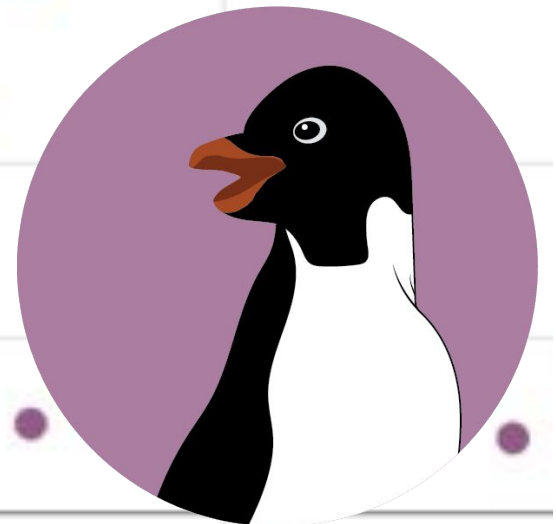
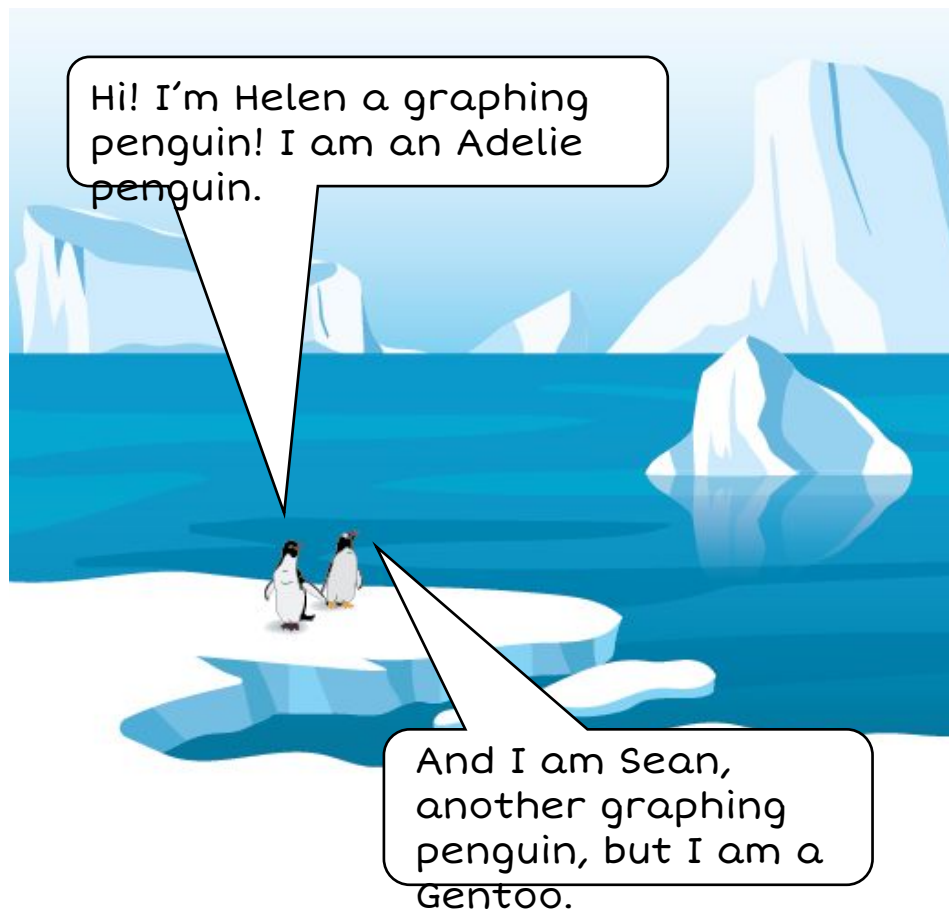




Two Penguins' Guide to Graphing



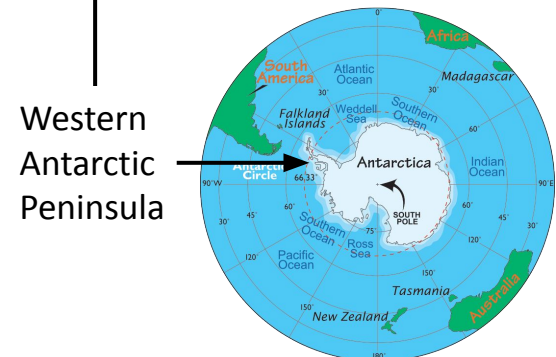
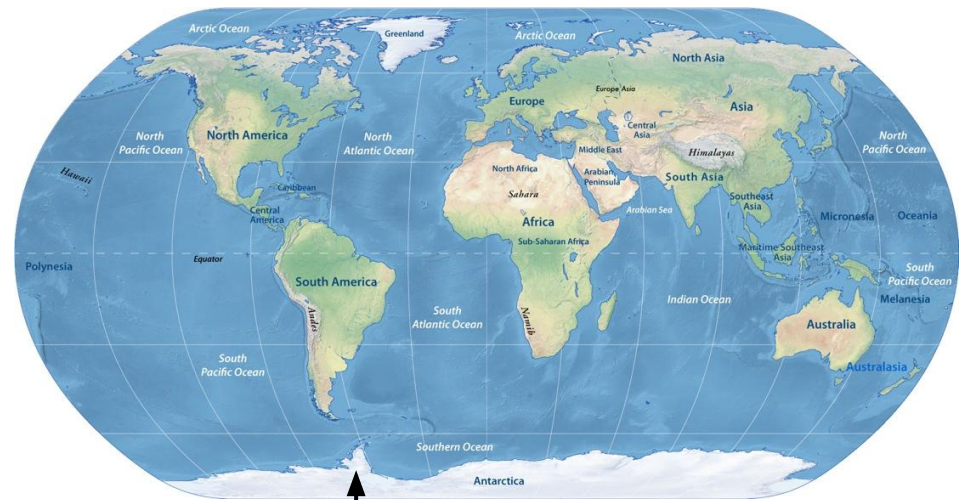


A lot of people know penguins are great swimmers, and often not so great walkers. But we have the special talent of graphing! We can't wait to introduce you to our favorite tool, CODAP. It is a free online tool that helps people create graphs to visualize data. We are going to guide you through this book giving you instructions and helpful hints.

So let's get started!

First you will need a link to a CODAP Data set. You will get that from whoever is helping you. Our data set is about...US!

We are two of the 3 penguin species from the Western Antarctic Peninsula. Antarctica is the continent at the bottom of the Earth and 98% of it is covered in ice! There is a lot scientists don't know about Antarctica and the things that live there. So, it is important we get involved to help them out.



Western
Antarctic
Peninsula

Our penguins are the Adelie (Helen!), Gentoo (Sean!), and Chinstrap (our local friends!). These penguin populations are measured in breeding pairs. So, remember that 1 breeding pair is actually 2 penguins.

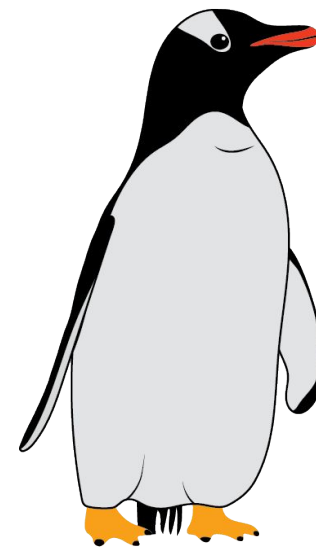
When you first get the link, your screen will look something like this:



On the left is a chart of data. It has 5 columns. The index is the number of data entries, we won't use that. Then there is the year the data was taken, and the population (in breeding pairs) of each penguin species from that year.

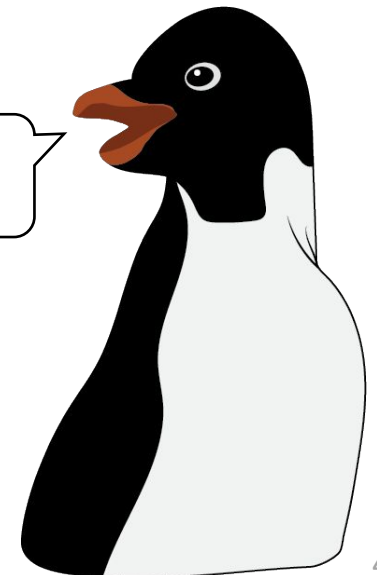
So in 1979 scientists counted 13,697 pairs of Adelies and 0 pairs of Chinstraps. There is no number in the Gentoo column, that could mean there was none or there was an error when the data was analyzed. But that is ok!

On the right is a graph of randomized dots. This is where we will create our graph.



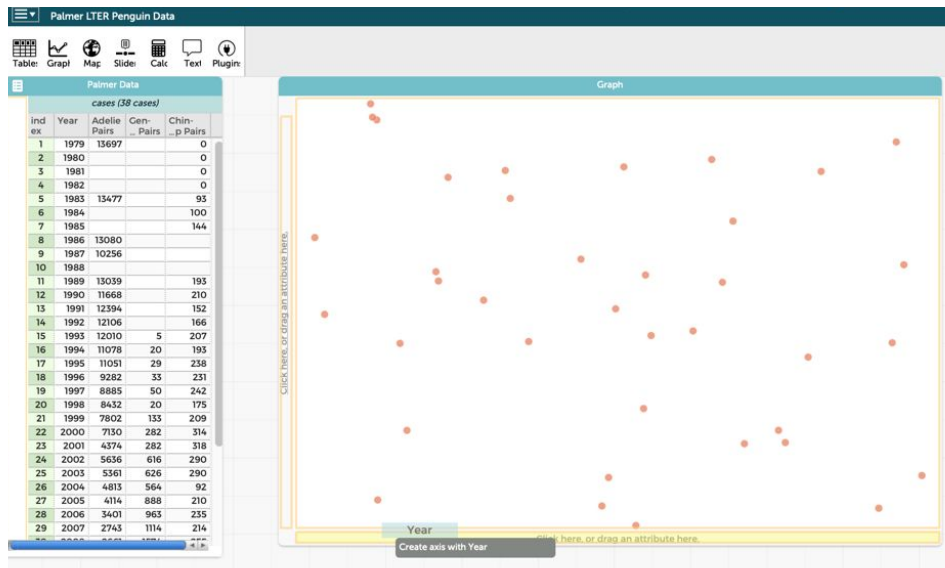
Look at the chart of data. In 1984 there is no entry for Adelie or Gentoo pairs, but there were 100 Chinstrap pairs.

So, how many Chinstrap penguins were there in 1984?



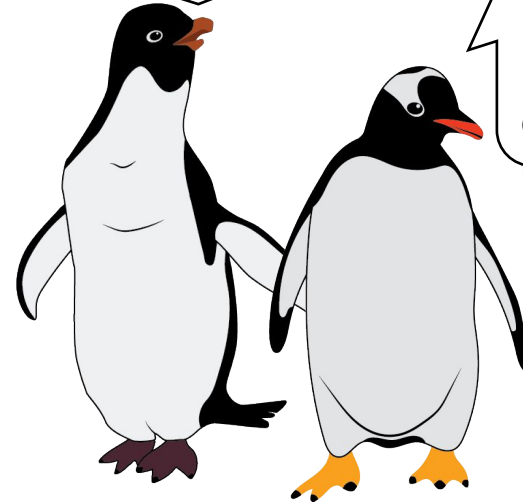
Now it is time to dive (like penguins for food!) into the data!

To start the graph, we are going to click the word “Year” from the top of the chart and drag it to the X-axis of the graph, then release the mouse. We are going to drag different items from the chart to the graph a lot. So we will call this “drag and drop” throughout our book.

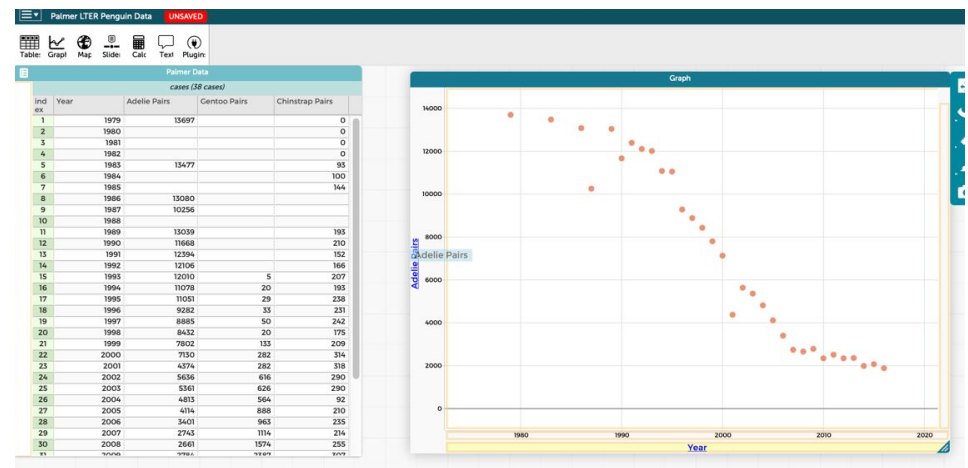


Our graphs have two axes, an X-axis and Y-axis. The X-axis is horizontal and is read from left to right. The Y-axis is vertical and is read from bottom to top.

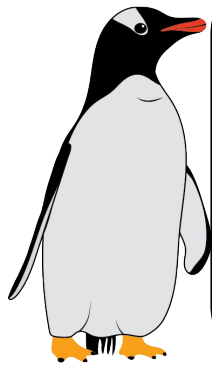
This is helpful to know because it is how most graphs are read!



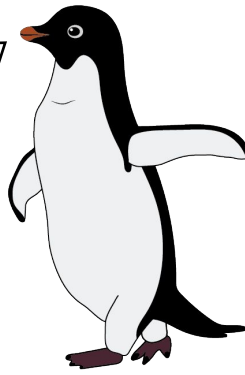
Now we need to add some penguins to our Y-axis. First drag and drop “Adelie Pairs” to the left side of the graph. It will look like this:



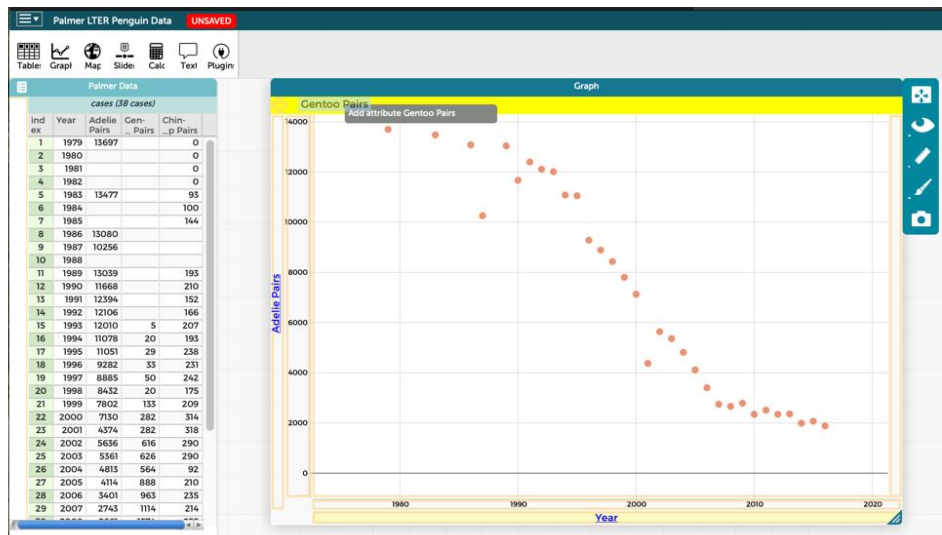
Adelie penguins are known as the “true Antarctic penguin species: because they need ice.



That is an interesting fact! Look at the graph we just made. What do you think it means for the population of Adelie

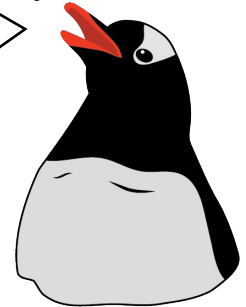


Now we want to add more penguins, this is a little tricky. We are going to drag and drop “Gentoo pairs” but bring it to the top of the graph (highlighted in yellow here). This will add it to the Y-axis with the Adelie pairs. A little plus sign appears on the left side.

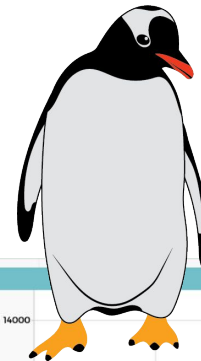


If you put the gentoo pairs on left side it will replace the Adelie pairs, which is good to know, but not what we

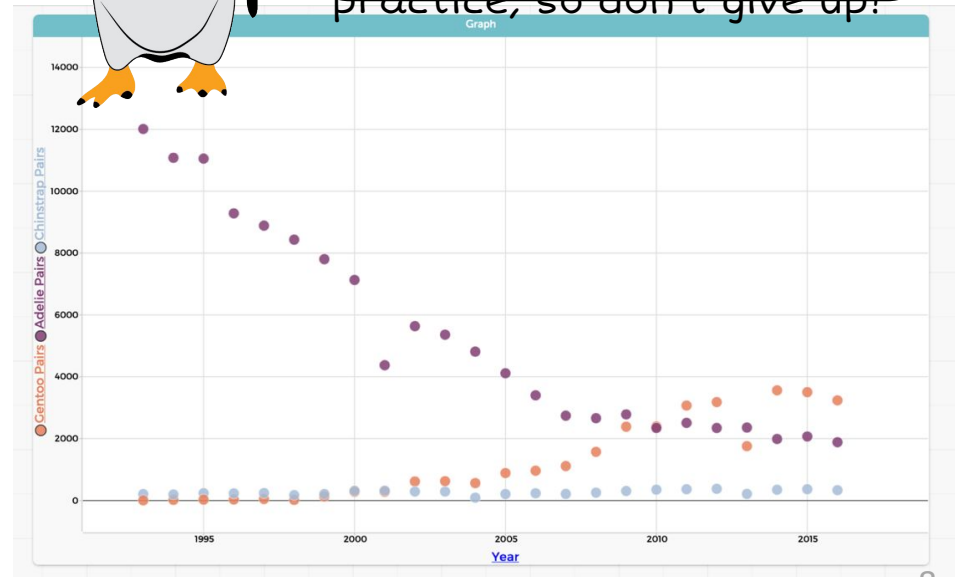
Did you know a lot of gentoo penguins live on islands near Antarctica instead of on the large continent? I wonder why...



Repeat that step for Chinstrap pairs and now your graph should look like this:



If your graph doesn't look similar to this, try to go back and figure out why, or ask for help. Stuff like this can take a lot of practice, so don't give up!

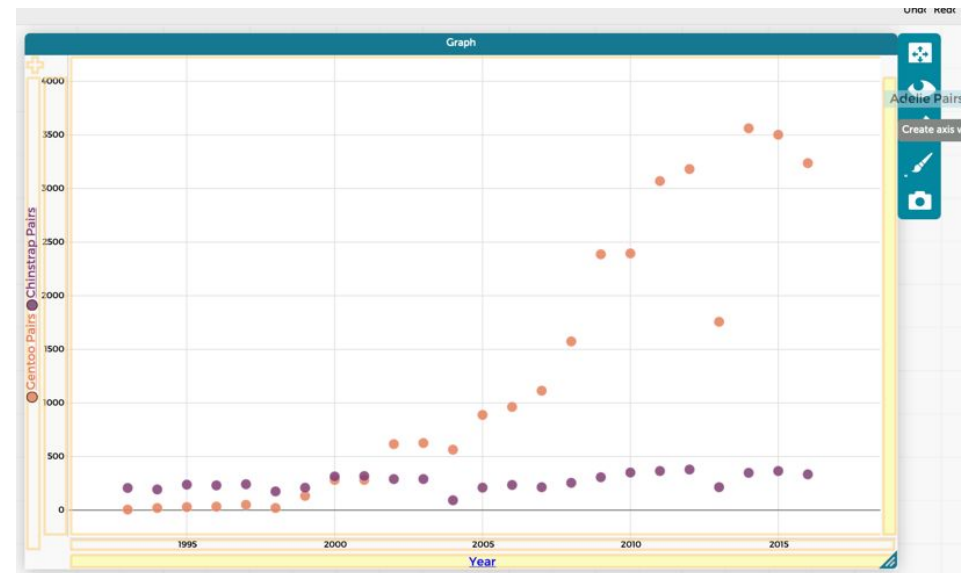


Let's take a second to examine our graph.

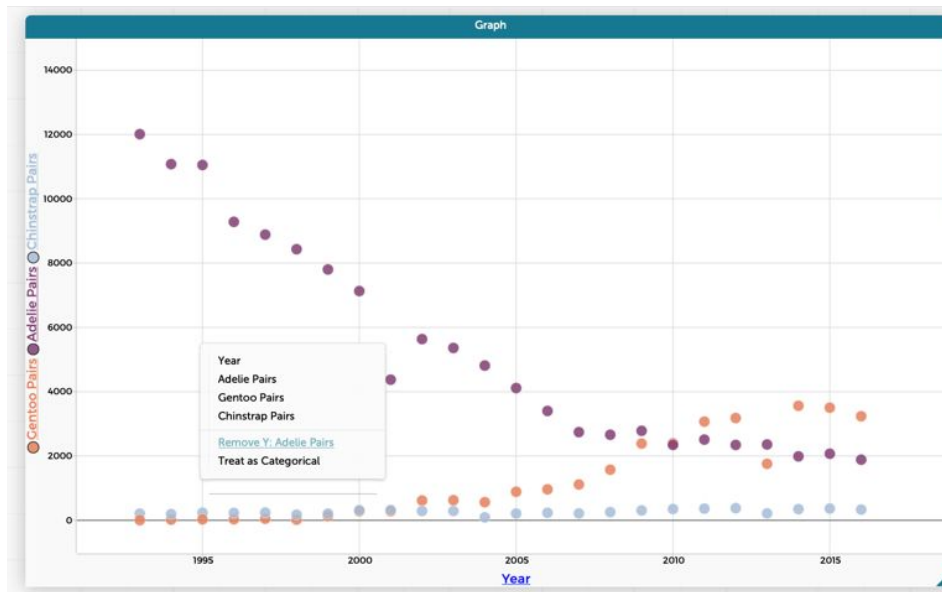
Time increases on the X-axis from 1979 to 2016.
Pairs of penguins increase on the Y-axis from 0 to 12,000.

It is a little hard to see what is happening to the penguin lines. Let's fix that and then think about why.

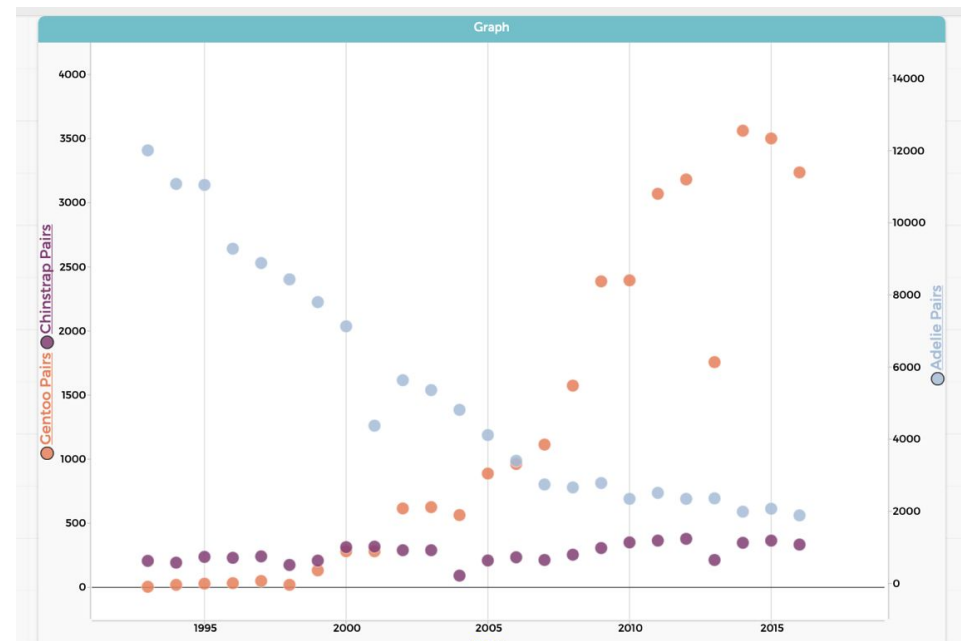
Click on "Adelie pairs" on the Y-axis and a little box pops up! Click "Remove Y: Adelie pairs"

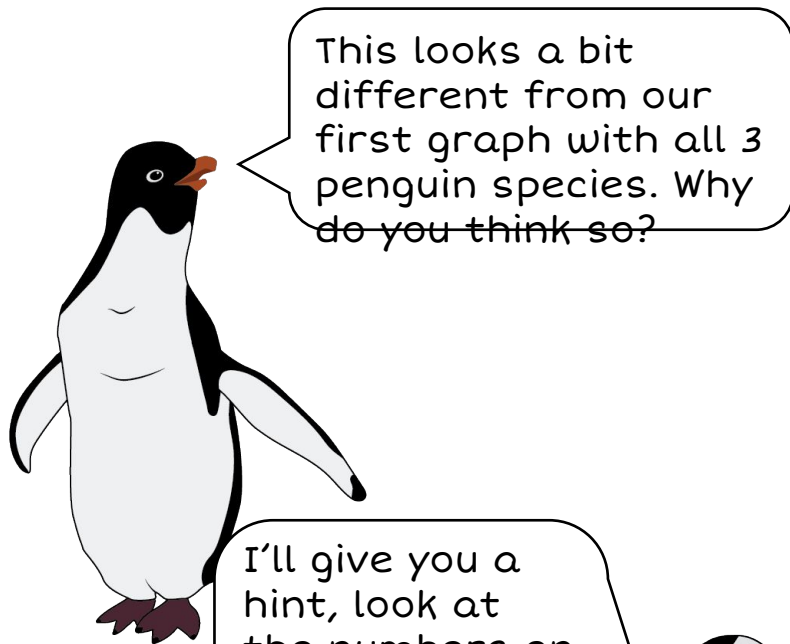


After that you should see a graph that looks like this:

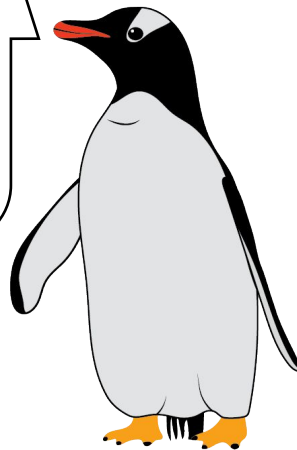


Now we want to add Adelie pairs back in but on the right side. Drag and drop "Adelie pairs" from the chart to the right side of the graph. This will create a second Y-axis.

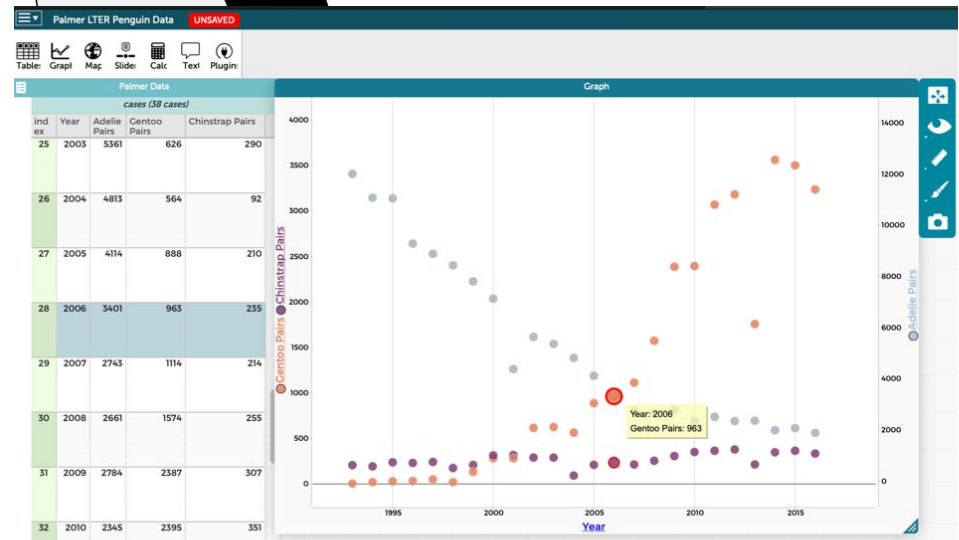
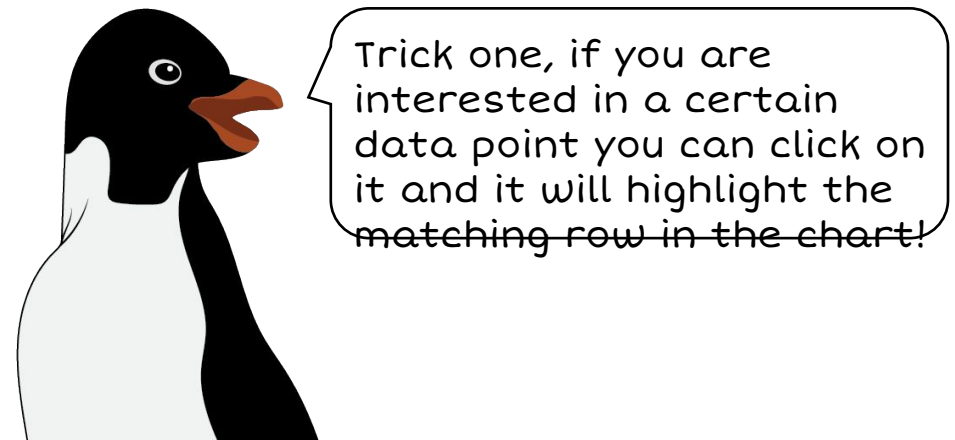




I'll give you a hint, look at the numbers on the Y-axis on each side of the graph. What do you notice about the numbers?



You are doing great! We want to show you a few tricks We've picked up in our travels (Did you know Gentoo penguins can swim up to 22 miles per hour? Some penguins can travel very far, and fast!) before we start really thinking about our data.

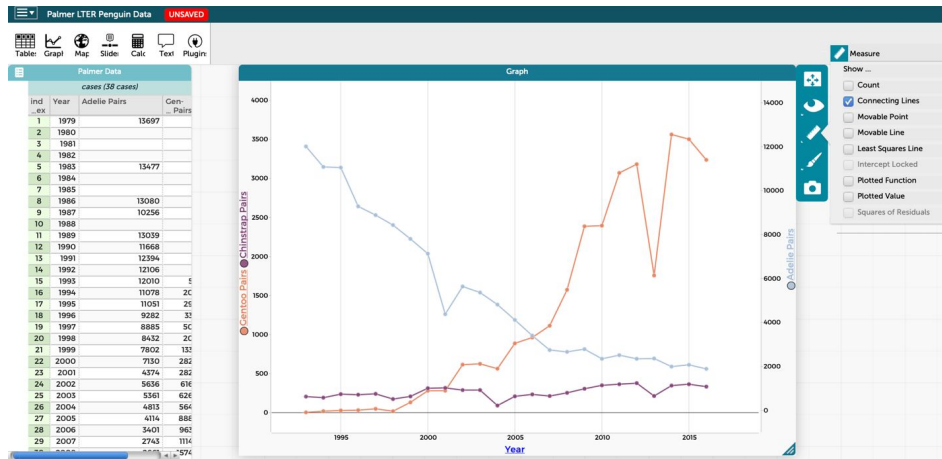


Another is that you can click and drag the graph and chart to move them around your screen. You can move the graph to a location you like better, similarly penguins can move to more suitable habitats if they don't like their home anymore.

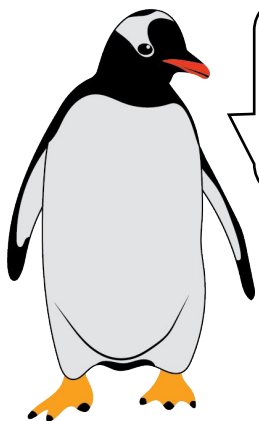


Sometimes, the dots are hard to look at, so scientists (and graphing penguins!) like to look at lines instead.

To do this click on the ruler on the right side of the graph and check the box that says, “Connecting Lines.”

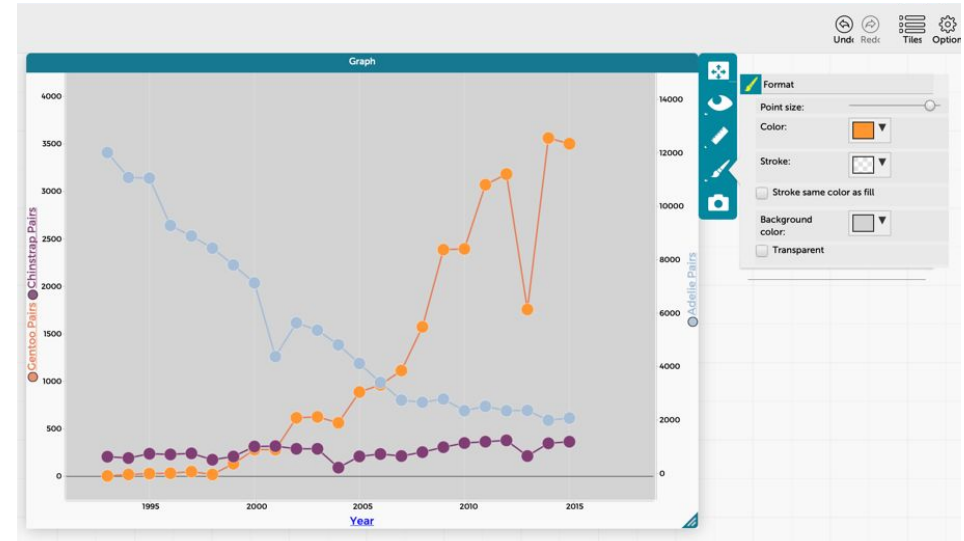


We like this view better so we are going to use it, but if you prefer the dots, you can uncheck the box.



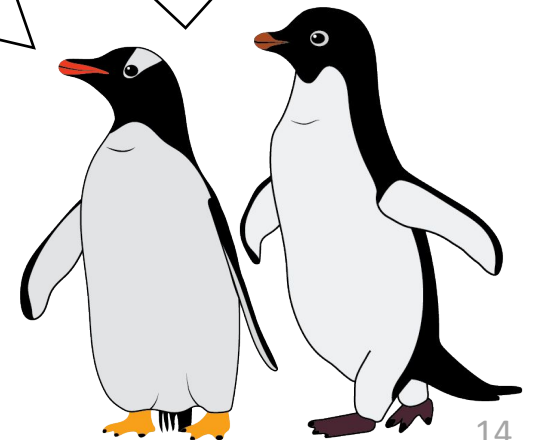
Some of those other lines are helpful when looking at data too, but we are not going to use them.

Another thing you can do is click on the paint brush on the right side of the graph. Here you can change the size of your dots and play around with colors.



I like to leave things they way they are automatically set.

But I like to change things up. It is up to you!



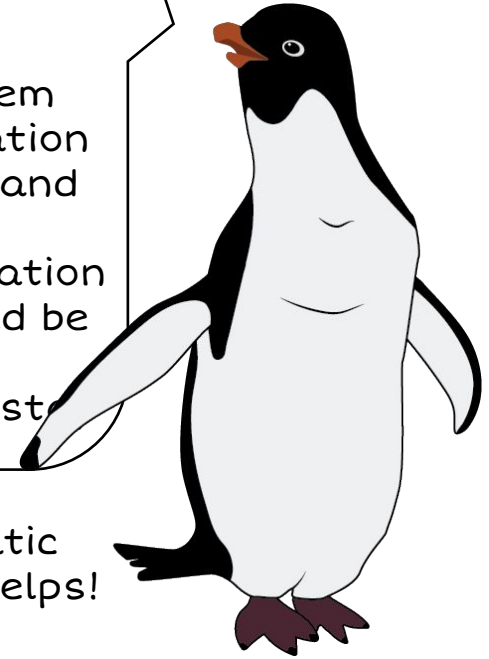
Time to think about our data! Our favorite part! Making graphs is cool and exciting but the most important part is understanding what the graph tells you. Something is happening to these penguin species and we need to find out what so we can tell other people.

As time increases, what happens to each penguin's population? (circle your answer)

Adelie:	Increases	Decreases	Steady
Gentoo:	Increases	Decreases	Steady
Chinstrap:	Increases	Decreases	Steady

Write down some ideas that you have about why this might be true:

Here is a hint!
Not much in scientific data is a straight line, and penguin populations are certainly not. A population that decreases would seem to have a big population in the earlier years and a smaller one in the later years. A population that increases would be opposite. A steady population may not stay exactly the same through time but it won't have a dramatic change. Hope that helps!



Ok! That graph was a bit of work but we are almost done. We want to show you that you don't have to build your graph with time (years) on the X-axis and all your penguins on the Y-axis, although this is a nice way to do it. You can compare data in a lot of ways!

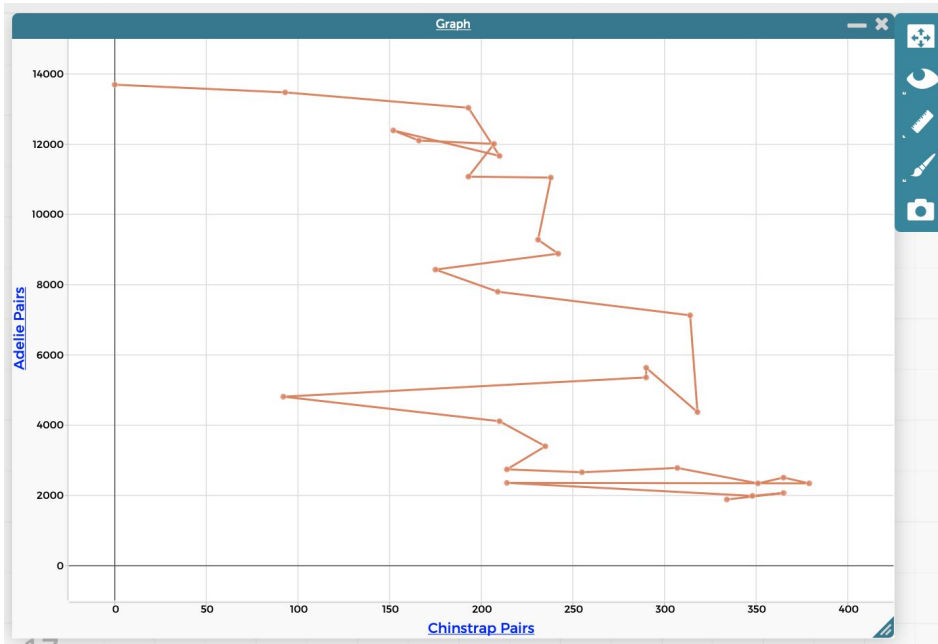
Go ahead and remove all the penguin species and year from the graph so you start over. You could also exit this browser and pull the original link up again.

Now choose any two penguins you want. Drag and drop one on the X-axis and one on the Y-axis. We are choosing Adelie and Chinstrap.



If you don't remember how to remove and add items to your graph, just look back in this book for how we did it before!

We put Adelie Pairs on the Y-axis and Chinstrap Pairs on the X-axis and this graph looks a lot different than our last one!



Let's take this one step at a time.

First, there is no year so we don't know when these population pair numbers are from. But we can still compare Adelie population to Chinstrap population.

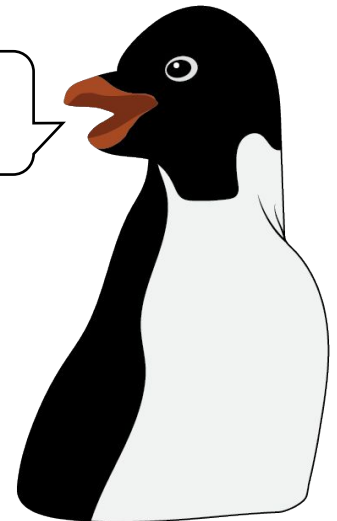
When Adelie pairs are highest, around 14,000 (remember that's almost 28,000 penguins!) Chinstrap penguins are at their lowest of 0 pairs.

But when Adelie penguins are at their lowest of about 2,000 pairs there are about 350 pairs of Chinstrap penguins.

So as Adelie pairs decrease, Chinstrap pairs

Does that match the pattern we saw before?

There are a lot of ways to look at data!



We only showed you SOME of the cool things you can do with graphing and CODAP, but we are sure you will learn a lot more neat tricks as you practice.

Thank you for hanging out and graphing with us!

-Your graphing penguins, Helen & Sean.

