptitle('Pooled Data') g12/demo.py matplotlib figure, saving fig1.savefig('figure.png') g11/demo.py matplotlib figure, setting the size fig, axs = plt.subplots(1,2,figsize=(12,6)) g20/demo.py matplotlib figure, tuning the layout fig1.tight_layout() g11/demo.py matplotlib figure, working with a list of axes for ax in axs: g20/demo.py matplotlib importing pyplot import matplotlib.pyplot as plt | matplotlib | axes, labeling the Y axis | ax1.set_ylabel("Population, Millions") | g11/demo.py |
| matplotlibaxis, turning offax1.axis('off')g26/demo.pymatplotlibcolors, xkcd palettesyr.plot(color='xkcd:lightblue',ax=ax1)g21/demo.pymatplotlibfigure, adding a titlefig2.suptitle('Pooled Data')g12/demo.pymatplotlibfigure, four panel gridfig3, axs = plt.subplots(2,2,sharex=True,sharey=True)g12/demo.pymatplotlibfigure, left and right panelsfig2, (ax21,ax22) = plt.subplots(1,2)g12/demo.pymatplotlibfigure, savingfig1.savefig('figure.png')g11/demo.pymatplotlibfigure, setting the sizefig, axs = plt.subplots(1,2,figsize=(12,6))g20/demo.pymatplotlibfigure, tuning the layoutfig1.tight_layout()g11/demo.pymatplotlibfigure, working with a list of axesfor ax in axs:g20/demo.pymatplotlibimporting pyplotimport matplotlib.pyplot as pltg11/demo.py | matplotlib | axes, setting a title | ax1.set_title('Population') | g11/demo.py |
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| matplotlib figure, adding a title fig2.suptitle('Pooled Data') g12/demo.py matplotlib figure, four panel grid fig3, axs = plt.subplots(2,2,sharex=True,sharey=True) g12/demo.py matplotlib figure, left and right panels fig2. (ax21,ax22) = plt.subplots(1,2) g12/demo.py matplotlib figure, saving fig1.savefig('figure.png') g11/demo.py matplotlib figure, setting the size fig, axs = plt.subplots(1,2,figsize=(12,6)) g20/demo.py matplotlib figure, tuning the layout fig1.tight_layout() g11/demo.py matplotlib figure, working with a list of axes for ax in axs: g20/demo.py matplotlib importing pyplot import matplotlib.pyplot as plt | matplotlib | axis, turning off | ax1.axis('off') | g26/demo.py |
| matplotlib figure, four panel grid fig3, axs = plt.subplots(2,2,sharex=True,sharey=True) g12/demo.py matplotlib figure, left and right panels fig2, (ax21,ax22) = plt.subplots(1,2) g12/demo.py matplotlib figure, saving fig1.savefig('figure.png') g11/demo.py matplotlib figure, setting the size fig, axs = plt.subplots(1,2,figsize=(12,6)) g20/demo.py matplotlib figure, tuning the layout fig1.tight_layout() g11/demo.py matplotlib figure, working with a list of axes for ax in axs: g20/demo.py matplotlib importing pyplot import matplotlib.pyplot as plt | matplotlib | colors, xkcd palette | <pre>syr.plot(color='xkcd:lightblue',ax=ax1)</pre> | g21/demo.py |
| matplotlibfigure, left and right panelsfig2, (ax21,ax22) = plt.subplots(1,2)g12/demo.pymatplotlibfigure, savingfig1.savefig('figure.png')g11/demo.pymatplotlibfigure, setting the sizefig, axs = plt.subplots(1,2,figsize=(12,6))g20/demo.pymatplotlibfigure, tuning the layoutfig1.tight_layout()g11/demo.pymatplotlibfigure, working with a list of axesfor ax in axs:g20/demo.pymatplotlibimporting pyplotimport matplotlib.pyplot as pltg11/demo.py | matplotlib | figure, adding a title | fig2.suptitle('Pooled Data') | g12/demo.py |
| matplotlibfigure, savingfig1.savefig('figure.png')g11/demo.pymatplotlibfigure, setting the sizefig, axs = plt.subplots(1,2,figsize=(12,6))g20/demo.pymatplotlibfigure, tuning the layoutfig1.tight_layout()g11/demo.pymatplotlibfigure, working with a list of axesfor ax in axs:g20/demo.pymatplotlibimporting pyplotimport matplotlib.pyplot as pltg11/demo.py | matplotlib | figure, four panel grid | fig3, $axs = plt.subplots(2,2,sharex=True,sharey=True)$ | g12/demo.py |
| $\begin{array}{llllllllllllllllllllllllllllllllllll$ | matplotlib | figure, left and right panels | fig2, $(a\times21,a\times22) = plt.subplots(1,2)$ | g12/demo.py |
| matplotlib figure, tuning the layout fig1.tight_layout() g11/demo.py matplotlib figure, working with a list of axes for ax in axs: g20/demo.py matplotlib importing pyplot import matplotlib.pyplot as plt g11/demo.py | matplotlib | figure, saving | fig1.savefig('figure.png') | g11/demo.py |
| matplotlib figure, working with a list of axes for ax in axs: g20/demo.py matplotlib importing pyplot import matplotlib.pyplot as plt g11/demo.py | matplotlib | figure, setting the size | fig, $axs = plt.subplots(1,2,figsize=(12,6))$ | g20/demo.py |
| matplotlib importing pyplot import matplotlib.pyplot as plt g11/demo.py | matplotlib | figure, tuning the layout | | g11/demo.py |
| matplotlib importing pyplot import matplotlib.pyplot as plt g11/demo.py | matplotlib | figure, working with a list of axes | for ax in axs: | g20/demo.py |
| $matplotlib \qquad \text{setting an edge color} \qquad \qquad \text{slices.plot(`COUNTYFP', edgecolor='yellow', linewidth=0.2. \ .} \qquad \qquad g26/demo.py$ | matplotlib | | import matplotlib.pyplot as plt | |
| | matplotlib | setting an edge color | ${\sf slices.plot(`COUNTYFP',edgecolor='yellow',linewidth=0.2.~.}$ | g26/demo.py |

| Module | Description | Example | Script |
|------------|--|---|---------------------|
| matplotlib | setting the default resolution | plt.rcParams['figure.dpi'] = 300 | g11/demo.py |
| matplotlib | using subplots to set up a figure | fig1, ax1 = plt.subplots() | g11/demo.py |
| OS | delete a file | os.remove(out_file) | g24/demo.py |
| os | importing the module | import os | g24/demo.py |
| os | test if a file or directory exists | if os.path.exists(out_file): | g24/demo.py |
| pandas | RE, replacing a digit or space | ${\sf unit_part} = {\sf values.str.replace(r'\d \s',",regex=True)}$ | g23/demo.py |
| pandas | RE, replacing a non-digit or space | $value_part = values.str.replace(r' \setminus D \setminus s', ", regex = True)$ | g23/demo.py |
| pandas | RE, replacing a non-word character | $units = units.str.replace(r' \backslash W', ", regex = True)$ | g23/demo.py |
| pandas | columns, dividing with explicit alignment | normed2 = 100*states.div(pa_row,axis='columns') | g09/demo.py |
| pandas | columns, listing names | <pre>print('\nColumns:', list(raw_states.columns))</pre> | g09/demo.py |
| pandas | columns, renaming | county = county.rename(columns={'B01001_001E':'pop'}) | ${\sf g10/demo.py}$ |
| pandas | columns, retrieving one by name | pop = states['pop'] | g09/demo.py |
| pandas | columns, retrieving several by name | <pre>print(pop[some_states]/1e6)</pre> | g09/demo.py |
| pandas | dataframe, appending | gen_all = pd.concat([gen_oswego, gen_onondaga]) | g15/demo.py |
| pandas | dataframe, boolean row selection | <pre>print(trim[has_AM], "\n")</pre> | g12/demo.py |
| pandas | dataframe, dropping a column | $both = both.drop(columns='_merge')$ | g15/demo.py |
| pandas | dataframe, dropping duplicates | <pre>flood = flood.drop_duplicates(subset='TAX_ID')</pre> | g14/demo.py |
| pandas | dataframe, dropping missing data | trim = demo.dropna(subset="Days") | g12/demo.py |
| pandas | dataframe, finding duplicate records | $dups = parcels.duplicated(subset='TAX_ID', keep=False$ | g14/demo.py |
| pandas | dataframe, getting a block of rows via index | sel = merged.loc[number] | g13/demo.py |
| pandas | dataframe, inner 1:1 merge | $join_i = parcels.merge(flood,$ | g14/demo.py |
| pandas | dataframe, inner join | $merged = name_data.merge(pop_data,left_on="State",right$ | g13/demo.py |
| pandas | dataframe, left 1:1 merge | $join_l = parcels.merge(flood,$ | g14/demo.py |
| pandas | dataframe, left m:1 merge | $both = gen_all.merge(plants,$ | g15/demo.py |
| pandas | dataframe, making a copy | trim = trim.copy() | g12/demo.py |
| pandas | dataframe, outer 1:1 merge | $join_o = parcels.merge(flood,$ | g14/demo.py |
| pandas | dataframe, reading zipped pickle format | sample2 = pd.read_pickle('sample_pkl.zip') | g16/demo.py |
| pandas | dataframe, resetting the index | $hourly = hourly.reset_index()$ | g17/demo.py |
| pandas | dataframe, right 1:1 merge | $join_r = parcels.merge(flood,$ | g14/demo.py |
| pandas | dataframe, saving in zipped pickle format | sample.to_pickle('sample_pkl.zip') | ${\sf g16/demo.py}$ |
| pandas | dataframe, selecting rows by list indexing | print(low_to_high[-5:]) | g09/demo.py |
| pandas | dataframe, selecting rows via boolean | dup_rec = flood[dups] | g14/demo.py |
| pandas | dataframe, selecting rows via query | trimmed = county.query("state == '04' or state == '36' ") | ${\sf g10/demo.py}$ |

| Module | Description | Example | Script |
|--------|--|--|-------------|
| pandas | dataframe, set index keeping the column | states = states.set_index('STUSPS',drop=False) | g22/demo.py |
| pandas | dataframe, shape attribute | print('number of rows, columns:', conus.shape) | g22/demo.py |
| pandas | dataframe, sorting by a column | county = county.sort_values('pop') | g10/demo.py |
| pandas | dataframe, sorting by index | summary = summary.sort_index(ascending=False) | g15/demo.py |
| pandas | dataframe, summing a boolean | <pre>print('\nduplicate parcels:', dups.sum())</pre> | g14/demo.py |
| pandas | dataframe, unstacking an index level | bymo = bymo.unstack('month') | g17/demo.py |
| pandas | dataframe, using a multilevel column index | means = grid['mean'] | g20/demo.py |
| pandas | dataframe, using xs to select a subset | print(county.xs('04',level='state')) | g10/demo.py |
| pandas | dataframe, using xs with columns | c1 = grid.xs('c1',axis='columns',level=1) | g20/demo.py |
| pandas | dataframe, writing to a CSV file | merged.to_csv('demo-merged.csv') | g13/demo.py |
| pandas | datetime, building via to_datetime() | date = pd.to_datetime(recs['ts']) | g14/demo.py |
| pandas | datetime, building with a format | $ymd = pd.to_datetime(sample['TRANSACTION_DT'], format=$ | g16/demo.py |
| pandas | datetime, extracting day attribute | recs['day'] = date.dt.day | g14/demo.py |
| pandas | datetime, extracting hour attribute | recs['hour'] = date.dt.hour | g14/demo.py |
| pandas | general, display information about object | sample.info() | g16/demo.py |
| pandas | general, displaying all columns | pd.set_option('display.max_columns',None) | g16/demo.py |
| pandas | general, displaying all rows | pd.set_option('display.max_rows', None) | g09/demo.py |
| pandas | general, importing the module | import pandas as pd | g09/demo.py |
| pandas | general, using qcut to create deciles | $dec = pd.qcut(\ county['pop'],\ 10,\ labels {=} range(1,\!11)\)$ | g10/demo.py |
| pandas | groupby, cumulative sum within group | cumulative_inc = group_by_state['pop'].cumsum() | g10/demo.py |
| pandas | groupby, descriptive statistics | <pre>inc_stats = group_by_state['pop'].describe()</pre> | g10/demo.py |
| pandas | groupby, iterating over groups | for t,g in group_by_state: | g10/demo.py |
| pandas | groupby, median of each group | <pre>pop_med = group_by_state['pop'].median()</pre> | g10/demo.py |
| pandas | groupby, quantile of each group | $pop_25th = group_by_state['pop'].quantile(0.25)$ | g10/demo.py |
| pandas | groupby, return group number | $groups = group_by_state.ngroup()$ | g10/demo.py |
| pandas | groupby, return number within group | seqnum = group_by_state.cumcount() | g10/demo.py |
| pandas | groupby, return rank within group | rank_age = group_by_state['pop'].rank() | g10/demo.py |
| pandas | groupby, select first records | $first2 = group_by_state.head(2)$ | g10/demo.py |
| pandas | groupby, select largest values | largest = group_by_state['pop'].nlargest(2) | g10/demo.py |
| pandas | groupby, select last records | $last2 = group_by_state.tail(2)$ | g10/demo.py |
| pandas | groupby, size of each group | num_rows = group_by_state.size() | g10/demo.py |
| pandas | groupby, sum of each group | state = county.groupby('state')['pop'].sum() | g10/demo.py |
| pandas | index, creating with 3 levels | $county = county.set_index([`state', `county', `NAME'])$ | g10/demo.py |

| Module | Description | Example | Script |
|--------|---|---|---------------------|
| pandas | index, listing names | print('\nIndex (rows):', list(raw_states.index)) | g09/demo.py |
| pandas | index, renaming values | div_pop = div_pop.rename(index=div_names) | g11/demo.py |
| pandas | index, retrieving a row by name | pa_row = states.loc['Pennsylvania'] | g09/demo.py |
| pandas | index, retrieving first rows by location | print(low_to_high.iloc[0:10]) | g09/demo.py |
| pandas | index, retrieving last rows by location | print(low_to_high.iloc[-5:]) | g09/demo.py |
| pandas | index, setting to a column | states = raw_states.set_index('name') | g09/demo.py |
| pandas | plotting, bar plot | reg_pop.plot.bar(ax=ax1) | g11/demo.py |
| pandas | plotting, histogram | hh_data['etr'].plot.hist(ax=ax0,bins=20,title='Distribu | g12/demo.py |
| pandas | plotting, horizontal bar plot | div_pop.plot.barh(ax=ax1) | g11/demo.py |
| pandas | plotting, scatter colored by 3rd var | $tidy_data.plot.scatter(ax=ax4,x='Income',y='ETR',c='typ.$ | g12/demo.py |
| pandas | plotting, scatter plot | hh_data.plot.scatter(ax=ax21,x='inc',y='etr',title='ETR | g12/demo.py |
| pandas | plotting, turning off legend | sel.plot.barh(x=`Name',y=`percent',ax=ax,legend=None) | g13/demo.py |
| pandas | reading, csv data | raw_states = pd.read_csv('state-data.csv') | g09/demo.py |
| pandas | reading, setting index column | $state_data = pd.read_csv(`state-data.csv',index_col='na$ | g11/demo.py |
| pandas | reading, using dtype dictionary | county = pd.read_csv('county_pop.csv',dtype=fips) | g10/demo.py |
| pandas | series, RE at start | $is_LD = trim['Number'].str.contains(r"1 2")$ | g12/demo.py |
| pandas | series, applying a function to each element | name_clean = name_parts.apply(' '.join) | g23/demo.py |
| pandas | series, automatic alignment by index | $merged[`percent'] = 100 *merged[`pop']/div_pop$ | g13/demo.py |
| pandas | series, combining via where() | mod['comb_units'] = unit_part.where(unit_part!=" , mo | g23/demo.py |
| pandas | series, contains RE or RE | $is_TT = trim['Days'].str.contains(r"Tu Th")$ | g12/demo.py |
| pandas | series, contains a plain string | $has_AM = trim['Time'].str.contains("AM")$ | g12/demo.py |
| pandas | series, contains an RE | $has_AMPM = trim['Time'].str.contains("AM.*PM")$ | g12/demo.py |
| pandas | series, converting strings to title case | $fixname = subset_view['NAME'].str.title()$ | ${\sf g16/demo.py}$ |
| pandas | series, converting to a list | print(name_data['State'].to_list()) | g13/demo.py |
| pandas | series, converting to lower case | name = mod['name'].str.lower() | g23/demo.py |
| pandas | series, dropping rows using a list | conus = states.drop(not_conus) | g22/demo.py |
| pandas | series, element-by-element or | is_either = is_ca is_tx | g16/demo.py |
| pandas | series, filling missing values | <pre>mod['comb_units'] = mod['comb_units'].fillna('feet')</pre> | g23/demo.py |
| pandas | series, removing spaces | units = units.str.strip() | g23/demo.py |
| pandas | series, replacing values using a dictionary | units = units.replace(spellout) | g23/demo.py |
| pandas | series, retrieving an element | <pre>print("\nFlorida's population:", pop['Florida']/1e6)</pre> | g09/demo.py |
| pandas | series, sort in decending order | div_pop = div_pop.sort_values(ascending=False) | g11/demo.py |
| pandas | series, sorting by value | $low_{to} = normed['med_pers_inc'].sort_values()$ | g09/demo.py |
| pandas | series, splitting strings on whitespace | $name\mathtt{_parts} = name.str.split()$ | g23/demo.py |

| Module | Description | Example | Script |
|----------|---------------------------------------|---|-------------|
| pandas | series, splitting via RE | trim['Split'] = trim["Time"].str.split(r": - ") | g12/demo.py |
| pandas | series, splitting with expand | exp = trim["Time"].str.split(r": - ", expand=True) | g12/demo.py |
| pandas | series, summing | reg_pop = by_reg['pop'].sum()/1e6 | g11/demo.py |
| pandas | series, unstacking | $tot_wide = tot_amt.unstack('PGI')$ | g16/demo.py |
| pandas | series, using isin() | fixed = flood['TAX_ID'].isin(dup_rec['TAX_ID']) | g14/demo.py |
| pandas | series, using value_counts() | $print(\ '\nOuter:\n', join_o['_merge'].value_counts(), s. \ .$ | g14/demo.py |
| requests | calling the get() method | response = requests.get(api,payload) | g18/demo.py |
| requests | checking the URL | print('url:', response.url) | g18/demo.py |
| requests | checking the response text | print(response.text) | g18/demo.py |
| requests | checking the status code | <pre>print('status:', response.status_code)</pre> | g18/demo.py |
| requests | decoding a JSON response | rows = response.json() | g18/demo.py |
| requests | importing the module | import requests | g18/demo.py |
| scipy | calling newton's method | <pre>cr = opt.newton(find_cube_root,xinit,maxiter=20,args=[y</pre> | g07/demo.py |
| scipy | importing the module | import scipy.optimize as opt | g07/demo.py |
| seaborn | adding a title to a grid object | jg.fig.suptitle('Distribution of Hourly Load') | g17/demo.py |
| seaborn | barplot | <pre>sns.barplot(data=hourly,x='hour',y='usage',hue='month',</pre> | g17/demo.py |
| seaborn | basic violin plot | <pre>sns.violinplot(data=janjul,x="month",y="usage")</pre> | g17/demo.py |
| seaborn | boxenplot | sns.boxenplot(data=janjul,x="month",y="usage") | g17/demo.py |
| seaborn | calling tight_layout on a grid object | jg.fig.tight_layout() | g17/demo.py |
| seaborn | drawing a heatmapped grid | sns.heatmap(means,annot=True,fmt=".0f",cmap='Spectral', | g20/demo.py |
| seaborn | importing the module | import seaborn as sns | g17/demo.py |
| seaborn | joint distribution hex plot | jg = sns.jointplot(data=bymo,x=1,y=7,kind='hex') | g17/demo.py |
| seaborn | setting axis titles on a grid object | jg.set_axis_labels('January','July') | g17/demo.py |
| seaborn | setting the theme | sns.set_theme(style="white") | g17/demo.py |
| seaborn | split violin plot | sns.violinplot (data = eights, x = "hour", y = "usage", hue = "mont | g17/demo.py |
| zipfile | importing the module | import zipfile | g15/demo.py |
| zipfile | opening a file in an archive | fh1 = archive.open('generators-oswego.csv') | g15/demo.py |
| zipfile | opening an archive | archive = zipfile.ZipFile('generators.zip') | g15/demo.py |
| zipfile | reading the list of files | print(archive.namelist()) | g15/demo.py |