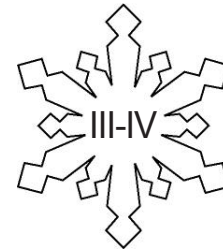


# How Oceans Affect Climate

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Levels



Grades 5-8

## Overview:

Students use the Internet to collect and compare data from a regional coastal weather station to data from an inland area (along similar latitudes) to determine what effect oceans have on temperature and climate.

## Objectives:

The student will:

- collect, record and explain temperature data;
- access remote data sets on the Internet;
- create graphs to compare data from two regions;
- learn how the temperature varies from inland regions to coastal regions; and
- understand that oceans play a role in temperature variability and climate from region to region.

## 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.
- [6] SA1.2 The student demonstrates an understanding of the processes of science by collaborating to design and conduct simple repeatable investigations.
- [7] SA1.2 The student demonstrates an understanding of the processes of science by collaborating to design and conduct simple repeatable investigations, in order to record, analyze (i.e., range, mean, median, mode), interpret data, and present findings.
- [8] SA1.2 The student demonstrates an understanding of the processes of science by collaborating to design and conduct repeatable investigations, in order to record, analyze (i.e., range, mean, media, mode), interpret data and present findings.
- [5] SD3.2 The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth's position and motion in our solar system by comparing heat absorption and loss by land and water.
- [6] S&P-3 The student demonstrates an ability to analyze data (comparing, explaining, interpreting, evaluating; or drawing or justifying conclusions) by using mean, median, mode, or range.
- [7] S&P-3 The student demonstrates an ability to analyze data (comparing, explaining, interpreting, evaluating or making predictions; or drawing or justifying conclusions by determining range, mean, median, or mode (M6.3.3).

## Materials:

- Computer with Internet access (<http://climate.gi.alaska.edu/Climate/Location>)
- Colored pencils
- STUDENT LAB PACKET: "How Oceans Affect Climate"
- STUDENT WORKSHEET: "How Oceans Affect Climate"

## Activity Procedure:

1. Distribute STUDENT LAB PACKETS. Lead a class discussion on whether coastal villages and inland villages along similar latitudes would have temperature differences. What would the differences be, and why? Explain it takes longer (more energy) to change the temperature of water than air or land. Therefore, temperatures of inland areas tend to change more than temperatures of coastal areas, since the coastal areas are "insulated" by the ocean. Introduce the testable question: "How do high and low temperatures in coastal regions differ from high and low temperatures in inland areas?"

- Instruct students to select their hypotheses on the student worksheet.
- Ask students to look up weather data for a coastal village by visiting <http://climate.gi.alaska.edu/Climate/Location>.
- Select “West Central.”
- The teacher should choose the station closest to the school (Nome, Wales or Unalakleet). Instruct all the students to use data from the same village.
- Students should record the “NCDC Normals” Mean Temperature for each month. Explain to students that the mean is the same as average. For example, the temperatures for every January from 1971 to 2000 were averaged together to get the mean temperature for January. Students should record the information for each month in the chart on their student lab packets. This is the coastal data.
- Ask students to navigate to the same data for Fairbanks from the same Web site: <http://climate.gi.alaska.edu/Climate/Location> (Click on Interior Basin, then select Fairbanks).
- Students should record the Fairbanks “NCDC Normals” mean temperature data on the appropriate chart on their student worksheets.
- Next, ask students to create a line graph comparing the monthly data for the two regions. They should use a different color line for each location. Remind them to include a key and a title.
- By looking at the line graphs, students should be able to interpret data trends of temperature differences between coastal and inland areas.
- Students can then draw their conclusion about the experiment and whether proximity to the ocean has an effect on climate.

**Teacher Note:** Explaining Latitude—Latitude gives the location of a place on Earth north or south of the Equator. Latitude lines also are known as parallels, since they are parallel and are equal distances from each other. When looking at a map, latitude lines run horizontally. Each degree of latitude is approximately 69 miles (111 km) apart. There is a variation due to the fact that Earth is not a perfect sphere, but an oblate ellipsoid (slightly egg-shaped). Hint: To remember latitude, imagine them as the horizontal rungs of a ladder (“ladder-tude”).

## Answers to Student Lab Packet:

Answers will vary.

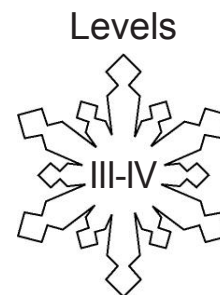
## Answers to Student Worksheet:

- 122 °F
- answers will vary
- 18 °C
- answers will vary
- Nome

Name: \_\_\_\_\_

## How Oceans Affect Climate

Student Lab Packet (page 1 of 5)



### Testable Question:

How do the high and low temperatures in coastal regions differ from the high and low temperatures in inland areas?

### Background Information:

Oceans have a major effect on climate because it takes water longer than air or land to heat up and cool down. A region's latitude has a great effect on its climate and weather. Generally, the further away from the equator, the colder the weather. However, if you compare two villages along similar latitudes (meaning one is not much further north or south than the other), do oceans make a difference in the temperature?

### Hypothesis:

Make an educated guess and check one:

- \_\_\_ A coastal area will have the same high and low temperatures over the course of a year as an inland area along the same or similar latitude.
- \_\_\_ A coastal area will have more extreme temperatures (warmer summers and cooler winters) than an inland area along the same or similar latitude.
- \_\_\_ A coastal area will have less extreme temperatures (cooler summers and warmer winters) than an inland area along the same or similar latitude.

### Experiment

Materials:

- Internet access
- Colored pencils

### Procedure:

1. Read the above background information.
2. Select a hypothesis (educated guess).
3. Look up weather data for a coastal village near your school by visiting the Web site: <http://climate.gi.alaska.edu/Climate/Location>.
4. First, select the "West Central" region.
5. From that page, click on "Choose a Location" on the left-hand menu.
6. Choose the station closest to your village. Your teacher will select the station.
7. Look at the first chart on the page that has the title "NCDC Normals."

Name: \_\_\_\_\_

## How Oceans Affect Climate

### Student Lab Packet (page 2 of 5)

8. Record the mean temperature for each month of the year on the Coastal Area Data Chart on the following page. (The mean temperature is the same as the average temperature).
9. Next, look up weather data for an inland area by returning to the Web site:  
<http://climate.gi.alaska.edu/Climate/Location>.
10. First, select "Interior Basin."
11. Then, select "Fairbanks."
12. Look at the first chart on the page with the title "NCDC Normals."
13. Record the mean (average) temperature for each month of the year on the Inland Area Data Chart on the following page.
14. Create a line graph comparing the mean temperatures at each location. Use a different color line for the coastal village and Fairbanks. Provide a key and a title.



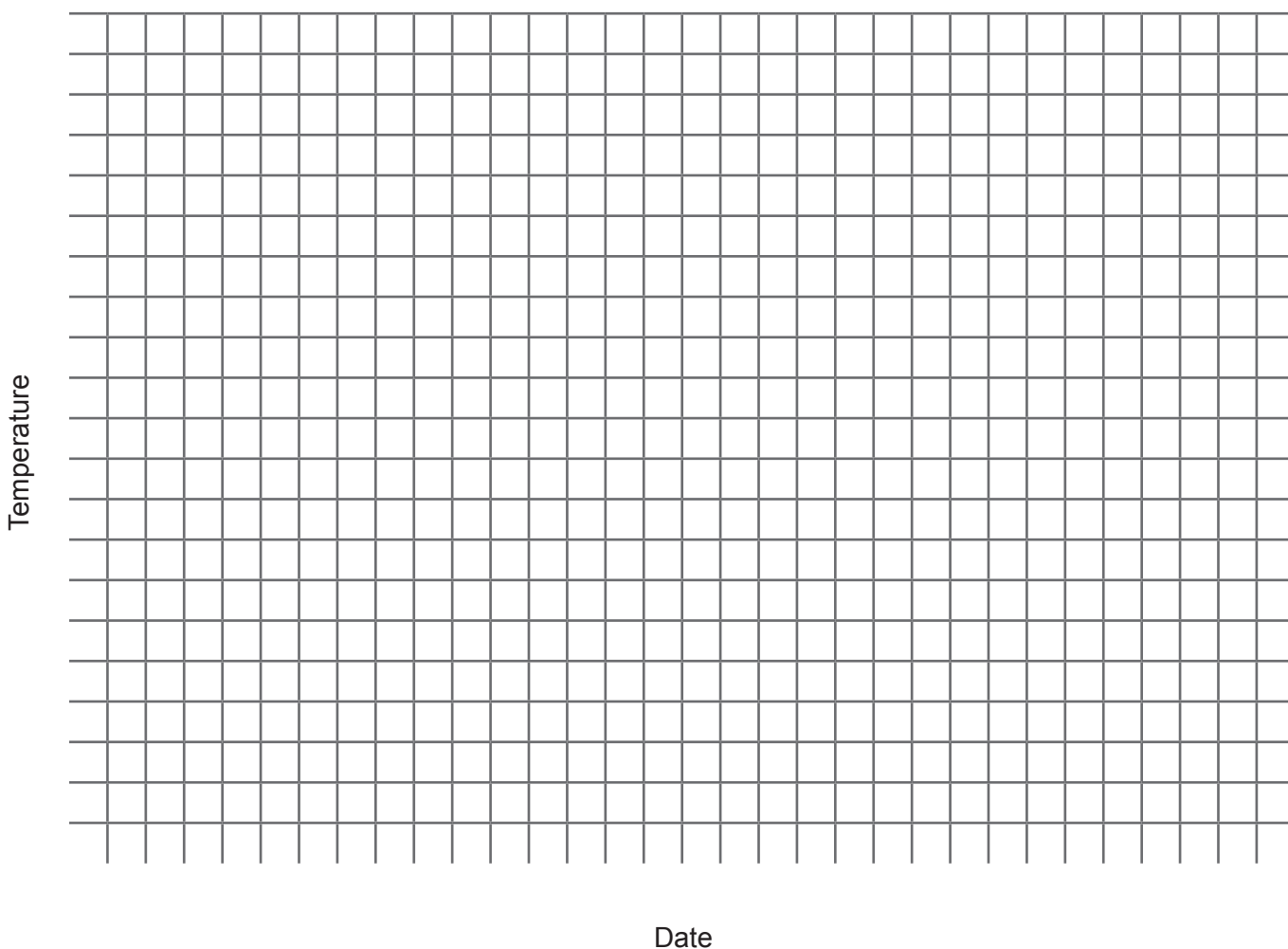
Name: \_\_\_\_\_

## How Oceans Affect Climate

Student Lab Packet (page 4 of 5)

### Analysis of Data:

1. Which location had the single highest temperature? \_\_\_\_\_
2. Which location had the single lowest temperature? \_\_\_\_\_
3. Create a line graph with the average monthly temperatures for each location. Use a different color line for each location. Label the units on the X and Y axes. Provide a title and a key.



Look at the graph to determine:

4. Which location was coldest overall? \_\_\_\_\_
5. Which location was warmest overall? \_\_\_\_\_

Name: \_\_\_\_\_

## How Oceans Affect Climate

Student Lab Packet (page 5 of 5)

### Conclusion:

1. Select the conclusion reached after the experiment:

- A coastal area will have the same high and low temperatures over the course of a year as an inland area along the same or similar latitude.
- A coastal area will have more extreme temperatures (warmer summers and cooler winters) than an inland area along the same or similar latitude.
- A coastal area will have less extreme temperatures (cooler summers and warmer winters) than an inland area along the same or similar latitude.

2. How did you reach your conclusion? Explain using complete sentences.

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### Further questions:

1. What other weather factors can influence the temperatures of an area?

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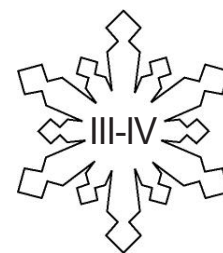
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Name: \_\_\_\_\_

## How Oceans Affect Climate Student Worksheet

Levels



A thermometer is an instrument that measures temperature. Temperature indicates how hot or cold something is. There are three standard scales commonly used to measure temperature: Fahrenheit, Celsius and Kelvin. In the United States, Fahrenheit is the norm, while Celsius is used in other countries and Kelvin is used by scientists.

Learning to convert temperatures between Celsius and Fahrenheit is an important skill. It is helpful when traveling to other countries and also for analyzing weather data sets.

1. Convert 50 degrees Celsius to Fahrenheit.

The formula for converting Celsius to Fahrenheit is:

$$\text{_____}^{\circ}\text{C} \times 9/5 + 32 = \text{_____}^{\circ}\text{F}$$

2. Use a thermometer to find the temperature in your classroom in Celsius. Convert this temperature to Fahrenheit using the math equation used above. Show your work. Check your calculations by looking at the Fahrenheit side of the thermometer.

3. Convert 65 degrees Fahrenheit to Celsius. The formula for converting Fahrenheit to Celsius is:

$$(\text{_____}^{\circ}\text{F} - 32) \times 5/9 = \text{_____}^{\circ}\text{C}$$

4. Check the outside temperature on the school weather station in Fahrenheit. Convert this temperature to Celsius using the mathematical formula used in problem 3. Show your work.

5. Look at the map. Which community would have cooler summers and warmer winters?

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