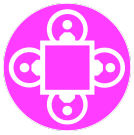
Subunit 1: Regional Climate

EXPLORE



Groupwork Norms

- Explain by telling how/why.
- Help others do things for themselves.

Part 1: Daily Weather Data for San Francisco

In Part 1 you will review data from a weather station at the San Francisco International Airport to see how the temperature changed during October 2016. You will work with a partner to investigate the question "How warm (and cool) did it get at the San Francisco International Airport in October?"

1. Your teacher will direct you to open the Tuva dataset "San Francisco Weather in October."

2. Spend 5 minutes exploring the dataset with your partner. Play around by dragging different options to the graph and observing what happens to it.

3. To answer the question, "How warm (and how cool) did it get at the San Francisco International Airport in October 2016?", you are going to construct a graph (Graph 1) of the high and low temperatures throughout the month. This dataset provides the highest and lowest temperatures at the San Francisco International Airport during each day in October 2016.

4. First, create a graph of the high temperatures. Follow these steps:
    a. Drag "October Day" to the horizontal axis (*x*-axis).
    b. Drag "Highest Temperature" to the vertical axis (*y*-axis).
    c. Click on "Line" in the menu at the top, and select "Line Graph by Category."
    d. Each dot in the graph represents the average temperature for one day during the month

5. Next, add the low temperatures to this same graph. Follow these steps:
    a. Return to your graph and add "Lowest Temperature" to the vertical axis (*y*-axis) to see how both the high and the low temperatures changed through October. (Use a different color than used for highest temperatures.)
    b. Drag "Lowest Temperature" to the small "+" sign to the left of the "Highest Temperature" label on the vertical axis (*y*-axis).
    c. You should now have two lines on the graph—red showing the highest daily temperatures and blue showing the lowest daily temperatures.

6. When you complete your graph, take a screenshot and save the image. Save this as "Graph 1: San

Francisco Weather in October 2016." It will be needed in Part 3. Record your answers to the following questions about Graph 1 in your Science Notebook:

a. What was the highest temperature during the month of October?
b. On which day (or days) did the highest temperature occur?
c. What was the lowest temperature during the month of October?
d. On which day (or days) did the lowest temperature occur?

TUVA TIP: If you create a graph that you would like to save, click on the Options icon in the top menu and then click on the camera icon.

Part 2: Monthly Average Weather Data for San Francisco

In Part 2, you will look at the temperature data for San Francisco over the last 30 years. You will use the data to explore the question "How do temperatures change throughout the year in San Francisco?"

1. Turn to your partner and share your thoughts about what the weather is like throughout the year in San Francisco. What do you predict are the hottest and coldest months of the year?
2. Your teacher will direct you to open the Tuva dataset **"**Climate in US Cities."
3. Read the information about the dataset in the pop-up window. This weather data was collected for 30 years, from 1980 to 2010. The dataset has data for several locations; for this activity, you will only look at data for the San Francisco International Airport.
4. Spend 5 minutes exploring the dataset with your partner. Play around by dragging different options to the graph and observing what happens to it.
5. Create a graph for the average temperature at the San Francisco International Airport by month. Start by filtering out all the data for the other locations besides the San Francisco International Airport. Follow these steps:
   a. Click on the pencil icon to the left of "Location" in "Case Card."
   b. Click "Clear" to uncheck all locations, then recheck "San Francisco International Airport."
   c. Close "Attribute Settings" by clicking the X in the upper-right corner, and close "Case Card" by clicking the < symbol.
6. Now create the line graph to show how temperatures change through the year. Follow these steps:

a. Drag "Month" to the horizontal axis (*x*-axis).
b. Drag "Mean High Temp" to the vertical axis (*y*-axis).
c. Drag "Mean Low Temp" to the small "+" sign to the left of "Mean High Temp" (also on the *y*-axis).
d. In the top menu, click "Line" and select "Line Graph by Category."
e. Your graph should show a red line connecting Mean High Temps and a blue line connecting Mean Low Temps.

7. When you have made your graph, take a screenshot and save it as "Graph 2: Monthly Average Weather Data for San Francisco." This graph will be needed for Part 3. Record your answers to the following questions about Graph 2 in your Science Notebook:
    a. Which month is usually the warmest month in San Francisco?
    b. Which month is usually the coldest in San Francisco?
    c. What was the average high and low temperature in October?
    d. How does this data compare with what you and your partner predicted?

Part 3: Synthesizing Graph 1 and Graph 2

Analyzing and Interpreting Data

1. Compare Graph 1: San Francisco Weather in October 2016 and Graph 2: Monthly Average Weather Data for San Francisco. Answer the following questions in your Science Notebook:
    a. Describe any similarities and differences between Graph 1 and Graph 2.
    b. Did any days on your data chart for October 2016 have temperatures that were higher than the monthly average? How many?
    c. Did any days on your data chart for October 2016 have temperatures that were lower than the monthly average? How many?
    d. How many days were near the average temperature?

2. The next graph shows the daily and average temperatures of San Francisco over the course of a year.
    a. What do you notice about the shapes of the thin and thick lines in this graph?
    b. What does *average temperature* mean? How is this different from *daily temperature*?

Comparing Daily and Average Temperature in San Francisco

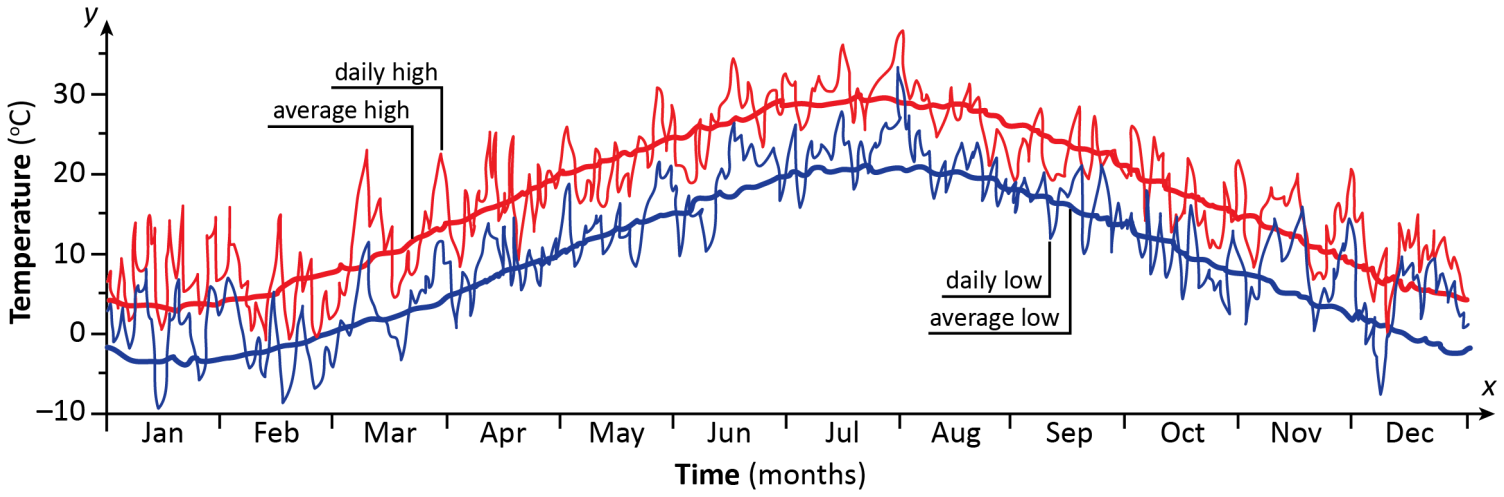


Image via Tuva Labs

3. In your Science Notebook, respond to the following questions:
    a. Based on what you explored in this lesson, how might you revise your definition of climate?
    b. If you watch the news in the morning and the reporter talks about how hot it will be today, is the reporter talking about weather or climate? Explain your thinking.
    c. How are weather and climate different?

Part 4: What Factors Influence a Region's Climate?

Introduction

You have been looking at one measure of a region's climate, the average monthly temperatures. In Part 4, we will explore what factors influence a region's climate. The following map shows the locations of five cities.

Image via Google Maps

The table that follows provides additional information about each city's location.

- *Latitude* is how far north or south a city is relative to the equator, which is at a latitude of 0°.
- *Longitude* is how far west or east a city is relative to the Prime Meridian, which is at a longitude of 0°.
- The amount of degrees increases as a city is located farther away from the equator or Prime Meridian.
- *Elevation* is a measure of how high a city is from sea level.

	City	Latitude	Longitude	Elevation
1	Barrow, AK	71°N	156°W	10 ft
2	San Francisco, CA	37°N	122°W	220 ft
3	Wichita, KS	37°N	97°W	1,302 ft
4	Kitale, Kenya	1°N	35°E	6,220 ft
5	Singapore	1°N	103°E	26 ft

1. Use the information on the map and in the data table to answer the following questions in your Science Notebook:
    a. Predict which city is going to be the warmest. Explain your thinking.
    b. Predict which city is going to be the coldest. Explain your thinking.
    c. Do you think some cities have similar climates? Explain your thinking.
    d. What factors are most important for determining a region's climate? Why do you think those factors are important?

2. Your teacher will direct you to open the Tuva dataset **"**Climate in US Cities". Use this data set to create a graph for the average monthly temperatures of the five cities. Start by selecting the data for the five cities.
    a. Click on the pencil icon to the left of "Location" in "Case Card."
    b. Click "Clear"to uncheck all locations, then recheck the following: 1) Barrow, AK; 2) "San Francisco International Airport;" 3) Wichita, KS;" 4) "Kitale, Kenya;" and 5) "Singapore."
    c. Close "Attribute Settings" by clicking the X in the upper right corner, and close "Case Card" by clicking the < symbol.

3. Create a line graph to compare the monthly average temperatures for the five cities. Follow these steps:
    a. Drag "Month" to the horizontal axis (*x*-axis).
    b. Drag "Mean Monthly Temp" to the vertical axis (*y*-axis).
    c. In the top menu, click "Line," and select "Line Graph by Category."
    d. Take a screenshot of your graph and save it as "Graph 3: Compare the Climates of Cities."

4. Copy the table that follows into your Science Notebook.
    a. Use your data to identify the highest and lowest monthly temperatures for each region.
    b. Record the average monthly temperature in June for each region. You can do so by hovering over each data point.

City		Average Monthly Temperature (°F)			Latitude	Longitude	Elevation
		Highest	Lowest	June			
1	Barrow, AK				71°N	156°W	10 ft
2	San Francisco, CA				37°N	122°W	220 ft
3	Wichita, KS				37°N	97°W	1,302 ft
4	Kitale, Kenya				1°N	35°E	6,220 ft
5	Singapore				1°N	103°E	26 ft

4. Discuss the following with your partner and then respond in your Science Notebook:
    a. Which city was the warmest? Why do you think this is the case?
    b. Which city was the coldest? Why do you think this is the case?
    c. When scientists examine the **range** in temperatures, they examine the difference between the highest and lowest numbers.
        - Which cities had the widest range in temperature?
        - Which cities had the smallest range in temperature?
        - What could explain these observations?
    d. Barrow, San Francisco, and Singapore are all around the same elevation.
        - Is there a relationship between latitude and a region's climate? If so, what is it?
        - Is there a relationship between longitude and a region's climate? If so, what is it?
    e. San Francisco and Wichita share the same latitude. Do they have the same climate? Why or why not?
    f. Kitale and Singapore also share the same latitude. Do they have the same climate? Why or why not?

6. Based on these findings, how might you revise your list of factors (Part 4, 1d) that contribute to a region's climate?