From Globes to Maps

When the curves of a globe become straight lines on a map, the size, shape, distance, or area can change. Imagine taking an orange peel and trying to flatten it on a table. You would either have to cut it or **distort**, or stretch, parts of it. Mapmakers face a similar problem in showing the surface of the Earth on a map. Using mathematics, they have created different types of map **projections** (pruh•JEK•shuhnz), or ways of showing the Earth on a flat sheet of paper. Each kind of projection shows the Earth's surface in a slightly different way.

Flattening Out the Planet

When you take an image of the Earth and flatten it, big gaps open up. To fill in the gaps, mapmakers stretch parts of the Earth. They show either the correct shapes of places or their correct sizes. It is impossible to show both. As a result, mapmakers use different map projections depending on their goals.

Map Projections

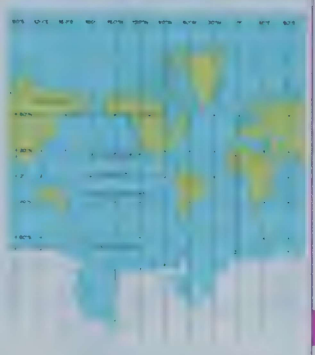
Take another look at that flattened orange peel. You might see something that looks like a map based on Goode's Interrupted Equal-Area projection. A map made using this projection shows continents close to their true shapes and sizes. This projection is helpful for comparing land areas among continents.

The map on the top right was made using the Mercator projection. It shows true direction and land shapes fairly accurately. However, it does not show correct size or distance. Areas located far from the Equator are distorted on this projection. Alaska, for example, appears much larger on a Mercator map than it does on a globe.

A map using the Robinson projection is less distorted. Land on the western and eastern sides of the Robinson map appears much as it does on a globe. Areas near the North and South Poles are distorted the most on this projection.

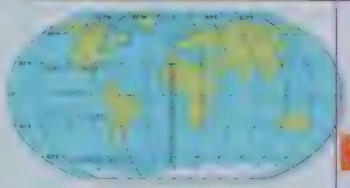
The Winkel Tripel projection gives a good overall view of the continents' shapes and sizes. You can see that land areas in this projection are not as distorted near the Poles.

Mercator Projection



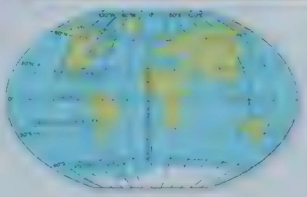
On a Mercator projection, land size and distance appear quite distorted.

Robinson Projection



The Robinson projection shows a truer picture of land size and shape. However, the North and South Poles show a great deal of distortion.

Winkel Tripel Projection



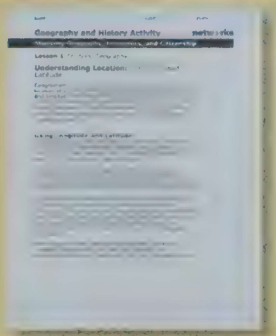
The representation of land areas on the Winkel Tripel projection most closely resembles the globe model.

PROGRESS CHECK

Analyzing What are an advantage and a disadvantage to using a map rather than a globe to study the Earth's geography?

WORKSHEET

Geography and History Activity: Understanding Location—Longitude and Latitude



Locating Have students complete the Geography and History Activity on latitude and longitude. Review the meaning of the terms *hemisphere*, *longitude*, and *latitude*. Direct students to complete the questions at the end of the worksheet, either individually or in groups. As students look at the map in the worksheet, **ask: Between which lines of latitude and longitude is our community located?** *(Students should identify your community's lines of latitude and longitude.)*

See page 25C for other online activities.

C Critical Thinking Skills

Contrasting Have students contrast the sizes and shapes of the continents shown on the map projections on these pages with the sizes and shapes of continents on a globe. **Ask: Why do landmasses on maps look different from those on globes?** *(Maps are flat representations of a round object. Each type of map distorts the view of Earth in some way.)* **Why do these map projections look different from each other?** *(Each map projection distorts the view of Earth in a different way. A map can show correct shapes or correct sizes, but not both.)* BL

W Writing Skills

Narrative Ask students to imagine they are a sailor in the 1600s sailing from Europe and trying to reach the New World. Instruct them to write a journal entry about their experiences at sea, including descriptions of their different locations expressed in terms of latitude and longitude.

T Technology Skills

Researching on the Internet Have students conduct online research to learn about the origins of the Mercator, Robinson, and Winkel Tripel projections. Have students share their findings with the class.

Content Background Knowledge

The oldest known map was discovered in 1993 by archaeologists in a cave in northern Spain. The small stone tablet measures only seven inches by five inches and is engraved with what appear to be symbolic representations of landscape features such as mountains and rivers. Scientists estimate the map to be almost 14,000 years old.

ANSWER, p. 31

PROGRESS CHECK An advantage is that maps are portable. A disadvantage is that maps distort either the size or the shape of Earth's landmasses and bodies of water.