Welcome back everybody. This is the second video in module 3, we just got done creating a dot density map. So now we're actually going to do a totally different type of analysis called points in polygon.

I'll explain that as we walk through it, but basically what we are going to do is we're gonna make a choropleth map that shows which countries have the most airports and sorted you that we're going to need to download and you do type of data, but first before we do that make sure you have the countries shapefile pulled up into QGIS, you'll see it on my screen.

What we need now is airport data for all worldwide airport data. Fortunately natural earth, that same website that we use to get these countries shapefile, all sizes shape file for airports locations across the world, and that's a shapefile as well. So let's go ahead and go to the natural earth website, I got it pulled up right here.

Go ahead and type this into your browser or if you want to go look at the module tools you'll see a link to it there, but yeah, you should go to the downloads page, you should see this green right here. Go and go up to large scale data and hit cultural, go ahead and scroll down just a little bit till we get to the airports. Go and download the airports.

All right, and once that is done go ahead and open it up, unzip it like we did with the countries, get in and the directory here and open the shapefile. You may need to go to add layer, add layer add vector layer and find it on your machine. I have it set up on mine so if I just double click on a shapefile it automatically opens in QGIS which you should definitely setup, it's really nice, or you can also drag it into the layers panel as well.

So there's a couple different options there. So once you get the airport data pulled up you'll see it here. We've got dots all over the world which is the locations at airports. We also have our country shape file still in there. So what we're going to do the first step we're going to do what's called a points in a polygon analysis.

And the idea is you're going to take polygons in this case, the shapes of countries and we're going to see how many points in this case airports are within that polygon. So what that's going to do is it's going to tell us how many airports are in each country. So it'll make a lot more sense as we go through it.

So go and go up to the vector menu button at the very top that we were using before, but instead of using research tools we're going to actually go into analysis tools and we're going to go to count points in polygon. So go ahead and click on

that. The polygons are going to be the countries like I said, which is already pre-populated which is really nice. If you had lots of polygons loaded into QGIS you might have to select here, but it's already got it selected here. You also notice that my San Marino shapefile is still in there, so don't select that.

Go ahead and select the countries and then the points is going to be the airports which is that shapefile I just added, and then these are all optional fields, I wouldn't worry about these right now. Go ahead and hit run in background.

And if you're looking around here you'll see a new color, go ahead and close out of that so you can look what's going on here.

So what happened is that we created a new shapefile, and this shapefile looks exactly the same to the country shadow that we had before, if you toggle it you'll see it looks exactly the same, but there is a piece of data added to this that will be helpful for creating this choropleth map.

And in order to see that, go ahead and click on this new layer which is called Count. Go ahead and right click on that, and go to open attribute table and go ahead and go to the far right again and you'll see this NUM points.

So you can change this if you want to re-go through the process and change NUM points, NUM points is just the default, but what NUM points presents in this case is how many different airports are in this particular shape, and again the shapes are representative of countries.

So what it did, is it looked at the United States for instance which is this very first line at the very top. It saw that there were 133 dots within the shape of the United States.

And again 133 dots represented airports, and it went ahead and added new column onto the sheet and added the value for the United States is 133 representing the amount of points within that polygon. And then you can see India is number two here. I'm going to scroll over to the left here India is number two here.

You can see there's 50 airports inside the boundaries of India, and then you can keep on working your way down and see the other values as well. So that is the first part of this, and it turned out well it did exactly what we want.

Now we're ready to create a choropleth map showing which countries have the most airports and we can now do that because we did the points in polygon analysis, we've got the number of points inside the polygons representing the airports, and now we can go forward and actually color it based on that value.

So go ahead and close out of that attribute table. We're gonna do a process that should be pretty similar to you. We did it in module 2 to make a choropleth map. We are gonna do the same process, we're just going to pick a different column name at this time which is the NUM points column instead of the fertility rate we were looking at before. Ok, so for the next step we're actually going to create the colors for the map.

So go ahead right click on the count shapefile that's been created and go ahead and click on properties and go back to the symbology, you may remember this from before. Go ahead and click on that symbology layer over here. Go ahead and click on graduated again.

And for the column this time instead of the fertility rate we're going to be looking at what we looked in module 2. We're gonna go to NUM points which again is representing the airports. So go ahead and click on that and we do a very similar process than we did before.

We're going to go to classify, we're going to see automatically generate this sort of key for us in these buckets which is nice just like I said before I didn't think red was appropriate for fertility rates, I don't think it's really appropriate for airports either. So let's go and change that to a blue.

Make sure you select second color and then blue. Hit OK. So first color is white, and the second color is blue. You can change the color 1 if you want. They might get a little confusing and be hard to read, but know that is an option.

Usually the best bet is to start with a white and end in some sort of dark color. In this case we're going to use blue. So go ahead and hit OK, and I'm gonna go ahead and make the number of buckets 6. So go ahead and hit classes 6. Hit OK, and now we have a choropleth map showing countries. The dark blue represents countries with lots of airports.

And then the white countries are fewer airports, and I actually have India selected over here so I'm going to go ahead and select off of that so you can see. There's our map so you can again you can see the United States is in dark blue, you have India over here that is a little bit lighter, you also have Canada a little low lighter. A lot of white here.

I will show you one other option you could do for this map. Go ahead and right click and go back to properties and go back to symbology. There is this mode right here when it comes to picking the buckets, you can play around with that a little bit. I'm

not gonna get too much into it, but you can see it will change the buckets the values in each bucket depending on which mode you select.

So depending on what you're trying to do you know maybe natural breaks is a little bit better. This this data sets a little hard because you have the United States who has almost three times as much airports as the next country which is India.

So the buckets can be hard to distinguish between some of the middle values because you have such a high value. So if you do natural breaks you might get a little bit of better options. Go ahead and apply that, you'll see that there's much more blue on the map.

What it did is it took basically 50, so that would be India which would be the second country on that list and anything above 50 which would only in this case be in United States engaged in the same color. That way you get much more variance between 50 and 0 and then you can actually start seeing some of these other countries as well.

Now is the best idea to go to that route. It can be a little misleading, I mean if there is a country that has a lot more of one thing or whenever you're trying to represent you definitely want to make sure that that's very clear that that country has a lot more than the other country, whatever your mapping.

But in this case, I kind of like this just because it does get a little more variance with other countries, but if I were going to publish this I would definitely make note in the text or some sort of you know, a little box outside of the United States just saying OK they have 133 and then the second is 50 just so people can get an idea of the scale that's going on here.

OK last thing we're going to do real quick here is just save what we've done. So go ahead and go up to the Count's layer within our layers panel. Go ahead and right click on that and go ahead and hit export, safe features as, go ahead and hit these little arrows here. Find a directory, make sure you find a directory and it's not trying to save in some random place you may not be able to save it depending on where you're trying to save it. I've got a little directory set up for this course.

You can save it on the desktop or whatever you want, but just make sure you find some sort of directory to save it in on and then I'm just going to call it "country's airports PIP" which is abbreviation for "points in polygon". You can spell it out if you want or you can call it whatever you want, but that's my call. I'm gonna hit save, hit OK.

It saved it, and it actually made a new layer in our layers panel as well. So that's the save version. So going forward if you want to manipulate that particular shapefile on your file system that's where you're going to need to go if you want it.

You also notice that the colors don't transfer over to the choropleth map that we created, it doesn't get transferred over there. I'll show you how to export that in the last module, but right now it just saves the shapes of the countries in the data which in this case is the airports for all the countries.

So that's it for this video. We've got one more analysis that we're going to run, and the last portion of the hands-on portion in module 3, so be sure to check it out. Thanks!