

How to Create a Choropleth Map showing Count of Members by Postal Code

A choropleth map, sometimes incorrectly called a heat map, can help you understand where your members live in your section. This can be useful when deciding where to hold face-to-face meetings that are located close to your members.

A choropleth map is a type of map in which a set of pre-defined areas, such as postal code regions or geopolitical regions are colored or patterned in proportion to a statistical variable within the area. The colorations correspond to geographic or political boundaries, whereas the coloration in a heat map doesn't correspond to boundaries.

The examples below show how one can create a choropleth map from membership data in OU Analytics. As an important reminder, **any data obtained from OU Analytics including these maps must be used for IEEE business only**. See the IEEE Data Access and Use Policy at <https://www.ieee.org/ieee-data-access-and-use-policy.html> for more details.

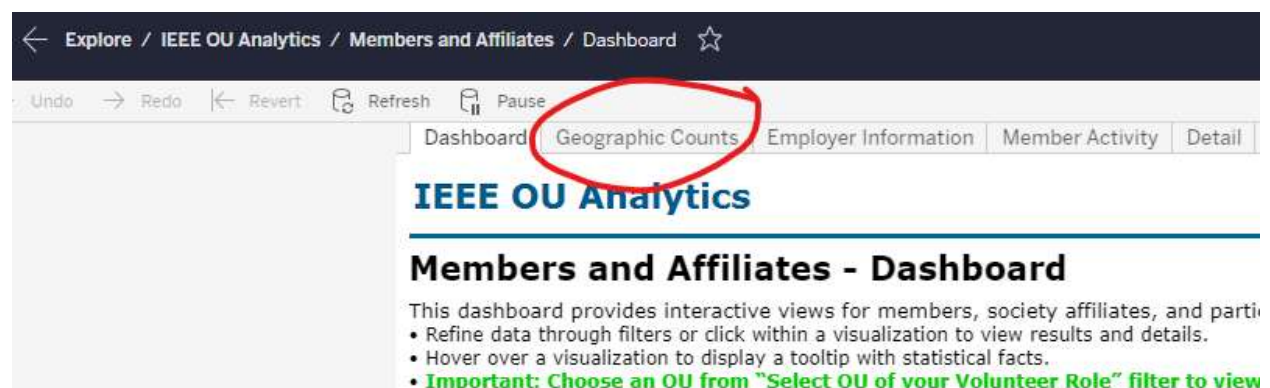
Note the map builder tool we're going to be using only works for US locations. If you know of a tool that works for other countries or a better tool for US locations please let us know!

Example 1 – Choropleth map of IEEE section members

In this example, a choropleth map will be created for the Boise section in Region 6 showing the number of IEEE members by zip code.

Step 1 – Gather the count of section members by 5-digit zip code

In IEEE OU Analytics, bring up the Members and Affiliates worksheet and select the "Geographic Counts" tab. Note this will let you get counts for section members by postal code.



Select the filters as desired. In this example I set the state filter to only include members in Idaho and Oregon. This excludes some members who live in other sections but have chosen to be assigned to the Boise section because of where they work.

← Explore / IEEE OU Analytics / Members and Affiliates / Geographic Counts ☆ Data Sources

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Dashboard Geographic Counts Employer Information Member Activity Detail

IEEE OU Analytics

Count by Geography

Region Council	Section	Subsection	City	State/Province	PostalCode	Country	Total
R6	Region 6 - No Council	Boise Section	Baker City	OR	97814	USA	4
			Boise	ID	83701	USA	1
					83702	USA	38
					83703	USA	6
					83704	USA	12
					83705	USA	7
					83706	USA	42
					83707	USA	9
					83709	USA	41
					83712	USA	20
					83713	USA	18
					83714	USA	16
					83716	USA	40
					83717	USA	2
					83725	USA	12
			Buhl	ID	83316	USA	1
			Caldwell	ID	83606	USA	1
					83607	USA	1
			Eagle	ID	83616	USA	28
			Emmett	ID	83617	USA	2
			Fruitland	ID	83619	USA	1
			Garden City	ID	83714	USA	5
			Garden Valley	ID	83622	USA	1
			Glenns Ferry	ID	83623	USA	1
			Halley	ID	83333	USA	10
			Jerome	ID	83338	USA	1
			Ketchum	ID	83340	USA	2
			Kuna	ID	83634	USA	7
			McCall	ID	83638	USA	4
			Melba	ID	83641	USA	1
			Meridian	ID	83642	USA	38
					83646	USA	29
					83680	USA	1
					83644	USA	2

Select OU of your Volunteer Role

Boise Section

Region

R6

Section

Boise Section

City

(All)

State/Province

(Multiple values)

Country

USA

Grade

(All)

IEEE Status

☐ (All)

☒ Active

☐ Applicant

☐ Arrears

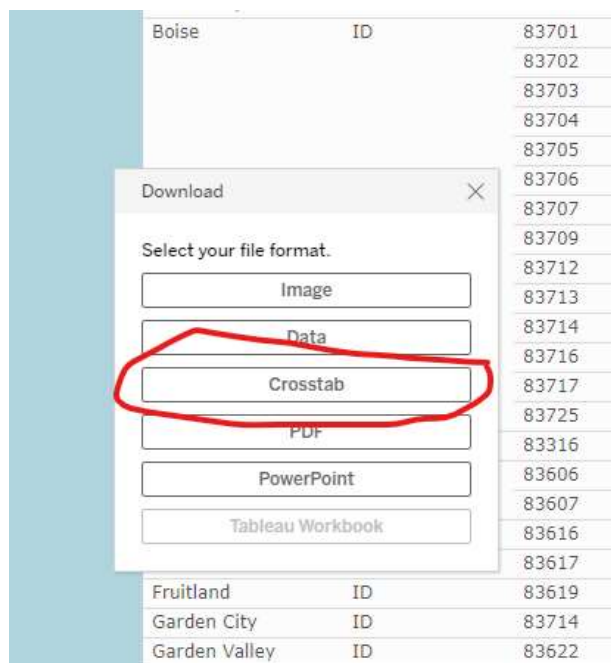
☐ Inactive

Cancel Apply

HKN Member

(All)

Use the "Download" button to download the statistical data. Use the Crosstab format then select CSV format. The data will download to "GEO Count.csv" format, or "GEO Count (#).csv" if a file of that name already exists.



Open the Geo Count file in Google Sheets. To open it, start Google Sheets, open a blank spreadsheet, click File > Import, click Upload, and select the CSV file from your downloads folder.

Delete all the columns except for PostalCode and Member Count by selecting the columns and clicking Edit > Delete columns (*range*).

This is also a good time to rename the spreadsheet to a meaningful name. In this example I renamed it to “Boise section member counts by postal code”.

Next, click Column B (Member Count), right click for the pop-up menu, and click “Sort sheet Z->A” to sort the rows by descending member count.

Boise section member counts by postal code

File Edit View Insert Format Data Tools Add-on

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	A	B
1	PostalCode	Member Cou
2	97814	
3	83701	
4	83702	
5	83703	
6	83704	
7	83705	
8	83706	
9	83707	
10	83709	
11	83712	
12	83713	
13	83714	
14	83716	
15	83717	
16	83725	
17	83316	
18	83606	
19	83607	
20	83616	
21	83617	
22	83619	
23	83714	
24	83622	

- Cut Ctrl+X
- Copy Ctrl+C
- Paste Ctrl+V
- Paste special ▶
- Insert 1 left
- Insert 1 right
- Delete column
- Clear column
- Hide column
- Resize column
- Group column
- Ungroup column
- Sort sheet A → Z
- Sort sheet Z → A
- Randomize range

Add a third column to the right of the PostalCode and Member Count columns. Call it Color. Rename the PostalCode column to ZIPCode.

Assign colors to groups of rows with roughly the same number of rows per group. It works best to assign three to six colors to the statistical data. Although the software that creates the choropleth maps can handle more colors, the labels can get confusing plus the mapBuilder tool can be quite slow if it has to work with many colors.

You can use HTML color names or hex values for the colors. See https://www.w3schools.com/colors/colors_names.asp for possible color names. For this example we'll use DarkRed, OrangeRed, Orange, and Yellow.

Boise section member counts by postal code

File Edit View Insert Format Data Tools Add-on

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	A	B	C	D
1	ZIPCode	Member Count	Color	
2	83706	42	DarkRed	
3	83709	41	DarkRed	
4	83716	40	DarkRed	
5	83702	38	DarkRed	
6	83642	38	DarkRed	
7	83646	29	DarkRed	
8	83616	28	DarkRed	
9	83712	20	OrangeRed	
10	83686	19	OrangeRed	
11	83713	18	OrangeRed	
12	83714	16	OrangeRed	
13	83704	12	OrangeRed	
14	83725	12	OrangeRed	
15	83333	10	OrangeRed	
16	83707	9	OrangeRed	
17	83705	7	Orange	
18	83634	7	Orange	
19	83703	6	Orange	
20	83301	6	Orange	
21	83714	5	Orange	
22	83687	5	Orange	
23	97814	4	Orange	
24	83638	4	Orange	
25	83669	4	Orange	
26	83647	3	Orange	
27	83717	2	Yellow	
28	83617	2	Yellow	
29	83340	2	Yellow	

Step 3. Display the map using randymajors.org mapBuilder tool.

We'll use the mapBuilder tool at <https://www.randymajors.org/custom-color-coded-maps> to generate the map.

Replace the Member Count values with range values. This is optional but makes a cleaner map key. You may want to save a copy of your spreadsheet with the original counts so you can easily change your ranges.

Boise section member counts by postal code

File Edit View Insert Format Data Tools Add-on

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	A	B	C	D
1	ZIPCode	Member Count	Color	
2	83706	28-42 members	DarkRed	
3	83709	28-42 members	DarkRed	
4	83716	28-42 members	DarkRed	
5	83702	28-42 members	DarkRed	
6	83642	28-42 members	DarkRed	
7	83646	28-42 members	DarkRed	
8	83616	28-42 members	DarkRed	
9	83712	9-20 members	OrangeRed	
10	83686	9-20 members	OrangeRed	
11	83713	9-20 members	OrangeRed	
12	83714	9-20 members	OrangeRed	
13	83704	9-20 members	OrangeRed	
14	83725	9-20 members	OrangeRed	
15	83333	9-20 members	OrangeRed	
16	83707	9-20 members	OrangeRed	
17	83705	3-7 members	Orange	
18	83634	3-7 members	Orange	
19	83703	3-7 members	Orange	
20	83301	3-7 members	Orange	
21	83714	3-7 members	Orange	
22	83687	3-7 members	Orange	
23	97814	3-7 members	Orange	
24	83638	3-7 members	Orange	
25	83669	3-7 members	Orange	
26	83647	3-7 members	Orange	
27	83717	1-2 members	Yellow	
28	83617	1-2 members	Yellow	

To make your Google sheet visible to the mapBuilder tool, share it using these steps from <https://www.randymajors.org/custom-color-coded-maps#createmapform>.

- (1) Click the **Share** button in the upper right corner, (2) click the **Get link** section in the box that appears, (3) change the sharing setting to **Anyone with the link** (keep the drop-down to the right set as **Viewer**), (4) click the **Copy link** button, and (5) click **Done**.

Before you share it be sure you've removed all the columns except ZIPCode, Member Count, and Color, so you don't unnecessarily expose any data which isn't needed to generate the map.

Paste the link into the form. Set the Map Title & Display Options at <https://www.randymajors.org/custom-color-coded-maps#createmapform>, then click on the View My Map link.

Set Map Title & Display Options

Set a title for your map, set the main color and choose other map layers to display (all optional)

Boise Section members

Set color

Standard
Map type
☐ Show labels

☐ Center map on user location
☐ Show county lines
☐ Show city limits
☐ Show ZIP Code boundaries

View My Map

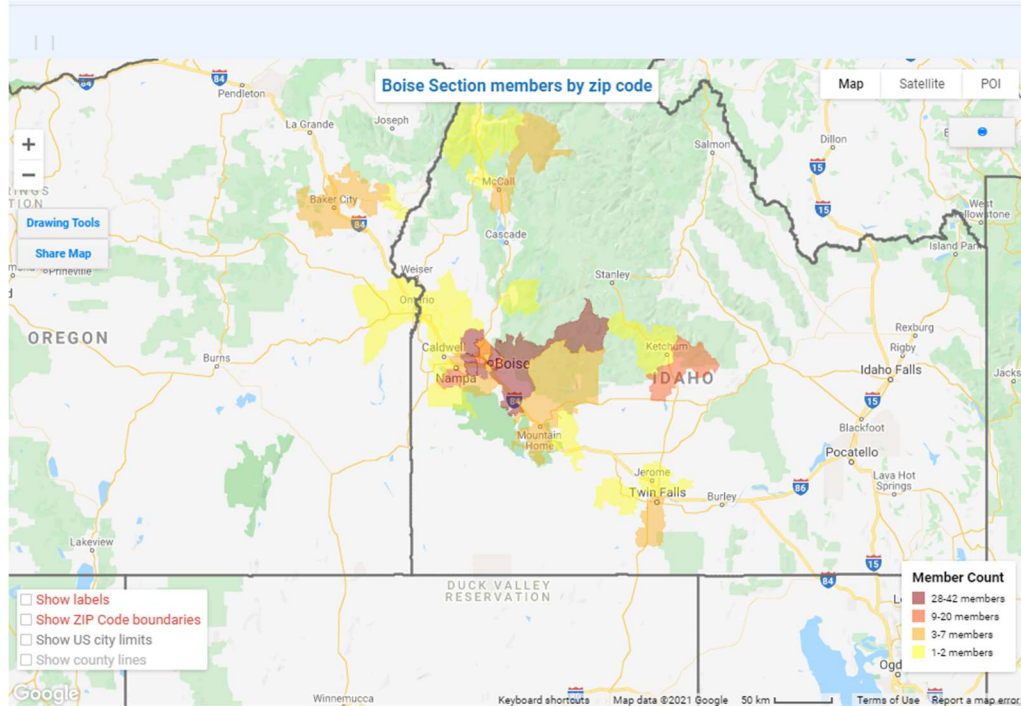
Ready! Click link at left to view your map.

You can bookmark the link or embed the link on another website!

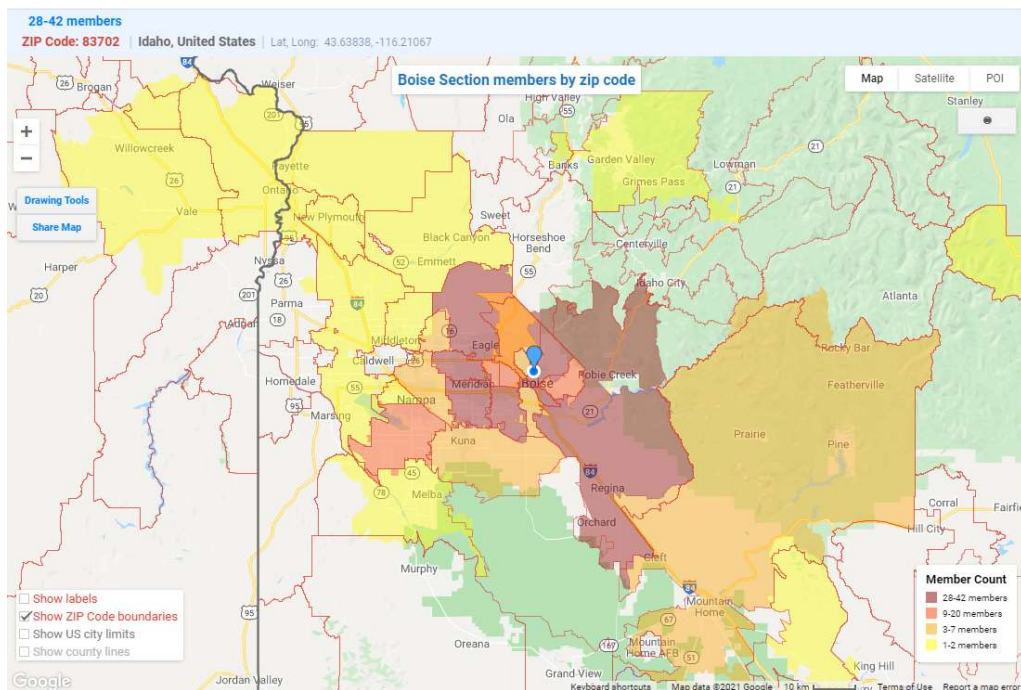
Note: If you include a map screenshot from this tool on your website, please include a small source attribution link pointing to this page.

randymajors.org Map Tools ©2021 randymajors.org

Here is the resulting map for the data in this example.



We can zoom in and out and change settings. We'll enable "Show ZIP Code boundaries", zoom in on Boise and the surrounding cities, and put a blue pin on downtown Boise. Note that the colored regions don't map to the zip code boundaries exactly. This is apparently a discrepancy between the mapBuilder tool and Google Maps.



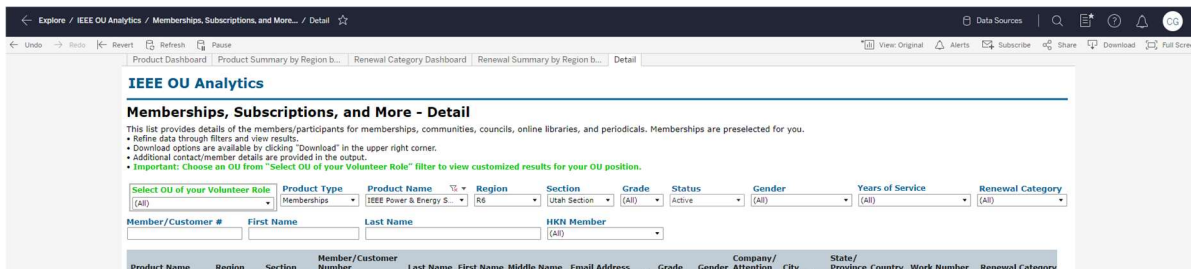
Example 2 – Choropleth map of IEEE society members in a section

In this example, a choropleth map will be created for the Utah section showing the number of IEEE Power & Energy Society members by zip code.

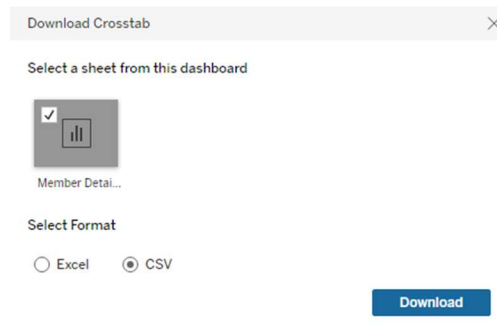
Step 1 – Gather the count of society members by 5-digit zip code

To get counts of society members, you will need to use the Memberships worksheet, download the membership data, then use Excel to remove the Zip+4 digits from the postal codes to get 5-digit zip codes, and then generate a pivot table to get the counts by zip code. The resulting pivot table can then be imported into a Google Sheet for display using the mapBuilder tool using Steps 2 and 3 below.

In IEEE OU Analytics, bring up the Memberships, Subscriptions, and More worksheet and select the "Detail" tab. Set the filter for Product Name and Section. In this example I set the Product Name filter to "IEEE Power & Energy Society" and the Section filter to the Utah Section.

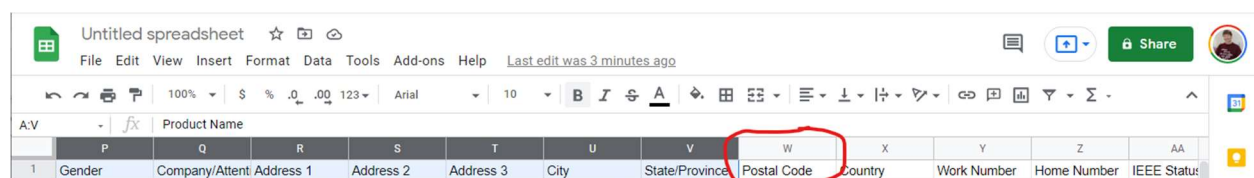


Download the results to a CSV file.

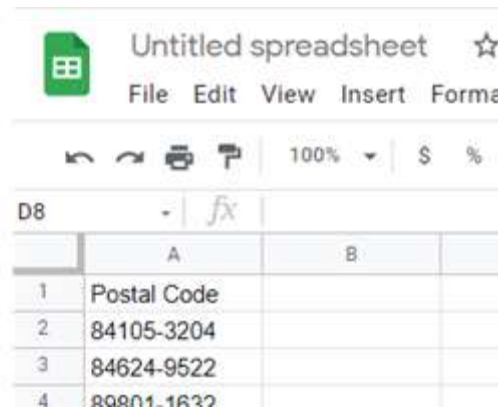


Step 2a. Extract the statistical data.

Open the CSV file in Google Sheets. To open it, first open a blank spreadsheet, go to File --> Import, click Upload, and select the CSV file from your downloads folder.



Delete all the columns except for Postal Code by selecting the columns and using Edit > Delete columns (range).



Untitled spreadsheet

File Edit View Insert Format

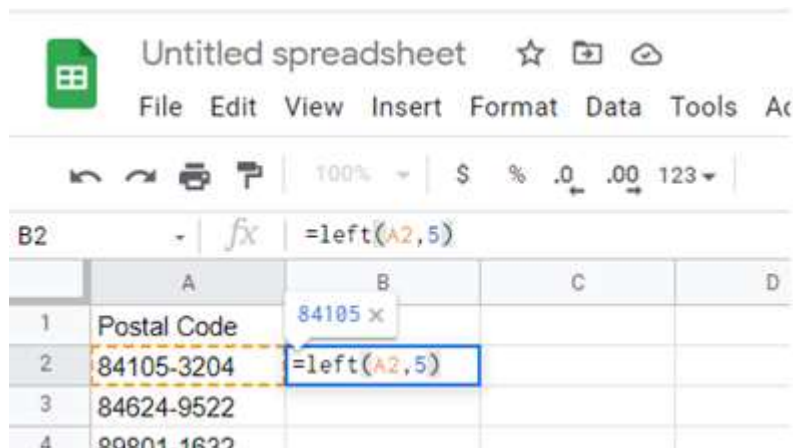
100% \$ %

D8

	A	B
1	Postal Code	
2	84105-3204	
3	84624-9522	
4	84624-9522	

Label Column B as ZIPCode. Put the formula `=left(A2,5)` in Cell B2 and accept Google Sheets prompt to autofill it in the rest of the column.

Before autofill:



Untitled spreadsheet

File Edit View Insert Format Data Tools

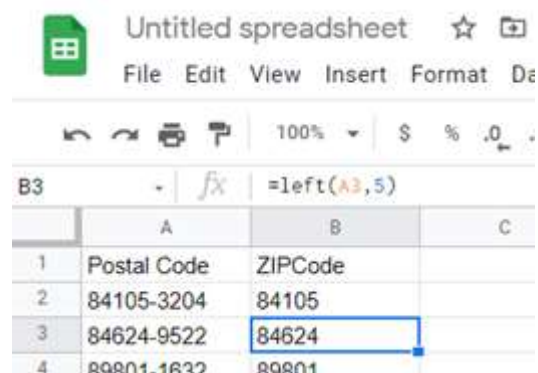
100% \$ % .0 .00 123

B2

`=left(A2,5)`

	A	B	C	D
1	Postal Code	84105 x		
2	84105-3204	<code>=left(A2,5)</code>		
3	84624-9522			
4	84624-9522			

After autofill:



Untitled spreadsheet

File Edit View Insert Format Data

100% \$ % .0 .00

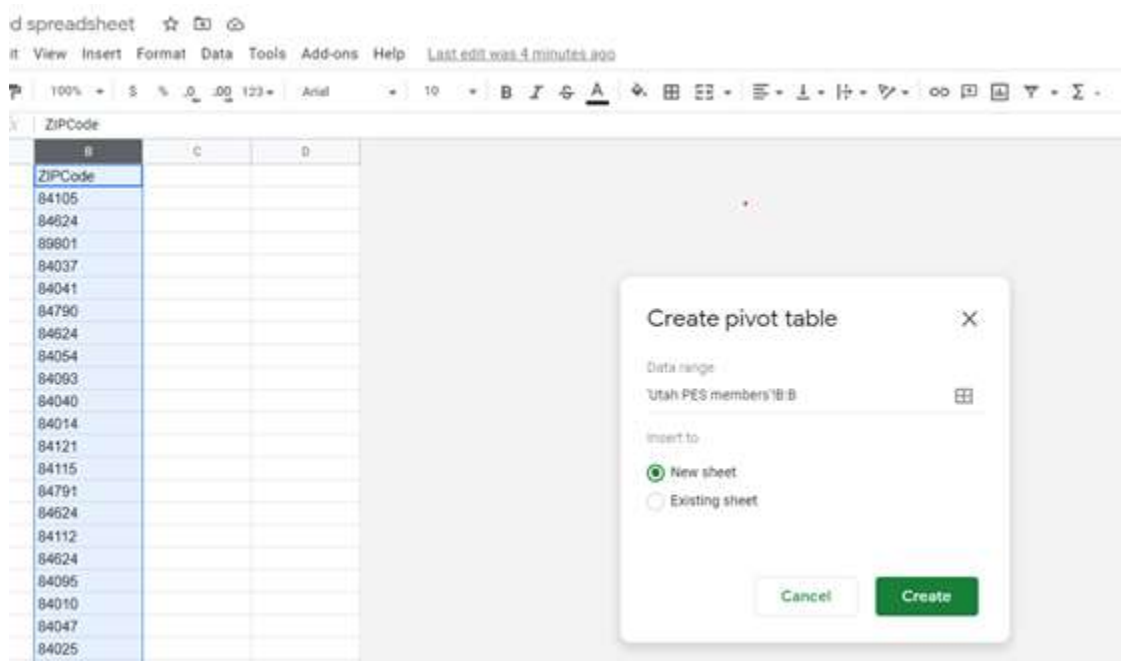
B3

`=left(A3,5)`

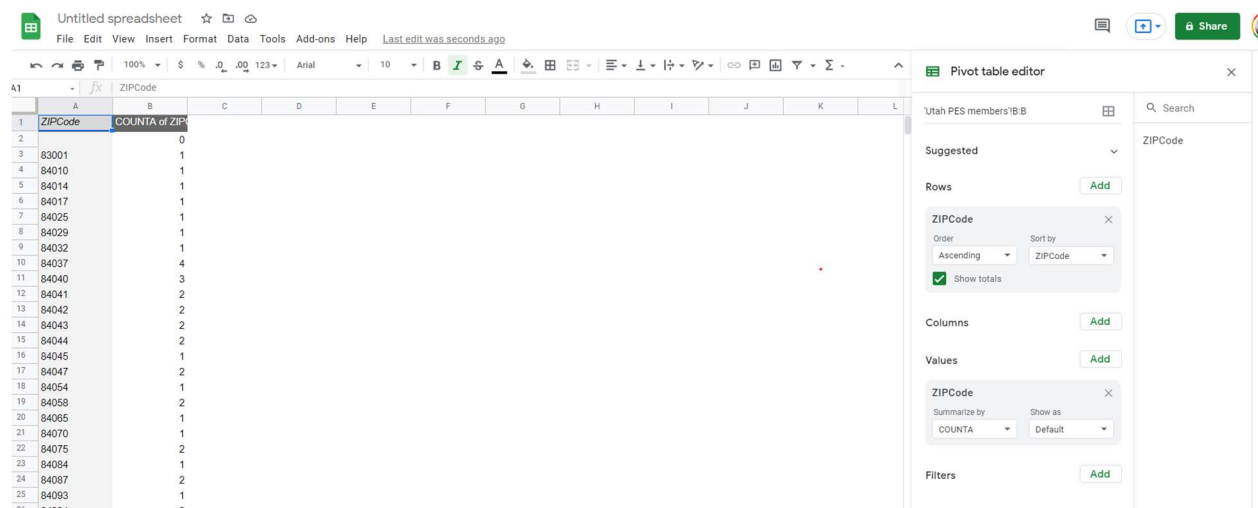
	A	B	C
1	Postal Code	ZIPCode	
2	84105-3204	84105	
3	84624-9522	84624	
4	84624-9522	84624	

To get a count of members by zip code, we'll create a pivot table.

Select Column B, then click Data > Pivot table, then click Create.



In the new pivot table sheet, click Rows > Add and select ZipCode. Then click Values > Add and select ZIPCode.



Now select the entire pivot sheet. To do this, you can press Control-A or click on the upper-left corner of the sheet. Click Edit > Copy or press Control-C.

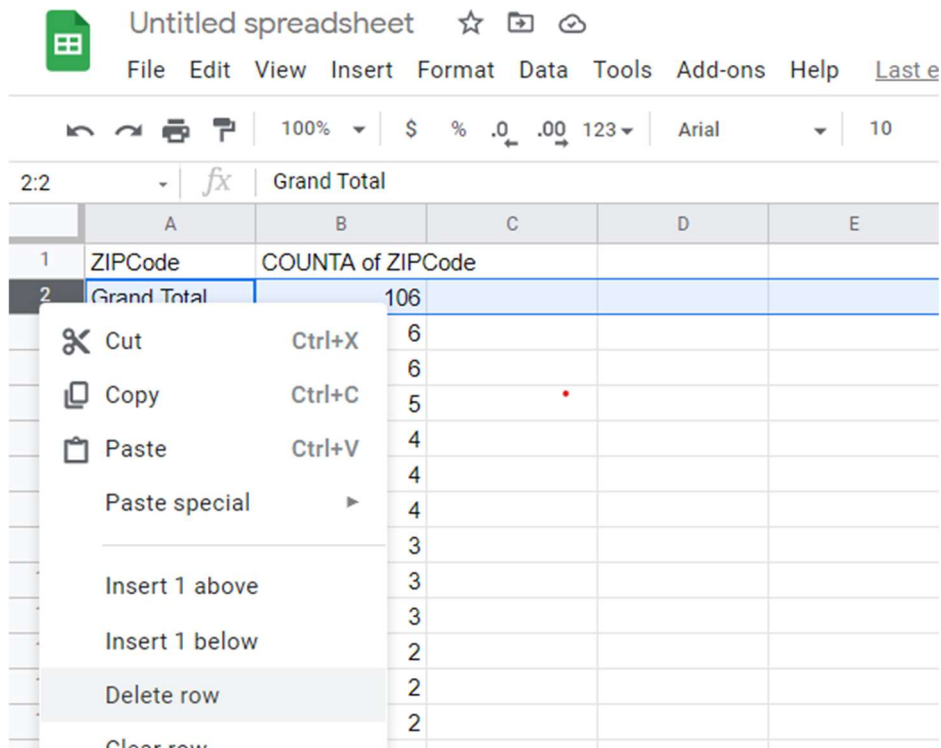
Now click Insert > New Sheet to create a new blank sheet.

Then in the new sheet click Edit > Paste Special > Paste Values Only.

Now select all of Column B by clicking at the top of the column.

Click on the down arrow at the top of the column, and in the pop-up menu click on "Sort sheet Z->A".

Click on Row 2 (“Grand Total”), right click to get the pop-up menu, and delete the row.



Rename Column B to “Member Count”.

Delete all the sheets except for the current sheet. Do this by clicking on the down arrow of each sheet tab, then click Delete on the pop-up menu, and click OK to confirm that you want to delete the sheet.

This is also a good time to rename the spreadsheet to a meaningful name. In this example I renamed it to “Utah PES member counts by postal code”.

Step 2b. Assign colors to statistical data.

Add a third column to the right of the ZIPCode and Member Count columns. Call it Color.

Using the same guidelines from the first example, assign colors to groups of rows with roughly the same number of rows per group.

Utah PES member counts by postal code

File Edit View Insert Format Data Tools Add-ons Help Last edit w

100% \$ % .0 .00 123 Arial 10

	A	B	C	D	E
1	ZIPCode	Member Count	Color		
2	84108	6	DarkRed		
3	84112	6	DarkRed		
4	84116	5	DarkRed		
5	84037	4	OrangeRed		
6	84102	4	OrangeRed		
7	84624	4	OrangeRed		
8	84040	3	OrangeRed		
9	84095	3	OrangeRed		
10	84104	3	OrangeRed		
11	84041	2	Yellow		
12	84042	2	Yellow		
13	84043	2	Yellow		
14	84044	2	Yellow		
15	84047	2	Yellow		
16	84058	2	Yellow		
17	84075	2	Yellow		
18	84087	2	Yellow		
19	84094	2	Yellow		
20	84103	2	Yellow		
21	84107	2	Yellow		
22	84109	2	Yellow		
23	84111	2	Yellow		
24	84321	2	Yellow		
25	84604	2	Yellow		
26	83001	1	Yellow		
27	84010	1	Yellow		
28	84011	1	Yellow		

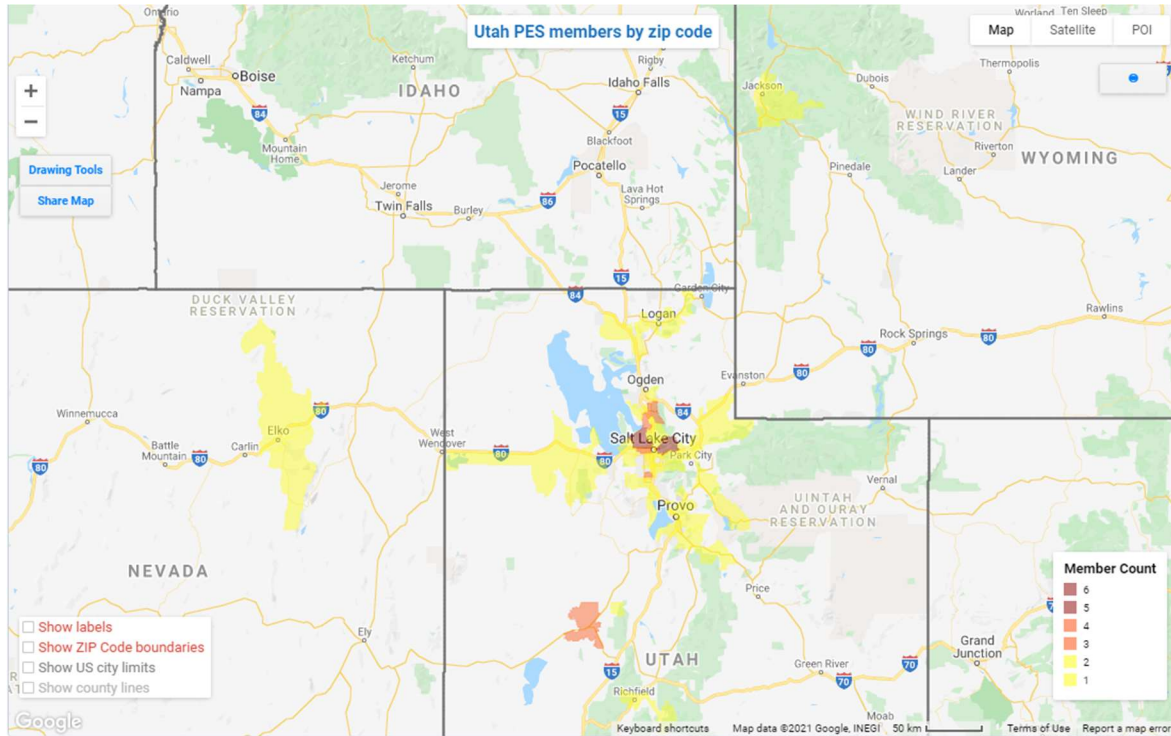
Step 3. Display the map using randymajors.org mapBuilder tool.

Refer to the instructions in Step 3 of the first example on how to share the spreadsheet and use the mapBuilder tool at <https://www.randymajors.org/custom-color-coded-maps> to generate the map.

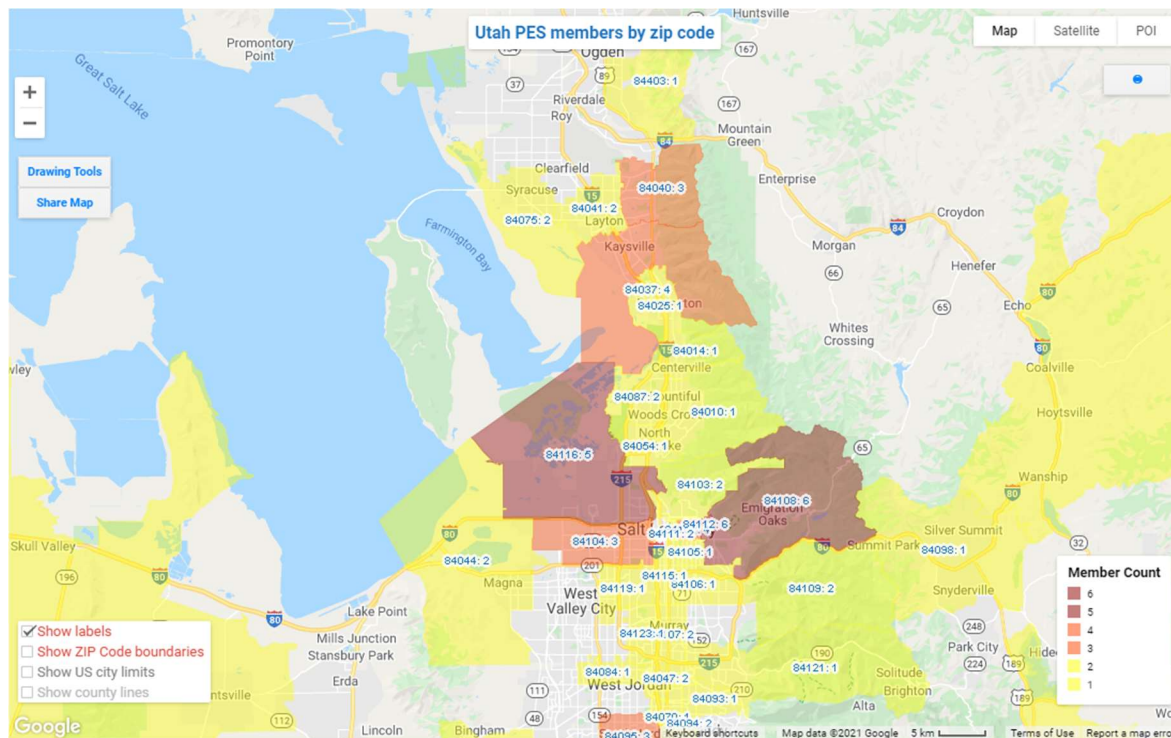
In this example we've already put the correct name on the ZIPCode column. The range of Member Count values is small enough that for this example we don't need to replace them with range values.

Make sure you've deleted all the sheets except for the one with the zip codes, member counts, and colors before you share the spreadsheet.

Here is the resulting map for the data in this example.



By clicking on the “Show labels” checkbox and zooming in, you can see labels in each zip code area with the member counts.



This completes the examples. I hope this set of instructions is useful to you. If you have questions or comments, please send them to Chris Gunning at cgunning@ieee.org .

Document Version 2. Sept. 28, 2021. Added chapter/society example.