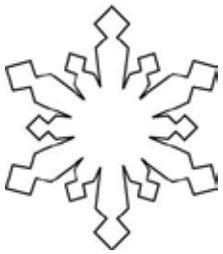
Climate Change



Overview:

In this activity, students will compare weather data from 1910-2000 to determine if there is a warming trend in their community.

Objectives:

The student will:

- use the Internet to locate scientific data;
- use graphs and charts to display data;
- analyze data; and
- perform research to determine if there is a warming trend.

GLEs Addressed:

Science

- [5-8] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

Math

- [5] S&P-1 The student demonstrates an ability to classify and organize data by [designing an investigation and collecting L], organizing, or displaying, using appropriate scale, data in real-world problems (e.g., social studies, friends, or school), using bar graphs, tables, charts, diagrams, or line graphs with whole numbers up to 50 (M6.2.1 & M6.2.2).
- [6] S&P-1 The student demonstrates an ability to classify and organize data by [designing an investigation and collecting L], organizing, or displaying, using appropriate scale for data displays (tables, bar graphs, line graphs, or circle graphs), data in real-world problems (e.g., social studies, friends, or school), with whole numbers up to 100 (M6.2.1 & M6.2.2)

Materials:

- Computer with Internet access
- STUDENT WORKSHEET: “Warming Trend”
- SUPPLEMENTARY MULTIMEDIA: “Greenhouse Effect” (www.ArcticClimateModeling.org)
- SUPPLEMENTARY MULTIMEDIA: “Climate Science Facts” (www.ArcticClimateModeling.org)
- SUPPLEMENTARY MULTIMEDIA: “Hot and Cold” (www.ArcticClimateModeling.org)
- SUPPLEMENTARY DIGITAL LECTURE: “Climate Change in Alaska” (www.ArcticClimateModeling.org)

Activity Procedure:

1. Remind students about the science of the Greenhouse Effect and the “Greenhouse Effect” lesson. What was discovered during that activity? (*The greenhouse effect traps heat near the surface of Earth. This effect is normal, and helps to regulate Earth’s temperature, however, if the levels of the gases that trap warm air increase, the greenhouse effect will increase global warming*.)
2. Ask students to think about the temperature of their community. Can they remember if it was warmer last year than this year?
3. Explain that to tell if the temperature of Earth is getting warmer, scientists need to look at large amounts of data. Temperatures from one year to the next may be warmer, but then may cool again the following

year. However, global warming implies a trend towards warming, meaning that over a long period of time (30 years or more) the average temperature of Earth has increased.

4. Tell students that during this activity they will determine if the temperature of their community is rising by looking at weather data from 1910, almost 100 years ago.
5. Hand out the STUDENT WORKSHEET: “Warming Trend.” Remind students that a prediction is an educated guess, which means that it is based on known information. To decide on a prediction, one may rely on scientific data or personal observations. For example, if a community member says that last winter was the coldest one he remembers, one might choose to guess that their community is not warming.
6. Guide students through the procedure for accessing the required data on the Internet and printing it to use with the worksheet. Make sure that the Internet browser window is enlarged to show all the data for one year on a single line before printing.
7. Explain that in each row the data shows the average temperature for each month in a given year. At the end of each row, the average for each season in displayed. The values given are for degrees Centigrade. To complete the assignment, the temperatures will have to be converted to F. Remind students how to do this conversion.
8. Point out that they will not need the data for every year. Students may want to use a ruler or extra sheet of paper to lie across their data for ease of reading.
9. Instruct students to complete their worksheets. Assist students in the use of Excel as needed. Complete the graphs as a class if necessary to increase student understanding.

Answers:

Answers will vary, except:

13. D) all of the above
14. D) they examine weather data over many years

Name:_____

Warming Trend

Student Worksheet (page 1 of 4)

Testable Question:

Is the average temperature in your community rising?

Prediction:

1. The average temperature in your community _____ (is/is not) rising.

   How did you decide on this prediction? _____

   _____

   _____

Experiment:

Procedure:

Step 1. Go to http://data.giss.nasa.gov/csci/stations/.

Step 2. In the search field, type the name of your community and click search. If you cannot locate your community, try a larger community near you (ex: Unalakleet, Nome, etc.). You can also find a community by clicking its approximate location on the map and then selecting it from the displayed list.

Step 3. Click on the "Download the data as text" link at the bottom of the page in the "Downloads" section. Print out the data and use to complete the worksheet.

Data:

2. Using Microsoft Excel, create a chart to list the weather data you printed. Label the first column "Year" and the other columns the months of the year, as shown below. Enter the values from your printout into the Excel spreadsheet. If you find it helpful, you may enter the information in the chart below and then transfer it to Excel.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1910												
1920												
1930												
1940												
1950												
1960												
1970												
1980												
1990												
2000												

Name:_____

Warming Trend

Student Worksheet (page 2 of 4)

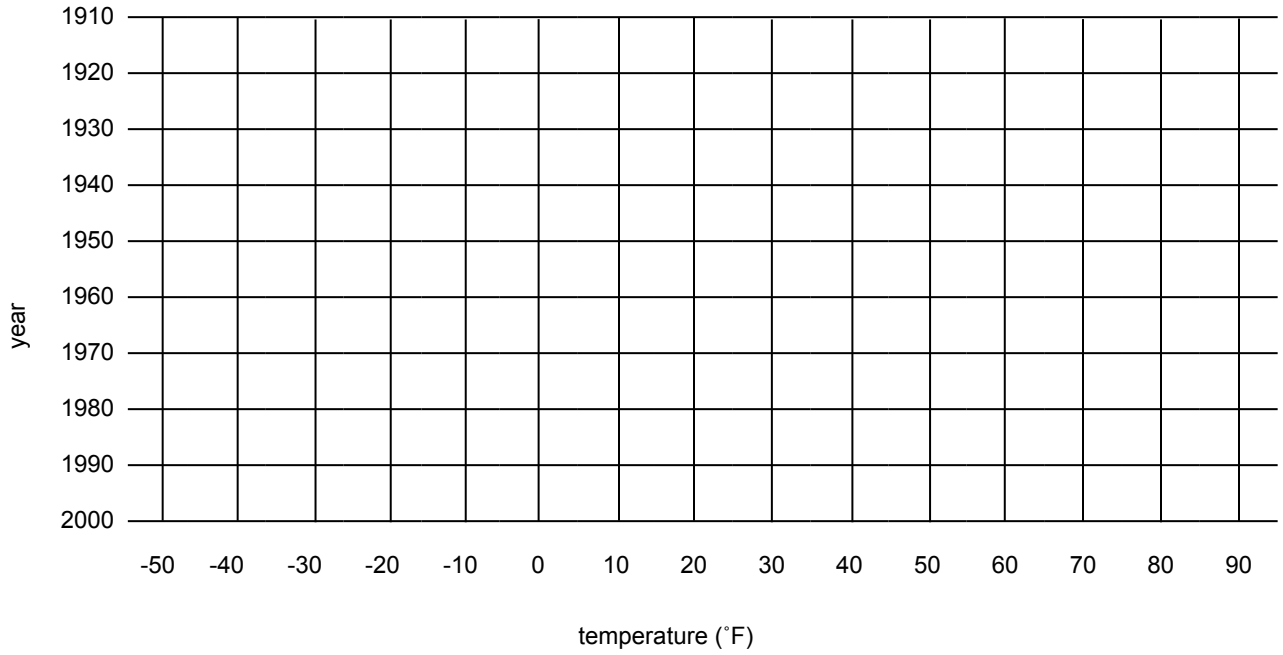
3. Convert the values in degrees Centigrade to degrees Fahrenheit. Underneath your first set of numbers, retype the years and month to create another chart. Copy and paste to do this. In the upper left corner, in the cell for Jan 1990 type the following =CONVERT(B2,"C","F"). Move your cursor to the bottom of the active cell until it changes to a +. Click and drag down to the 2000. Click on the bottom corner of the newly selected area and drag across to the left until the entire chart is filled. Request assistance from your teacher as needed.

Data Analysis:

4. Using the Excel spreadsheet, calculate the average of January temperatures. Click on the cell immediately below the last Jan 2000 Fahrenheit value. Click on the function button, select average and click okay, then type in the range of cells you want the function to use in the calculation. To type in a range of cells, type the first cell number, a colon, and then the last cell number. For example, the range from B2 to B11 would be B2:B11.

   _____ °F

5. Use the values from January to make a line graph in the space below.



6. Using the Excel spreadsheet, calculate the average of July temperatures. Use the same method as outlined in Data Analysis Question 1.

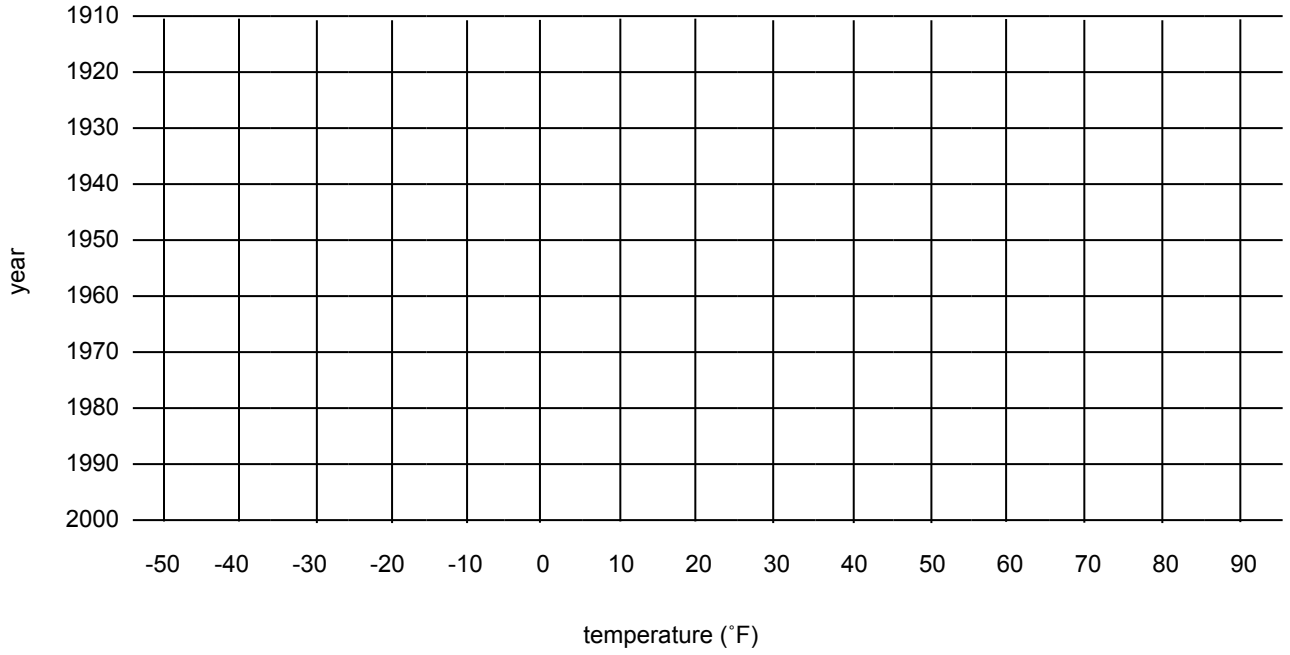
   _____ °F

Name:_____

Warming Trend

Student Worksheet (page 3 of 4)

7. Use the values from July to make a line graph in the space below.



8. In general, which direction does the January line graph move?

   A. up B. down C. flat

9. In general, which direction does the July line graph go move?

   A. up B. down C. flat

Conclusion:

10. The average temperature in your community _____ (is/is not) rising.

11. Was your prediction supported or unsupported?_____

12. Explain how your conclusion was reached. _____

    _____

    _____

    _____

Name:_____

Warming Trend

Student Worksheet (page 4 of 4)

Further Questions:

13. What is one cause of global warming?
    A. Pollution
    B. Greenhouse Effect
    C. Deforestation
    D. All of the Above

14. How do scientists tell if a community has experienced warming?
    A. They examine daily weather data.
    B. They examine monthly weather data.
    C. They examine yearly weather data.
    D. They examine weather data over many years.

15. What would happen to your community if global warming increased?

_____

_____

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_____

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