Lesson 2

MAIN IDEAS

1. **Geography** Over time, new learning and new discoveries changed maps of the world.

2. **Culture** Many elements found on maps today were developed centuries ago.

3. **Science and Technology** Modern mapmakers use ancient principles and modern technology to produce maps.

TAKING NOTES

**Reading Skill: Summarizing**

Summarizing means to restate the important points of a passage in your own words. For Lesson 2, summarize each of the main sections, using a chart similar to this one.

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▲ Astrolabe  An astrolabe is an instrument that helped sailors to determine their distance from the equator. Astrolabes like the ones shown above helped make long voyages of exploration possible. These voyages produced knowledge that improved maps.

**CALIFORNIA STANDARDS**

**CST 3** Students use a variety of maps and documents to identify physical and cultural features of neighborhoods, cities, states, and countries and to explain the historical migration of people, expansion and disintegration of empires, and the growth of economic systems.

**HI 1** Students explain the central issues and problems from the past, placing people and events in a matrix of time and place.

**HI 2** Students understand and distinguish cause, effect, sequence, and correlation in historical events, including the long- and short-term causal relations.
Mapping the World

Build on What You Know Have you ever drawn a map to show a friend where something was? Drawing maps is a skill that humans have used for thousands of years. Understanding and reading maps is an important skill for historians because they need to know where events took place.

History of Mapmaking

ESSENTIAL QUESTION What were important advances in maps?

In Lesson 1, you learned about geography and the ways it affects history. Maps, a basic tool of geographers, allow historians to show where and how historical events occurred. The skills and methods people use to make maps are called cartography (kahr•TOG•ruh•fee). The oldest surviving map was drawn on a clay tablet in Babylon more than 4,000 years ago. Old maps show how ancient people saw their world.

Early Cartography Ptolemy (TAHL•uh•mee), an ancient Greek geographer, wrote about making maps more accurate. Over the years, the works of Ptolemy became lost to Europeans. However, his techniques were still known in the Muslim world. In the 800s, Muslim scholars translated the works of Ptolemy into Arabic. His ideas remained important and influenced many Islamic mapmakers. Their maps often showed their holy city of Mecca at the center. This could be very useful to Muslims traveling to Mecca.
Cartography Advances  Around 1155, the first known printed map appeared in a Chinese encyclopedia. This development was important because printing allowed more copies of a map to be made. In the early 1400s, the Chinese explorer Zheng He (juhng huh) made detailed maps that helped China expand its trading network. Europeans were also seeking to expand their trading networks.

Thanks to Muslim scholars, Europeans rediscovered the works of Ptolemy in the 1400s. His writings helped European cartographers make more accurate maps. At the time, educated Europeans knew that the world is round. But on a flat map of the round Earth, parts of Earth look smaller or larger than they really are. This stretching or shrinking is called distortion. To control this problem, cartographers developed various types of projections. A projection is a way of keeping the distortion of a flat map consistent and manageable. (See the Geography feature below.)

Better maps were a great help to European sailors. Still, sailing was dangerous, and accurate navigation was very hard. Even the famous explorer Christopher Columbus had trouble figuring out his exact location. He thought he was in or near Asia when he was really near the coast of Florida.

What technology allowed more copies of maps to be made?

Map Projections

Because Earth is round, every flat map distorts its surface to some extent. A projection is a way of controlling the distortion. Many types of projections exist. Each one distorts areas on Earth in a certain way. Three common projections are shown at right.

Mercator Projection  In a Mercator projection, the continents are more and more distorted as one moves farther from the equator. However a Mercator projection is an excellent reference for directions.

Homolosine (hoh•MAHL•uh•SYN) Projection  In a homolosine projection, the oceans are divided. This projection accurately shows the shapes and sizes of the landmasses. But the distances on the map are not correct.

Robinson Projection  A Robinson projection is often used in textbooks. It shows the entire Earth. The relative sizes of the continents and oceans are almost accurate. But regions near the poles appear flattened.
Mapmaking has improved over the centuries. Still, the maps of today contain many elements that people developed hundreds of years ago.

**Hemispheres** On maps, Earth can be divided into two equal halves. Each half is called a hemisphere. An imaginary line is used to divide Earth into north and south halves. This line is called the equator. The half of Earth north of the equator is the Northern Hemisphere. The half south of the equator is the Southern Hemisphere.

Another imaginary line divides Earth into east and west halves. This line is called the prime meridian (muh•RIHD•ee•uhn). The prime meridian is also known as the Greenwich (GREHN•ihch) meridian because it goes through Greenwich, England. The half that is west of the prime meridian is the Western Hemisphere. The half that is east of the prime meridian is the Eastern Hemisphere.

**Latitude and Longitude** As you have read, Ptolemy thought of ideas that improved mapmaking. One of his ideas was to create two sets of lines to locate places on Earth. Imaginary lines that run parallel to the equator are called latitude lines. They are used to identify coordinates in the northern and southern hemispheres. Longitude lines are imaginary lines that go around Earth through the north and south poles. They are used to identify coordinates in the eastern and western hemispheres.

By using a grid of latitude and longitude lines, you can find the absolute location of a place, the point where its latitude and longitude lines cross. The grid is based on the system of dividing a circle into 360 degrees. Every place on Earth has a unique absolute location. For example, the absolute location of Istanbul, Turkey, is 48° north latitude and 28° east longitude.
**Physical Maps**  Physical maps show the landforms and bodies of water that are found in particular areas. They also show the shapes of regions. The physical map on this page shows the British Isles. Physical maps have color and shading and sometimes show elevations. On this map, darker green indicates hills and mountains. Blue lines indicate rivers.

Notice that the physical map shows modern country borders, but the names of England, Ireland, Scotland, and Wales are not on the map. Physical maps do not focus on political divisions, such as countries.

**Political Maps**  Political maps show features on Earth’s surface that humans created. A political map might include such features as cities and countries. The political map on this page shows the British Isles. Notice how it is different from the physical map of the British Isles. Ireland and the United Kingdom are shown in different colors on the political map.

Political maps also often show capitals, major cities, and important landforms. This map shows the two national capitals of Dublin and London, as well as several major cities. It also shows four political regions within the United Kingdom. They are England, Northern Ireland, Scotland, and Wales.
Thematic Maps  Thematic maps focus on specific types of information. They might show physical and political information, but that is not their main purpose. For example, the map on this page shows where different types of Christianity were dominant in the British Isles during the Reformation. (You will learn about the Reformation in Chapter 14.)

The colors show where the different belief systems dominated. In other thematic maps, colors can be used to show climates, natural resources, population, or movements of people or ideas. Thematic maps can show a variety of information. Because of this, thematic maps are important tools for historians. You can practice your map-reading skills by using the Skillbuilder on pages 22–23.

REVIEW  What elements are common to physical, political, and thematic maps?

Technology Changes Mapmaking

ESSENTIAL QUESTION  How can new technology make better maps?

Geographers and historians are always looking for better, more accurate maps—physical, political, and thematic. Today geographers use satellites to get information about Earth.

Global Positioning System  The Global Positioning System (GPS) can tell a person his or her exact location on Earth. GPS uses a series of 24 satellites called Navstars that send radio signals to Earth. People can pick up these signals by using a certain type of receiver. The receiver displays latitude, longitude, altitude, and time.

This technology was originally developed by the U.S. military to provide more accurate battlefield information. Now hikers, explorers, sailors, drivers, and, of course, mapmakers use GPS to figure out locations.
An artificial satellite is a device sent into space, where it orbits Earth or some other object. Many satellites gather information that helps mapmakers, historians, and archaeologists.

Some satellites take photographs of Earth such as the one shown here. As a result, geographers make more accurate maps of landforms and bodies of water.

Some satellites scan infrared waves from Earth. Images such as this one can help archaeologists locate sites for future digs. In addition, such scans can reveal to historians how past humans changed their environments and where natural disasters have taken place.

Weather Forecasting Technology has improved weather maps. The Geostationary Operational Environmental Satellite (GOES) is a weather satellite. This satellite flies in orbit at the speed of Earth’s rotation. As a result, it always views the same area. GOES gathers information that is helpful in producing more accurate weather maps.

Geographic Information Systems Finally, a new high-tech tool that geographers use is geographic information systems (GIS). A GIS stores information about the world in a computer. It is able to combine information from many sources and show it in the form of a map.

Geographers often use GIS to solve problems. First, the geographers must decide what kinds of information will help them solve a problem. This information could include maps, photographs, statistical data, and pictures taken by satellites. The geographers then divide the information into layers. For example, one layer might show the physical features, such as hills and valleys, of a region.

A GIS then forms a map by combining the layers of information. The geographers can add or subtract layers to focus their research. Then they study the map. Using GIS in this way, geographers can study an area much more quickly, and in more detail, than they ever could before. The layers of information from GIS are very detailed and useful. But geographers are not the only ones who can make use of this technology.
**Historians’ Use of Maps**  By entering historical data into GIS, historians can make layered historical maps. For example, historians might put ancient trade routes on top of a modern satellite image. Then they could compare the courses of the routes with the locations of cities in the region to see whether cities developed along those routes.

**Review**  How might satellite mapping help historians?

**Lesson Summary**

- Over the centuries, cartographers from many cultures have developed and improved maps.
- Reading maps involves skill in understanding features developed by mapmakers over hundreds of years. There are many types of maps, including physical, political, and thematic maps.
- Geographers use satellites and GIS to get geographic information and to solve problems.

**Why It Matters Now . . .**

When you read a map, you interpret many features developed by cartographers over the centuries. People today also benefit from new mapping technologies. For example, GPS helps make accurate maps, but it can also guide rescuers quickly to wherever they are needed.

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**Terms & Names**

1. Explain the importance of:
   - cartography
   - hemisphere
   - longitude
   - projection
   - latitude

**Using Your Notes**

**Summarizing**  Use your completed chart to answer the following question:

2. How has technology changed mapmaking? (HI 2)

**Main Ideas**

3. How did Ptolemy’s works affect European mapmakers during the 1400s? (HI 1)
4. What types of features are shown on a physical map? (CST 3)
5. How can historians use the same technology as geographers in their work? (CST 3)

**Critical Thinking**

6. **Making Inferences**  Why are maps important to historians? (CST 3)
7. **Drawing Conclusions**  Why might it be useful for major landforms to be shown on a political map? (CST 3)

**Activity**

**Making a Map**  Draw a map of the area where you live. Show streets, landmarks, and physical features. Show which way is north. Then describe the relative location of where you live by using the elements in your map. (CST 3)