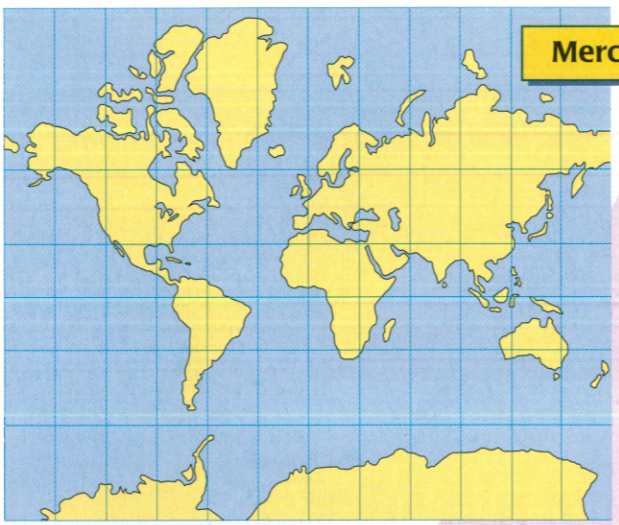
MAP PROJECTIONS

Map projections are the means by which the curved surface of the earth is transferred to the flat surface of a map. There are an infinite number of map projections, but none is as accurate as a globe. Because the earth is a sphere, a globe is its only perfect model. A globe simultaneously shows accurate shapes, sizes, distances, and directions. No world map shows all four of these properties accurately. Every world map distorts at least one of them.

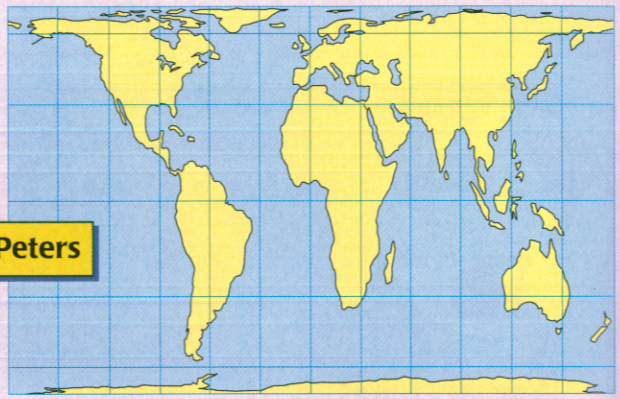
The projections shown here belong to three categories.

- **Conformal projections** show true shapes, but distort sizes. (You can remember this term's meaning by associating shape with the word *form* in conformal.)
- **Equal-area projections** show all areas in their true relative sizes, but distort shapes.
- **Compromise projections** allow some size distortions in order to portray shapes more accrately. In all types of world maps, distortion is generally least near the center and greatest at the edges.



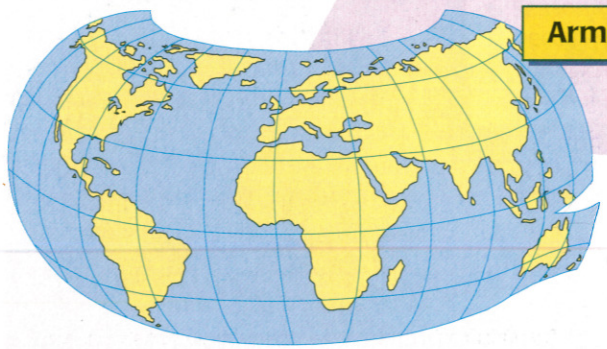
Mercator

First published in 1569, the **Mercator** is a *conformal* projection. The poles are shown not as points, but as lines the same length as the Equator. The result is extreme size distortion in the higher latitudes. The Mercator was designed for navigation, and the true compass direction between any two points is shown by a straight line.



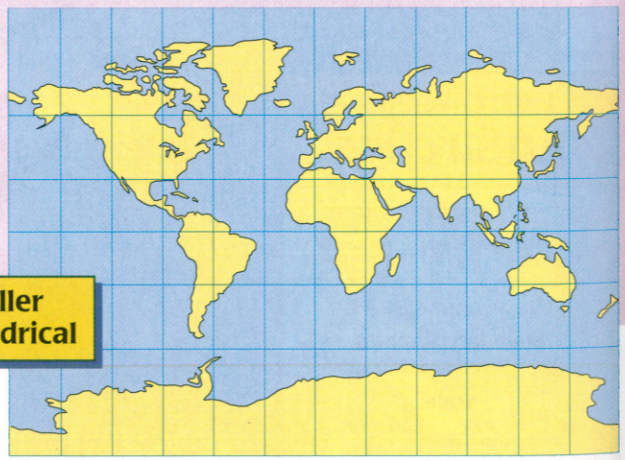
Gall–Peters

An *equal-area* projection first produced in the 1850s, the **Gall-Peters** greatly distorts shapes. Features near the Equator are stretched vertically, while features near the poles are flattened horizontally. The resulting shapes are quite different from those on a globe.



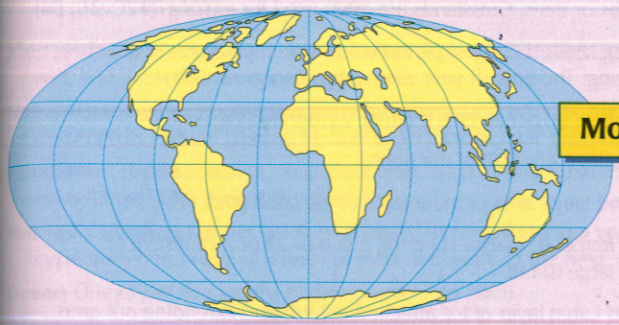
Armadillo

The **Armadillo** is a *compromise* projection is intended to give young students the impression of a map being peeled from a globe. Because its unique appearance causes severe distortions, especially at the outer edges, it is seldom used outside the classroom.



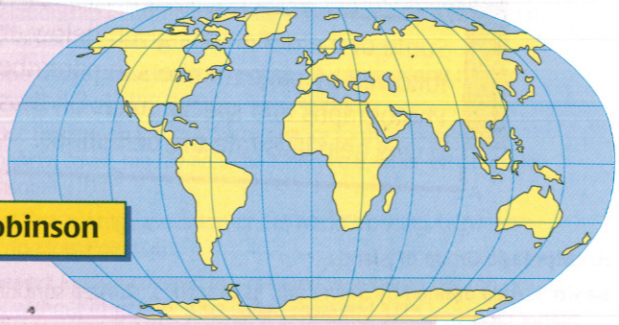
Miller Cylindrical

The **Miller** cylindrical is a *compromise* projection based on the Mercator. Its shapes are not as accurate as those of the Mercator, but it has much less size distortion. The Miller projection is often used when mapping world time zones.



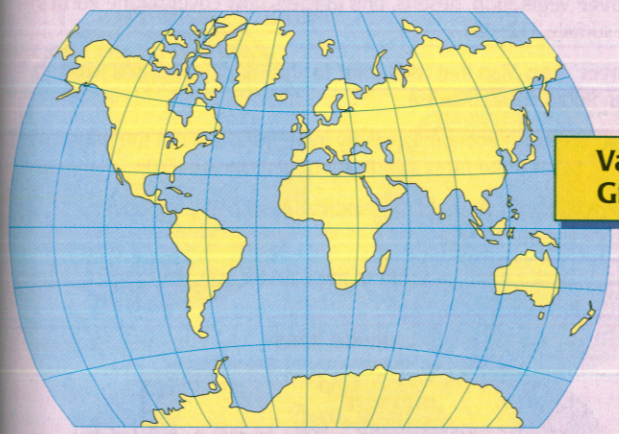
Mollweide

The oval shape of the **Mollweide** reminds viewers of a globe. An *equal-area* projection, it is frequently used for world distribution maps. (A distribution map shows the location and extent of something—such as crops, livestock, or people—across the face of the earth.)



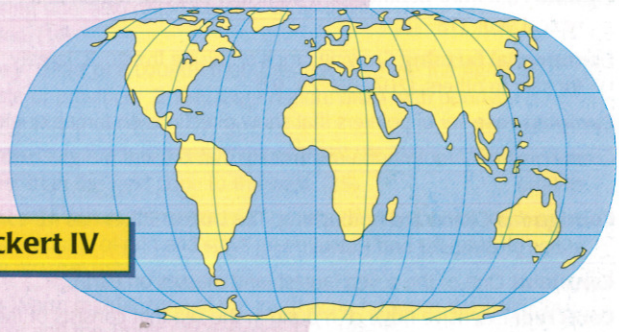
Robinson

First used in 1963, the **Robinson** is a *compromise* projection. Because it presents a reasonable overall picture of the world, it is often used for educational materials. It looks similar to the Eckert IV (below), but has more distortion in the polar areas.



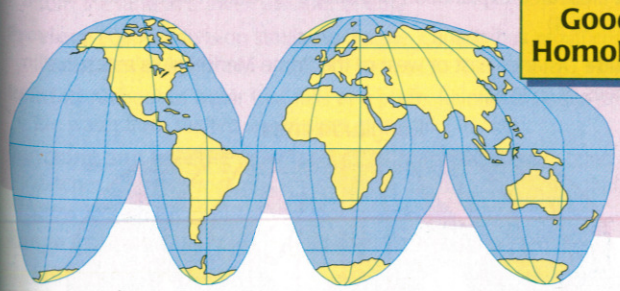
Van der Grinten

The **Van der Grinten** is a *compromise* between the Mercator and the Mollweide. The full projection forms a circle, but the polar areas are normally not shown. Shapes and directions are reasonably accurate between 60°N and 60°S, where most of the world's people live.



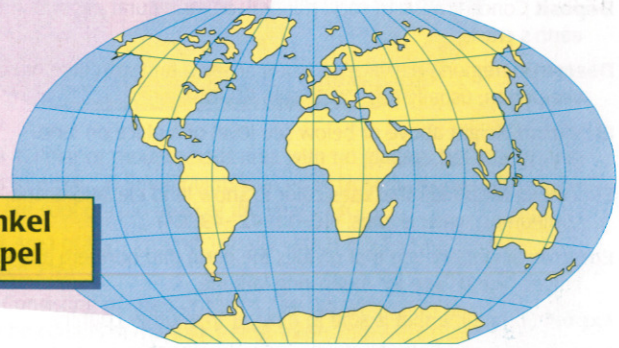
Eckert IV

An *equal-area* projection, the **Eckert IV** has relatively minor shape distortions near the Equator and poles. The result is a map well-suited either for general reference or for showing world distributions. It is often used to map world climates and other themes.



Goode's Homolosine

The **Goode's Homolosine** is an *equal-area* projection that also shows shapes extremely well. Shapes can be shown more accurately than on most equal-area maps because the grid is interrupted or split in the ocean areas. The interruptions allow land areas to be shown with less stretch or distortion.



Winkel Tripel

The **Winkel Tripel** is a *compromise* projection. Its oval shape and curving parallels result in a map with realistic shapes and minor size distortions at all latitudes. It has less size distortion than the Van der Grinten and less shape distortion than the Robinson.