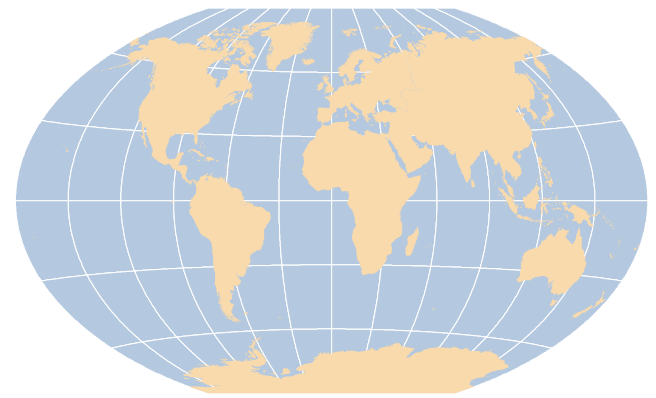


Map Distortions

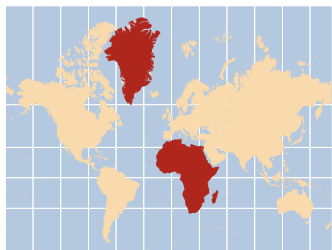
When we flatten a round globe onto a piece of paper, there will be problems with any projection that we choose. The projection of the three-dimensional globe onto a two-dimensional piece of paper requires some stretching, which results in distortion.

Since we know that all map projections have errors (distortions), we have to understand what types of distortions each type has so we can pick the best projection for a particular map. All maps will have distortion of at least one of these properties: distance, direction, area, shape, or scale.



**Winkel Tripel Projection:
A Compromise**

Some projections, known as compromise projections, try to strike a balance between the types of distortions included. This keeps the distortions small and makes the features on the map look similar to the way they are portrayed on a globe. The Winkel Tripel Projection, for example, has distortions of area, direction, and distance, but they are small projections.



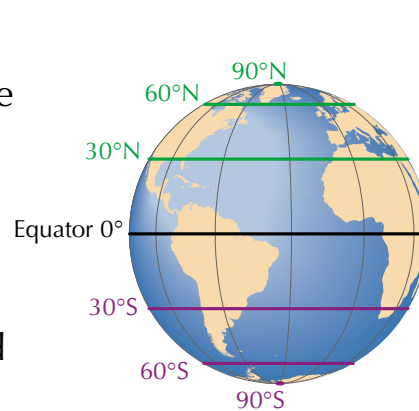
The Mercator Projection is a cylindrical projection that preserves shape but distorts area. Greenland appears the same size as Africa on this map, though Africa is in fact more than 14 times larger in real life.



The Gall-Peters Projection is a cylindrical projection that preserves area but distorts direction. The continent of South America looks like it has been stretched on this map.

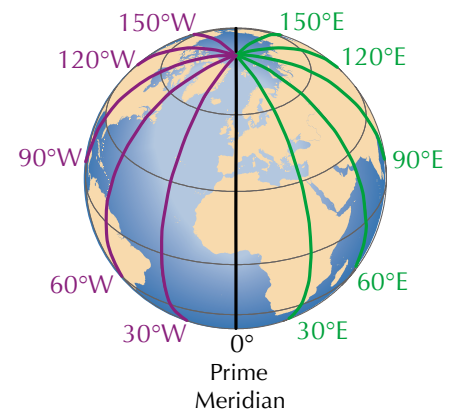
Latitude and Longitude Lines

To describe a location on the Earth exactly, we need a locational system, like a grid. Geographers use a coordinate grid system with crossing lines that are called lines of latitude and line of longitude. Each location on Earth's surface can be described relative to this grid, using what is called a coordinate. In order for the grid to work on the surface of the three-dimensional globe, latitude and longitude are measured in degrees (represented by the symbol $^{\circ}$ after a number). A coordinate includes a latitude measurement and a longitude measurement. The coordinate for the city of Fresno, California is 36° north latitude and 119° west longitude.



Latitude

Lines of latitude go around the Earth from east to west, but they measure the distance north or south from the Equator. The Equator is at 0° , with the North Pole at 90° north and the South Pole at 90° south.



Longitude

Lines of longitude connect the North and South Poles, but they measure the distance east or west from the Prime Meridian. The Prime Meridian is given a value of 0° , and longitude goes up to 180° east and west.



In this picture, this sign marks the location of the 45th parallel (line of latitude), but there is no line on the ground because these lines are imaginary. We draw imaginary lines on the globe in order to help us find and explain the exact location of places on Earth.