

The Long and Lat of It _____

Levels V-VI



Grades 9-12

Overview:

During this lesson, students will learn the significance of the grid of lines drawn on globes, and use latitude and longitude lines to learn more about their own community.

Objectives:

The student will:

- locate, label, and understand the significance of the Equator, Prime Meridian, International Date Line, Arctic Circle, Antarctic Circle, Tropic of Cancer, Tropic of Capricorn; and
- use latitude and longitude to locate places on a map, give the location of their village, and determine the distance from their village to the Arctic Circle.

GLEs Addressed:

Science

- [9] 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.
- [10-11] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, analyzing data, developing models, inferring, and communicating.

Materials:

- TRANSPARENCIES: "Latitude Lines," "Longitude Lines," and "International Time Zones"
- STUDENT WORKSHEETS: "The Long and Lat of It," "Determining Locations," "Latitude Calculations"
- World globe

Activity Procedure:

1. Ask students to name other places they have visited in Alaska and in the world. Ask them to point the locations out on a map.
2. Explain that in order to find any location on a world map or globe without searching endlessly, a grid work of imaginary lines has been established from east to west, and from north to south, covering the whole world. This grid work of lines works like a street map, and a system of degrees and directions are used, like a house address or the intersection of two roads, to pinpoint a location anywhere in the world. For students who have used a GPS this system of labeling a location may be familiar.
3. Use a world globe to show how Earth is divided into the Northern Hemisphere and the Southern Hemisphere by an imaginary line called the Equator.
4. Place the OVERHEAD "Latitude Lines" on the overhead projector. Define lines of latitude, and explain that the North Pole is at 90° north latitude (90° N), while the South Pole is at 90° south latitude (90° S). The Equator is at 0° latitude. A hint for remembering latitude is that the lines run horizontally, like the rungs of a ladder, or "ladder-tude."
5. Ask students to locate the Seward Peninsula on the globe. What latitude lines shown on the globe lie above and below the peninsula? (Depending on the globe, students should be able to find 75° N above and 60° N below.)

6. Point out the Arctic and Antarctic Circles on the globe (these regions may be indicated with dotted lines). Ask students if they know the meaning of these circles. Explain that the circles indicate the highest latitude at which the sun can be seen throughout the year. Beyond this point, there is a period of darkness each year when the sun never crests the horizon. The winter and summer solstice are on or about December 21 and June 21.
7. Use the world globe to explain that Earth also is divided into the Eastern Hemisphere and the Western Hemisphere by two imaginary lines running from the North Pole to the South Pole called the Prime Meridian and the International Date Line. The Prime Meridian runs through Greenwich, England, while the International Date Line runs through the Bering Strait.
8. Place the OVERHEAD "Longitude Lines" over the top of the OVERHEAD "Latitude Lines" on the overhead projector. Define lines of longitude, and point out that Greenwich, England lies along the Prime Meridian at 0° longitude, while the Seward Peninsula lies just east of the International Date Line at 180° longitude.
9. Use the globe to show that locations east of the Prime Meridian and west of the International Date Line have an eastern longitude and lie in the eastern Hemisphere, while locations west of the Prime Meridian and east of the International Date Line have a western longitude and lie in the western hemisphere.
10. Ask the class which hemisphere the Seward Peninsula is in. (Answer: western)
11. Place the OVERHEAD "International Time Zones" on the overhead projector.
12. Explain that the Prime Meridian is also the line used to establish time zones around the world. Imaginary lines running from the North Pole to the South Pole make up 24 time zones around the world. The time zone containing the International Date Line, which runs through the Bering Strait, represents the first hour in a 24-hour day, while the time zone to the west of the International Date Line represents the last hour in a 24-hour day. Point out that the International Date Line has some pretty obvious bends in it. This was done to allow all of Alaska to fall within one day, while all of Russia falls within the next day. A similar jog occurs in the southern hemisphere.
13. Explain to students that Little Diomedes lies on the east side of the International Date Line, while Big Diomedes lies on the west side. However, they lie within the same time zone. Ask students: If it is 2 p.m. on Little Diomedes, what time is it on Big Diomedes? This is a little tricky. It's the same time, but the date is one day later. They lie within the same time zone, but the International Date Line divides the time into two days.
14. Distribute the STUDENT WORKSHEETS for students to complete.

Answers to Student Worksheets:

The Long and Lat of It:

- | | |
|---------------------------|------------------|
| 1. Prime Meridian | 5. Equator |
| 2. Antarctic Circle | 6. Longitude |
| 3. International Dateline | 7. Arctic Circle |
| 4. Latitude | |

Determining Location:

Village latitude and longitude should be circled.

Latitude Calculations:

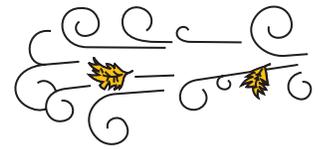
- | | |
|----------------------|----------------------|
| 1. 4591.95 | 3. Answers will vary |
| 2. Answers will vary | 4. 60° |

Name: _____

The Long and Lat of It

Student Worksheet

Levels V-VI



Word Bank

Equator

Prime Meridian

International Date Line

Arctic Circle

Antarctic Circle

Latitude Lines

Longitude Lines

Directions: Fill in the blank after each definition below, using the correct locations listed in the Word Bank.

1. A line representing 0° longitude that passes through Greenwich, England.

2. A line representing the southernmost point the sun is visible on the southern winter solstice.

3. A line mostly at 180° longitude. When this line is crossed going east, the date is one day earlier. When this line is crossed going west, the date is one day later.

4. Lines running horizontally around the globe used as a means of pinpointing a location anywhere on Earth.

5. A circle halfway between the north and south poles that divides Earth into the northern and southern hemispheres.

6. Lines running vertically around the globe from pole to pole and used as a means of pinpointing a location anywhere on Earth.

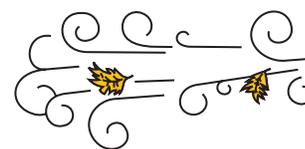
7. A line representing the northernmost point the sun is visible on the northern winter solstice.

Name: _____

Determining Location

Student Worksheet

Levels V-VI



1. Read the explanations in the boxes below, and circle the latitude and longitude of your village on the chart below. Note: Only minutes (') and not seconds (") are given. A specific location, like a school, would require that seconds also be given. Use this data to solve the problems on the next page.

Location	Latitude	Longitude
Brevig Mission	65° 20' N	166° 30' W
Little Diomedede	65° 46' N	168° 57' W
Gambell	63° 44' N	171° 37' W
Golovin	64° 33' N	163° 5' W
Elim	64° 37' N	162° 19' W
Koyuk	64° 56' N	161° 12' W
Savoonga	63° 38' N	170° 28' W
Shaktoolik	64° 17' N	161° 14' W
Shishmaref	66° 14' N	166° 8' W
Saint Michael	63° 26' N	162° 14' W
Stebbins	63° 32' N	162° 19' W
Teller	65° 9' N	166° 31' W
Unalakleet	63° 50' N	160° 54' W
Wales	65° 35' N	168° 5' W
White Mountain	64° 41' N	163° 27' W

Determining Location using Latitude and Longitude

Latitude and longitude lines cover Earth's surface in an imaginary grid work, like a net covering a ball. These lines make up a coordinate system that can be used to describe any location on Earth's surface. Knowing the exact latitude and longitude for a location can be very important. Global Positioning Systems (GPS) are standard equipment on many boats and aircraft, and can give exact location in the event of an emergency.

Using Latitude and Longitude to Determine Distance

Latitude and longitude can be used to calculate how far it is from one place to another. The distance between each latitude line is 111 km (or 69 miles). To further pinpoint a location, latitude lines are divided into units of measure called minutes and seconds. A minute is 1.85 km (or 1.15 miles), and a second is 30.83 m (or 101.2 feet). Note: Because lines of longitude meet at the poles, the distance between lines of latitude is greatest at the equator and decreases as they move north and south toward the poles. Therefore, the distance between lines of longitude will vary depending on location.

Distance between Lines of Latitude:

- 1 degree (°) = 111 km or 69 miles
- 1 minute (') = 1.85 km or 1.15 miles
- 1 second (") = 30.83 m or 101.2 feet

Name: _____

Latitude Calculations

Student Worksheet



Latitude can be used to determine how far your village is from the Arctic Circle, by following the steps below. The latitude of the Arctic Circle is given as 66° 33' N. Use the latitude of your village (from the chart on the STUDENT WORKSHEET: "Determining Location") to fill in the missing information.

1. Convert the latitude of the Arctic Circle into miles from the Equator.

Arctic Circle latitude = 66° 33'

Step 1: $\frac{66}{\text{(degrees of latitude)}} \times \frac{69}{\text{(miles/degree of latitude)}} = \underline{\hspace{2cm}} \text{ miles}$

Step 2: $\frac{33}{\text{(minutes of latitude)}} \times \frac{1.15}{\text{(miles/minute of latitude)}} = \underline{\hspace{2cm}} \text{ miles}$

Step 3: $\underline{\hspace{2cm}} \text{ miles} + \underline{\hspace{2cm}} \text{ miles} = \underline{\hspace{2cm}} \text{ miles}$
(Answer Step 1) (Answer Step 2) Distance from Equator to Arctic Circle

2. Using the latitude for your village from the STUDENT WORKSHEET: "Determining Location," convert the latitude of your village into miles from the Equator using the same formula as in number 1.

The latitude of your village = _____

Step 1: $\frac{\hspace{2cm}}{\text{(degrees of latitude)}} \times \frac{69}{\text{(miles/degree of latitude)}} = \underline{\hspace{2cm}} \text{ miles}$

Step 2: $\frac{\hspace{2cm}}{\text{(minutes of latitude)}} \times \frac{1.15}{\text{(miles/minute of latitude)}} = \underline{\hspace{2cm}} \text{ miles}$

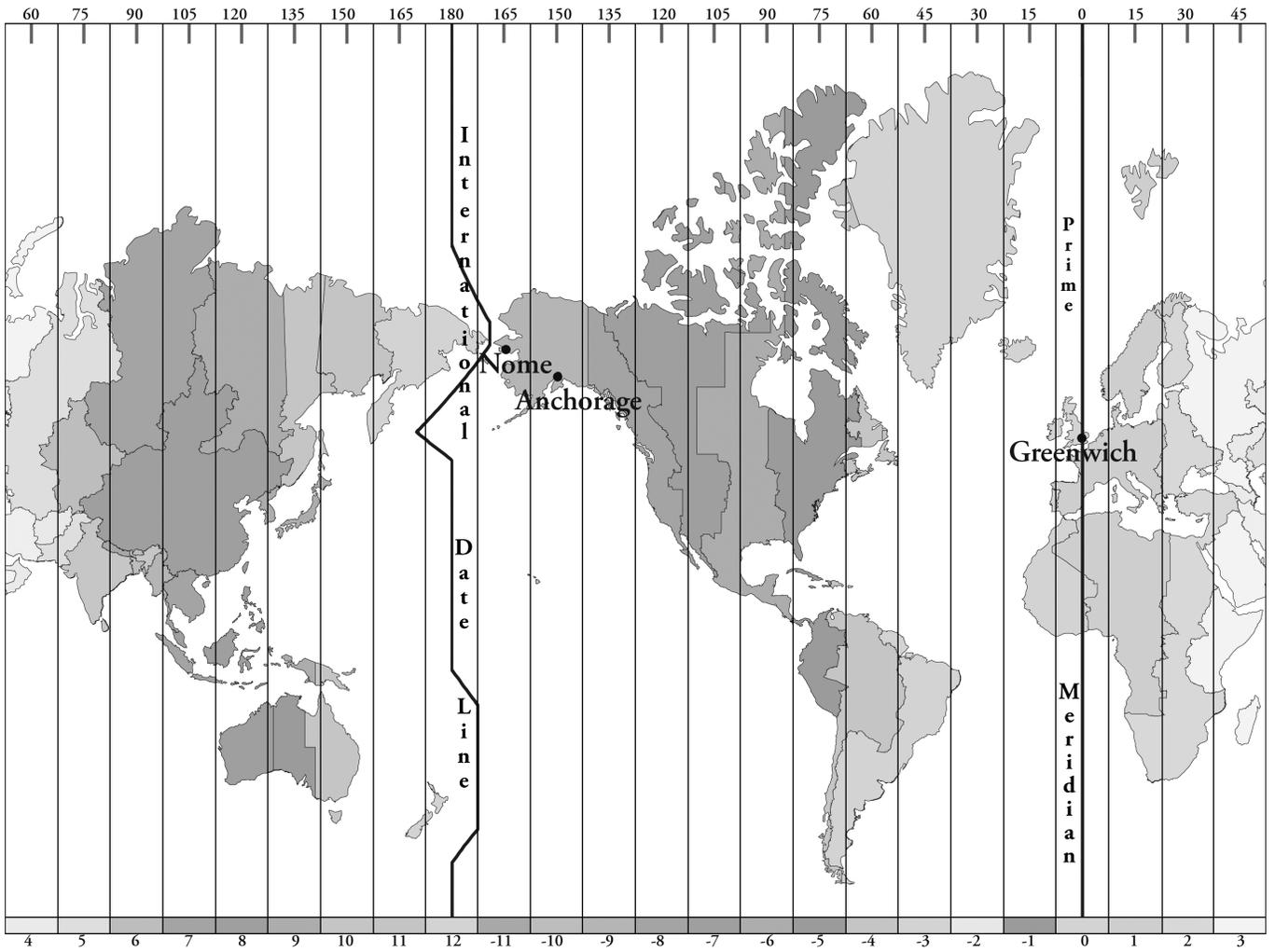
Step 3: $\underline{\hspace{2cm}} \text{ miles} + \underline{\hspace{2cm}} \text{ miles} = \underline{\hspace{2cm}} \text{ miles}$
(Answer Step 1) (Answer Step 2) Distance from Equator to your village

3. Subtract the answer to question 2 from the answer to question 1 to find out how far it is from your village to the Arctic Circle:

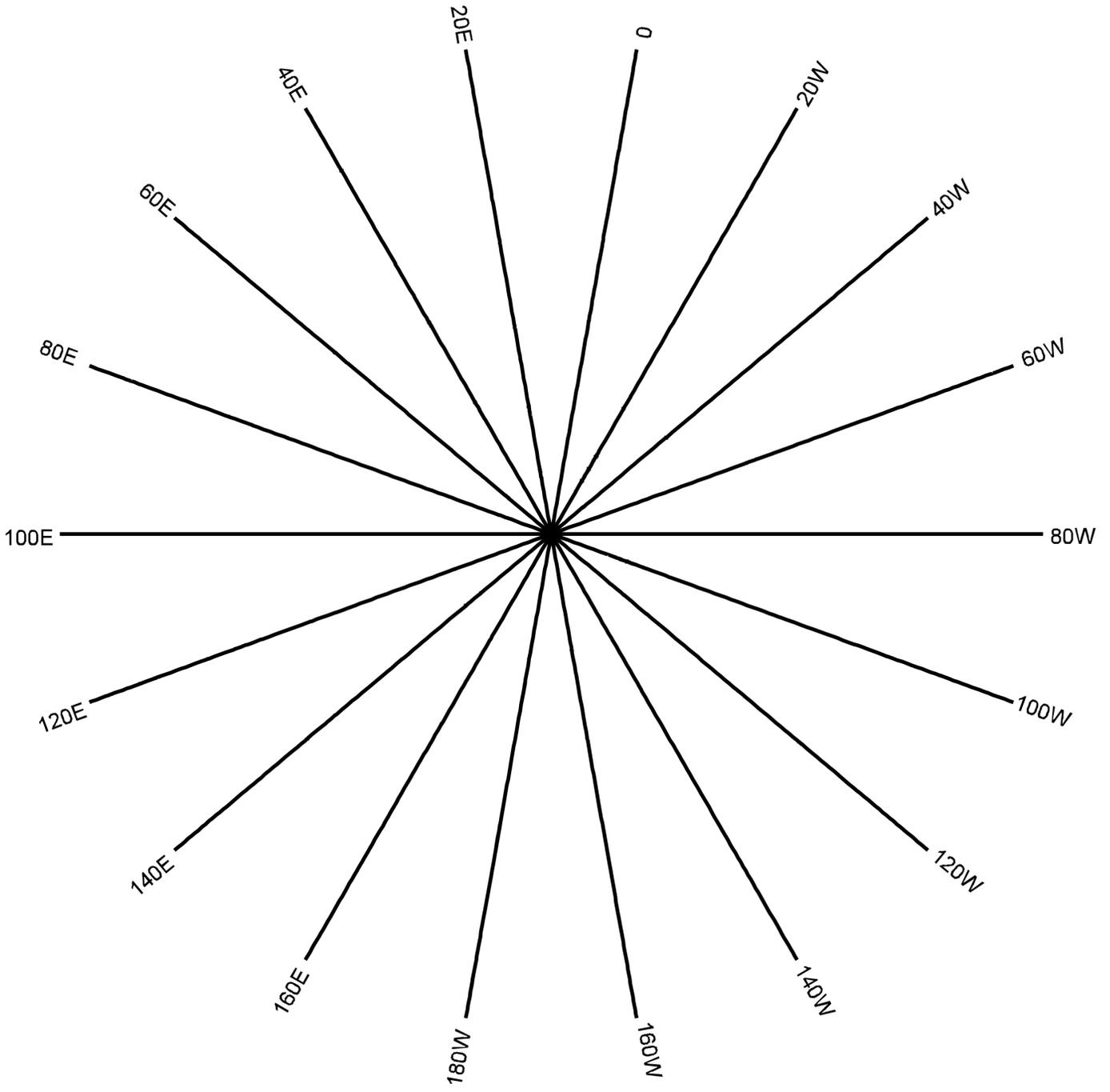
$\underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ miles}$
(answer from 1, above) (answer from 2, above) Distance between your village and the Arctic Circle

4. If an explorer were to travel around the world, would they travel farther by following a latitude line at 15° or a latitude line at 60°?

International Date Lines Overhead



Northern Hemisphere Longitude Lines Overhead



Northern Hemisphere Latitude Lines Overhead

