



BIG Idea Earth scientists use mapping technologies to investigate and describe the world.

Vocabulary

Key Concepts

Section 2.1 Latitude and Longitude

- cartography (p. 30)
- equator (p. 30)
- International Date Line (p. 33)
- latitude (p. 30)
- longitude (p. 31)
- prime meridian (p. 31)

MAIN Idea Lines of latitude and longitude are used to locate places on Earth.

- Latitude lines run parallel to the equator.
- Longitude lines run east and west of the prime meridian.
- Both latitude and longitude lines are necessary to locate exact places on Earth.
- Earth is divided into 24 time zones, each 15° wide, that help regulate daylight hours across the world.

Section 2.2 Types of Maps

- conic projection (p. 35)
- contour interval (p. 36)
- contour line (p. 36)
- geologic map (p. 38)
- gnomonic projection (p. 35)
- map legend (p. 39)
- map scale (p. 39)
- Mercator projection (p. 34)
- topographic map (p. 36)

MAIN Idea Maps are flat projections that come in many different forms.

- Different types of projections are used for different purposes.
- Geologic maps help Earth scientists study patterns in subsurface geologic formations.
- Maps often contain a map legend that allows the user to determine what the symbols on the map signify.
- The map scale allows the user to determine the ratio between distances on a map and actual distances on the surface of Earth.

Section 2.3 Remote Sensing

- Geographic Information System (p. 44)
- Global Positioning System (p. 44)
- Landsat satellite (p. 41)
- remote sensing (p. 41)
- sonar (p. 43)
- TOPEX/Poseidon satellite (p. 42)

MAIN Idea New technologies have changed the appearance and use of maps.

- Remote sensing is an important part of modern cartography.
- Satellites are used to gather data about features of Earth's surface.
- Sonar is also used to gather data about features of Earth's surface.
- GPS is a navigational tool that is now used in many everyday items.

Vocabulary Review

Each of the following sentences is false. Make each sentence true by replacing the italicized word with a vocabulary term from the Study Guide.

- The study of mapmaking is called *topology*.
- A *gnomonic projection* is a map that has parallel lines of latitude and longitude.
- The process of collecting data about Earth from far above Earth's surface is called *planetology*.
- Landsat satellite* uses sonar waves emitted from a ship to map the ocean floor.
- A *map scale* explains what the symbols on the map represent.

Replace the underlined words with the correct vocabulary term from the Study Guide.

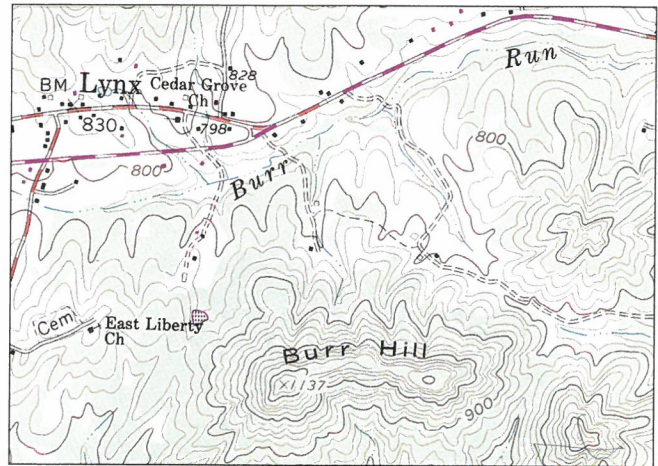
- Latitude lines run north to south and are measured from the prime meridian.
- A map legend shows the ratio between distances on a map.
- GPS mapping combines many traditional types of maps into one.
- GIS technology helps determine a user's exact location.

Choose the correct vocabulary term from the Study Guide to complete the following sentences.

- Zero longitude is known as the _____.
- The difference in elevation between two side-by-side contour lines on a topographic map is called the _____.
- _____ is the use of sound waves to detect and measure objects underwater.
- The _____ serves as the transition line for calendar days.
- A(n) _____ is used on a topographic map to indicate elevation.

Understand Key Concepts

Use the figure below to answer Questions 15 and 16.

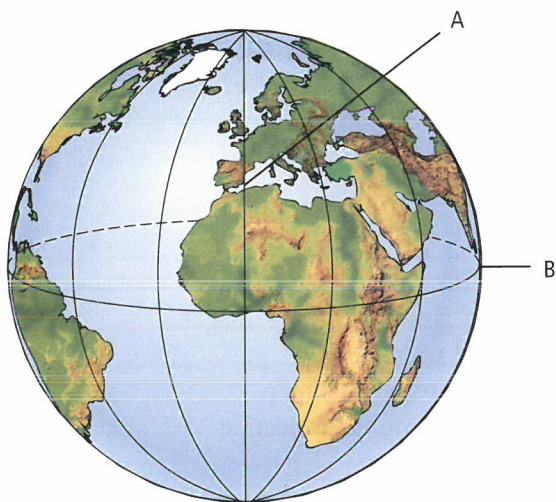


- What is shown in this image?
 - a Landsat image
 - a topographic map
 - a gnomonic projection
 - a GIS map
- What are the lines in the figure called?
 - hachures
 - contour lines
 - latitude lines
 - longitude lines
- Refer to **Figure 2.4**. How many time zones are there in Australia?
 - 5
 - 1
 - 3
 - 10
- Which is a use of Sea Beam?
 - to map continents
 - to map the ocean floor
 - to map Antarctica
 - to map mountains and valleys
- On a topographic map, which do hachures point toward?
 - higher elevations
 - lakes
 - no change in elevation
 - lower elevations
- Which is not usually included in map legends?
 - interstates
 - people
 - rivers
 - railroads

Constructed Response

21. **Locate** What time is it in New Orleans, LA, if it is 3 P.M. in Syracuse, NY? Refer to **Figure 2.4** for help.
22. **Explain** If you wanted to study detailed features of a volcano, would you use a map with a scale of 1:150 m or 1:150,000 m? Why?

Use the figure below to answer Questions 23 and 24.



23. **Identify** What is the line labeled A?
24. **Identify** What is the line labeled B?
25. **Explain** What is the maximum potential height of a mountain if the last contour line is 2000 m and the map has a contour interval of 100 m?
26. **Describe** how radar used in the *TOPEX/Poseidon* satellite differs from the sonar used in the collection of data by Sea Beam.
27. **Infer** Based on what you have learned in this chapter, how might an astronomer map objects seen in the night sky?
28. **Practice** Think back to the Launch Lab at the beginning of the chapter. What type of map projection would be best for the map you drew? Why?
29. **Explain** how degrees of longitude are calculated.
30. **Explain** how degrees of latitude are calculated.

Use the figure below to answer Question 31.



31. **Interpret** what type of projection is shown in the figure. What would this type of projection be used for?

Think Critically

32. **Apply** Would a person flying from Virginia to California have to set his or her watch backward or forward? Explain.
33. **Consider** why a large country like China might choose to follow only one time zone.
34. **CAREERS IN EARTH SCIENCE** Analyze how an architect trying to determine where to build a house and a paleontologist trying to determine where to dig for fossils might use a geologic map.

Use the figure below to answer Question 35.



35. **Apply** What is the projection shown above? What would be two uses for this type of projection? Explain.
36. **Plan** Make a map from your school to the nearest supermarket. How will you determine the scale? What will you need to include in your legend?

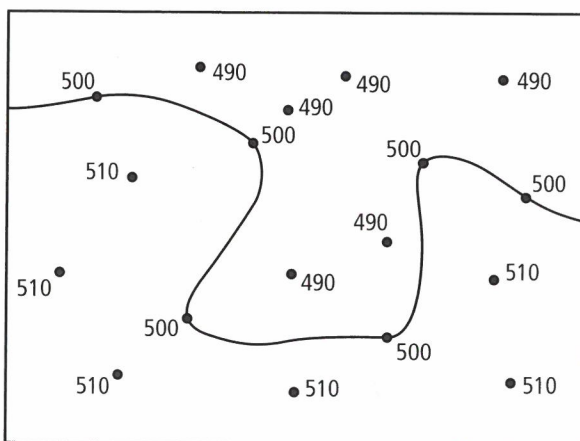
- 37. **Analyze** Why isn't a conic projection used to navigate a ship or an aircraft?
- 38. **Design** an experiment to test the accuracy of several types of GPS receivers. Make sure you include your control, dependent, and independent variables.
- 39. **Evaluate** Briefly describe GIS and how it can be used by your community to develop an emergency plan for a severe storm, earthquake, blizzard, drought, or another potential local disaster.
- 40. **Explain** why it is necessary to have three satellite signals to determine elevation when using a GPS receiver.

Concept Mapping

- 41. Use the following to complete a concept map about remote sensing: *remote sensing, TOPEX/Poseidon satellite, Landsat satellite, GPS, uses radar to map ocean floor, uses visible light and infrared radiation to map Earth's surface, and uses microwaves to determine location of user.* For more help, refer to the *Skillbuilder Handbook*.

Challenge Problem

Use the figure below to answer Question 42.



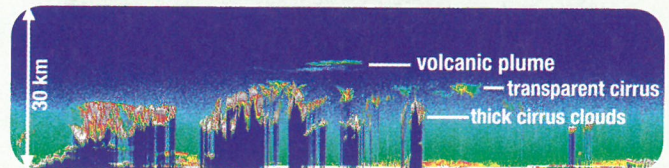
- 42. **Assess** Trace the following image to create a topographic map. Connect the elevation measurements to create contour intervals.

Additional Assessment

- 43. **WRITING in Earth Science** Write a journal entry for an explorer traveling across America before an accurate map was made.

DBQ Document-Based Questions

Data obtained from: NASA, CALIPSO satellite image.



This is a satellite image from NASA's CALIPSO satellite. CALIPSO is similar to the other remote sensing technologies you learned about in this chapter, but instead of radar or sonar, it uses something called lidar that sends pulses of light and measures the time it takes for the light to reflect back to the satellite. Based on the amount of time it takes for the light to reflect, CALIPSO and scientists can determine what is located below the satellite. The image above was collected on June 7, 2006, across the Indian Ocean. The navy blue areas indicate that no data was detected.

- 44. At approximately how many kilometers is the volcanic plume located?
- 45. At approximately how many kilometers is the thick cirrus cloud located?
- 46. Why do you think the volcanic plume is higher than the thick cirrus clouds?
- 47. Why do you think there was no data detected below the thick cirrus clouds?

Cumulative Review

- 48. Why are graphs, charts, and maps useful? (Chapter 1)
- 49. Why is good communication important in the field of science? (Chapter 1)

Standardized Test Practice

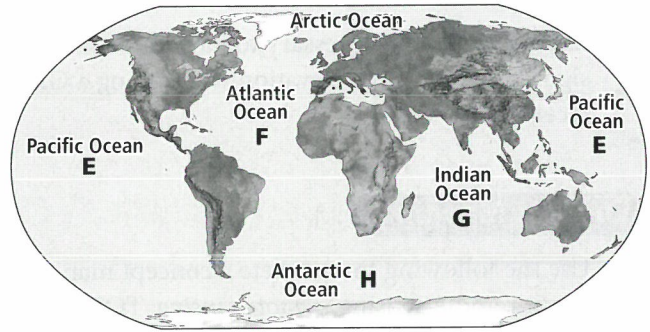
Multiple Choice

Use the map to answer Questions 1 and 2.



- What is the latitude and longitude of the location pointed out by the arrows?
 - 30° N, 100° W
 - 45° N, 105° W
 - 30° N, 90° W
 - 10° N, 90° W
- Roughly how many degrees of latitude does the United States cover?
 - 10°
 - 15°
 - 20°
 - 25°
- Which would be most useful if you were lost in the Sahara desert?
 - Landsat satellite
 - TOPEX/Poseidon satellite
 - Global Positioning System
 - topographic map of Africa
- What is the reference point for lines of longitude?
 - the equator
 - the prime meridian
 - the International Date Line
 - the 360th meridian
- Why do cartographers break down degrees of longitude and latitude into minutes and seconds
 - to get a better time frame of how long it takes to get from one place to the next
 - to help travelers with planning trips
 - to locate positions on Earth more precisely
 - to make cartography easier to understand

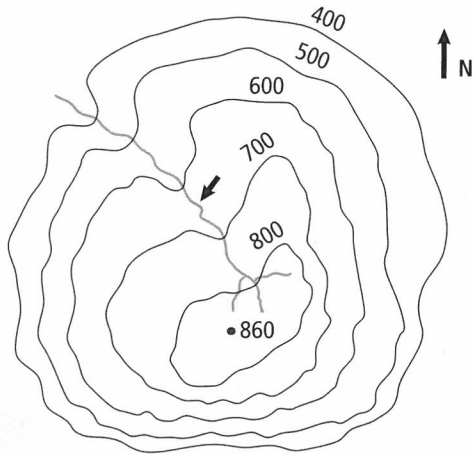
Use the map below to answer Questions 6 and 7.



- What problem do cartographers encounter when creating maps such as the one shown above?
 - placing all of the continents in the correct position
 - transferring a three-dimensional Earth onto a flat piece of paper
 - naming all of the important locations on the map
 - placing lines of latitude and longitude at the correct locations
- What improvements could be made to make this map more helpful to sailors?
 - Distort the size of the continents.
 - Show only the water locations and not the locations of the land.
 - Label the various continents.
 - Add lines of latitude and longitude for navigation.
- For what purpose are conic projection maps typically used?
 - road and weather maps
 - showing changes in elevation
 - plotting long distance trips
 - showing one specific point on Earth

Short Answer

Use the map below to answer Questions 9–11.



9. What is the map above showing?
10. What do the numbers on the map represent?
11. How might a hiker use this map in creating a route to get to the top?
12. Why would a ship find Sea Beam technology beneficial?
13. The distance from Earth to the Sun is 149,500,000 km. Rewrite this number using scientific notation.
14. Why is it important to include legends on a map?
15. Jenna measured the temperature of solutions before, during, and after an exothermic reaction. Which type of display would show the changes in temperature throughout the reaction most clearly and why?

Reading for Comprehension

Map Likely Fake, Experts Say

Recently, a Chinese map, including North America, Antarctica, and Australia, was unveiled. This map purported to show that a Chinese explorer discovered America in 1418, but has been met with skepticism from cartographers and historians alike. Antiquities collector Liu Gang, who unveiled the map in Beijing, says it proves that Chinese seafarer Zheng discovered America more than 70 years before Christopher Columbus set foot in the New World. But experts have dismissed the map as a fake. They say the map resembles a French seventeenth-century world map with its depiction of California as an island. That China is not shown in the center also suggests the Chinese did not make the map, one expert says.

Article obtained from: Lovgren, S. "Chinese Columbus" map likely fake, experts say. *National Geographic News*. January 23, 2006.

16. Why might a seventeenth-century map show California as an island?
 - A. California really was an island back then.
 - B. America had not been explored well enough to know that California was actually connected.
 - C. California was so different from the rest of America that they assumed it was an island.
 - D. A river was mistakenly drawn to look like part of the ocean.
17. What can be inferred from this passage?
 - A. China should be put in the center of every map drawn.
 - B. The map is an exact copy of the seventeenth-century world map.
 - C. Liu Gang wants people to believe that the Chinese first discovered America.
 - D. Liu Gang drew the map himself.

NEED EXTRA HELP?

If You Missed Question . . .

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Review Section . . .

2.1 2.1 2.1 2.3 2.1 2.2 2.2 2.2 2.2 2.2 2.2 2.3 1.2 2.2 1.3